

BUILDING A NETWORK FOR MANUFACTURING INNOVATION

HEARING

BEFORE THE

SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
COMMITTEE ON SCIENCE, SPACE, AND
TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRTEENTH CONGRESS

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**BUILDING A NETWORK FOR
MANUFACTURING INNOVATION**

THURSDAY, DECEMBER 12, 2013

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Subcommittee met, pursuant to call, at 10:05 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Larry Bucshon [Chairman of the Subcommittee] presiding.

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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Subcommittee on Research and Technology

Building a Network for Manufacturing Innovation

Thursday, December 12, 2013

10:00 a.m. to 12:00 p.m.

2318 Rayburn House Office Building

Witnesses

Panel I

The Honorable Tom Reed, Member, U.S. House of Representatives

The Honorable Joseph P. Kennedy, III, Member, U.S. House of Representatives

Panel II

Mr. Jonathan Davis, Global Vice President of Advocacy, SEMI

Dr. Richard A. Aubrecht, Vice Chairman of the Board, Vice President, Strategy & Technology, Moog Inc.

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**U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY**

Building a Network for Manufacturing Innovation

**Thursday, December 12, 2013
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building**

Purpose

On Thursday, December 12, the Subcommittee on Research and Technology will hold a hearing to examine the need for a manufacturing innovation network and to review H.R. 2996, the “Revitalize American Manufacturing and Innovation Act of 2013,” sponsored by Representatives Tom Reed (R-NY) and Joe Kennedy (D-MA).

Witnesses

Panel I

- **The Honorable Tom Reed**, Member, U.S. House of Representatives
- **The Honorable Joseph P. Kennedy, III**, Member, U.S. House of Representatives

Panel II

- **Mr. Jonathan Davis**, Global Vice President of Advocacy, SEMI
- **Dr. Richard A. Aubrecht**, Vice Chairman of the Board, Vice President, Strategy & Technology, Moog Inc.
- **Dr. Stephan Biller**, Chief Scientist Manufacturing Technology, GE Global Research
- **Dr. Stan A. Veuger**, Resident Scholar, American Enterprise Institute for Public Policy Research

Background

Manufacturing has been a significant part of American productivity since the industrial revolution. Manufacturing’s share of gross domestic product is approximately 11 percent, and manufacturing output has risen by 13 percent in the last several years. However, employment in the manufacturing sector as a share of the economy is significantly lower than in the post-World War II era. Despite some modest increases recently,^{1,2} American manufacturing has seen large employment declines since 2000.³ Some reports have cited declines in manufacturing employment as an indicator of a decrease in U.S. economic competitiveness,⁴ while others suggest that declines are primarily attributed to increases in productivity.⁵

¹ Made in America, Again, August 2011, Boston Consulting Group.

² Manufacturing’s Secret Shift: Gaining Competitive Advantage by Getting Closer to the Customer; March 2011, Accenture

³ Bureau of Labor Statistics, <http://www.bls.gov/data/>.

⁴ S. Ezell and R. Atkinson, “The Case for a National Manufacturing Strategy,” April, 2011, The Information Technology and Innovation Foundation. <http://www.itif.org/files/2011-national-manufacturing-strategy.pdf>

⁵ Council on Competitiveness Report, Make: An American Manufacturing Movement, December 2011, <http://www.compete.org/publications/detail/2064/make/>

Most analysts agree that manufacturing continues to be an important part of the American economy. Manufacturing is generally more research and development intensive than other sectors of the economy,⁶ and therefore more closely tied to the nation's innovative capacity.⁷ However, stakeholders express a variety of opinions on the appropriate prescription to maintain or strengthen the American manufacturing sector.

National Institute of Standards and Technology

The National Institute of Standards and Technology (NIST) is a non-regulatory agency within the Department of Commerce. Originally founded in 1901 as the National Bureau of Standards, NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. By working closely alongside industry, NIST has become recognized as a provider of high-quality information utilized by the private sector.

NIST supports U.S. manufacturing through a combination of measurement science research programs conducted through NIST Scientific and Technical Research Services and through extramural manufacturing programs, including the Manufacturing Extension Partnership and the Advanced Manufacturing Technology Consortia Program.

Scientific and Technical Research and Services

NIST currently operates six laboratory units, under the Scientific and Technical Research and Services (STRS) line in the budget, which conduct research and development for measurement science, standards, and technology. Research at the NIST laboratories is intended to advance the agency's mission of promoting US innovation and industrial competitiveness by developing and supplying test methods, measurement tools and know-how, and scientific data that are embedded in the processes, products and services of nearly every U.S. manufacturing industry, as well as the nation's service sector. NIST STRS is funded at \$579.8 million for Fiscal Year 2013.

Manufacturing Extension Partnership

NIST's Hollings Manufacturing Extension Partnership (MEP) works with small and mid-sized U.S. manufacturers to help them create and retain jobs, increase profits, and save time and money. The nationwide network provides a variety of services, from innovation strategies to process improvements to green manufacturing. MEP also works with partners at the state and federal levels on programs that put manufacturers in position to develop new customers, expand into new markets and create new products. MEP provides resources in five key areas: technology acceleration, supplier development, sustainability, workforce and continuous improvement. MEP was funded at \$119.4 million for Fiscal Year 2013.

Advanced Manufacturing Technology Consortia Program

⁶ OECD Science, Technology and R&D Statistics <http://www.oecd-ilibrary.org/content/data/data-00183-en>

⁷ S. Ezell and R. Atkinson, "The Case for a National Manufacturing Strategy," April, 2011, The Information Technology and Innovation Foundation. <http://www.itif.org/files/2011-national-manufacturing-strategy.pdf>

The Advanced Manufacturing Technology Consortia (AMTech) Program, initially proposed by the Administration in the FY 2012 budget without explicit legislative authorization, is designed to incentivize the formation of and provide resources to industry-led consortia that will support basic and applied research on long-term, pre-competitive and enabling technology development for the U.S. manufacturing industry. The objective of AMTech is to establish and strengthen technology consortia, driven by industry, to identify and prioritize research projects addressing long-term U.S. industrial research needs. AMTech received initial funding of \$14.2 million for Fiscal Year 2013.

Advanced Manufacturing National Program Office

In June 2011, the Administration launched the Advanced Manufacturing National Program Office (AMNPO), an interagency office that includes the Department of Commerce (through NIST), the Department of Defense, the Department of Energy, NASA and the National Science Foundation. The AMNPO does not have its own line item in the budget, but rather is supported through participant agency appropriations.

Housed at NIST, the AMNPO is intended to provide coordination of federal advanced manufacturing activities. It is tasked with identifying opportunities for investments in R&D, precompetitive collaboration, and shared infrastructure to support U.S. manufacturing. It is also intended to build links to technology and innovation partnerships involving U.S. manufacturers, universities, state and local governments, and other organizations.

The National Network for Manufacturing Innovation (NNMI)

The President's FY13 and FY14 budget requests included a proposal for a one-time mandatory fund of \$1 billion to establish the National Network for Manufacturing Innovation, a public-private partnership of competitively-selected institutes that would each concentrate on a particular area of advanced manufacturing technology development. According to background information provided by the Administration, the goal of the institutes is to "bring together industry, universities and community colleges, federal agencies, and regional and state organizations to accelerate innovation by investing in industrially relevant manufacturing technologies with broad applications, and to support manufacturing technology commercialization by bridging the gap between the laboratory and the market."⁸

The Administration envisions the NNMI to be the foundation of a U.S. innovation infrastructure of linked regional hubs of manufacturing excellence. The NNMI also includes an emphasis on education and workforce development in advanced manufacturing skills. The Administration proposes up to 15 institutes across the country, with the federal support to last 5-7 years. The Committee on Science, Space and Technology held a hearing (<http://science.house.gov/hearing/technology-and-innovation-subcommittee-hearing-assembling-facts-examining-proposed-national>) to review the Administration's NNMI proposal in the 112th Congress.

In August 2012, the Administration announced a pilot manufacturing institute, the "National Additive Manufacturing Innovation Institute (NAMII)," based in Youngstown, Ohio to

⁸ National Network for Manufacturing Innovation <http://www.manufacturing.gov/amp/nnmi.html>

accelerate and integrate additive manufacturing technologies to the U.S. manufacturing sector and to increase domestic manufacturing competitiveness. The pilot institute was established by reprogramming \$30 million in appropriations for the Department of Defense (DOD), the Department of Energy (DOE), NASA, NSF and other federal agencies. In the 2013 State of the Union Address, the President announced plans for three additional manufacturing institutes to be funded through DOD and DOE appropriations.

H.R. 2996, “The Revitalize American Manufacturing and Innovation Act of 2013.”

In early August, Rep. Tom Reed (NY) and Rep. Joe Kennedy (MA) introduced H.R. 2996, the “Revitalize American Manufacturing and Innovation Act of 2013,” (<http://congress.gov/cgi-bin/query/z?c113:H.R.2996>;) to authorize the creation of a Network for Manufacturing Innovation Program, based on the President’s NNMI proposal. H.R. 2996 would authorize \$600 million instead of \$1 billion as requested in the President’s proposal. Sen. Sherrod Brown (OH) and Sen. Roy Blunt (MO) introduced a companion measure, S. 1468, the “Revitalize American Manufacturing and Innovation Act of 2013,” in the Senate.

H.R. 2996 establishes the Network for Manufacturing Innovation (NMI) Program within NIST to improve American manufacturing competitiveness; stimulate innovation; facilitate transition of novel technologies to commercialization; accelerate workforce development; and leverage non-Federal capital.

The bill creates Centers for Manufacturing Innovation (CMI) to address challenges in advanced manufacturing and focus on manufacturing processes, new materials or technologies, and supply chain methodologies. CMIs will include active participation from industry, research universities, community colleges, and other entities. Activities of the CMIs include research and development, proof-of-concept and prototyping, and reducing the cost, time, and risk of commercialization of new technologies and processes. CMIs will also develop education and training programs and conduct outreach and engagement with small and mid-size businesses. Existing manufacturing centers, including the National Additive Manufacturing Innovation Institute, will be considered part of the NMI.

Under the bill, federal funding for CMIs will be awarded by the Secretary to assist in the planning, establishment, and support of centers through an open, merit-based application process. Federal funding to Centers will be limited to seven years, after which Centers will need to be self-sustaining.

H.R. 2996 establishes a National Program Office to carry out the planning, management and coordination of the centers for innovation. The Office will coordinate with other federal agencies engaged in advanced manufacturing including: DOD, Education, DOE, NASA, NSF and NIST. Within one year, the program offices will need to develop a strategic plan to guide the entire program. The Office will establish a public clearinghouse of activities being carried out within the program. Additionally, the Office will work with the Hollings Manufacturing Extension Partnership programs with the intention of coordination and avoiding duplication of efforts.

The bill requires annual reports to be delivered from the National Program Office to the Secretary of Commerce and Congress. The GAO will conduct a triennial assessment to ensure the program is fulfilling the goals of the legislation.

H.R. 2966 authorizes \$600 million in Appropriations for the creation of the Network for Manufacturing Innovation Fund, to be offset by a \$600 million rescission from appropriated discretionary funds that remain available for obligation.

Chairman BUCSHON. Good morning. The Subcommittee on Research and Technology will come to order. We are going to have a little bit of a change of order today, because, on our first panel, Congressman Tom Reed is in a markup in another Committee that, he is delayed, and couldn't testify first, so we are going to go to our second panel.

So I would like to welcome everyone to today's hearing, titled "Building A Network For Manufacturing Innovation." In front of you are packets containing the written testimony, biographies, and truth in testimony disclosures for today's witnesses. I will recognize myself for five minutes for an opening statement.

I am pleased to call to order this morning's hearing to examine the need for a manufacturing innovation network, and to review H.R. 2996, the Revitalization American Manufacturing Innovation Act of 2013, authored by Representative Tom Reed of New York and Representative Joe Kennedy of Massachusetts. I am pleased that Congressman Reed and Congressman Kennedy will be joining us later today as witnesses to discuss their proposed legislation.

Nationally, manufacturing supports 17.2 million jobs, with 12 million Americans, or roughly nine percent of the workforce, employed directly in manufacturing. Manufacturing represents approximately 11 percent of the American economy, and has the greatest multiplier effect of any major sector in the American economy. According to the Bureau of Economic Analysis, each dollar spent in manufacturing generates an additional \$1.35 in spending. In Indiana, there are nearly 10,000 manufacturers, employing more than a half a million workers, which represents 1/6 of Indiana's workforce. Not surprisingly, my state ranks first in manufacturing employment, and second in manufacturing as a gross state product.

The 8th District of Indiana is home to many of these manufacturers, and I have seen the work being done firsthand at manufacturers like Berry Plastics, Toyota Motor Corporation, and ALCOA. Along with the many manufacturers in our district, universities like Vincennes University, University of Evansville, and University of Southern Indiana offer degrees related to advanced manufacturing, and work closely with these entities to develop a talented, well trained workforce.

H.R. 2996 would establish a 600 million dollar new program based on the President's Fiscal Year 2013 and Fiscal Year 2014 budget request for the National Network for Manufacturing Innovation. H.R. 2996 would establish a network for manufacturing innovation, building a public-private partnership through Centers for Manufacturing Innovation.

Nearly half of the government spending in 2012 was spent automatically on mandatory entitlement programs. And, here in Washington, D.C., we are having an ongoing discussion about reining in the spending on the mandatory programs in order to prevent budget cuts to government programs, such as research and development, that also may affect such proposals as H.R. 2996.

I look forward to hearing from all of our witnesses, and their thoughts about the proposed legislation, and I thank them for joining us today.

[The prepared statement of Mr. Bucshon follows:]

PREPARED STATEMENT OF SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
CHAIRMAN LARRY BUCSHON

I am pleased to call to order this morning's hearing to examine the need for a manufacturing innovation network and to review H.R. 2996, the Revitalize American Manufacturing and Innovation Act of 2013, authored by Representative Tom Reed of New York and Representative Joe Kennedy of Massachusetts.

I am pleased Congressman Reed and Congressman Kennedy are joining us today as witnesses to discuss their proposed legislation.

Nationally, manufacturing supports 17.2 million jobs—with 12 million Americans, or roughly nine percent of the workforce, employed directly in manufacturing. Manufacturing represents approximately 11 percent of the American economy, and has the greatest multiplier effect of any major sector in the American economy. According to the Bureau of Economic Analysis, each dollar spent in manufacturing generates an additional \$1.35 in spending.

In Indiana, there are nearly 10,000 manufacturers employing more than half a million workers, which represents one sixth of Indiana's workforce. Not surprisingly, my state ranks first in manufacturing employment and second in manufacturing as a gross state product.

The 8th district of Indiana is home to many of these manufacturers and I have seen the work being done firsthand at manufactures like Berry Plastics, Toyota Motor and Alcoa. Along with the many manufacturers in our district, universities like Vincennes University, the University of Evansville and the University of Southern Indiana offer degrees related to advanced manufacturing and work closely with these entities to develop a talented and well-trained workforce.

H.R. 2996 would establish a \$600 million new program, based on the President's FY13 and FY14 budget request for the National Network for Manufacturing Innovation (NNMI). H.R. 2996 would establish a network for manufacturing innovation building public-private partnerships through Centers for Manufacturing Innovation.

Nearly half of government spending in 2012 was spent automatically on mandatory entitlement programs. Many in Washington D.C. refuse to discuss and enact real reforms that will rein in spending on mandatory spending programs in order to prevent budget cuts to government programs such as research and development on the discretionary side, affecting programs like the proposal in H.R. 2996.

I look forward to hearing from all of our witnesses on their thoughts about the proposed legislation, and I thank them for joining us here today.

Chairman BUCSHON. Now I will recognize the Ranking Member, gentleman from Illinois, Mr. Lipinski, for his opening statement.

Mr. LIPINSKI. Thank you, Mr. Chairman. Thank you for holding this hearing, and I think that—I want someone to count up the hearings. I believe we—hard to believe anyone has had more hearings than we have had in the Subcommittee, but that is great, because we are looking at a lot of very important issues to the country, such as this one on manufacturing. I am looking forward to hearing from Mr. Reed and Mr. Kennedy about their bill. And, prior to that, hearing from our expert witnesses here in front of us, who are going to testify as the Subcommittee continues its examination of what we can do to revitalize America's manufacturing sector.

The legislation we are discussing today is based in large part on the proposed National Network for Manufacturing Innovation, or NNMI. I have been a strong supporter of the NNMI concept, and I am proud to be a co-sponsor of H.R. 2996. Although we have heard time and time again about the crucial link between economic growth and a vibrant U.S. manufacturing sector, I think these facts bear repeating. At 60 percent of all exports, manufacturing is the largest contributor to U.S. trade. Manufacturing employs more than 11 million Americans in jobs providing above-average pay and benefits. The sector adds approximately \$1.6 trillion to our Gross Domestic Product. According to the Bureau of Economic Analysis, manufacturing has a larger multiplier effect than any other major economic activity. One dollar spent in manufacturing generates \$1.35 in additional economic activity. And, finally, manufacturing accounts for nearly 70 percent of private sector research and development.

Behind all these facts and figures is a strong link between manufacturing and innovation. And let's be honest, our Nation's competitive edge is slipping. We have to take note of countries such as Korea, Japan, and Germany that have a larger share of the advanced manufacturing sector than the United States. These nations, and others, are investing heavily in manufacturing and innovation, and they are doing so in a much more comprehensive way than we are. It is not as if the Federal Government isn't doing any good work in the areas I mentioned, but if we want to create the environment that will produce the high paying jobs of the future, and help this country keep its competitive edge, then we need to do more to support and expand advanced manufacturing.

The legislation we are discussing today has the potential to do just that. The manufacturing institutes created under the proposal can serve as centers of manufacturing excellence, accelerating innovation in the transition of cutting edge manufacturing technologies and processes to the marketplace. They can also serve as a nexus for addressing our manufacturing talent shortage. I think it is important for our manufacturing workforce, from scientists and engineers, to production workers and technicians, to have access to and experience with new, innovative technologies.

H.R. 2996 is modeled after the successful Fraunhofer Institutes in Germany. Many experts believe Germany has been able to withstand a global financial crisis in large part due to its focus on innovative technologies as a key driver of economic growth. The

Fraunhofer Institutes are widely considered to be a central and key component of the country's high tech strategy. Based on Germany's success, a number of countries, including Britain and France, have adapted the Fraunhofer model to improve the competitiveness of their manufacturers. And, in fact, sources ranging from a recent National Research Council report, to groups like the National Association of Manufacturers, have called for the establishment of a similar network of public-private manufacturing centers in the United States.

Simply put, made in America equals American jobs and a strong economy. Now, when our position as a global leader in science and technology is being threatened, we can't afford to lose our capacity to create the breakthrough technologies of tomorrow. Mr. Chairman, we must adopt smart policies and encourage innovation, and investment in manufacturing. I believe H.R. 2996 is a smart policy. I look forward to working with you, and all of my colleagues, to advance legislation like this to help keep American manufacturing strong.

Thank you, Mr. Chairman. I yield back the balance of my time.
[The prepared statement of Mr. Lipinski follows:]

PREPARED STATEMENT OF SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
RANKING MINORITY MEMBER DANIEL LIPINSKI

Thank you Mr. Chairman for holding this hearing. I am happy that we have Mr. Reed and Mr. Kennedy with us today to talk about their bill, and I look forward to hearing from them and all of our witnesses who are here to testify as the Subcommittee continues its examination of American manufacturing and efforts to revitalize this critical sector. The legislation we are discussing today is based in large part on the proposed National Network for Manufacturing Innovation or NNMI. I have been a strong supporter of the NNMI concept and I'm proud to cosponsor H.R. 2996.

Although we've heard time and time again about the crucial link between economic growth and a vibrant U.S. manufacturing sector, I think these facts bear repeating:

At 60 percent of all exports, manufacturing is the largest contributor to U.S. trade. Manufacturing employs more than 11 million Americans in jobs providing above average pay and benefits. The sector adds approximately \$1.6 trillion to our gross domestic product. According to the Bureau of Economic Analysis, manufacturing has a larger multiplier effect than any other major economic activity—\$1 spent in manufacturing generates \$1.35 in additional economic activity. And finally, manufacturing accounts for nearly 70 percent of private sector research and development.

Behind all of these facts and figures is the strong link between manufacturing and innovation. And let's be honest, our nation's competitive edge is slipping. We have to take note of countries such as Korea, Japan, and Germany that have a larger share of the advanced manufacturing sector than the United States. These nations and others are investing heavily in manufacturing and innovation and they are doing so in a much more comprehensive way than we are.

It's not as if the federal government isn't doing any good work in the areas I mentioned, but if we want to create the environment that will produce the high-paying jobs of the future and help this country keep its competitive edge, then we need to do more to support and expand advanced manufacturing.

The legislation we are discussing today has the potential to do just that. The manufacturing institutes created under the proposal can serve as centers of manufacturing excellence, accelerating innovation and the transition of cutting-edge manufacturing technologies and processes to the marketplace. They can also serve as the nexus for addressing our manufacturing talent shortage. I think it is important for our manufacturing workforce—from scientists and engineers to production workers and technicians—to have access to and experience with new, innovative technologies.

As I understand it, H.R. 2996 is modeled after the successful Fraunhofer Institutes in Germany. Many experts believe Germany has been able to withstand the global financial crisis in large part due to its focus on innovative technologies as a key driver of economic growth. The Fraunhofer Institutes are widely considered to be a central and key component of the country's high-tech strategy.

Based on Germany's success, a number of countries, including Britain and France have adapted the Fraunhofer model to improve the competitiveness of their manufacturers. And in fact, sources ranging from a recent National Research Council report to groups like the National Association of Manufacturers have called for the establishment of a similar network of public-private manufacturing centers in the United States.

Simply put, "Made in America" equals American jobs and a strong economy. Now when our position as a global leader in science and technology is being threatened, we can't afford to lose our capacity to create the breakthrough technologies of tomorrow.

Mr. Chairman, we must adopt smart policies that encourage innovation and investment in manufacturing. I believe H.R. 2996 is a smart policy. I look forward to working with you and all of my colleagues to advance legislation like this that will help keep American manufacturing strong.

Thank you, Mr. Chairman and I yield back the balance of my time.

Chairman BUCSHON. Thank you, Mr. Lipinski. I now would like to recognize the Ranking Member of the Full Committee, Ms. Johnson, for her opening statement.

Ms. JOHNSON. Thank you very much, Mr. Chairman. I would like to compliment and praise my colleagues, Mr. Kennedy and Mr. Reed, for their bipartisan work to advance the legislation we are considering this morning. The purpose of H.R. 2996 is conveyed in the legislation's title, the Revitalize American Manufacturing and Innovation Act. I am supportive of this legislation, and its purpose to revitalize American manufacturing, because I strongly believe that if the United States is to remain competitive in the long term, we need to ensure that American companies maintain their capacity to manufacture innovative products right here at home.

The key to maintaining this capacity is through strategic investments in advanced manufacturing research, development, and education. While the United States is struggling to sustain its competitive edge, other countries are focusing their full attention on manufacturing, they are implementing the policies and programs necessary to build the 21st century economies now. We simply cannot afford to stand on the sideline and watch our competitors pass us by. A vibrant manufacturing sector is just too important.

That is why, earlier this year, I introduced the Advancing Innovative Manufacturing Act of 2013, or the AIM Act. My legislation also brings the public and private sectors together to tackle the research needs of the industry. Additionally, the AIM Act focuses on ensuring that small and medium sized manufacturers have the tools they need to innovate.

Because the decline of U.S. manufacturing is a threat to the middle class jobs in our economy, the Democratic discussion draft of the America Competes Reauthorization Act includes a number of manufacturing related provisions. In fact, the proposal we are considering today is a part of that discussion draft. We need our manufacturing sector to be the most sophisticated in the world, using transformative technologies and manufacturing processes. By doing this, we can maintain our global leadership.

And I am hopeful that, as this Committee considers the reauthorization of NSF, NIST, and DOE's Office of Science, we can come together across the aisle to include policies that will stimulate American manufacturing and American jobs. Mr. Chairman, on a daily basis, many times we hear about spending so much on Medicaid, spending so much on other aid programs. Well, Mr. Chairman, until we pass legislation of this sort, we will be increasing those rolls, rather than eliminating them. I hope that this legislation can move forward. And I thank you, and yield back the balance of my time.

[The prepared statement of Ms. Johnson follows:]

PREPARED STATEMENT OF FULL COMMITTEE RANKING MEMBER
EDDIE BERNICE JOHNSON

Thank you, Mr. Chairman. I'd like to praise my colleagues, Mr. Kennedy and Mr. Reed for their bipartisan work to advance the legislation we are considering this morning. The purpose of H.R. 2996 is conveyed in the legislation's title, the Revitalize American Manufacturing and Innovation Act.

I am supportive of the legislation and its purpose to revitalize American manufacturing because I strongly believe that if the United States is to remain competitive in the long-term, we need to ensure that American companies maintain their capacity to manufacture innovative products here at home.

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While the United States is struggling to sustain its competitive edge other countries are focusing their full attention on manufacturing. They are implementing the policies and programs necessary to build 21st century economies now. We simply cannot afford to stand on the sideline and watch our competitors pass us by. A vibrant manufacturing sector is just too important.

That is why, earlier this year I introduced the Advancing Innovative Manufacturing Act of 2013—or the AIM Act. My legislation also brings the public and private sectors together to tackle the research needs of industry. Additionally, the AIM act focuses on ensuring small and medium-sized manufacturers have the tools they need to innovate.

Because the decline of U.S. manufacturing is a threat to middle class jobs and our economy, the Democratic discussion draft of the America Competes Reauthorization Act includes a number of manufacturing-related provisions. In fact, the proposal we are considering today is a part of that discussion draft.

We need our manufacturing sector to be the most sophisticated in the world, using transformative technologies and manufacturing processes. By doing this, we can maintain our global leadership. I am hopeful that as this Committee considers the reauthorization of NSF, NIST, and DOE's Office of Science we can come together across the aisle to include policies that will stimulate American manufacturing and American jobs.

Thank you, Mr. Chairman and I yield back the balance of my time.

Chairman BUCSHON. Thank you, Ms. Johnson. If there are Members who wish to submit additional opening statements, your statements will be added to the record at this point.

I am now going to introduce our panel of witnesses, and then we will hear their testimony. Our first witness is Mr. Jonathan Davis, Global Vice President of Advocacy for SEMI, the global industry association serving 2,000 member companies in the nano and micro electronics manufacturing supply chains. Prior to this, Mr. Davis served as the head of the Semiconductor IC Business Unit. Mr. Davis earned a five year architecture degree from Kansas State University College of Architecture, and designed and studied at the University of Missouri at Columbia School of Journalism.

Our second witness is Dr. Richard Aubrecht, Vice Chairman of the Board, and Vice President for Strategy and Technology at Moog, Incorporated. Dr. Aubrecht began his career at Moog in 1969 as a design and development engineer. Dr. Aubrecht studied at the Sibley School of Mechanical Engineering at Cornell University from 1962 to 1969, where he earned his Bachelor's, Master's, and Doctorate degrees.

Our third witness is Dr. Stephan Biller, Chief Scientist for Manufacturing Technologies at GE Global Research. He is responsible for GE's global advanced manufacturing strategy, and the development of GE's smart manufacturing initiative across GE businesses. Dr. Biller received a degree in electrical engineering from the RWTH Aachen in Germany, and a Doctorate in Industrial Engineering and Management Science from Northwestern University, and an MBA from the University of Michigan.

And our final witness is Dr. Stanley Veuger, Resident Scholar at the American Enterprise Institute for Public Policy Research. His academic research focuses on political economy and applied micro-economics. Before joining AEI, Dr. Veuger was a teaching fellow at the Harvard Kennedy School, Harvard College, and the Universitat Pompeu Fabra. He is a graduate of Atrac University and Erasmus University at Rotterdam, and holds a Masters in Economics from the Universitat Popeu Fabra—that is hard to say—as well as a Master's and Doctorate in Economics from Harvard University.

Welcome to all of our witnesses. As you should know, the spoken testimony is limited to five minutes, after which Members of the Committee have five minutes each to ask questions. Your written testimony will be introduced into the record of the hearing.

I now recognize our first witness, Mr. Davis, for five minutes for his testimony.

**TESTIMONY OF Mr. JONATHAN DAVIS,
GLOBAL VICE PRESIDENT OF ADVOCACY, SEMI**

Mr. DAVIS. Chairman Bucshon, Ranking Member Lipinski, and Members of the Committee, thank you for allowing me to be here to testify before you today on the need to strengthen advanced manufacturing in the United States through public-private partnerships, like the ones authorized in H.R. 2996, the Revitalize American Manufacturing and Innovation Act.

SEMI is a global industry association with about 500 U.S. member companies that serve the semiconductor manufacturing supply chain. Semiconductors are small integrated circuits, or ICs, more

commonly known as computer chips, but today these chips power far more than computers. They are the essential enabling technology for all electronics and electronic systems. Computers, cell phones, tablets, TVs, automobiles, medical devices, and components in systems for national defense and security.

SEMI represents a manufacturing supply chain that is heavily dependent on innovation and commercialization to perpetuate an incredibly advanced pace of technological development. On average, SEMI North American member companies re-invest 10 to 15 percent of their annual revenues into research and development each and every year. The cost to commercialize technology continues to increase as we compete with global competitors supported by foreign government investment. Governments around the world understand the strategic value of complete manufacturing supply chains. Many are supporting efforts to assist homegrown manufacturers to compete with U.S. companies, while also providing powerful incentives for U.S. manufacturers to move offshore.

In the case of semiconductor manufacturing equipment, we see intense efforts by foreign governments to commercialize next-generation technology outside of the United States. In Europe, they have launched the 10/100/20 strategy that will supply 10 billion Euros from the EU to leverage large investments by industry, with a goal of 20 percent market share. In China, the twelfth five-Year Plan from 2011 to 2015 from the Central Government calls for \$600 billion for seven priority technology areas, two of which include semiconductor related equipment. Taiwan and Korea also have robust funding support in efforts to strengthen their local supply chains for their important national industries. This localization effort often results in direct pressure on U.S. technology providers to relocate to their regions. Often, for both financial, or customer relations reasons, the pressure to relocate overseas is formidable.

We understand that the U.S. faces its own budgetary fiscal challenges related to discretionary and non-discretionary funding. Mandatory funding continues to grow, while non-discretionary funding becomes smaller, and that model simply isn't sustainable. It is our hope that Congress will find the correct balance between discretionary and non-discretionary programs so that worthy policy objectives, such as H.R. 2996, can be debated, and we hope implemented.

We believe that 2996, the Revitalize American Manufacturing and Innovation Act, provides the needed leadership by the United States government to compete with foreign governments, and to strengthen and grow strategically important manufacturing industry. This legislation provides public-private partnership model that we believe will strengthen the supply chains of numerous strategic manufacturing industries.

The legislation doesn't help one company, or one university. It enables an entire vertical supply chain for specific manufacturing industries. We believe that is the proper role for the Federal Government to take, assist an entire industry, with everyone, including academia, state and local governments, and industry putting skin in the game. 2996 authorizes the creation of Centers for Manufacturing Innovation. Each center will focus on a specific technology

for the commercialization of manufactured goods. Such a model allows for pre-competitive research, or pilot scale manufacturing product development.

As I said earlier, SEMI member companies' cost to commercialize the next generation of technology into then manufactured product is extremely expensive. Having a shared manufacturing pilot line for all companies, including large and small, that are part of the supply chain saves resources for everyone. It is especially important for small and medium suppliers, who cannot afford the high cost to commercialize technology. The legislation is technology neutral. The government cannot require specific technologies. Rather, they will be competed through a merit based solicitation process.

One of the technologies our member companies produce are light emitting diodes, and I see mine is red now, so I will refer you to my written testimony, and be happy to answer questions.

[The prepared statement of Mr. Davis follows.]

Written Testimony
Jonathan Davis, Global Vice President, Advocacy, SEMI
Before the
Committee on Science, Space, and Technology
Subcommittee on Research and Technology
U.S. House of Representatives
December 12, 2013

Chairman Buchson, Ranking Member Lipinski, and members of the committee, thank you for allowing me to testify before you today on the need for public-private partnerships to strengthen advanced manufacturing in the United States, like the ones authorized by H.R. 2996, the Revitalize American Manufacturing and Innovation Act.

My name is Jonathan Davis, and I am a Global Vice President for SEMI – a global industry association that serves the semiconductor manufacturing supply chain, with about 500 U.S. member companies. Semiconductors are small integrated circuits or "ICs" – known as "computer chips". They are the enabling technology for all electronics and electronic systems – computers, cell phones, tablets, TVs, automobiles, medical devices, and components and systems for national defense and security.

SEMI represents a manufacturing supply chain which is heavily dependent on innovation and commercialization to perpetuate what is an incredible pace of technological advancement. On average SEMI North American members reinvests 10-15% of revenues into R&D and every year. The cost to commercialize technology continues to increase as we compete with global competitors supported by foreign government investment.

SEMI Members' Business Challenges

Governments around the world understand the strategic value of complete manufacturing supply chains. Many are supporting efforts to assist home grown manufacturing to compete with U.S. companies while also providing incentives to U.S. manufacturers to move offshore. In the case of the semiconductor equipment manufacturing, we see intense efforts by foreign government to commercialize next generation technology outside of the United States.

In Europe, they have launched the '10/100/20' strategy that will supply €10 billion from the EU to leverage €100 billion investment by industry, with the goal of 20 percent of global chip manufacturing by 2020.

In China, the 12th 5-year plan (2011-2015) from the central government calls for \$600 Billion for 7 priority technology areas, 2 of which include semiconductor related equipment.

Taiwan and Korea also have robust funding support in efforts to strengthen the local supply chain for their important national industries. This localization effort often results in direct pressure on US technology providers to relocate to their regions. Often, for both financial reasons and customer relations – the pressure to relocate some operations overseas is formidable.

We understand that the U.S. government faces its own budgetary fiscal challenges related to discretionary and non-discretionary funding. Mandatory funding continues to grow while non-discretionary funding becomes smaller. This model isn't sustainable. It's our hope that the Congress will find the correct balance for discretionary and non-discretionary programs so worthy public policy objectives such as H.R. 2996 can be debated and we hope implemented into policy.

H.R. 2996, the Revitalize American Manufacturing and Innovation Act

We believe H.R. 2996, the Revitalize American Manufacturing & Innovation Act provides the needed leadership by the United States government to compete with foreign government efforts and strengthen and grow strategically important manufacturing industries.

This legislation provides a public private partnership model that we believe can strengthen the manufacturing supply chains of numerous strategic manufacturing industries. The legislation won't help one particular company or university. It will enable an entire vertical supply chain for a specific manufacturing industry. We believe this is the proper role for the federal government to take – assist an entire industry, with everyone, including industry, academia, and state and local governments putting skin in the game.

H.R. 2996 authorizes the creation of Centers for Manufacturing Innovation (CMI). Each CMI will focus on a specific technology for commercialization of manufactured goods. Such a model allows for precompetitive research and or pilot scale manufacturing product development. As I mentioned earlier, SEMI member companies cost to commercialize next generation technology into a manufactured product is extremely expensive. Having a shared manufacturing pilot line for all companies, large and small, that are part of the supply chain to share saves resources for everyone. This is especially important for small and medium suppliers who cannot afford the high cost to commercialize technology.

The legislation is technology neutral. The government cannot require specific technologies in the solicitations from the NIST based Network for Manufacturing Innovation (NMI) program office. All industries representing many different technologies can participate in bringing forth solicitation responses for consideration...with competition for the best ideas, and the strongest programs being at the center of the submissions

The legislation has an emphasis on proposals that strengthen U.S. manufacturing industries and return value to the U.S. tax payer in retaining and creating U.S. based manufacturing jobs. Also matching funds are required; most likely a 2 to 1 match from industry, with a requirement that the CMI's being self-sustaining without any federal funding after 7 years. These requirements will bring industries that commercialize technology to the forefront versus industries that are still in research and development.

In closing, SEMI supports H.R. 2996 as a useful and constructive mechanism for the federal government to partner with industry to strengthen advanced manufacturing in the United States. Thank you for your invitation to testify here today, and I look forward to answering any questions you may have.

Witness Biography:

**Jonathan Davis
Global Vice President of Advocacy, SEMI**

Jonathan Davis is a member of the Global Executive Team of SEMI, the global industry association serving 2,000 member companies in the nano- and microelectronics manufacturing supply chains.

In his role as Global Vice President of Advocacy, he works to ensure SEMI member interests are represented on all global fronts.

Prior to his current position, Davis served as head of the Semiconductor IC Business Unit with responsibility for market research and statistics programs, SEMI International Standards, the Environmental Health and Safety (EHS) Division and SEMICON expositions, conferences and programs worldwide.

Previously, Davis served as President of SEMI North America and Executive VP of Global Expositions, Communications, Marketing and EHS. Davis had responsibility for the association's global exposition operations, corporate marketing, creative services, communications and public relations, research and information products.

Davis joined SEMI in 1992 to initiate the organization's Outreach Program and lead the association's Membership Department.

Before joining SEMI, Davis worked for nine years at HNTB, a national architecture and engineering firm. He earned a 5-year architecture degree from the Kansas State University College of Architecture and Design and studied at the University of Missouri at Columbia School of Journalism.

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Chairman BUCSHON. Thank you, Mr. Davis.
I will now recognize our next witness, Dr. Aubrecht, for his testimony, five minutes.

**TESTIMONY OF DR. RICHARD A. AUBRECHT,
VICE CHAIRMAN OF THE BOARD,
VICE PRESIDENT,
STRATEGY & TECHNOLOGY, MOOG INC.**

Dr. AUBRECHT. Thank you very much for this opportunity to testify. Let me start by giving a little background on Moog. We are headquartered in Buffalo, New York. We have been in business for about 60 years. We were actually a spin-out of Cornell University to begin with. Our primary products and technologies relate to precision motion control. We supply flight controls for aircraft. We have all the flight controls on the F-35. We have the same position with Boeing on the 787, and with Airbus. This is the first time Airbus has ever gone outside Europe for that sort of control system. And just recently we won the same kind of a program at Embraer in Brazil.

We are a global company, about \$2-1/2 billion in sales, 13,000 employees. We are a manufacturing company. We have had a history of 60 years of being on the leading edge of the technology, but what enables that is to be a leading edge manufacturer. It is not just a matter of being able to design things. You have got to be able to make things. And so, with our global perspective—I travel all over the world. We have locations in 30 countries around the world, 15 manufacturing locations around the world, seven locations in the United States, and so I am very aware of the competitive nature of international manufacturing. And what we—a lot of what we sell overseas we make overseas, but we also export a lot from our facilities here in the United States.

I am in full agreement with the premise outlined in the Dear Colleague letter. Manufacturing is very important in the U.S. economy, and it also is highly dependent upon the skilled technicians, and machinists, and electronic technicians that put our products together every day. Currently we are facing a significant increase in our need for training. We had a great growth period in the 1970s and '80s. A lot of these people are retiring over the next ten years, so we have significant need at this point in time for improved training.

I believe the question we should be asking today is not do we need more training, but how to more effectively provide training. This Act is about productivity, and about innovation, and I would suggest to think about how you can be more productive and innovative in training. Recently, in the last five or six years or so, there have been—what are called massive open online courses have been developed. There are 100 universities that have joined consortia, such as Udacity, and—ExEd is the other one, and they are redoing the model for providing education. And it seems to me that you could take that model and use that for providing a lot of the basic training that you need for manufacturing technicians of all kinds, machinists, electronic technicians, software programmers. It can be done online. That is the whole premise of that sort of training.

The reason for doing it is that you can get the very best lecturers to put the courses together, and then provide them asynchronously to people all over the country. So you have got an ability to be able to deliver wherever it is. We have some of our facilities in Murphy, North Carolina. There are no training facilities in Murphy, North Carolina. This would enable us to be able to provide courses to these sort of people all over. The other is it is asynchronous, so people can do it on their time. You don't have to show up at 7:00 on Tuesday and Thursday evening, and drive 100 miles to go to the course.

So, to me, the Federal Government could play a very key role in seeding that sort of capability, work with people like Coursera and ExEd that have put these programs together. They have the technology already worked out to provide the courses. What is needed is somebody to pull that together and provide the seed funding. There is also, it seems to me, a number of natural partners for all of that. There are—the companies who manufacture the equipment, they already have training programs in place, but they are all in place programs. You have to travel to wherever their training centers are, very expensive to do that. The other are—part of what is mentioned in the material for the Act is talking about supply chain management. There are two associations of people and supply chain managers. They already have training and certificate programs. You could work with them and provide their kind of training online all over the country.

So it seems to me, when you think about innovation, you want to think about, how is it we can provide more training at a much lower cost? The universities that have gone into this already have seen that their—the cost per student goes down by an order of magnitude. It is down less than ten percent of what it costs to do it in place. And the other countries that I travel to aren't even thinking about this at this point, even at the university level. So if the United States wanted to gain a significant advantage in training for manufacturing, this would be one way of doing, use it—use the online capabilities that are already there.

In summary, I think the government could very effectively take that sort of a role, and provide the necessary risk capital, is the way I think of it, to be able to get some sort of thing going. It is not going to happen unless somebody like that steps in and does it. The industry will support it once it is there, but you have to have somebody who takes and pulls it together. And, as I say, there are natural partners. You don't have to start from ground zero.

So thank you very much.

[The prepared statement of Dr. Aubrecht follows:]

Moog

12 December 2013

Testimony
House Committee on Science and Technology

I am very pleased to have been invited to testify at the 12 December 2013 Congressional Hearings relative to H.R. 2996.

Moog Inc. is a 2.6 billion dollar company with our own facilities in 30 countries. We design and manufacture precision motion controls applied on aircraft of all types, launch vehicles, satellites, and industrial automation. We have been a leading-edge manufacturing company since our founding in 1951. Today, we have manufacturing locations in seven USA locations and 15 countries around-the-world. Significant factors in our success have been our focus on using innovative manufacturing machinery and technology, training our employees, and developing supply chain partners.

With this background, I can say my Moog colleagues and I are in full agreement with the premises outlined in Mr. Reed's and Mr. Kennedy's "Dear Colleague" letter. Manufacturing is a very important component in the USA economy. Many of our most skilled and experienced machinists, test technicians, and manufacturing engineers will be retiring in the next ten years. I do not believe we are unique in this regard. Most of our supply chain vendors have the same problem. We have worked with Erie Community College in Buffalo on training programs for over 40 years with good results. However, we now have facilities in six other locations, most of which do not have local training programs comparable to those in Buffalo. So having a network of Centers could help provide the in-place for training where we have facilities. The Federal Government could provide the seed money to create such a network. However, it seems to me that the question we should be addressing is not "Do we need more training in advanced manufacturing techniques and technologies?" but rather "How to most effectively provide the capabilities for training?"

Since this Act is about increasing productivity and innovation, it would seem the Act should encourage or even mandate that the leading-edge training and education techniques should be used. In the past five years, there has been a very rapid development of Massive Open On-line Courses (MOOCS). About one hundred of colleges and universities, including the leading schools are actively and aggressively pursuing developing their on-line course offerings. The courses are available on-line with the lectures available asynchronously. MOOCS have already

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shown they can produce a quality educational experience for many fields at a cost one-tenth of the on-campus model. I believe the MOOCS model can be used to provide the foundation courses for many of the disciplines needed in manufacturing such as mathematics, electronics, computer science, etc. Clearly, some training involves hands-on experience with actual equipment. However, most of the basic courses can be taught in the MOOCS format.

Consortia of universities have already been formed by groups, such as Udacity, edX, and Coursera, who have developed the processes and infrastructure to deliver on-line courses. Their current capabilities could be expanded to include the type of training and courses required for advanced manufacturing. The major advantages of the MOOCS format is the courses are taught by the best lecturers and students can access the lecturers on their own schedules without having to travel to a specific location at a specific time. In addition, courses are not dependent on the availability of physical facilities which is a large cost with the in-place education model.

It would also be possible to engage with companies and organizations that already have training programs in manufacturing. These would include companies who manufacture production equipment. They have the best view of the advances being made in manufacturing technologies and have an inherent interest in training people to operate their machines. Relative to supply chain, there are two groups, APICS and The Supply Chain Council, who have training and certificate programs in place for supply chain people. There is a possible role for the Federal Government to help these programs increase their reach by enabling these natural partners to develop their training in the MOOCS format.

How should policy makers prioritize spending decisions on manufacturing research and development programs in the current budget environment?

Relative to manufacturing research, I do not believe the Federal Government needs to spend on manufacturing research. We participate in industrial consortia at Purdue, Penn State, University of Wisconsin, and the University of Illinois on specific technical areas. Each of these has a manufacturing component. These are funded by companies who manufacture products. Most

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of the research is pre-competitive and openly shared. I believe this is a more effective model than having the Federal Government pick which technologies to research and develop.

Relative to training, as I outlined above, there is a role for the Federal Government in developing a new lower cost model for training programs. This Act risks being just another in a long string of Federally-sponsored training programs if it does not use this as an opportunity to change the training delivery mechanisms and these by dramatically lower the cost through the MOOCS model. The provision for a seven-year sunset should prevent this from becoming another institution with its own interest groups.

Given the current budget deficits, it is difficult to increase spending in any area without making cuts in other programs. Manufacturing is a very important component in the U.S. economy. To maintain our competitive position in the global economy, we need to have the best most productive workforce. That takes training. We have previously seen cycles when a large number of employees retired in a relatively short time period. Several articles by various professional and trade groups have noted the current large number of retirements just at the point there are a number of new manufacturing technologies. So one could argue a manufacturing initiative will provide a real sustained return to the U.S. economy. But as with a business, one needs to make reductions in one area to fund investments in another area.

In summary, this Bill comes at an opportune time to innovate the way manufacturing training is accomplished at a time when there is an increased need for training. The research component is probably best left to the universities with corporate consortia funding.

BIOGRAPHY

Dr. Richard A. Aubrecht, Vice Chairman, Vice President, Strategy and Technology, has worked at Moog Inc. since 1969. He began his career at Moog as a Design and Development Engineer at Moog GmbH, in Germany. He managed a Research and Development section in the Domestic Controls Division from 1972 to 1974, and then served as Manager of the Special Products Division from 1974 to 1976.

From 1976 to 1979, Dr. Aubrecht worked as Vice President of Research and Development, Midwest American Dental Division of American Hospital Supply Corp. He returned to Moog Inc. in 1979 to serve in the Office of the President, and was named Vice President Administration and elected a Director in 1980. In 1988, he was named Chairman of Moog Inc. and served in that capacity until 1996 when he was elected Vice Chairman and Vice President, Strategy and Technology.

Dr. Aubrecht studied at the Sibley School of Mechanical Engineering at Cornell University from 1962 to 1969 where he earned B.S., M.S. and Ph.D. Degrees.

He has served or is currently serving as a Director of several organizations including the Western New York Technology Development Center, the Engineering Dean's Advisory Council at SUNY Buffalo, Buffalo Prep, and the Mercy Hospital Foundation. He is currently Chairman of CUBRC and The Hauptman-Woodward Institute. Both are leading-edge technology development companies. In the field of education, he has been a Trustee and Trustee Emeritus of The Nichols School since 1982 and a Trustee of Cornell University since 1992.

Chairman BUCSHON. Thank you, Dr. Aubrecht.
I will recognize now Dr. Biller for five minutes for his testimony.

**TESTIMONY OF DR. STEPHAN BILLER,
CHIEF SCIENTIST MANUFACTURING TECHNOLOGY,
GE GLOBAL RESEARCH**

Dr. BILLER. Chairman Buchson, Ranking Member Lipinski, Members of the Committee, it is a privilege to share with you today GE's thoughts on the creation of the NNMI program, and the establishment of Centers of Manufacturing Innovation, or CMIs.

GE Global Research was America's first industrial research lab, established in 1900. For more than 100 years, it has been the cornerstone of innovation for GE, and a proud contributor to the U.S. lab manufacturing revolution that helped shape and define the 20th century. Today we would like to share GE's thoughts on launching an NNNMI, and the critical role such an initiative can play in helping American companies be leaders in the next manufacturing revolution that is rapidly defining the 21st century.

Innovation has always been one of our nation's greatest assets, but if the United States is going to be a leader in manufacturing moving forward, the country needs to embrace new trends that are driving our ability to compete.

Mr. LIPINSKI. Dr. Biller, could you pull the microphone closer?

Dr. BILLER. Is this better?

Chairman BUCSHON. That is much better.

Dr. BILLER. I am sorry. Okay. To become more competitively globally, government support for innovation has to become more targeted, involve more partners, and commit to longer time horizons that are closer to commercialization. Other developed high wage countries, such as Germany and Japan, have long taken such an approach, and found much success, considering their levels of manufacturing employment. Similarly, the launch of the NNMI would embrace this innovation model, and significantly improve the competitiveness of U.S. manufacturing.

The success of the NNMI will depend on having a healthy ecosystem of centers of manufacturing innovations, or the CMI's, with participants from academia, government, and industry. We believe that it is paramount to U.S. manufacturing competitiveness that the CMIs help small and medium enterprises, the SMEs, introduce novel manufacturing technology into the U.S. manufacturing supply chain more rapidly. To provide these SMEs with the best possible framework to succeed, we recommend adapting a SEMATECH-like collaboration model that provides broad access to state-of-the-art equipment, draws leadership of CMIs from industry, and leverages CMIs as a training ground to develop an advanced manufacturing workforce. We believe the NNMI can provide the broad framework that strengthens the U.S. industrial base position as a global manufacturing leader.

Last year GE was very pleased when the first innovation institute was established under the NNMI, in additive manufacturing, or NAMI, in Youngstown, Ohio, and is proud to be an industry partner. Already NAMI is beginning to show how big companies like GE can connect and work effectively with small and medium companies to push new advancements.

In the same way that CMIs should draw upon the unique skills of academia, government, and industry, it is equally important for each of the CMIs' governing boards to draw its membership from academia, government, and industry. When it comes to day-to-day operations, however, the leaders for each institute, and a number of their staff, should be recruited from private industry, and have demonstrated experience in the insertion of advanced manufacturing technology into production. We believe that is really the key. This will ensure that industry sees the benefit of engagement with CMIs, and participants in these institutes, on a long term basis.

Many large companies, like GE, have continued to use apprenticeship programs to build the skilled workforce of tomorrow. The skills gap, however, is not limited to producing a production workforce. The proportion of science and engineering workforce older than 50 has risen significantly in recent years as well. We must also place emphasis on replenishing the advanced manufacturing researchers that will be necessary to develop tomorrow's technology breakthroughs. The NNMI is really an ideal place to do that.

Regarding the design of these CMIs for broad impact, GE would like to make the following recommendations. Each Center for Manufacturing Innovation should focus its effort on addressing the fundamental technical barriers that prevent manufacturers from broadly adopting specific technologies. To accomplish this, each CMI should adopt an inclusive SEMATECH-like approach that includes participants from each part of the manufacturer's supply chain. The equipment within each of these CMIs should be made available to all companies so they can conduct manufacturing trials to reduce implementation risks, and improve the productivity and competitiveness of their manufacturing operations, very much like the Fraunhofer Institutes in Germany.

At the same time, companies that provide advanced technology equipment to the CMIs should be allowed to count these in-kind contributions toward membership or participation fees. This will ensure that the CMIs will always have access to state-of-the-art equipment. The advisory boards that provide direction to the CMIs should be comprised of individuals from industry, government, academia, but the leadership teams should be recruited from industry, and should have experience in the insertion of advanced manufacturing technology. Additionally, the NNMI should create a mechanism for collaboration, technology transfer, and the aspect of sharing.

Finally, working with community college and universities, CMIs should provide internships to train the future advanced manufacturing workforce. Furthermore, mechanisms should be created to allow private sector employees to collaborate at the CMIs for long term assignments. The NNMI represent, really, a significant opportunity for the United States to restore its manufacturing prowess and improve its competitiveness. GE is really committed to creating an industrial manufacturing ecosystem by working with other organizations to form these CMIs.

Thank you, and I look forward for your questions.
[The prepared statement of Dr. Biller follows:]

**Testimony before
The Subcommittee on Research and Technology of the House Committee on Science, Space
and Technology
Thursday, December 12, 2013**

**Stephan Biller – Chief Manufacturing Scientist, GE Global Research
Email: biller@ge.com**

Chairman Bucshon, Ranking Member Lipinski and members of the Committee, it is a privilege to share with you GE's thoughts on the creation of the Network of Manufacturing Innovation (NNMI) Program and the establishment of Centers for Manufacturing Innovation (CMI). I am Stephan Biller and I serve as GE's Chief Manufacturing Scientist at GE Global Research.

GE Global Research was America's first industrial research lab, established in 1900. For more than 100 years, it has been cornerstone of innovation for GE and proud contributor to a US led manufacturing revolution that helped shape and define the 20th century. .

Today, GE's research and development organization is a thriving global enterprise with research centers in every major region of the world. We support every GE business with advanced technology solution that impact a wide range of industry sectors from energy, aviation and transportation to water, healthcare, lighting and appliances. With a global perspective in several industries, we essentially have a front row seat to the challenges and opportunities our businesses face every day to remain competitive in the global economy. It's this firsthand experience and perspective that continually teaches us new lessons on how manufacturers can be competitive. With this context, I'd like to share GE's thoughts on the launching of an NNMI and the critical role such an initiative can play in helping American companies be leaders in the next manufacturing revolution that is rapidly defining the 21st century.

Launching an NNMI

Historically and today, innovation has always been one of our nation's greatest assets. But if the US is to be a leader in manufacturing moving forward, the country needs to embrace new trends that are driving manufacturing competitiveness. Future success requires more expansive thinking about how you allocate your funding resources and how you collaborate to drive needed advances.

The U.S. has always been strong in supporting early stage R&D discoveries that have ultimately led to new commercial opportunities. A great example is GE's introduction of the first digital x-ray product in 1999. It was early support from the US government in the basic science behind digital x-ray that kept the technology development moving at a critical juncture of the research program. This paradigm is changing. Today, government support for innovation has to be more targeted, involve more partners and be committed to longer time horizons. For innovations to be implemented by enterprises of all sizes, funding and collaboration needs to continue to a small-scale production level, or later stages of R&D closer to commercialization. Other developed high-wage countries, such as Germany and Japan have long taken such an approach and their current level of manufacturing competitiveness is evidence that such a funding approach is highly beneficial to their societies considering their levels of manufacturing employment. Similarly, the launch of the Network of Manufacturing Innovation (NNMI) would provide an opportunity to significantly improve the competitiveness of U.S. manufacturing.

Fostering public-private partnerships and building shared facilities and infrastructure, the U.S. will be well positioned to redefine its manufacturing infrastructure. To maximize the impact of the National Network for Manufacturing Innovation (NNMI), it is essential to establish a healthy ecosystem of Centers for Manufacturing Innovation (CMI) with participants from academia, government, and industry. We believe that it is paramount to US manufacturing competitiveness that the CMIs help small and medium enterprises (SMEs) introduce novel manufacturing technology into the U.S. manufacturing supply chain more rapidly.

To provide SMES with best possible framework to succeed, we recommend adopting a SEMATECH-like collaboration model that provide broad access to state-of-the-art equipment, draws leadership for CMI's from industry, and leverages CMI's as a training ground to develop an advanced manufacturing workforce. SEMATECH is an ecosystem of private and public players in the broader semiconductor community (device makers, universities, governments, national laboratories, and the entire industry supply chain). Together, they worked to successfully to re-establish U.S. leadership in the semiconductor industry space. Following the SEMATECH model, the NNMI can provide the broad framework that strengthens the U.S. industrial base's position as a global manufacturing leader.

GE involvement in NNMI

At GE, we believe that disruptive innovation often happens at the intersection of technical fields as well as during collaborations between academia, government labs, and enterprises of all sizes. The NNMI provides an ideal framework for these types of intersections and collaborations in manufacturing to flourish and importantly, welcome a larger pool of SMEs that previously have not had the opportunity to participate in these efforts.

Last year, we were pleased when the first innovation institute was established under the National Network for Manufacturing Innovation (NNMI) in additive manufacturing and proud to be an industry partner. Already the National Additive Manufacturing Innovation Institute is beginning to show how big companies like GE can connect and work effectively with small and medium sized enterprises to push new advancements. It underscores the vital importance creating an advanced manufacturing ecosystem that allows SMEs to unleash their practical innovation capability within the CMI's. Such efforts will substantially improve the US-based supply base and domestic innovation.

For SMEs to grow and be globally competitive, they need to understand the market opportunities and technical needs that their products and processes can address. By adopting a SEMATECH-like model for CMI's, SMEs will be able to work in close collaboration with large

industrial enterprises, which source parts or equipment from the SMEs. This will enable SMEs to more efficiently understand the requirements their products must satisfy. And it is with this critical information that SMEs will be able to most efficiently allocate their resources and shorten their development cycles.

Similarly, CMIs can be a great support for advancing promising technology being developed in university research and development labs across the nation. With the increased emphasis universities are placing on technology transfer and commercialization, the CMIs will create a robust pipeline of university-initiated technologies that could be scaled up for insertion into the domestic supply chain.

In addition to being a member of the National Additive Manufacturing Innovation Institute (NAMII), GE also has been participating in the proposals for the three most recently announced institutes. Specifically, GE has partnered with UI Labs in response to the Digital Manufacturing and Design Innovation Institute (DMDI). This institute is of particular importance as it will enable the broad implementation of the digital thread into enterprises of all sizes. We believe the digital thread represents the next big frontier in manufacturing that will revolutionize how product design and manufacturing happens. More collaboration on design and manufacturing processes is happening virtually, which will provide a new degree of access for SMES to become more active participants. The DMDI can help encourage greater SME participation by providing them access to advanced manufacturing digital technology and the opportunity to train their staff in these tools. Only with proficiency in these tools will SMEs be able to stay competitive in product and manufacturing systems design and improve productivity and quality in cooperation with the large enterprises.

Beyond the DMDI, GE also has participated in a New York led consortium being proposed in response to the DOE's Wide Band Gap Semiconductor Institute, as well as teams responding to a recent U.S. Department of Defense (DOD) call to establish a Lightweight and Modern Metals Manufacturing Institute (LM3II).

CMI Governance and Technology Transfer

In the same way that CMIs should draw upon the unique skills of academia, government, and industry, it is equally important for each CMI's governing board to draw its membership from academia, government and industry. When it comes to day-to-day operation, however, the leaders for each institute and a number of their staff should be recruited from private industry, and they should bring demonstrated experience in the insertion of advanced manufacturing technology into production. If the expectation is that each CMI will become self-sufficient, industry will need to see the fruits of its investment manifested in new capabilities. This is particularly important given the stated expectations that private industry should provide up to 50% of the funding to operate the CMIs. Drawing much of the institute's leadership team from industry is the best way to ensure that industry sees the benefit of engagement with CMIs and participates in these institutes on a long-term basis.

Strengthening Workforce Skills

As was pointed out in the NSTC report, 67% of companies surveyed in a recent industry association survey reported a serious shortage in the availability of qualified workers. Many large companies like GE have continued to use apprentice programs to build the skilled workforce of tomorrow. For example, GE Aviation in Lynn, Massachusetts has partnered with North Shore Community College for its apprentice program, and GE Energy in Schenectady, New York has partnered with Hudson Valley Community College's successful Manufacturing Technical Systems program. This program provides trained manufacturing employees to the 19 companies that have partnered with HVCC, and it boasts a 95% placement rate prior to graduation¹. In addition, GE has partnered with 190 companies to establish the Get Skills to Work program. The program's goal is to train and match 100,000 veterans with jobs by 2015.

¹ Manufacturing Technical Systems (A.O.S), www.hvcc.edu/eit/mft/career.html

In 2012, GE was able to meet its commitment to hire 1,000 veterans. It is on pace to meet its goal of hiring 5,000 veterans between 2012 and 2016. Today, one of every 13 GE employees in the United States is a veteran.

The skills gap, however, is not limited to producing a production workforce. According to the National Science Foundation, the proportion of the science and engineering workforce older than 50 increased from 18% to 27% between 1993 and 2008. As a result, it is equally important to place emphasis on replenishing the advanced manufacturing researchers that will be necessary to develop tomorrow's technology breakthroughs. The NNMI is an ideal mechanism to create the next generation of skilled innovators, which is critical if the United States is going to continue to be a source of new ideas in the world.

Recommendations

As we think about how best to design the CMIs for broad impact, GE would like to make the following recommendations:

1. Each Center for Manufacturing Innovation (CMI) should focus its efforts toward addressing the fundamental technical barriers that prevent manufacturers from more broadly adopting specific new technologies. To accomplish this, each CMI should adopt an inclusive SEMATECH-like model that includes participants from each part of the manufacturing supply chain.
2. The equipment within a CMI should be made available to all companies so they can conduct manufacturing trials to reduce implementation risks and improve the productivity and competitiveness of their manufacturing operations. At the same time, companies that provide advanced technology equipment to the CMIs should be allowed to count these in-kind contributions toward membership or participation fees. This will ensure that CMIs always have access to state-of-the-art equipment.
3. The advisory boards that provide direction to a CMI should be comprised of individuals from industry, government, and academia, but their leadership teams should be recruited from industry and should have experience in the insertion of advanced manufacturing technology

into production. Additionally, the NNMI should create a mechanism for collaboration, technology transfer, and best practice sharing between CMIs.

4. Working with community colleges and universities, CMIs should provide internships to train the future advanced manufacturing workforce. Furthermore, mechanisms should be created to allow private sector employees to co-locate at CMIs for long-term assignments designed to help them develop additional manufacturing expertise and actively participate in technology development and transition.

Conclusion

The NNMI represents a significant opportunity for the United States to restore its manufacturing prowess and improve its competitiveness. By facilitating partnerships between industry, government, and academia through Centers for Manufacturing Innovation, there is great potential to scale up advanced technologies that are currently in their infancy. General Electric is committed to creating an industrial manufacturing ecosystem by working with other organizations to form CMIs that can help to restore the domestic industrial commons.

Thank you and I look forward to answering any questions.

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Stephan Biller, PhD

Stephan Biller is the Chief Manufacturing Scientist at General Electric. He is responsible for GE's global advanced manufacturing strategy and the development of GE's Smart Manufacturing Initiative across GE businesses to increase speed and productivity. Prior to being named to this position in April 2012, he was a Technical Fellow & Global Group Manager for Sustainable & Efficient Manufacturing Systems at General Motors' R&D. Dr. Biller received a Dipl.-Ing. degree in Electrical Engineering from RWTH Aachen, a Ph.D. in Industrial Engineering and Management Science from Northwestern University, and an MBA from the University of Michigan. He has been granted nine patents, developed 22 trade secrets, and co-authored more than 60 peer-reviewed publications.



Chairman BUCSHON. Thank you, Dr. Biller.
I now recognize Dr. Veuger for five minutes for his testimony.
Welcome.

**TESTIMONY OF DR. STAN A. VEUGER,
RESIDENT SCHOLAR,
AMERICAN ENTERPRISE INSTITUTE FOR
PUBLIC POLICY RESEARCH**

Dr. VEUGER. Thank you. Mr. Chairman, Mr. Ranking Member, I would like to thank you for the opportunity to testify today before the Committee. I am here to discuss the need for a manufacturing innovation network, as proposed in H.R. 2996. H.R. 2996 proposes to appropriate \$600 million to—for establishing a network for manufacturing innovation consisting of Centers for Manufacturing Innovation. These centers are meant to address challenges in advanced manufacturing to retain or expand industrial production and jobs in the United States. They must do so in areas determined by the Secretary of Commerce to be of importance in attaining these goals, and they must feature representatives from multiple entities from a broad range of categories.

The Secretary of Commerce's decision as to which Centers are worthy of federal funding will be—decides these overall goals on criteria including the involvement of small and medium sized manufacturing firms, as well as on how the Center for Manufacturing Innovation will strengthen and leverage the assets of a region.

Now, according to the Bureau of Labor Statistics, the manufacturing sector employs some 12 million workers in the United States, down from almost 20 million in the late 1970s. It is about half a million more than at the end of 2009, but still about two million fewer than before the start of the Great Recession. These figures do not suggest what is commonly referred to as a true Renaissance of U.S. manufacturing, but a look at sales manufacturers' sales figures provides much more of an underpinning to such a view of U.S. manufacturing.

According to the Census Bureau, manufacturing sales are indeed back where they were at their previous peak. After falling by about 25 percent during the recession, they had rebounded by July of this year. What this suggests, of course, that most of the recent resurgence of manufacturing in the United States has been highly capital intensive. That is, output is increasing without much new hiring. It has been true for decades. It is mostly a product of technological progress, and does not appear to be a trend that is about to reverse.

It is also certainly not a phenomenon that is unique to the United States. Even Germany, touted for its positive trade balance—manufacturing products in H.R. 2996, have seen manufacturing employment as a share of total employment plummet over the past 40 years. These broad long term developments, driven by technological change more than domestic public policy, are important to consider when analyzing the state of manufacturing today. It seems unlikely manufacturing will regain its old central role in the labor market in our modern economy, and striving to reverse the trends highlighted before us is likely to be costly, and ultimately fruitless.

Now, new spending initiatives, like the manufacturing innovation network proposed here, look even less attractive if we also consider the state of the Federal Government's finances. Over the past 40 years mandatory spending, particularly on entitlement programs such as Social Security and Medicare, has escalated rapidly. Less than 20 percent of the Federal budget now goes toward programs other than Social Security, Medicare, Medicaid, CHIP, other safety net programs, defense, and interest payments, and almost half of that—half of the remaining 20 percent pays for benefits for federal retirees and veterans. This development puts immense pressure on discretionary spending programs, some of which are quite crucial to the nation's future. Instead of allocating funds to new manufacturing innovation initiatives, I prefer that current spending on scientific and medical research be maintained, that some of the more unfortunate sequestration cuts in those areas be reversed. More importantly, to preserve such important programs, Congress needs to commit to serious entitlement reform in order to keep entitlement spending from further crowding out all other spending.

At the same time, setting the stage for enduring American competitiveness is certainly within the realm of the possible. By removing uncertainty about a country's fiscal policies, but providing tax and regulatory relief to both manufacturing and non-manufacturing firms, by training workers to be able to function in today's globalized economy, and by benefitting from the domestic oil and gas industry's newfound health, the United States can continue to be home to extraordinarily successful innovative firms in manufacturing and elsewhere.

In sum, I believe that there is a variety of ways in which to address, or at least alleviate, some of the problems often attributed to the decline of manufacturing in the United States. None of these are cure-alls, but some of them—though possibly politically difficult are more genuinely beneficial than others, including corporate tax reform and entitlement reform. Thank you.

[The prepared statement of Dr. Veuger follows:]



American Enterprise Institute for Public Policy Research

**Statement before the Committee on Science, Space, and Technology
Subcommittee on Research and Technology**

Comments on H.R. 2996 - Revitalize American Manufacturing and Innovation Act of 2013

**Stan Veuger
Resident Scholar
American Enterprise Institute
December 12, 2013**

The views expressed in this testimony are those of the author alone and do not necessarily represent those of the American Enterprise Institute.

Mr. Chairman, Mr. Ranking Member, Members of the Committee, I would like to thank you for the opportunity to testify today before the Committee.

I am here to discuss the need for a “manufacturing innovation network,” as proposed in H.R. 2996, the “Revitalize American Manufacturing and Innovation Act of 2013.”

H.R. 2996 proposes to appropriate \$600 million to establishing a Network for Manufacturing Innovation Program consisting of centers for manufacturing innovation. These centers are meant to “address challenges in advanced manufacturing” to retain or expand “industrial production and jobs in the United States.” They must do so in areas determined by the Secretary of Commerce to be of importance in attaining these goals, and they must feature representatives from multiple “entities” from a broad range of categories. The Secretary of Commerce’s decision as to which centers are worthy of federal funding will be based, besides these overall goals, on criteria including the involvement of small- and medium-size manufacturing firms, as well as “how the center for manufacturing innovation will strengthen and leverage the assets of a region.”

I will discuss what the justifications are for this focus on manufacturing, as opposed to other sectors in the economy; how this increase in discretionary spending fits into the broader fiscal outlook; and how these centers for manufacturing innovation meet the needs of manufacturing firms in the United States.

According to the Bureau of Labor Statistics, the manufacturing sector employs some 12 million workers in the U.S., down, from almost 20 million in the late 1970s. That is 500,000 more than at the end of 2009, but still about 2 million fewer than before the start of the Great Recession (see Figure 1).

These figures certainly do not suggest a renaissance of U.S. manufacturing, but a look at manufacturers’ sales figures provides more of an underpinning for such a view of U.S. manufacturing. According to the Census Bureau, manufacturers’ sales are, indeed, back where they were at their previous peak. After falling by about 25% during the 2007-2009 recession, they had rebounded by July of this year (see Figure 2). What this suggests, of course, is that most of the recent resurgence of manufacturing in the United States has been highly capital intensive. That is, output is increasing without much hiring. This has been true for decades, is mostly a product of technological progress, and does not appear to be a trend that is about to reverse.

It is also not a phenomenon that is unique to the United States. Even Germany, that paragon of manufacturing prowess in the industrialized West, touted for its positive trade balance in advanced manufacturing products in Section II of the bill, has seen manufacturing employment as a share of total employment plummet over the past forty years (see Figure 3).

These broad, long-term developments, driven by technological change more than domestic public policy, are important to consider when analyzing the state of manufacturing today. It seems unlikely that manufacturing will regain its old central role in our modern economy, while striving to reverse the trends highlighted before is likely to be costly yet ultimately fruitless. Having the Secretary of Commerce micromanage investments in production technologies only makes this more likely.

New spending initiatives like this look even less attractive if we also consider the state of the federal government's finances. Over the past 40 years, mandatory spending, particularly on entitlement programs such as Social Security and Medicare, has escalated rapidly (see Figure 4). Less than 20% of the federal budget now goes toward programs other than Social Security, Medicare, Medicaid, CHIP, other safety net programs, Defense, and interest payments. And almost half of that pays for benefits for federal retirees and veterans. This development puts immense pressure on discretionary-spending programs, some of which are quite crucial to the nation's future. Instead of allocating funds to new manufacturing innovation initiatives, I would prefer that current spending on scientific and medical research be maintained, and that some of the more unfortunate sequestration cuts in that area be reversed. More importantly, to preserve such important programs, Congress needs to commit to serious entitlement reform, in order to keep entitlement spending from further crowding out all other spending.

At the same time, setting the stage for enduring American competitiveness is certainly a possibility. By removing uncertainty about the country's fiscal policies, by providing tax and regulatory relief to both manufacturing and non-manufacturing firms, by training workers to be able to function in today's globalized economy, and by benefitting from the domestic oil and gas industry's newfound health, the U.S. can continue to be home to extraordinarily successful, innovative firms in manufacturing and elsewhere.

On the taxation side, the United States has the highest statutory corporate tax rate in the developed world. Many governments around the world have taken steps over the past few decades to lower their corporate tax rates, and for good reason. Excessively high corporate tax rates serve to make investments less attractive, raise the prices of goods, and lower wages; a wide range of effective rates arbitrarily favors some firms over others. Steps to reduce this burden on U.S. firms and the U.S. subsidiaries of foreign firms would be welcome.

There are also real gains to be made on the education side. Over the past 30 years, the added value of human capital has increased drastically. College graduates have seen their hourly earnings increase by some 20%, while high school graduates have seen their earnings decrease (see Figure 5).

The labor market dynamics have been more subtle than those figures imply, though. Especially more recently, it is mid-skilled occupations that have become less common and less well-rewarded, not low-skilled occupations (see Figure 6). This polarization of the labor market is to a large extent driven by automation and information technology, but also of a post-secondary education system that does not provide graduates with the skills required to be successful in today's labor market. This is a problem that is not unique to the U.S., but certainly one that appears to be larger here than in a country like Germany (see Figure 7).

In sum, I believe that there is a variety of ways in which to address or at least alleviate some of the problems often attributed to the decline of manufacturing in the United States. None of these are cures-all, but some of them, though possibly politically difficult, are more genuinely beneficial than others, including corporate tax reform and entitlement reform.

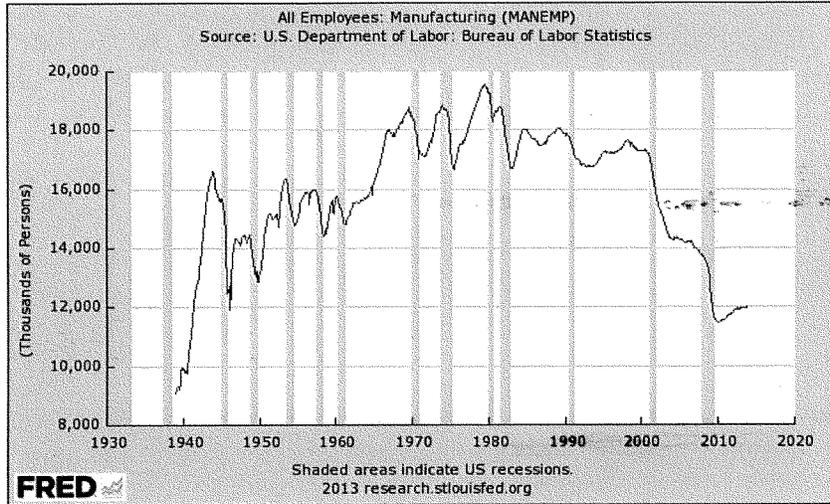


Figure 1: Employment in Manufacturing (source: FRED)

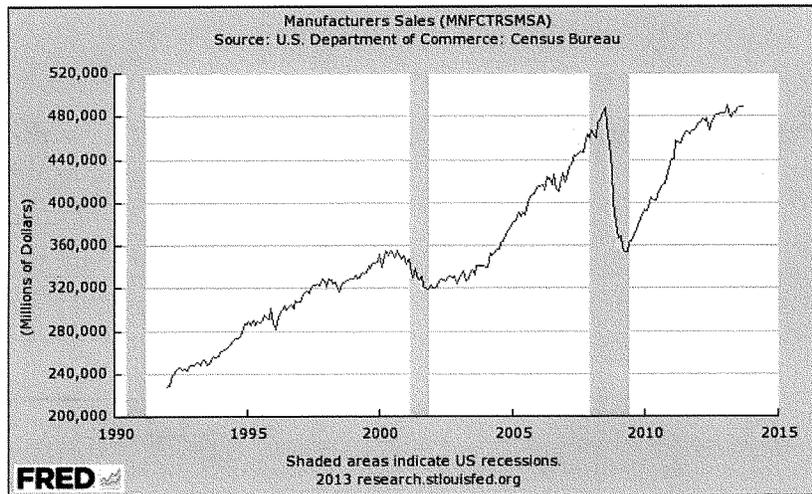


Figure 2: Manufacturing Sales (source: FRED)

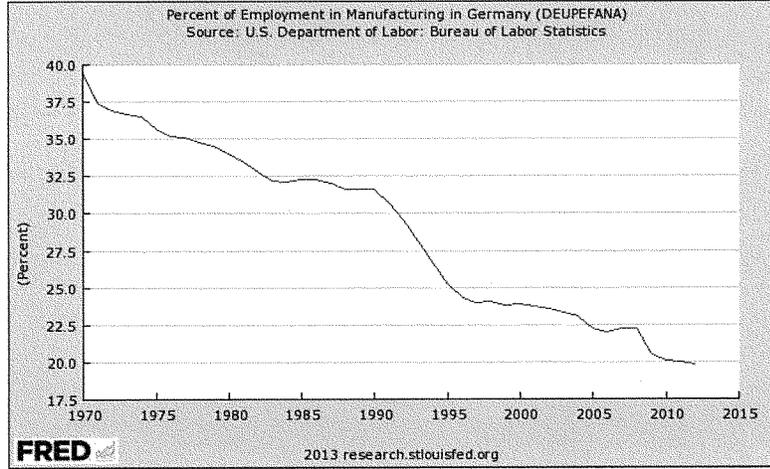
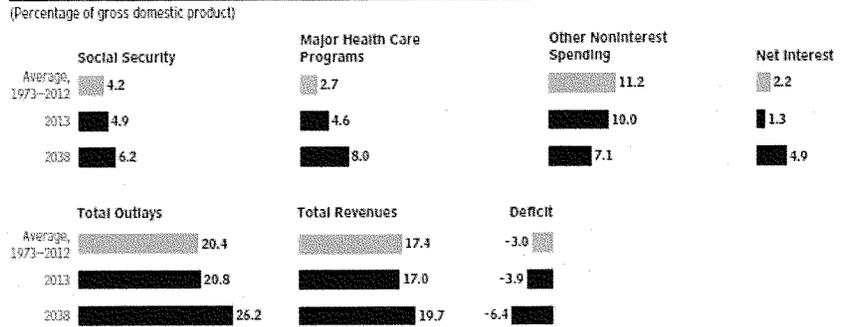


Figure 3: Manufacturing Employment as a Share of Total Employment in Germany (source: FRED)

Figure 1-3.
Spending and Revenues Under CBO's Extended Baseline, Compared With Past Averages



Source: Congressional Budget Office.

Notes: The extended baseline generally adheres closely to current law, following CBO's 10-year baseline budget projections through 2023 and then extending the baseline concept for the rest of the long-term projection period.

These numbers reflect recent revisions by the Bureau of Economic Analysis to estimates of gross domestic product (GDP) in past years and CBO's extrapolation of those revisions to projected future GDP.

Major health care programs consist of Medicare, Medicaid, the Children's Health Insurance Program, and subsidies offered through new health insurance exchanges. (Medicare spending is net of offsetting receipts.) Other noninterest spending is all federal spending other than that for major health care programs, Social Security, and net interest.

Figure 4: Spending and Revenues by Category (source: Congressional Budget Office)

Percent changes in real hourly earnings by education, 1979–2007

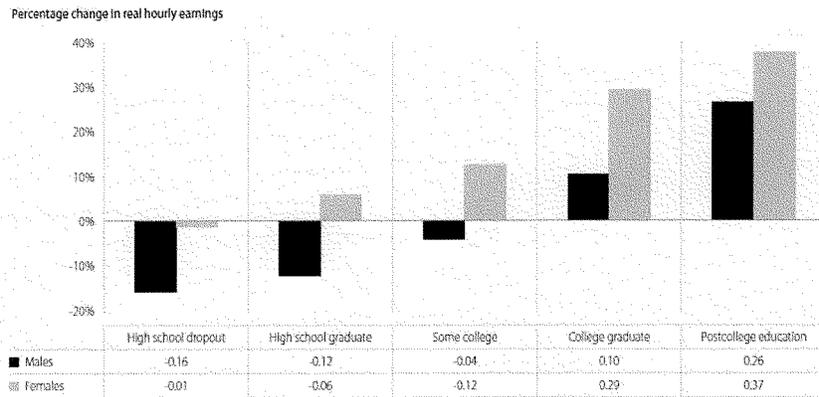


Figure 5: Real Hourly Earnings by Education Level (source: The Hamilton Project at the Brookings Institution)

Smoothed changes in employment by occupational skill percentile, 1979–2007

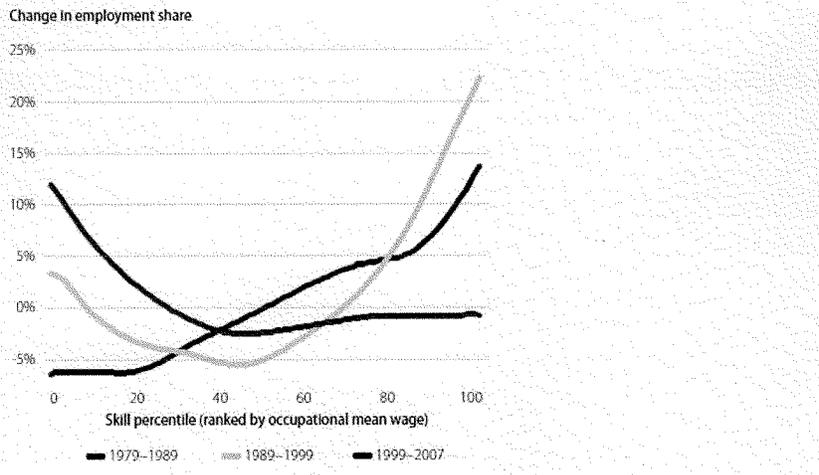


Figure 6: Employment Changes by Occupational Skill Level (source: The Hamilton Project and Center for American Progress)

Exhibit 1

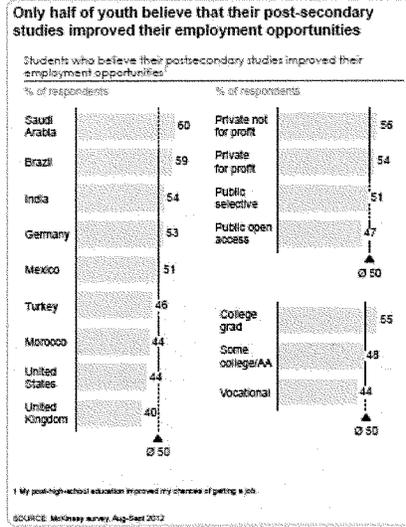


Exhibit 2

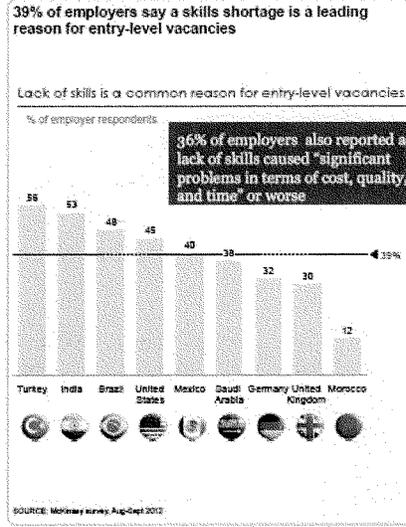


Figure 7: Post-secondary Education Assessments (source: McKinsey & Co.)

Stan Veuger**Resident Scholar, American Enterprise Institute for Public Policy Research**

Stan Veuger is a resident scholar at AEI. His academic research focuses on political economy and applied microeconomics, and has been published in *The Quarterly Journal of Economics*. He writes frequently for popular audiences on a variety of topics, including policy uncertainty, Obamacare, and tax policy. He is a regular contributor to *The National Interest*, *U.S. News & World Report*, and *AEIdeas*, AEI's policy blog. Before joining AEI, Dr. Veuger was a teaching fellow at the Harvard Kennedy School, Harvard College, and Universitat Pompeu Fabra. He is a board member of the Netherland-American Foundation in Washington and a senior editor at *The Bulwark*, a quarterly public policy journal, and was a National Review Institute Washington Fellow. He is a graduate of Utrecht University and Erasmus University Rotterdam, and holds an M.Sc. in Economics from Universitat Pompeu Fabra, as well as A.M. and Ph.D. degrees, also in Economics, from Harvard University.

Experience

Resident Scholar, American Enterprise Institute, June 2013 - present

Research Fellow, American Enterprise Institute, April 2012 - June 2013

Education

Ph.D., economics, Harvard University, 2012, thesis: "Essays in Political Economy"

M.Sc., economics, Universitat Pompeu Fabra, 2005

Doctorandus, Spanish language and literature, Universiteit Utrecht, 2004

Doctorandus, business administration, Rotterdam School of Management, 2004

Chairman BUCSHON. Thank you, Dr. Veuger, for that testimony. I would like to thank all the witnesses for their testimony, and remind the Members that the Committee rules limit questioning for five minutes. The Chair, at this point, will open the round of questioning, and I recognize myself for five minutes.

Dr. Aubrecht, I am interested since your company is so global, if you had two or three things that are really potentially disadvantaging the United States versus the rest of the world when it comes to manufacturing, what would those be?

Dr. AUBRECHT. Regulations would be the one that would head my list.

Chairman BUCSHON. And—or—what—I mean, what direction do you think the rest of world's going when it comes to these type of things, like regulation, taxation, or—let me just give you an example. There is a business in my district, a large company, that, when I talked to the CEO, and he told me what his offer was to move his company to a foreign country, it almost seemed like an offer you couldn't refuse, except for the fact that American manufacturers want to stay in America, and they want to employ U.S. citizens. But, on the face of it, it was—it seemed like a pretty difficult offer to refuse, although they did. What are the few things that you think that America can—that we should be doing that will make us be able to compete with offers like that, or from around the world, I mean, just in general? Other than regulation, as you said.

Dr. AUBRECHT. Well, the whole topic of the day is on innovation and manufacturing, and as I—focused on was the training aspect of the whole thing. Our assets walk out the door every night, and you need to maintain the capability of the people in the organization, from the design engineers, down to the people that are putting the product together on a daily basis. And in terms of productivity, our American workforce that we have in Buffalo is the best that we have anywhere in the world.

At the same time, the Buffalo economy is not doing all that well. We put an ad in the paper or online for somebody, we get 100 applicants for one spot. And—so I think the—our experience that way is not typical for a lot of American manufacturers. We are able to get the people and retain the people. We have less than one percent turnover in the company. But, as I say, we have people retiring, and now trying to find other younger people to come in and replace them, we are having to do a lot more training. We have had apprentice programs we have run with the community college. We have also become a much more global company. If you go back 20 years, 90 percent of our manufacturing was done in Buffalo, New York, and today we are down to maybe 25 percent because we made the acquisitions, we put facilities in other places in the United States, and we are finding the training capabilities in those places are not as good.

The flipside of that is—you are—talking earlier about the Fraunhofer Institutes, I spent three years living in Stuttgart, and worked with the Fraunhofer Institutes there. That provides a great advantage. One of the real advantages that Germany has is not just that kind of a capability, but the training programs that they have that start in what you think of as 9th grade in the United States. People come out—we can hire people at 19 and put them

in front of a half a million dollar machine tool, and they know what to do with it. And we can't do that here in the United States. That is the thing we need to improve on, is the skills to be able to actually execute. We have got great design engineers, great capability, but the question is, how well do you execute that?

I would also suggest that one of the other things you ought to think about with this is about—they say we do about \$2-1/2 billion. 700 million of that is sales that ultimately end up to the U.S. Government. So our productivity is of great interest to you as well, in terms of how much do you get for your defense spending dollars. And so I would think that that would be another place that you ought to be thinking about it, is how is it you could link with other people who are customers in the government for the products we end up producing.

Chairman BUCSHON. Thank you. And I also serve on the Education and Workforce Committee, which this is a challenge that that Committee's working on, as—trying to figure out K through 12 education, and where—like you pointed out, where we can make some adjustments that when people finish high school, that they already have a significant amount of skill, if that is their area that they want to pursue, and have those options available to them at the high school level—

Dr. AUBRECHT. Um-hum.

Chairman BUCSHON. —and come out with up front better training. And I think we are going to start doing a better job of that. We have gotten a little bit behind, but I think we are going to catch up. So that definitely is important.

I am going to—to all witnesses—I will start with Mr. Davis. We have held a number of hearings in the Subcommittee, and we are considering legislation to reauthorize funding for basic research at NSF, NIST, and the DOE Office of Science. As you know, we are facing difficult budget times, and what recommendations would you have for policymakers in prioritizing Federal spending on advanced manufacturing programs?

Mr. DAVIS. Thank you, Congressman. Clearly, I think in the context of today's discussion, our industry views the research and development that is oriented towards commercialization, how we take innovation and make sure that those innovations propel economic growth, jobs, and prosperity in the United States.

Chairman BUCSHON. Dr. Veuger, do you want—any comments on that? And then I am going to be out of time. Am I out of time? I am out of time.

I now yield to the Ranking Member, Mr. Lipinski, for his questioning. Thank you.

Mr. LIPINSKI. Thank you. I want to thank all of our witnesses for their testimony. And, in—pointing out that this bill really proposes that this is going to be a public-private partnership led by industry, and I think that is very important, and that Mr. Davis had brought up that this will assist an entire industry. I think those are important things to understand about this bill.

And, Dr. Aubrecht, certainly couldn't agree with you more on the need to do better with training, and I am glad to hear in Buffalo that the supply of workers, and qualified ready workers is there,

but I certainly hear from manufacturers in Chicago that that is not necessarily the case, and I think we need to do more on that.

But I wanted to ask Dr. Biller, as proposed in this legislation, the main purpose of the centers for manufacturing is to close the gap between R&D activities in deployment of technological innovation in domestic production of goods. I have—it has been—one of my biggest issues for me is to do what we can at the Federal level to help to close that gap. We have great R&D that goes on in this county, and, unfortunately, so much of it does not get deployed into innovation, and some of it that does isn't—is not done here.

So, in your testimony, you mentioned that Federal Government support has to involve more partners, and be committed to longer time horizons. You also indicate that research collaborations need to continue to later stages of R&D, closer to commercialization. So I wanted to ask, does the legislation address the needs you have identified in your testimony, and why is it important that research supported by the centers get to the production level, or later stages of R&D?

Dr. BILLER. It is really all about getting over that Valley of Death we have been talking about between—for technology at readiness level four to seven, which is really what the Fraunhofer Institutes and the SEMATECH model essentially addressed. So it is important for companies like General Electric that we have access to that, but I think it is even more important that we create an ecosystem of small and medium enterprises that have access to that kind of technology, because they have neither the skills, nor the money, to develop technology through that Valley of Death.

And, just as we have seen now in the additive manufacturing space, where the creation of an ecosystem allows us to draw upon an innovation capability from a much broader supply base, we need to think about how we are going to create that ecosystem of a much broader supply base with SMEs and traditional manufacturing, which is probably 99 percent of current manufacturing, and additive being maybe one or less.

So, to us, to stay globally competitive, and particularly in the United States, it is very, very important that we get our small and medium enterprise through that Valley of Death, and give them access to advanced manufacturing technologies. And I think that is where the NNMI's can play a key role in accomplishing that. So that is why we are so supportive of this model. And, again, in Germany and Japan, you have SMEs being so successful, and being world leaders, because they have support, like the Fraunhofers, or the Japanese equivalent.

Mr. LIPINSKI. Okay. And, sir, getting back to the public-private partnerships, why are these so—and you have talked about a few things. Are there other things you could talk about, why these are so attractive to industry?

Dr. BILLER. If we think—if you think about, for example, the suggested DMDI Institute on digital manufacturing innovation, there the SMEs need to learn simulation capabilities, capabilities to design product in virtual—launch the factories in a virtual environment, thereby increasing innovation, decreasing cost. They have to integrate with the large companies in a digital space. They currently don't have the engineers trained to do that. They currently

don't have the software available to them to do that. We need to think of these CMIs as a commons essentially, where we are going to train our SMEs, as well as develop technology, and give them access to that, so that they stay globally competitive. For us it is always, you know, the best thing is make what you sell, that—thereby you are the closest to your customer, your product engineers are together with your manufacturing engineers. And we need to think of manufacturing as a requirement for product innovation. That is why we think it is so important.

Mr. LIPINSKI. And as manufacturing leaves this country, that is the great fear, that innovation will also leave the country, as the people who are doing innovation are moved over, or it is all done where the manufacturing's done outside the country, so—thank you. I yield back.

Chairman BUCSHON. Thank you. I now recognize Mr. Schweikert for five minutes for his line of questioning.

Mr. SCHWEIKERT. Thank you, Mr. Chairman. I want to sort of back up, and maybe even move slightly more conceptually.

Gentlemen, if you were to lay out in front of me and say, here is where we are finding innovation, creativity, sort of break through concepts as much as technology, and I don't mean it geographically, I mean it organizationally, are you finding it coming out of the universities? Are you finding it coming out of small manufacturers? Are you finding it when a half a dozen engineers from Intel go off and start their own business? Where is that ecosystem of the—sort of the cutting edge ideas? Where is it coming from? Mr. Davis, start there.

Mr. DAVIS. So if I could say all of the above, and I think that is one of the attractive elements of this legislation, is it tries to leverage the synergies between private enterprise, universities, state and federal governments, small and medium sized enterprises.

Mr. SCHWEIKERT. Well, but—back to the—very precise in the question. Where do you see the innovation actually happening?

Mr. DAVIS. So innovation and invention are two different things, in my mind. I think invention happens in fundamental research in universities, where basic breakthroughs occur. Innovation becomes the application of—

Mr. SCHWEIKERT. The adoption of?

Mr. DAVIS. Yeah, the adoption and application of those inventions in commercial ways. So I think, from an industry association perspective, we see innovation happening with companies—

Mr. SCHWEIKERT. Okay.

Mr. DAVIS. —ideas to market.

Mr. SCHWEIKERT. Doctor?

Dr. AUBRECHT. For us it is primarily our design engineers. Our fundamental business model is to get very close to our customers, and find out what their problem is. This is a classic Clayton Christensen, find out what your problem—customer's problem is, and go solve it. And it is that interface with our customers, and that dialogue that happens between the—our—design engineers for our customers and our engineers, that is where the innovation happens. When we were doing the 787 program, we had 25 of our engineers working in Boeing's Seattle facility for about four years to design our flight controls right into the aircraft. There is a tremen-

dous amount of innovation that came out of that. The experience that our people get doing that is what is led us to do the next generation for other aircraft, then.

Mr. SCHWEIKERT. Okay. So your smart people went on site with your customer?

Dr. AUBRECHT. Exactly, and that is where we see the most sources of the innovation, is working with your end customer, and understanding what their problem is, and having your people work with them. It is the same with manufacturing. It is getting our manufacturing people to work with—sometimes it is universities, sometimes it is the equipment manufacturers—talking to the equipment manufacturer about—your machine is doing this great, however, if you did this with it—and, again, it is the same sort of—

Mr. SCHWEIKERT. Well, that is the translation of the knowledge that is been gained. I am sort of trying to understand where those ideas are germinating.

Dr. AUBRECHT. It is the same kind of conversation.

Mr. SCHWEIKERT. Okay. Dr. Biller?

Dr. BILLER. I agree wholeheartedly with Dr. Aubrecht. It happens in the factories, when our researchers go to those factories, try to figure out where the pinpoints—what are the problems? For us, our factories are the customers. And then, conversely, when we go into our supply chain, we help our SMEs and our business partners in the same way. We are trying to find out what the problem is, go after the problem. Innovation really happens for manufacturing on the plant floor, with smart people, including academics, including people from government labs, including people from industrial research labs.

Mr. SCHWEIKERT. Okay. Doctor? This is easy. I can just sort of go, Doctor, Doctor—

Dr. VEUGER. I think I would agree with the all of the above answer that I think all of the previous speakers have given. And I think that is what makes it hard to justify the federal government giving preference to certain processes, certain groups, certain places over others, and to, you know, to place, admittedly, a large part of the economy, but still one sector of one industry over others.

Mr. SCHWEIKERT. Can—actually, can you elaborate on that? Because it is touching on—one of my concerns is often, when a piece of legislation like this, that is very well meaning, does—because of the financial incentives and mechanics built into that, do you start to silo where innovation actually starts to be developed because of the financial incentives there. So, Doctor, please continue there.

Dr. VEUGER. I mean, I would—I mean, it seems clear that a bill like this, in a way, subsidizes innovation in manufacturing over all other innovation and R&D. I mean, that may be something you want to do for some reason, but it is—I mean, it is certainly true that there is an element of prioritization there.

Mr. SCHWEIKERT. Okay. And, with that, Mr. Chairman, I am out of time. Thank you.

Chairman BUCSHON. Thank you. I now recognize Dr. Bera—

Mr. BERA. Great. Thank you—

Chairman BUCSHON. —five minutes.

Mr. BERA. Thank you, Mr. Chairman, and, you know, I want to thank my colleague, Mr. Kennedy, for bringing this important piece of legislation to the forefront. It is incredibly timely that we are talking about how we revive the manufacturing sector, and how we create jobs. I had a town hall with my constituents back in Sacramento County last night, a telephone town hall, and in that I heard from a number of folks that, you know, are consistently looking for jobs. I heard from one young veteran who returned, all she wants is to find a job. She is not asking for Unemployment benefits or anything, she just wants to find a job. I also heard from a desperate couple that is been out of work for two years, and they are incredibly worried about Unemployment benefits being cut off, but they are not asking for an extension. They need that extension, but they want a job. They have been looking for jobs.

Now, Dr. Aubrecht, you touched on part of our challenge, this skills mismatch. There are plenty of jobs out there, but our workforce, our graduates, are not trained to meet those jobs, so we do have to double the effort to make sure we are addressing that skills mismatch. You know, another challenge is—maybe Mr. Davis touched on this, or all of you touched on it, is inconsistent Federal policy. I mean, we have not defined, you know, what our goal is, how we are going to make those investments, what kind of a regulatory framework we are going to do, so we can create that—those jobs, so we can make those investments, so our kids, our graduates, are able to fill those needs. In addition, we have seen dramatic reductions on our investment in R&D, and that creates another challenge for us.

And then Mr. Lipinski touched on, you know, this issue of technology transfer, you know, how we quickly get these ideas out of our academic institutions, and out of R&D, into, you know, industry so we can commoditize them, and grow industries. That said, we do have some assets, and some natural advantages. I think, Dr. Veuger, you touched on this energy Renaissance that is coming. That will make our manufacturing base much more competitive.

Dr. Biller, you touched on—I think the term you used was make it where you sell. And, you know, as I have been talking to some international multinationals, they are considering locating their manufacturing sector here in the United States because the advantages that they have in lower costs of labor, we are about to potentially outweigh those advantages, given they are selling to our market. You know, if they build it here, they don't have the cost of transport, and we have much lower energy costs, plus we do have the rule of law and so forth here. So there are some advantages there. We are still the most innovative economy.

I haven't asked a question yet, but on that sector of investment in R&D, and on technology transfer, coming out of an academic background myself, and any of you can answer this question, what can we do to allow industry to partner much more closely with our academic institutions to make it easier to take those ideas to market as quickly as possible? Maybe Dr. Aubrecht?

Dr. AUBRECHT. Yeah. One of my other involvements—I am a trustee at Cornell. I have been a trustee there for about 25 years, and one of my primary interests there has been technology transfer. And I have looked at models elsewhere around—some of my

other trustee colleagues have looked at models elsewhere around the country. There was an experiment that was run in the California university system about ten years ago. Berkeley lives in the same neighborhood as Stanford. Stanford had a tremendous amount of industry sponsored research. Berkeley had relatively little, and it all had to do with licensing. And what Berkeley did was to run an experiment and allow the researchers to do royalty-free non-exclusive licenses. And, as a result of that, in a relatively short time period, Berkeley went from under \$10 million to over \$100 million a year in industry sponsored research. And it seems to me it is the same sort of model.

There are places where that doesn't work. If you think about medical research for drugs, drugs—a drug company is going to want to have an exclusive license, otherwise they are not going to put a billion dollars into developing a drug. But for a lot of other things, what they found is—they put together industry consortia—we are currently partnering with about six universities that have industry sponsored consortia, and a lot of those it is royalty-free non-exclusive licenses. It is a pre-competitive sort of research that ends up going on. And if you look at the research that the federal government sponsors, coming out of the NSF, or NIH, or whatever, it seems to me that more of that ought to be done with royalty-free non-exclusive licenses.

What happens is researchers get together, or the engineers are talking to each other, that is great. They can see the problem, they get it defined, and then they spend a year and a half with the attorneys trying to work out a contract. This is nuts. So do it royalty-free non-exclusive wherever possible. And it seems to me you could roll that into the legislation for NSF and NIH to say, we want royalty-free non-exclusive licenses. We want the scientists and engineers talking to each other, not the attorneys.

Mr. BERA. Great. Sounds great.

Chairman BUCSHON. I would agree with Dr. Aubecht.

Mr. BERA. Okay.

Chairman BUCSHON. I now recognize Mr. Collins for his questioning.

Mr. COLLINS. Thank you, Mr. Chairman, and Dr. Aubrecht. Very good to see you again today. Moog is in my district, if you will, in East Aurora, but also they have their rocket facility up in Niagara Falls, which is also in my district, so I like to think at some point in time we may have more rocket scientists in the 27th Congressional District than in any other in the country.

And I have toured your facility, so here is my question. And I am involved in manufacturing and in high tech businesses, and many case, it is the IP that makes you who you are.

Dr. AUBRECHT. Um-hum.

Mr. COLLINS. So Moog, a multi-billion dollar corporation, does R&D all the time. You protect what you do with IP. That is what differentiates you, whether it is rocket engines, or a new fuel source, or whatever. And now we are talking about something like the antithesis to that, that you are going to sit down in an industry group, so this isn't going to be a Moog facility, and in that jointly develop technology where you don't have a competitive edge any longer. And I am—being, you know, I very much support this, I am

co-sponsoring this legislation, but the naysayers might say, you know, help me through that loop of what you do now. You protect your IP at all costs, and now you are going to go try to leapfrog somewhere, and you don't have any IP. Help us through that a little bit.

Dr. AUBRECHT. So to me it is a question of, you know, you talked about technology readiness level. When you are down with the technology, one and two, three sort of level, that is pre-competitive kind of stuff most of the time, and while you can generate some IP coming out of that, what is really important is the intellectual engagement of the scientists and the engineers at that point in time to see what is possible and with a lot of the innovation that happens today, it is not just in one field. Where we are innovating, where usually people are involved with five or six or seven disciplines, and the question is how you bring them together and provide a way that people can openly exchange their ideas.

Mr. COLLINS. Can you give like an example, like something that somebody can grab hold of and say, okay, now I got it? You are a little bit conceptual there.

Dr. AUBRECHT. Okay. Aircraft flight controls. It is the computer, but it takes people who understand the software architecture, the digital programming for all of that, how it is going to function in the aircraft, you need to have the aerodynamicists involved, you have to have the structural engineers involved. They all need to come together and be able to say, here is what the fundamental problem is and then the people who have the specific technologies in digital hardware and digital software and systems engineering can go create a new product. And that is where the IP is created.

So you can have—we have conversations with all sorts of people in those other disciplines out of pre-competitive. We are not telling them where we are going to head with it, but ultimately there are ideas that come out of that. We have this kind of relationship with MIT right now. It is all pre-competitive sort of things that we are taking those ideas and learning how to implement them. To me it is the intellectual engagement that really drives all of that, and so with this sort of legislation what you'd like to do in these centers is to provide that sort of independent zone where people can trade ideas and talk about things before they are, before you create IP that you consider is going to be proprietary.

Mr. COLLINS. And so one follow-up question. Since this is at max seven years of funding—

Dr. AUBRECHT. Uh-huh.

Mr. COLLINS. —50/50 federal government and either industry or states, and then the money is gone. And from what I am hearing this isn't going to be a facility that is going to be making things, having sales, making profits, covering their own costs. So it is a cash burn operation, technology one, two, three. So what happens at the end? Does it go out of existence since it is not generating income and the money's gone? What happens after seven years. Anybody want to—

Mr. DAVIS. I will take a shot at trying to answer both those questions. You had asked for an example of how companies might want to participate and preserve their IP. In my industry, a state-of-the-art, high-volume manufacturing facility for integrated circuits can

cost 5 or \$6 billion or more because of the high capital equipment costs.

So if you are a small or medium-sized enterprise that is trying to develop a new process or introduce a new material or test a kind of component, it is very difficult to engage. The cost of entry is so high that it is very difficult.

But a shared facility would enable multiple entities to use that facility to develop processes that could then be commercialized, differentiated, and have IP associated with it.

So the pre-competitive sharing of facilities is a great asset.

Mr. COLLINS. So in that situation because it is shared, could you envision that, you know, after the seven year timeframe industry would say they are almost like a trade association? We are going to assess a certain amount of dues to keep this going after year seven. It is working great. We see the value of it. Is that—

Mr. DAVIS. Absolutely, Congressman. I think that is one example of a sustaining model that could very well work wherein an established facility then becomes essentially rented out for people that want to—

Mr. COLLINS. Okay.

Mr. DAVIS. —test processes.

Mr. COLLINS. I can see that. My time is expired. Thank you very much.

Chairman BUSCHON. You are welcome. In fact, at—in my district there is a battery innovation center outside of Great Naval Surface Warfare Center in Westgate, which is doing exactly what you are talking about where multiple people from different areas are talking about trying to innovate on the next generation of energy storage so to speak and batteries. And it is, I think it is going to be successful.

With that I recognize Ms. Esty for five minutes.

Ms. ESTY. Thank you, Mr. Chairman. I want to thank you for holding this hearing and to my colleagues, Mr. Kennedy and Mr. Reed for introducing this legislation which I am looking forward to being a cosponsor of.

I am from Connecticut, one of the homes of manufacturing, and these issues are of critical importance. I have companies such as Click Bond and Industrial Heater Corporation, who are engaged in this effort. These are small manufacturing companies, frequently family owned, who have held on through the recession by investing their family money to keep going. So this issue about workforce development is critically important.

You have touched on and sort of referred to the importance on colocation, whether it is for innovation for small companies but also being near your customer, which seems to me is a very important issue of why if we are going to get the benefit of innovation in manufacturing, it needs to be done in the United States. That has important elements that not captured by flying our engineers to the plants in China because I have heard that from companies and why, in part, not just the energy dynamic changing but also the importance of having that close innovation happening right there on the plant floor.

So, Dr. Biller, I would like you if you could expand a little bit more on the apprenticeship programs. I have introduced a piece of

legislation, the First Step Act, to try to support apprenticeship and training programs, that critical piece between not quite ready workforce and the workforce I know we need on the plant floor that I hear from manufacturers that have openings right now even with the high unemployment rate in Connecticut.

So can you talk about how these apprenticeship programs are working and what we could do at the Federal level to help scale those up and disseminate those?

Dr. BILLER. Yeah. So GE has partnered with about 190 companies to establish the Get Skills to Work Program basically trying to get about 100,000 veterans into the workforce, and then we are working with community colleges and trying to define the skills we need within our, that applies to our GE, energy business, it applies to our business in Massachusetts on aviation. We have to define those skills specifically for these people that they can use them within the factories.

If we want to scale this, and I think I read your legislation, I think it is a very good idea. We want to make sure that we get certification that is truly certification. So if I look at a piece of paper that says I am certified in X, Y, Z, I know what that means, and so it appears to me that a national institute could certify that and thereby giving employers the assurance that a person who has such a certificate can really do a certain job.

So I think that will be the way to scale it, provide community colleges with a level of certification that they then implement.

Ms. ESTY. Thank you, because in part we have been approaching this as you probably know in Connecticut looking at veterans as well, trying to get certification on the military side that translates to civilian.

Dr. BILLER. Yes.

Ms. ESTY. And nationalized certification that allows transporting those skills from company to company and around the country and we'd love to follow up with any of you on that point because I do think that is a critical missing component that in our Federal system if you compare with say Germany or other countries that are nationalized, that that has hampered us in our mobility, in our ability to make sure our community colleges and other training facilities have, if it is welding, level one, everyone knows exactly what that means, so you as an employer know what that means. You know where your employee is starting because I think this is a critical component.

Are there other pieces—something I would like some of you to mention, we had an earlier hearing this year where we talked about the basic importance of R&D and frankly, a consistent funding stream and really looking at these innovation corridors in Silicon Valley and 128 and Boston, which were really fueled by the Department of Defense, which had very large sums of money for a very long period of time that allowed the sort of free-flowing R&D from which other things could spin out but also had specific tasks assigned. And I know we are trying to do this around batteries right now, around energy storage. If any of you would like to comment on the importance of that, sort of consistency of funding streams on the basic level but then task specific to try to go from there.

Dr. BILLER. I think it is really critical that we look at consistent funding. Starting and stopping wastes at least a year every time you do it, and so, you know, in a five year program it wastes 20 percent of U.S. taxpayers' money if that is how you want to do it. So consistency is really critical.

I want to come back to the previous question of Mr. Collins, who talked about how do we sustain this. I have been a member of the Center of Intelligent Maintenance for about 13 years where we started with very little government funding and over time we have recruited many, many members, I think 50 or 60 companies, each putting in \$40,000 a year, and that became a very—so the government funding was maybe 1 or two percent of the total funding, and it was, again, a pre-competitive situation. We developed algorithms for maintenance, for machines, and for vehicles, and then we took that inside the companies and implemented that. It is the implementation in this case where really the competitiveness starts, not in the development of the actual algorithms and TRL one, two, three.

Ms. ESTY. Thank you very much.

Chairman BUSCHON. I now recognize Mr. Hultgren for his line of questioning.

Mr. HULTGREN. Thank you, Mr. Chairman. Thank you all for being here. This is a very important conversation and discussion that we need to be having where we are talking about competitiveness for the United States, specifically in manufacturing and especially in high tech manufacturing, and we need to do everything we can here in Congress to be working with you to be helping with that.

So I know in my home state, Illinois, we have got statistics say 578,200 manufacturing jobs and 1.8 million jobs are tied in directly to manufacturing. A little over 12 percent of Illinois GDP is attributable to manufacturing, making it the largest share, and yet significant challenges manufacturing is facing right now. I know we have discussed in this Subcommittee over the last months the disconnect between many academic institutions and industry that often makes it more difficult to train our next generation's workforce.

There are also obvious tax and regulatory issues U.S. industries face. I know I have heard excluding labor costs it is still 20 percent more expensive to manufacture in the United States compared to other trading partners.

So my question, first, would address to all of you if you could make a comment. I know the goal of the proposed network is to aid high-tech manufacturing in the U.S., and I absolutely agree that we need to encourage this. Some might say, though, if any amount of Federal spending on science and technology, they question whether that would help manufacturing as much as significant regulatory and tax reform potentially would help manufacturing. I wonder if you could provide us with your thoughts on this, as well as how to create the optimal environment to support high tech manufacturing and job creation here in the U.S.

I throw that out to any of you if you have thoughts. I know it is a big question.

Mr. DAVIS. That is a big question, Congressman. Thank you for that. A month ago or so Speaker Boehner visited one of our member company facilities in Ohio, not in Silicon Valley. It was a subsidiary of a Silicon Valley company that made very highly-specialized components, which sort of speaks to the complex nature of supply chains. And it was very interesting when Speaker Boehner asked about how he sees priorities, mentioned that the application of research and development, that he understood that particularly from some of the enterprises in his district, and I think that is an essential point from an industry perspective is being able to harness the synergies of research and development, get over the Valley of Death, and commercialize. And that can happen in synergistic ways in Centers such as the ones defined by this legislation.

Mr. HULTGREN. Any other thoughts?

Again, just boiling the question down. I mean, I absolutely agree and want, you know, basic talk all the time of encouraging research and developments and want to make sure we have got that commitment, but also what I hear from my manufacturers is they want to do that, but the biggest weight they feel is regulatory burden and tax burden. So—sorry for the feedback. Hopefully we will get that taken care of. But any thoughts on that? You know, again, we would like both, but to me what I am hearing is a prioritization on regulatory reform and tax reform. Would you agree, disagree?

Dr. BILLER. We would certainly agree that regulation reforms would greatly help in any state, Illinois, Michigan, New York. I think any state we—that would be certainly beneficial, but I also want to point out, you know, you make the point between research and development. So we are doing—we are the best country in the world in research. I don't think anybody would doubt that. We are not the best country in development, and so we are researching for the world and giving it away in TRL four to seven, and, you know, from an investment perspective we really need to go longer and maybe more focused and thereby we would reap for the Nation the benefits of the research we are doing in one to three. I am not for cutting research. I am just for let's think about how we prioritize that in a way that we are not doing research only. We also move through that Valley of Death and get to the development.

Mr. HULTGREN. Yeah. I think we all want that. Another thing I talk about all the time on the Committee is what, when times are tough and certainly they are right now, what can only federal government do, and that is where I think basic scientific research is something, and it is very difficult to put together a business plan that makes sense for basic scientific research. It is still tough for development, but it is a little easier if you have kind of the understanding of why something works to apply it and make our lives better for it.

So that is—I would love to do both, I would love to have the resources we need for both, but I think that is the challenge, making sure we still are strong on the research side while also pushing as opportunity comes and resources come to find ways to work with industry to continue development. So I totally agree.

My time is winding down. Real quick question, may I, Chairman? Mr. Davis, just quickly, you touched on some other foreign government subsidies for your industry that lure away American compa-

nies. I wonder if you can expound on what these incentives are but more importantly what impact they might have on the U.S. economy and if there is any national security implications of these supply chains moving overseas?

Mr. DAVIS. Well, speaking primarily for the commercial aspect, I think what we see increasingly in foreign governments is a choice to compete and a decision to move from making stuff to designing stuff, to move up the value chain. China's five year plan is very specific in identifying, unambiguous in identifying key technology areas to make substantial investment. So I think some of the ways in which foreign governments appear to provide great clarity is being specific about the kinds of industries that they want to develop and cultivate. Certainly as industry migrates overseas and the research and development and the capacity to manufacture moves with it, there are certainly national security implications.

Mr. HULTGREN. Again, my time has expired. Thank you, Chairman. You wouldn't mind if we could follow up with questions we might have just to get a little bit more detail. I know our time is limited here today, but thank you so much. I appreciate you being here and all the information you have shared.

Thank you, Chairman, for your generosity.

Chairman BUSCHON. I now recognize Ms. Kelly for her questioning.

Ms. KELLY. Thank you, Mr. Chair, and thank you for being here today. I am also from Illinois and represent the south side of Chicago and further south, and manufacturing is one of my biggest employers, but we are suffering in my area from unemployment higher than even the State of Illinois' average.

You talk about in your testimony, Dr. Biller, the importance of small and medium-sized manufacturers and indicate that the Centers for Manufacturing Innovation proposed by the legislation can help small and medium enterprises introduce novel manufacturing technology into the U.S. supply chain more rapidly.

What do you think are some of the specific challenges faced by some of the smaller manufacturers?

Dr. BILLER. Well, let's try and take the idea of creating a new product and a new product line in the virtual space, because that is really where the development is going, that people are creating something in a computer-aided design. Then they are moving through computer-aided manufacturing, computer-aided engineering. Everything happens essentially in the computer. It is all digital.

And so now our suppliers, especially the smaller ones, might lack, A, access to such tools because they are expensive, and B, access to engineers who can operate those tools, even if they had those tools. So for us it is really critical that those SMEs get trained in these skills and that they have access maybe on a, you know, buy-by-the-drink way through an institute way so that they can actually continue to be our suppliers or become our supplier. What we want at General Electric, we want to have as competitive a supply base as possible. It helps us, it helps the nation, helps the suppliers, it helps everybody. And so we think that is really critical that we get to such an environment where people have access to that, and if we don't allow SMEs to acquire such skills, then we

will see what we have seen before, that companies will leave because they have such skills in other countries and let's make no mistake about it. You know, China, Germany, Japan, they are all helping the SMEs to get such suppliers. Fraunhofer have been in existence for, you know, 60 or 70 years, continuously, basically serving as a transfer mechanism from one SME to the next by developing the technologies in these Federal institutes.

So we think this is really required to continue to have an SME and maybe even to expand the SME base and hopefully help your district to get to a better employment level.

Ms. KELLY. Right, because it is more of the small and medium-sized manufacturers that really hire the area residents and that, like has been said already, that people have a great concern about not being able to replace people when they retire because people don't have the skills.

Dr. BILLER. Yes.

Ms. KELLY. Thank you.

Chairman BUSCHON. Thank you. I now ask unanimous consent for Mr. Kennedy to participate.

Without objection the Chair now recognizes Mr. Kennedy for five minutes.

Mr. KENNEDY. Mr. Chairman, thank you. I appreciate that. I appreciate the time today and your patience and generosity to add me on. I also want to thank you for holding this hearing and for—a big round of thanks to the Ranking Member as well, Mr. Lipinski, for all of his support, not just for the bill but for advanced manufacturing and the concept behind this bill for quite some time, sir, so thank you very, very much.

Mr. Collins, thank you for your questions for making the time, and for your support of the legislation as well, and I saw Mr. Reed pop in. I know he is going to be here, back momentarily.

To the witnesses, thank you very, very much for your time. Thank you for your testimony. I have, Mr. Chairman, with me a number of letters of support from some outside organizations that I wanted to submit for the record if I could, so I ask with unanimous consent—

Chairman BUSCHON. Without objection.

[The information appears in Appendix I]

Mr. KENNEDY. —to the record. Thank you very much, and they are from the Motor and Equipment Manufacturers' Association, the National Association of Manufacturers, the Information Technology and Innovation Foundation, which includes Alcoa, Ansys, Applied Materials, Autodesk, DuPont, National Modeling and Simulation Coalition, Owens Illinois, Rockwell Automation, TechSolve, Cal Berkeley, Cal Irvine, University of Southern California, One Voice representing the National Tooling and Machining Association, and the Precision Metal Forming Association, Precision Machine Products Association, DOW, and the Semiconductor Equipment and Materials International, otherwise known as SEMI. Mr. Davis, thank you very, very much.

I wanted to speak briefly, you will be hearing from me in another couple of minutes, so I will try to keep it brief. A number of comments from I think the witnesses and from my colleagues here I think took the holistic view of the challenges facing the U.S. manu-

facturing industry from regulation taxes uncertainty, overall global, or excuse me, economic uncertainty here in the United States and globally, the training issue that has come up time and, again, sir, as well as energy costs and the potential innovation surrounding energy costs that could lead to at least a support for bringing some of the manufacturing processes back home.

I wholeheartedly agree with all of those observations and critiques. This bill obviously attempts to try to get at a small part of this but I think a critical part nonetheless, and Mr. Biller, I was hoping to get you to elaborate a little bit seeing as GE is involved in one of these pilot programs in Youngstown, Ohio, that you already mentioned already the Ohio National Additive Manufacturing Innovation Institute focused on additive manufacturing otherwise known as perhaps more colloquially 3D printing.

I just was hoping that you could discuss a little bit more about how big companies like GE can work effectively with smaller and medium-sized enterprises to fill that gap that you I think so eloquently described that Valley of Death that exists for so many companies out there. If you could just give us a little bit of an overview from your experience.

Dr. BILLER. Sure. So GE has been a founding member of the NAMII, the National Institute for Additive Manufacturing, Youngstown, Ohio. The great thing about this institute is I think we have close to 100 companies participating in this program and so this allows us to work closely with the suppliers. We can understand better what their capability is. We can help them understand what capability we are looking for when we are looking for a supplier. It allows us to grow our own capability, additive manufacturing for production is a fairly new field, so it will allow us to have access to people who are being trained in additive manufacturing as well as our suppliers who have access to people who are coming out of school or who have been employees at that center and typically the employees at these centers, they cycle through the center, they stay for two years and then they move on to go work in industry typically or in academia.

And so creating that kind of environment where people can get together and say, here, this is as a Nation where we want to go in terms of additive manufacturing. We all agree that this pre-competitive, and here is where we can move the needle from it being, you know, very new technology and unestablished technology, technology where we don't understand the pure properties, where we don't understand how to produce this at a lower cost and so forth to a level where it becomes competitive and where we get a supply base and in fact, establish a supply base in additive manufacturing. It is a very new field, and so I think was really an ideal first CMI.

Mr. KENNEDY. Thank you, sir, and Mr. Davis, if I could, and I realize the time is brief, but you mentioned a little bit before some of the unique challenges I think in your comments about the speaker, about that SEMI—comes to grips with as you are trying to develop new products without being burdened by high costs and the high risks associated with that type of innovation and the costs associated with it.

Could you discuss a little bit on how the semiconductor industry is impacted by these issues and some of the ways that hopefully

a model like this will address it even though I am 10 seconds over-time?

Mr. DAVIS. Thank you for your leadership on this bill, Congressman, and thank you for the question.

I think the essential thing facing manufacturers such as those in our association is how you maintain a pace of innovation, and innovation isn't something you fund once, buy, and then you have got it. It is an ongoing process that needs to be sustained within this country.

By way of example, when I think about innovative products, things that have changed our economy and our competitiveness, you look at this thing, which I believe probably every person in this room has one of in their pockets. Every single element of this smart phone that makes it smart is a product of industry collaboration and public/private partnerships. Touchscreen displays, global positioning system, the internet, wireless connectivity, microchips. All those things were products of public/private partnership.

So the vision and leadership that this country can take through acts such as this lay a foundation for future prosperity in this country in innovation, and I am not sure if that answered your question specifically but—

Mr. KENNEDY. Beautifully, sir. Thank you, and Mr. Chairman, thank you for your generosity. I am sorry to cut it short. Thank you very much.

Chairman BUSCHON. The gentleman is welcome.

At this point I would like to thank the witnesses for their interesting and valuable testimony. The witnesses are excused, and we will take a short break while we set up our second panel. Thank you, gentlemen, for your testimony. Appreciate it.

[Recess.]

Chairman BUSCHON. All right. We will reconvene for our second panel of very distinguished witnesses. Our first witness is the Honorable Tom Reed, the Representative from the 23rd District of New York and a Member of the Ways and Means Committee, and our second witness is the Honorable Joseph P. Kennedy III, Representative from Massachusetts, 4th Congressional District, and a Member of the Science Committee.

As you know witnesses' testimony is limited to five minutes, and I will recognize Mr. Reed for his testimony.

**TESTIMONY OF THE HONORABLE TOM REED,
MEMBER, U.S. HOUSE OF REPRESENTATIVES**

Hon. REED. Thank you very much, Mr. Chairman, and Ranking Member Lipinski and Members of the Committee for the opportunity to weigh in and testify on this important legislation before you, and I do not anticipate taking the entire five minutes as I have submitted written testimony to the Committee.

Again, I sincerely would like to thank you for bringing this legislation before the Committee today. I am proud to have introduced this legislation, the Revitalize America Manufacturing and Innovation Act with my good friend and good colleague, Congressman Joe Kennedy, from Massachusetts, a Member of this Committee, as well as working in a bicameral fashion with Senator Sherrod

Brown of Ohio and Roy Blunt of Missouri on companion legislation in the Senate.

I think this is an exciting piece of legislation that is going to advance manufacturing in America. As a co-chair of the House Manufacturing Caucus here in Congress, I am a firm believer that this legislation will take a step in the right direction to enhancing American manufacturing and partnering manufacturers together with academia, businesses and institutions across America and in a public/private manner to bring products from the lab into a commercialized setting. The bill also addresses the clear workforce development issues we face in America in regards to matching up the skill sets of advanced manufacturing. This bill in my opinion brings that public/private partnership mentality together for purposes of innovation, workforce development, and a firm commitment to a philosophy that I believe in, and that we are going to make it here to sell it there.

I serve on the Ways and Means Committee and do a lot of work on the trade front. One statistic that really jumps out to me on this issue, and that is people need to realize that on the world economic stage, 95 percent of the world's consumers live outside of U.S. borders. That means we have to build it here, sell it there, and having this type of legislation will bring together those public/private partnerships that will encourage and empower U.S. manufacturing to be competitive and to really achieve that goal of making it here to sell it there.

I come from a district of western New York as the Chairman knows. It is an exciting area of the world in the sense that Corning Incorporated is headquartered in my home town of Corning, New York, Corning Incorporated, and the makers of the glass many of us have in our iPads and our iPhones, and companies like Dresser-Rand, Cummins, and Lufkin. They are all posed to gain from this legislation and the concepts that we have here put forth.

I was proud to work with the constituent company of G. W. List and the Finger Lakes Community College to partner those two institutions up on a pilot demonstration project where the community college was using the resources of that manufacturer and that manufacturer was using the resources of the community college to create a work training program that brought kids and young adults from a situation where they didn't have the skills to participate in that U.S. manufacturing setting, and at the end of that program were certified and moved right into an employment situation.

That is what this legislation is trying to do in part on a national level, and we are proud to be partnering with that.

With that I ask the Committee to weigh in favorably on this legislation, and I appreciate the effort that you have done in highlighting RAMI and the exciting opportunity that it represents working with a true good friend Joe Kennedy, on this legislation. It has been a joy, and it is been something that I think we can be proud of in a bipartisan, bicameral manner to advance U.S. manufacturing here in Congress.

And with that I yield back.

[The prepared statement of Mr. Reed follows:]

**Testimony of Congressman Tom Reed
New York, 23rd Congressional District**

**House Science Committee, Subcommittee on Research & Technology
December 12, 2013**

Good morning, Chairman Bucshon, Ranking Member Lipinski, and members of the Committee. I would like to thank you for bringing this legislation before the Committee today. I am proud to have introduced this legislation, *The Revitalize American Manufacturing Innovation (RAMI) Act*, with my colleague Congressman Joe Kennedy from Massachusetts, a Member of this Committee as well as Senators Sherrod Brown of Ohio and Roy Blunt of Missouri.

My district is home to a wide variety of manufacturers from Lockheed Martin and Dresser-Rand who work with our nation's military to Corning Incorporated, Cummins and small and medium size firms stretched across the Southern Tier and Finger Lakes Region of New York State. These manufacturers continue to make a comeback in the manufacturing sector and grow our nation's high-skilled workforce. Knocking down barriers to growth, cutting that red tape and allowing these businesses do their jobs is the best way to support a sector that employs more than 11 million Americans. One way we can spur that growth is through public-private partnerships outlined in the Revitalize American Manufacturing and Innovation Act that I look forward to discussing with you today.

I recently visited Lufkin-RMT in Wellsville, NY to hear about their recent expansion into a state-of-the-art 55,000 square foot facility. They are also making strides locally in partnering with area colleges to tackle workforce issues from the bottom up. On the other side of my district I have seen great partnerships such as that between G.W. Lisk and Finger Lakes Community College who are working together to train the next generation of manufacturing workers. It's manufacturer's like Lufkin-RMT and G.W. Lisk that truly see the long-term benefit of creating manufacturing hubs and public-private partnerships, like those created under the RAMI Act.

Regrettably we continue to see many new ideas and technologies coming out of local universities and community colleges that are not able to make the jump to commercialization in domestic factories. *The Revitalize American Manufacturing and Innovation (RAMI) Act of 2013*, H.R. 2996, will help rebuild our manufacturing capacity and create an environment where the private sector will invest in the strengths of our nation and American manufacturing will grow.

We have seen how this concept can work in the ongoing success of the Youngstown, Ohio National Additive Manufacturing Innovation Institute. I have been working with my friend from Ohio, Congressman Tim Ryan, as leaders of the House Manufacturing Caucus together to broadcast the accomplishments that are happening every day in Youngstown and projecting how the next three centers and those hopefully to follow can change the way American manufacturing evolves. Youngstown is proving that if we coordinate efforts at the federal and local level with our manufacturer's and higher education institutions, we can continue to build upon the American manufacturing renaissance. I look forward to hearing from the panelists today, both

GE and Moog, two great New York companies, who have been involved in the Youngstown manufacturing hub.

Encouraging manufacturing and technology innovation through coordinating resources will commercialize research and development into manufactured products and train an advanced manufacturing workforce to support our job-creating manufacturers. Having a network of manufacturing institutes is what we need here in America to 'Make it here, sell it there. *The Revitalize American Manufacturing and Innovation Act* will add more manufacturing institutes to bolster private-sector job creation and advance our competitive edge. We'll engage the best and the brightest minds in manufacturing, academia and business to move American manufacturing forward.

The *RAMI Act* in summary will:

- Establish a Network for Manufacturing Innovation to improve the competitiveness of U.S. manufacturing and increase domestic production;
- Build public-private partnerships through Centers for Manufacturing Innovation among higher education, community colleges as well as small and large manufacturer's to promote best practices and address advanced manufacturing challenges; and,
- Comprehensively address our skills gap by producing a next generation talent pool requiring skilled production workers and engineers by focusing on education, workforce training, research and development, and commercialization.
- The bill will be fully paid for, with offsets, as I feel strongly about getting the U.S. out of the current debt crisis we find ourselves in. Creating jobs and spurring innovation through companies like those represented in the room today will also help in that effort.
- The network would be funded, as currently written, by a one-time \$600 million investment in the National Institute of Standards and Technology (NIST). It would require support from non-government resources and would prohibit federal financial assistance for any institute beyond a seven year period.
- Institutes will be selected for participation and funding through a competitive, merit review process run by the Secretary of Commerce and NIST.
- The bill is supported by the National Association of Manufacturer's, Information Technology & Innovation Foundation, SEMI, Motor Equipment Manufacturers Association, AFL-CIO, Precision Machined Products Association as well as the One Voice / National Tooling & Machining Association/Precision Metal forming Association Coalition.

Congressman Tom Reed Biography

Congressman Tom Reed was first elected to represent the 29th District of New York in a special election held November 2, 2010. He took office during the “lame duck” session of the 111th Congress and began his own full two year term in the 112th Congress on January 5, 2011. Reed was re-elected on November 6, 2012 to serve a two year term in the new 23rd District.

In June 2011 Congressman Reed was appointed to the Committee on Ways and Means. The Ways and Means Committee has broad jurisdiction over many issues including tax policy, trade, health care, and Social Security. He serves on the Human Resources, Oversight, and Select Revenue Measures subcommittees of Ways and Means.

“Job creation and the nation’s financial health are the most important challenges facing the country and upstate New York,” Tom says. “Serving on Ways and Means allows me to have a direct impact on supporting job growth, simplifying the burdensome tax code and reigning in federal spending. This is why the voters of the 23rd District sent me to Washington.”

Reed has gained a reputation of fighting for job creation through tackling our national debt, reducing burdensome regulations on small businesses – our country’s drivers of private-sector job growth, – reforming the tax code to make it simpler, fairer, and less costly, and developing an “all-of-the-above” comprehensive energy policy. Last year, Tom began an initiative to spotlight taxpayer dollars being frittered away by federal agencies. The program has highlighted more than \$14,781,015,198 of wasteful spending thus far.

“Our first purpose is to be a resource for everyone in the district,” Reed says. Since first being elected in 2010, Tom has held more than 100 town hall meetings and continues to maintain an aggressive town hall and tele-town hall meeting schedule. With district offices in Corning, Geneva, Ithaca, Jamestown, Olean, and remote office hours throughout the district, Reed’s accessibility to constituents is his first priority. Tom’s staff has also completed more than 5,000 constituent cases. “At each milestone we reach, we’re looking ahead to the next one, focusing on how we can better serve the 23rd district. Our team is continually working to improve upon the level of assistance we provide.”

Tom currently Co-Chairs the House Manufacturing Caucus and Congressional Natural Gas Caucus, and is Vice Chair of the Congressional Diabetes Caucus.

Previously, Tom served on the Rules, Judiciary, and Transportation and Infrastructure committees.

Tom is one of 12 children raised by Tom and Betty Barr Reed – both long-term residents of the city of Corning, N.Y. His father was a veteran of both World War II and the Korean War. Tom attended All Saints Academy, Corning East High School, and is a 1989 graduate of Horseheads High School. He graduated from Alfred University in 1993 with a degree in Political Science. While at Alfred, Tom also was captain of the men's swim team.

“In our family, the military ethics of honor, integrity and commitment to our nation are not just terms or concepts to be thrown around haphazardly,” Tom recalls from his upbringing. “They are beliefs to be held sacred and always respected.” Tom's father died when Tom was only two years old. “We watched as our mother carried on, moving the remaining five children with her to our hometown of Corning, where she raised us by herself in the home my grandfather built.”

Tom graduated from the Ohio Northern University College of Law in 1996 and began work in Rochester, N.Y. Tom's wife Jean worked as a waitress while he studied for the bar exam and they started their family. “She also worked through the night at Strong Memorial, so I could start my legal career,” Tom states. In 1999, they returned to his hometown of Corning, where he and Jean live with their children, Autumn and Will. After opening his private practice, he spent the next 11 years building his law firm and other businesses dealing with real estate and mortgage brokerage. Today, Tom's businesses employ more than 25 people.

Tom has served on many community boards in the Corning area. It was his commitment to family and friends, an enduring love for his hometown, and a deep concern about the “personal, petty political issues” he saw at City Hall that propelled him to seek political office – Mayor of the City of Corning. He served one full term from 2008 through 2009.

Concerning his approach to representing the 23rd District, Tom says, “I still believe that the power of our nation is not in the government we create, but rather the honest individuals who show up day in and day out and work for a living. We must again become a nation of personal accountability - one where our government does not guarantee success to everyone, but rather simply guarantees the individual is given the opportunity to succeed.”

Chairman BUSCHON. Thank you. Now recognize Mr. Kennedy.

**TESTIMONY OF THE HONORABLE JOSEPH P. KENNEDY, III,
MEMBER, U.S. HOUSE OF REPRESENTATIVES**

Mr. KENNEDY. Thank you, Mr. Chairman. Thank you, again, to Ranking Member Lipinski, to Members of the Committee that are here. Thank you for the invitation to come and testify about the Revitalize American Manufacturing Innovation Act, otherwise known as RAMI, H.R. 2996, a bill that we have been working on very hard with my colleague, Mr. Reed, from New York, and I also want to thank, as I said a moment ago, Mr.—the Ranking Member, Mr. Lipinski, for his leadership on this issue for a long time, for his co-sponsorship as well as the Ranking Member of the full Committee, Ms. Johnson, and Mr. Collins as well for his co-sponsorship. I also wanted to recognize Senators Sherrod Brown and Roy Blunt for their introduction of companion legislation in the Senate.

Back home in the Commonwealth machines are buzzing today. At Thermo Fisher Scientific in Franklin they are lacing together complex engineering processes to build air quality monitors that help keep our air clean around the country. At Johnson & Johnson in Raynham 3-D manufacturing models are becoming wax structures that ultimately give doctors the ability to conduct intricate spinal surgeries and create custom titanium joints for knee and hip replacements among many others. At General Dynamics in Taunton, cutting-edge technologies are being utilized to create lifesaving battlefield communication systems for our men and women in uniform.

From the Berkshires to the Blackstone Valley, Massachusetts manufacturers are innovating at a breakthrough pace or excuse me, breathtaking pace and are carefully rebuilding what our sluggish economy needs most, stronger, more sustainable pathways to middle class jobs. In doing so they are promoting a model of economic development that is locally sourced and regionally driven. The Massachusetts story is not unique. Across the country innovation industries are transforming the American economy and giving our once-fading manufacturing industry new legs of innovation like advanced manufacturing, life sciences, information technology, and defense.

For the past six months manufacturing activity has steadily expanded. In November it hit its fastest pace in two and a half years, and that growth is expected to continue. U.S. high tech manufacturing is the largest in the world, accounting for \$390 billion of global value added and high tech manufacturing in 2010.

However, the share of U.S. manufacturing in the—the U.S. share in the world market has declined from 34 percent in 1998, to 28 percent in 2010, and in 2011, the trade deficit of advanced products was up equal to 17 percent of total U.S. trade deficit.

There is no doubt that manufacturing has suffered mightily in the past few decades, but the slow and steady improvement that we see today is positive. In a time of growing income inequality and a time of still-evaporating middle class jobs and decreased economic mobility, manufacturing can and must remain the cornerstone of the American economy.

As policymakers if we want the success that we have seen in recent months to continue, then we must focus our efforts on better linking innovation and manufacturing sectors, understanding that the latter is critical as a vehicle for bringing the former to market.

I am proud to be here to testify in support of this bill which Congressman Reed and I believe will help accomplish these important goals. The Revitalize American Manufacturing and Innovation Act focuses on building as MIT puts it, “industrial ecosystems that bring together businesses, educators, innovators under one roof to pursue manufacturing processes that are relevant to the local economy.”

Currently very few of these coordinated regional support systems exist for manufacturers, innovators, and entrepreneurs outside of places like Cambridge, Silicon Valley, parts of New York and Ohio, leaving independent businesses to fend for themselves. RAMI aims to fix that as Congressman Reed pointed out in his testimony.

This bill uses some public funds to fuel the creation of these regional institutes, mandating that any partnership be wholly self-sufficient within seven years. Most importantly, RAMI sets a strong framework and then lets local stakeholders take the reins. This is locally-driven, public/private partnership that should be a model that is fueled so much success back home in Massachusetts where Governor Deval Patrick has created regional networks around science, technology, engineering, and mathematics, otherwise known as STEM education, and advanced a statewide manufacturing collaborative.

These efforts have allowed Massachusetts to focus on the specific needs and strengths of different parts of our state and avoid a top-down, one-size-fits-all approach to economic development and job creation. As a result, precision manufacturing and advanced manufacturing businesses are steadily growing, bringing with them solid middle-class jobs that hold enormous promise for industrial communities that have long been the backbone of our economy.

Advanced manufacturing jobs in Massachusetts have an average annual salary of \$75,000, and economists forecast over 100,000 jobs in this sector opening up over the next decade as older workers retire, not to mention the brand new ones that will come from any additional economic growth.

Mr. Chairman, thank you very much for the opportunity to testify today. Thank you to the Committee for their consideration of this important piece of legislation, and I ask for all of you to look on it favorably as well.

Thanks very much.

[The prepared statement of Mr. Kennedy follows:]

Opening Statement – Rep. Joseph P. Kennedy, III (MA-04)
Committee on Science, Space, and Technology – Subcommittee on Research and Technology
Hearing: “Building a Network for Manufacturing Innovation”

December 12, 2013

Chairman Bucshon, Ranking Member Lipinski, members of the Committee, thank you for the invitation to testify on the *Revitalize American Manufacturing and Innovation (RAMI) Act, H.R. 2996*, a bill I introduced with my colleague Congressman Tom Reed. I'd also like to recognize Senators Sherrod Brown and Roy Blunt for introducing companion legislation in the Senate.

Back home in the Commonwealth, machines are buzzing today. At AccuRounds in Avon, they are transforming 12-foot steel bars into sophisticated tools for everything from cornea surgery to national defense. At Thermo Fisher Scientific in Franklin, they're lacing together complex engineering processes to build air quality monitors that help keep air clean around the country. At Johnson & Johnson in Raynham, digital 3-D models are becoming wax structures that ultimately give doctors the ability to model intricate spinal surgeries and create custom titanium joints.

From the Berkshires to the Blackstone Valley, Massachusetts manufacturers are innovating at a breathtaking pace and carefully rebuilding what our still-sluggish economy needs most: stronger, more sustainable pathways to middle class jobs. In doing so, they are promoting a model for economic development that is locally sourced and regionally driven.

And the Massachusetts story is not unique. Across the country, innovation industries are transforming the American economy and giving our once-fading manufacturing industry new legs in industries like advanced manufacturing, life sciences, information technology and defense.

For the past six months, manufacturing activity has steadily expanded. In November, it hit its fastest pace in 2.5 years and that growth is expected to continue. U.S. high-tech manufacturing is the largest in the world, accounting for \$390 billion of global value added in high-tech manufacturing in 2010. However, the share of the U.S. in the world market is declining, from 34 percent in 1998 to 28 percent in 2010. And, in 2011, the trade deficit of advanced technology products was equal to 17 percent of total U.S. trade deficit.

There is no doubt that manufacturing has suffered mightily these past few decades. But, the movement we see today is positive, slow and steady. In a time of growing income inequality; in a time of still-evaporating middle-class jobs and decreased economic mobility – I believe manufacturing can and should remain a cornerstone of our American economy.

As policy-makers, if we want the success we've seen in recent months to continue, then we must focus our efforts on better linking innovation with manufacturing – understanding that the latter is a critical vehicle for bringing the former to market.

I am proud to be here today to testify in support of this bill with my colleague, Congressman Reed, which we believe would accomplish these important goals. The *Revitalize American Manufacturing and Innovation Act* focuses on building – as MIT puts it – “industrial ecosystems” that bring together businesses, educators, innovators and government under one roof to pursue manufacturing processes relevant to the local economy.

Currently, very few of these coordinated regional support systems exist for manufacturers, innovators and entrepreneurs, outside of places like Cambridge and Silicon Valley, which leaves independent businesses to fend for themselves. RAMI aims to fix that, as Congressman Reed pointed out in his testimony.

The bill uses modest public funds to fuel the creation of these regional institutes, mandating that any partnership be wholly self-sufficient within 7 years. Most importantly, RAMI sets a strong framework and then lets local stakeholders take the reins.

This locally-driven, public-private partnership model is what has fueled so much success back home in Massachusetts, where Governor Patrick has created regional networks around Science, Technology, Engineering and Mathematics (STEM) education and a statewide Advanced Manufacturing Collaborative. These efforts have allowed Massachusetts to focus on the specific needs and strengths of different parts of our state and avoid a top-down, one-size-fits-all approach to economic development and job creation.

As a result, precision and advanced manufacturing businesses are steadily growing, bringing with them solid, middle-class jobs that hold enormous promise for the industrial communities that have long been the economic backbone of our state. Advanced manufacturing jobs in Massachusetts currently have an average annual salary of \$75,000 and economists forecast over 100,000 jobs in this sector opening up over the next decade as older workers retire — not to mention the brand new ones that will be created from any additional growth.

Mr. Chairman there is no question today we face a federal budget landscape that can seem unforgiving. But it is our responsibility – as the men and women elected to make policy decisions on behalf of a country struggling to find its economic footing – to employ some vision and some foresight when tackling these challenges; to look beyond politics today in the interest of progress tomorrow.

If we fail to plan for the future, if we fail to make the investments we need for the kind of country we want; then we will put this country on a path of economic stagnation that will be harder and harder to reverse.

I thank you and members of the subcommittee for this opportunity, and encourage your support of this bill.

Congressman Joseph P. Kennedy
Official Biography

Joseph P. Kennedy III is proud to serve the Fourth District of Massachusetts in Congress. Having dedicated his career to public service, Joe brings a firm commitment to social justice and economic opportunity to the U.S. House of Representatives. Elected in November of 2012, he represents a diverse district that spans from the suburbs of Boston to the more industrial towns of Massachusetts' South Coast.

Prior to seeking office, Joe served the Commonwealth of Massachusetts as an Assistant District Attorney in both the Middlesex County and Cape and Island's District Attorneys' Offices. A graduate of Harvard Law, he was an active member of the school's Legal Aid Bureau – a pro-bono law firm that provided legal services to low-income families around Boston. During that time he also co-founded an afterschool program for at-risk youth in the Boston area with his wife, Lauren.

Earlier in his career Joe served as a member of the Peace Corps in the Dominican Republic where he designed and implemented an economic development project that helped create jobs and increase the standard of living in an isolated community near Puerto Plata. Joe has also worked as an international development analyst for the United Nations' Millennium Project and as an anti-poverty consultant abroad. He is fluent in Spanish and currently sits on the House Committee on Foreign Affairs, as well as the House Committee on Science and Technology.

Born and raised in Massachusetts, Joe holds a bachelor's degree in Management Science and Engineering from Stanford University.

He lives with his wife, Lauren, and their dog, Banjo, in Brookline, Mass.

Chairman BUSCHON. Thank you very much, gentlemen, for your testimony, and we heard today on the first panel a lot of great ideas going along with your bill, and as a Member of the Education and Workforce Committee, from that angle also about the future of American manufacturing and about workforce development and how that really is going to start, needs to be started in K-12 education and increase our pipeline so to speak, development into highly-technically trained people that are filling the 21st century jobs. As both of you know when you go into our factories today, the high-tech computer work is needed. Almost everything is robotic, even in small manufacturing facilities, and if we are going to continue to be competitive internationally, workforce development is very important, as well as also I think some of the larger issues that we also discussed related to regulation, taxation, and everything else that we can do.

But I have a lot of confidence in America to compete. We always have, and we always will, and this is a critical area that we need to work on. So thank you again.

With that, the record will remain open for two weeks for additional comments and written questions, and the witnesses are excused, and the hearing is adjourned. Thank you very much.

Mr. KENNEDY. Thank you, Mr. Chairman.

[Whereupon, at 11:51 a.m., the Subcommittee was adjourned.]

Appendix I

ADDITIONAL MATERIAL FOR THE RECORD

SUBMITTED LETTERS FOR THE RECORD BY THE HONORABLE JOSEPH P. KENNEDY, III,
MEMBER, U.S. HOUSE OF REPRESENTATIVES



Brian Raymond
Director, Technology Policy
Tax and Domestic Economic Policy

October 22, 2013

The Honorable Tom Reed (R-NY)
United States House of Representatives
1504 Longworth House Office Building
Washington, DC 20515

The Honorable Joseph P. Kennedy, III (D-MA)
United States House of Representatives
1218 Longworth House Office Building
Washington, DC 20515

Dear Representative Reed and Representative Kennedy:

The National Association of Manufacturers (NAM), the largest manufacturing association in the United States, representing small and large manufacturers in every industrial sector and in all 50 states, supports the revenue neutral *Revitalize American Manufacturing and Innovation Act of 2013* (H.R. 2996), which could help accelerate the development of advanced manufacturing technologies.

Innovation is the lifeblood of U.S. manufacturing and the NAM strongly supports policies to ensure that manufacturers in the United States are the world's leading innovators. Manufacturers account for two-thirds of private-sector research and development (R&D) and enjoy many existing public-private partnerships with universities and the government in this area. This investment in R&D and ongoing productive partnerships creates the innovation and intellectual property that helps fuel manufacturing growth in the U.S.

The *Revitalize American Manufacturing and Innovation Act of 2013* has the potential to strengthen the technology leadership position that manufacturers have worked years to establish. By creating a network of innovation centers, the legislation will bring together businesses, schools, and government in a joint effort to speed the transfer of advanced manufacturing technology and techniques into the commercial sector. This cooperative partnership will benefit all three sectors and the economy as a whole.

Adoption of new technologies and advanced manufacturing techniques has long been critical to small and medium-sized manufacturers. As the manufacturing community recovered from the devastating recession of 2009, restoring 500,000 of the 2.3 million jobs lost during the downturn, the ability of small and medium manufactures to use technology to adapt played a critical role in this job creation. They would not have survived this and other economic contractions without it. These companies are therefore all "advanced manufacturers" given their innovative use of new technologies and tools.

The legislation recognizes this important role small and medium-sized manufacturers play in the innovation ecosystem by including engagement and outreach with these job-creators as a key activity of the centers. It requires the Department of Commerce to solicit recommendations and advice from these entities when developing the strategic plan. The legislation also requires that before each center is launched the selection process must consider how it will engage small and medium-sized manufacturers to improve their capacity to commercialize new processes and technologies. The centers are also required to ensure that

Leading Innovation. Creating Opportunity. Pursuing Progress.

The Honorable Tom Reed (R-NY)
The Honorable Joseph P. Kennedy, III (D-MA)
October 22, 2013
Page Two

the NAM-supported Hollings Manufacturing Extension Partnership (MEP) program is also incorporated to ensure these new centers reach small and medium-sized companies.

Increased innovation and technological advancements in manufacturing will benefit the U.S. economy. Coupled with pro-growth, pro-jobs policies, training a 21st-century workforce, expanding access to the international marketplace and making the U.S. the best place in the world to manufacture, the *Revitalize American Manufacturing and Innovation Act of 2013* has the potential to drive critical innovations for the manufacturing community and its workers.

Sincerely,

A handwritten signature in black ink, appearing to read "BR" followed by a stylized flourish.

Brian Raymond
Director, Technology Policy



itif.org

October 25, 2013

Senator Sherrod Brown
Hart-713, U.S. Congress
Washington, DC 20510

Senator Roy Blount
Russell-260, U.S. Congress
Washington, DC 20510

Representative Joe Kennedy
Longworth-218, U.S. Congress
Washington, DC 20515

Representative Tom Reed
Longworth-1504, U.S. Congress
Washington, DC 20515

Dear Congressmembers:

The undersigned organizations are writing to express our strong support for *The Revitalize American Manufacturing and Innovation Act of 2013*, legislation that would authorize the establishment of a National Network for Manufacturing Innovation (NNMI).

To maximize America's competitive edge in advanced manufacturing, we believe the private and public sectors must work together to leverage existing resources and expertise to create robust networks focused on comprehensive innovation at all points along the product development and commercialization chain. NNMI accomplishes these goals by bringing together small businesses, industry leaders, universities, research institutions, and the states to address the gap between research and the commercialization of the new technologies and processes that will best position American companies to compete globally for decades to come.

By focusing on creating an ecosystem that supports regional innovation, while also being a national resource to promote American competitiveness in key industrial sectors and technologies, NNMI will help to create an environment where new innovations can be swiftly deployed to producers, especially small and medium-sized manufacturers.



itif.org

A pilot institute, the National Additive Manufacturing Innovation Institute, founded in Youngstown, Ohio in August 2012, has already demonstrated success in developing and bringing to market additive manufacturing (e.g., 3-D printing) technologies. And in May 2013, three new Institutes of Manufacturing Innovation were announced. These will spur innovation in digital manufacturing and design, lightweight metals manufacturing, and next-generation power electronics. Industry stands ready to co-invest in these public-private partnerships, which are poised to play a pivotal role in strengthening America's industrial competitiveness. However, in the absence of a well-structured framework authorized and funded by Congress, it will be difficult to realize the full potential of such Institutes.

We commend your leadership in crafting and bringing to this legislation to the floor. We urge you to work on a bipartisan basis in the committees of jurisdiction to pass this legislation as swiftly as possible.

Sincerely,

The Information Technology and Innovation Foundation

Alcoa

ANSYS

Applied Materials

Autodesk

Dupont

National Modeling and Simulation Coalition

Owens Illinois

Rockwell Automation

TechSolve

University of California – Berkley

University of California – Irvine

University of Southern California



November 6, 2013

The Honorable Tom Reed
1504 Longworth House Office Building
Washington, DC 20515

The Honorable Joseph Kennedy, III
1218 Longworth House Office Building
Washington, DC 20515

Dear Representatives Reed and Kennedy:

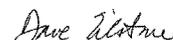
On behalf of One Voice, the joint effort between the National Tooling and Machining Association (NTMA) and the Precision Metalforming Association (PMA), and our nearly 3,000 metalworking member companies, thank you for your leadership and continued efforts to highlight the importance of manufacturing in America. Your introduction of H.R. 2996, the Revitalize American Manufacturing and Innovation Act, is an important step in fostering an environment which encourages American manufacturers to grow and thrive.

Manufacturing businesses employ nearly 12 million Americans and represent more than 10 percent of our entire economy, and is a vital industry for the future of our economic and national security. To strengthen and expand the manufacturing base in the U.S., we must engage leaders at every level. The establishment of public-private like the Centers for Manufacturing Innovation (CMI) will help the development of strategies and best practices to enhance U.S. industrial competitiveness while also helping to meet the workforce needs of our industry and strengthening the manufacturing base in the U.S.

Thank you for your leadership on this issue on behalf of the metalworking industry and we look forward to working with you.

Sincerely,


William E. Gaskin
PMA President


Dave Tilstone
NTMA President



November 14, 2013

The Honorable Tom Reed
1504 Longworth House Office Building
Washington, DC 20515

The Honorable Joseph Kennedy, III
1218 Longworth House Office Building
Washington, DC 20515

Dear Representatives Reed and Kennedy:

On behalf of the Precision Machined Products Association (PMPA), our members and the roughly 100,000 employees nationwide in our industry, thank you for your continued efforts to address the issues facing businesses manufacturing in America. Your introduction of H.R. 2996, the Revitalize American Manufacturing and Innovation Act, is an important step to support the growth and improvement of manufacturers across the country.

Manufacturing employs nearly 12 million Americans and represents more than 10 percent of our entire economy, making it a vital industry for the future of our economic and national security. In order to revitalize American manufacturing, we must advance policies that will enhance U.S. industrial competitiveness. The establishment of public-private like the Centers for Manufacturing Innovation (CMI) will help the development of strategies and best practices to strengthen and expand the American manufacturing base while also helping to meet the workforce needs of our industry.

Thank you for your consideration and your leadership on this issue on behalf of the metalworking industry. Your introduction of H.R. 2996 once again proves your steadfast commitment to companies manufacturing in America.

Sincerely,

Michael Kobylka
Executive Director
PMPA



SEMI North America
1200 G Street, NW Suite 325
Washington, DC 20005

Tel: 1.202.393.5552
Fax: 1.202.393.5555
semidc@semi.org
www.semi.org

October 22, 2013

The Honorable Sherrrod Brown
517 Hart Senate Office Building
US Senate
Washington, DC 20510

The Honorable Roy Blunt
260 Russell Senate Office Building
US Senate
Washington, DC 20510

The Honorable Tom Reed
1504 Longworth House Office Building
US House of Representatives
Washington, DC 20515

The Honorable Joseph Kennedy III
1218 Longworth House Office Building
US House of Representatives
Washington, DC 20515

Dear Senators Brown and Blunt and Representatives Reed and Kennedy:

As the President and CEO of Semiconductor Equipment and Materials International (SEMI), I write to you to in full support of your bills, S. 1468 and H.R. 2996, the Revitalize American Manufacturing and Innovation Act.

As you know, SEMI is the global industry association serving the manufacturing supply chain for the micro- and nano-electronics industries. In the US, SEMI has nearly 500 member companies representing 70,000 employees across the country. These companies represent the most advanced manufacturing capability that is available anywhere in the world, which enables the manufacturing of all modern electronics.

While the US is still the world leader with 40% of all semiconductor manufacturing equipment being produced in America, the rest of the world is quickly taking market share. In fact, this industry is being targeted with specific government incentives from countries around the world, who are putting billions of dollars in subsidies on the table to attract a greater market share. In addition, they are looking to gain additional intellectual property which is the cornerstone of any modern and successful innovation based economy.

With this in mind, we applaud your leadership in introducing these companion bills to help solidify America's position in creating and retaining advanced manufacturing in the US. Ours is an industry that has witnessed first-hand the benefits of public-private partnerships. We know industry-led initiatives like the one proposed in S.1468/H.R. 2996 can have a great impact on not only ramping up new innovations, but also in helping to solidify industries and technologies where we have leadership, as well as creating and retaining jobs that go along with it.

Again, thank you for your leadership in supporting a bipartisan and common sense proposal that will have a real impact on advanced manufacturing in the US. I look forward to working with you to see that this bill is enacted into law as quickly as possible.

Sincerely,

Denny McGuirk
President & CEO
SEMI



The Dow Chemical Company
Midland, Michigan 48674

December 11, 2013

Representative Tom Reed
Committee on Science, Space and
Technology
US House of Representatives
Washington, DC 20515

Representative Joseph Kennedy
Committee on Science, Space and
Technology
US House of Representatives
Washington, DC 20515

Dear Representatives Reed and Kennedy:

The Dow Chemical Company urges the Committee to support the draft legislation of the Revitalize American Manufacturing and Innovation Act of 2013 (H.R. 2996) currently before it. We respectfully request that this letter be made part of the hearing record on the draft legislation.

This bill would formally codify the proposed network of National Network of Manufacturing Institutes (NNMI's) allowing the systematic establishment of regional institutes across the country, coordinate the activities of stakeholders, and provide a mechanism by which priorities are determined through a competitive, merit-based review process.

Dow's Chairman and Chief Executive Officer, Andrew N. Liveris is the co-chair of the Advanced Manufacturing Partnership, a group of manufacturers, universities, colleges, labor representatives and federal policymakers that recommended to The White House the establishment of a network of regional manufacturing innovation institutes throughout the country. The goal of the network of institutes is to invite collaboration between the public and private sectors, universities and community colleges to more efficiently and effectively bring cutting-edge, critical technologies to commercialization. These institutes will consider technologies that are both critical to national security and are a source of competitive advantage in potentially large U.S and global markets. Companies and academic institutions of all sizes can leverage these institutes for access and guidance on implementing these critical technologies.

NNMI's are intended to leverage all available resources for rapid technology development while concurrently training the talent pipeline, building the workforce and the capability to deliver new technologies providing a competitive advantage in the global market.

Implementation of the NNMI is important to the future of manufacturing in the United States, and will form the foundation on which the U.S. will reestablish its competitive edge in manufacturing technology, and product and process innovation.

Sincerely,



Carrie E. Houtman
The Dow Chemical Company
Government Affairs Director
2030 Building
Midland, MI 48674

Dow is a U.S. multinational corporation that produces a diversified industry-leading portfolio of specialty chemicals, advanced materials, agrosociences and plastics businesses delivers a broad range of technology-based products and solutions to society. Our customers are in approximately 160 countries and participate in high growth sectors such as electronics, water, energy, coatings and agriculture. In 2012, Dow had annual sales of approximately \$57 billion and employed approximately 54,000 people worldwide.

Motor & Equipment Manufacturers Association
 1030 15th Street, NW Suite 500 East Washington, DC 20005
 Tel 202.393.6362 Fax 202.737.3742 E-mail info@mema.org



November 1, 2013

The Honorable Tom Reed
 United States House of Representatives
 Washington, D.C. 20515

The Honorable Joe Kennedy
 United States House of Representatives
 Washington, D.C. 20515

Dear Representatives Reed and Kennedy:

The Motor & Equipment Manufacturers Association (MEMA) represents more than 1,000 companies that manufacture motor vehicle parts for use in the light- and heavy-duty vehicle original equipment and aftermarket industries. Motor vehicle parts manufacturers are the nation's largest direct employer of manufacturing jobs – over 734,000 workers in all 50 states. MEMA represents its members through four affiliate associations: Automotive Aftermarket Suppliers Association (AASA); Heavy Duty Manufacturers Association (HDMA); Motor & Equipment Remanufacturers Association (MERA); and Original Equipment Suppliers Association (OESA).

MEMA commends you on the recent introduction of the Revitalize American Manufacturing and Innovation Act of 2013 (H.R. 2996). The manufacturing hubs created in this critical legislation will help ensure the competitiveness of America's manufacturers, including suppliers.

Motor vehicle parts manufacturers are part of a vibrant and innovative industry, with suppliers playing a significant role in the development and deployment of new technologies. In fact, advanced technology vehicles are not possible without suppliers, who are responsible for 30 percent of the total annual \$18 billion automotive research and development investment. Suppliers provide much of the intellectual capital required for the design, testing and engineering of new parts and systems.

H.R. 2996 will bring together government and private agencies, business and industry, universities and other organizations and establish the National Network for Manufacturing Innovation. This important network of manufacturing hubs will help accelerate the development and deployment of new technologies through collaborative work between all parties. The hubs will also help parts manufacturers address some of the challenges facing the industry today, such as the development of light-weight materials and required manufacturing processes. To meet these challenges, the hubs will allow suppliers to leverage multi-discipline stakeholders across industrial, academic and governmental sectors. Suppliers will be able to make use of these resources to stimulate growth and advancements in vehicle technologies, meeting customer demands from vehicle manufacturers and future regulatory requirements for safer and more efficient vehicles.

MEMA strongly supports your legislation and is prepared to work with you to seek support and passage. The manufacturing hubs created by your legislation are important to suppliers and should be part of any manufacturing initiative that the federal government pursues. Increasing the competitiveness of the U.S. manufacturing sector helps suppliers support the productivity, innovation and human capital development needed to support the forecasted incremental production of an additional 600,000 vehicles in the United States and launch a record number of new product over the next two years as well as the long-term product innovation and workforce development required for decades to come.

Thank you again for your leadership on this important issue, and MEMA looks forward to working with you on this legislation.

Sincerely,

Steve Handschuh
 President & CEO



113TH CONGRESS
1ST SESSION

H. R. 2996

To require the Secretary of Commerce to establish the Network for Manufacturing Innovation and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

AUGUST 2, 2013

Mr. REED (for himself and Mr. KENNEDY) introduced the following bill; which was referred to the Committee on Science, Space, and Technology, and in addition to the Committee on Appropriations, for a period to be subsequently determined by the Speaker, in each case for consideration of such provisions as fall within the jurisdiction of the committee concerned

A BILL

To require the Secretary of Commerce to establish the Network for Manufacturing Innovation and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE.**

4 This Act may be cited as the “Revitalize American
5 Manufacturing and Innovation Act of 2013”.

6 **SEC. 2. FINDINGS.**

7 Congress finds the following:

1 (1) In 2011, manufacturing contributed
2 \$1,800,000,000,000 to the Nation's economy and
3 accounted for 47 percent of all United States ex-
4 ports.

5 (2) If ranked as its own country, the United
6 States manufacturing sector would be the 10th larg-
7 est economy in the world.

8 (3) American manufacturers employ more than
9 11,000,000,000 Americans in jobs with wages and
10 benefits that are one-third higher than the wages
11 and benefits in other sectors.

12 (4) Manufacturing has the highest multiplier ef-
13 fect, with every dollar in final sales of manufactured
14 products resulting in \$1.34 in output from other sec-
15 tors.

16 (5) As the source of nearly one-third of the
17 United States investment in research and develop-
18 ment manufacturing, firms drive innovation in the
19 United States.

20 (6) Countries such as Korea, Japan, and Ger-
21 many have a larger share of the advanced manufac-
22 turing sector than the United States. Each of these
23 countries has a positive trade balance in advanced
24 manufacturing products. In contrast, the United

1 States had an \$81,000,000,000 trade deficit in
2 2010.

3 (7) The United States share of research and
4 development spending dropped from 43.1 percent in
5 1998 to 37.3 percent in 2008, while China's share
6 of research and development spending increased
7 from 3 percent to 11.4 percent during the same pe-
8 riod.

9 (8) According to a survey by the Council on
10 Competitiveness, chief executive officers view the
11 quality and availability of scientists, researchers, and
12 engineers and the quality and availability of skilled
13 production workers as the first and second most im-
14 portant drivers of competitiveness.

15 (9) According to the Organization for Economic
16 Co-Operation and Development, the United States
17 ranked 27th out of 29 developed countries in the
18 percentage of students who earned bachelor's de-
19 grees in science and engineering in 2009.

20 (10) Colleges in China and India award more 4-
21 year engineering bachelor's degrees than United
22 States colleges.

1 **SEC. 3. ESTABLISHMENT OF NETWORK FOR MANUFAC-**
2 **TURING INNOVATION.**

3 The National Institute of Standards and Technology
4 Act (15 U.S.C. 271 et seq.) is amended—

5 (1) by redesignating section 34 as section 35;

6 and

7 (2) by inserting after section 33 (15 U.S.C.
8 278r) the following:

9 **“SEC. 34. NETWORK FOR MANUFACTURING INNOVATION.**

10 **“(a) ESTABLISHMENT OF NETWORK FOR MANUFAC-**
11 **TURING INNOVATION PROGRAM.—**

12 **“(1) IN GENERAL.—**The Secretary of Com-
13 merce shall establish within the Institute a program
14 to be known as the ‘Network for Manufacturing In-
15 novation Program’ (referred to in this section as the
16 ‘Program’).

17 **“(2) PURPOSES OF PROGRAM.—**The purposes of
18 the Program are—

19 **“(A)** to improve the competitiveness of
20 United States manufacturing and to increase
21 domestic production;

22 **“(B)** to stimulate United States leadership
23 in advanced manufacturing research, innova-
24 tion, and technology;

25 **“(C)** to facilitate the transition of innova-
26 tive technologies into scalable, cost-effective,

1 and high-performing manufacturing capabili-
2 ties;

3 “(D) to facilitate access by manufacturing
4 enterprises to capital-intensive infrastructure,
5 including high-performance computing, in order
6 to improve the speed with which such enter-
7 prises commercialize new processes and tech-
8 nologies;

9 “(E) to accelerate the development of an
10 advanced manufacturing workforce;

11 “(F) to facilitate peer exchange of and the
12 documentation of best practices in addressing
13 advanced manufacturing challenges; and

14 “(G) to leverage non-Federal sources of
15 support to promote a stable and sustainable
16 business model without the need for long-term
17 Federal funding.

18 “(3) SUPPORT.—The Secretary, acting through
19 the Director, shall carry out the purposes set forth
20 in paragraph (2) by supporting—

21 “(A) the Network for Manufacturing Inno-
22 vation established under subsection (b); and

23 “(B) the establishment of centers for man-
24 ufacturing innovation.

1 “(4) DIRECTOR.—The Secretary shall carry out
2 the Program through the Director.

3 “(b) ESTABLISHMENT OF NETWORK FOR MANUFAC-
4 TURING INNOVATION.—

5 “(1) IN GENERAL.—As part of the Program,
6 the Secretary of Commerce shall establish a network
7 of centers for manufacturing innovation.

8 “(2) DESIGNATION.—The network established
9 under paragraph (1) shall be known as the ‘Network
10 for Manufacturing Innovation’ (referred to in this
11 section as the ‘Network’).

12 “(c) CENTERS FOR MANUFACTURING INNOVATION.—

13 “(1) IN GENERAL.—For purposes of this sec-
14 tion, a ‘center for manufacturing innovation’ is a
15 center that—

16 “(A) has been established by a person to
17 address challenges in advanced manufacturing
18 and to assist manufacturers in retaining or ex-
19 panding industrial production and jobs in the
20 United States;

21 “(B) has a predominant focus on a manu-
22 facturing process, novel material, enabling tech-
23 nology, supply chain integration methodology,
24 or another relevant aspect of advanced manu-

1 facturing, as determined by the Secretary, with
2 the potential—

3 “(i) to improve the competitiveness of
4 United States manufacturing;

5 “(ii) to accelerate investment in ad-
6 vanced manufacturing production capacity
7 in the United States; and

8 “(iii) to enable the commercial appli-
9 cation of new technologies or industry-wide
10 manufacturing processes; and

11 “(C) includes active participation among
12 representatives from multiple industrial entities,
13 research universities, community colleges, and
14 such other entities as the Secretary considers
15 appropriate, which may include career and tech-
16 nical education schools, Federal laboratories,
17 State, local, and tribal governments, businesses,
18 educational institutions, and nonprofit organiza-
19 tions.

20 “(2) ACTIVITIES.—Activities of a center for
21 manufacturing innovation may include the following:

22 “(A) Research, development, and dem-
23 onstration projects, including proof-of-concept
24 development and prototyping, to reduce the
25 cost, time, and risk of commercializing new

1 technologies and improvements in existing tech-
2 nologies, processes, products, and research and
3 development of materials to solve pre-competi-
4 tive industrial problems with economic or na-
5 tional security implications.

6 “(B) Development and implementation of
7 education and training courses, materials, and
8 programs.

9 “(C) Development of innovative methodolo-
10 gies and practices for supply chain integration
11 and introduction of new technologies into sup-
12 ply chains.

13 “(D) Outreach and engagement with
14 small- and medium-sized manufacturing enter-
15 prises, in addition to large manufacturing en-
16 terprises.

17 “(E) Such other activities as the Sec-
18 retary, in consultation with Federal depart-
19 ments and agencies whose missions contribute
20 to or are affected by advanced manufacturing,
21 considers consistent with the purposes described
22 in subsection (a)(2).

23 “(3) ADDITIONAL CENTERS FOR MANUFAC-
24 TURING INNOVATION.—The National Additive Man-
25 ufacturing Innovation Institute and pending manu-

1 manufacturing centers under interagency review shall be
2 considered centers for manufacturing innovation.

3 “(d) FINANCIAL ASSISTANCE TO ESTABLISH AND
4 SUPPORT CENTERS FOR MANUFACTURING INNOVA-
5 TION.—

6 “(1) IN GENERAL.—In carrying out the Pro-
7 gram, the Secretary of Commerce shall award finan-
8 cial assistance to a person to assist the person in
9 planning, establishing, or supporting a center for
10 manufacturing innovation.

11 “(2) APPLICATION.—A person seeking financial
12 assistance under paragraph (1) shall submit to the
13 Secretary an application therefor at such time, in
14 such manner, and containing such information as
15 the Secretary may require.

16 “(3) OPEN PROCESS.—In soliciting applications
17 for financial assistance under paragraph (1), the
18 Secretary shall ensure an open process that will
19 allow for the consideration of all applications rel-
20 evant to advanced manufacturing regardless of tech-
21 nology area.

22 “(4) SELECTION.—

23 “(A) COMPETITIVE, MERIT REVIEW.—In
24 awarding financial assistance under paragraph

1 (1), the Secretary shall use a competitive, merit
2 review process.

3 “(B) COLLABORATION.—In awarding fi-
4 nancial assistance under paragraph (1), the
5 Secretary shall, acting through the National
6 Program Office established under subsection
7 (e)(1), collaborate with Federal departments
8 and agencies whose missions contribute to or
9 are affected by advanced manufacturing.

10 “(C) CONSIDERATIONS.—In selecting a
11 person who submitted an application under
12 paragraph (2) for an award of financial assist-
13 ance under paragraph (1) the Secretary shall
14 consider, at a minimum, the following:

15 “(i) The potential of the center for
16 manufacturing innovation to advance do-
17 mestic manufacturing and the likelihood of
18 economic impact in the predominant focus
19 areas of the center for manufacturing in-
20 novation.

21 “(ii) The commitment of continued fi-
22 nancial support, advice, participation, and
23 other contributions from non-Federal
24 sources, to provide leverage and resources
25 to promote a stable and sustainable busi-

1 ness model without the need for long-term
2 Federal funding.

3 “(iii) How the center for manufac-
4 turing innovation will engage with small-
5 and medium-sized manufacturing enter-
6 prises, to improve the capacity of such en-
7 terprises to commercialize new processes
8 and technologies.

9 “(iv) How the center for manufac-
10 turing innovation will carry out educational
11 and workforce activities that meet indus-
12 trial needs related to the predominant
13 focus areas of the center for manufac-
14 turing innovation.

15 “(v) How the center for manufac-
16 turing innovation will advance economic
17 competitiveness.

18 “(vi) How the center for manufac-
19 turing innovation will strengthen and lever-
20 age the assets of a region.

21 “(5) LIMITATION ON PERIOD FOR AWARDS.—
22 No award of financial assistance may be made under
23 paragraph (1) to a center of manufacturing innova-
24 tion after the 7-year period beginning on the date on

1 which the Secretary first awards financial assistance
2 to a center under such paragraph.

3 “(e) NATIONAL PROGRAM OFFICE.—

4 “(1) ESTABLISHMENT.—The Secretary of Com-
5 merce shall establish, within the Institute, the Na-
6 tional Office of the Network for Manufacturing In-
7 novation Program (referred to in this section as the
8 ‘National Program Office’), which shall oversee and
9 carry out the Program.

10 “(2) FUNCTIONS.—The functions of the Na-
11 tional Program Office are—

12 “(A) to oversee the planning, management,
13 and coordination of the Program;

14 “(B) to enter into memorandums of under-
15 standing with Federal departments and agen-
16 cies, whose missions contribute to or are af-
17 fected by advanced manufacturing, to carry out
18 the purposes described in subsection (a)(2);

19 “(C) to develop, not later than 1 year after
20 the date of the enactment of the Revitalize
21 American Manufacturing and Innovation Act of
22 2013, and update not less frequently than once
23 every 3 years thereafter, a strategic plan to
24 guide the Program;

1 “(D) to establish such procedures, processes,
2 and criteria as may be necessary and appropriate
3 to maximize cooperation and coordinate of the activities of the Program with programs
4 and activities of other Federal departments and agencies whose missions contribute
5 to or are affected by advanced manufacturing;
6 and

7 “(E) to establish a clearinghouse of public
8 information related to the activities of the Program; and
9 and

10 “(F) to act as a convener of the Network.

11 “(3) RECOMMENDATIONS.—In developing and
12 updating the strategic plan under paragraph (2)(C),
13 the Secretary shall solicit recommendations and advice from a wide range of stakeholders,
14 including industry, small- and medium-sized manufacturing enterprises, research universities,
15 community colleges, and other relevant organizations and institutions.
16 and

17 “(4) REPORT TO CONGRESS.—The Secretary
18 shall transmit the strategic plan required under
19 paragraph (2)(C) to the Committee on Commerce,
20 Science, and Transportation of the Senate and the
21 Committee on Science, Space, and Technology of the
22 House of Representatives.
23 and
24 and

1 “(5) HOLLINGS MANUFACTURING EXTENSION
2 PARTNERSHIP.—The Secretary shall ensure that the
3 National Program Office incorporates the Hollings
4 Manufacturing Extension Partnership into Program
5 planning to ensure that the results of the Program
6 reach small- and medium-sized entities.

7 “(6) DETAILEES.—Any Federal Government
8 employee may be detailed to the National Program
9 Office without reimbursement. Such detail shall be
10 without interruption or loss of civil service status or
11 privilege.

12 “(f) REPORTING AND AUDITING.—

13 “(1) ANNUAL REPORTS TO THE SECRETARY.—

14 “(A) IN GENERAL.—The Secretary of
15 Commerce shall require recipients of financial
16 assistance under subsection (d)(1) to annually
17 submit a report to the Secretary that describes
18 the finances and performance of the center for
19 manufacturing innovation for which such assist-
20 ance was awarded.

21 “(B) ELEMENTS.—Each report submitted
22 under subparagraph (A) shall include—

23 “(i) an accounting of expenditures of
24 amounts awarded to the recipient under
25 subsection (d)(1); and

1 “(ii) a description of the performance
2 of the center for manufacturing innovation
3 with respect to—

4 “(I) its goals, plans, financial
5 support, and accomplishments; and

6 “(II) how the center for manu-
7 facturing innovation has furthered the
8 purposes described in subsection
9 (a)(2).

10 “(2) ANNUAL REPORTS TO CONGRESS.—

11 “(A) IN GENERAL.—Not less frequently
12 than once each year, the Secretary shall submit
13 a report to Congress that describes the per-
14 formance of the Program during the most re-
15 cent 1-year period.

16 “(B) ELEMENTS.—Each report submitted
17 under subparagraph (A) shall include, for the
18 period covered by the report—

19 “(i) a summary and assessment of the
20 reports received by the Secretary under
21 paragraph (1);

22 “(ii) an accounting of the funds ex-
23 pended by the Secretary under the Pro-
24 gram; and

1 “(iii) an assessment of the Program
2 with respect to the purposes described in
3 subsection (a)(2).

4 “(3) TRIENNIAL ASSESSMENT BY GAO.—

5 “(A) IN GENERAL.—Not less frequently
6 than once every 3 years, the Comptroller Gen-
7 eral of the United States shall submit to Con-
8 gress an assessment of the operation of the
9 Program during the most recent 3-year period.

10 “(B) ELEMENTS.—Each assessment sub-
11 mitted under subparagraph (A) shall include,
12 for the period covered by the report—

13 “(i) a review of the management, co-
14 ordination, and industry utility of the Pro-
15 gram;

16 “(ii) an assessment of the extent to
17 which the Program has furthered the pur-
18 poses described in subsection (a)(2); and

19 “(iii) such recommendations for legis-
20 lative and administrative action as the
21 Comptroller General considers appropriate
22 to improve the Program.

23 “(g) ADDITIONAL AUTHORITIES.—

24 “(1) APPOINTMENT OF PERSONNEL AND CON-
25 TRACTS.—The Secretary of Commerce may appoint

1 such personnel and enter into such contracts, finan-
2 cial assistance agreements, and other agreements as
3 the Secretary considers necessary or appropriate to
4 carry out the Program including support for re-
5 search and development activities involving a center
6 for manufacturing innovation.

7 “(2) TRANSFER OF FUNDS.—The Secretary
8 may transfer to other Federal agencies such sums as
9 the Secretary considers necessary or appropriate to
10 carry out the Program.

11 “(3) AUTHORITY OF OTHER AGENCIES.—In the
12 event that the Secretary exercises the authority to
13 transfer funds to another agency under paragraph
14 (2), such agency may award and administer all as-
15 pects of financial assistance awards under this sec-
16 tion.

17 “(4) USE OF RESOURCES.—In furtherance of
18 the purposes of the Program, the Secretary may use,
19 with the consent of a covered entity and with or
20 without reimbursement, the land, services, equip-
21 ment, personnel, and facilities of such covered entity.

22 “(5) ACCEPTANCE OF RESOURCES.—In addition
23 to amounts appropriated to carry out the Program,
24 the Secretary may accept funds, services, equipment,

1 personnel, and facilities from any covered entity to
2 carry out the Program.

3 “(6) COVERED ENTITY.—For purposes of this
4 subsection, a covered entity is any Federal depart-
5 ment, Federal agency, instrumentality of the United
6 States, State, local government, tribal government,
7 Territory or possession of the United States, or of
8 any political subdivision thereof, or international or-
9 ganization, or any public or private entity or indi-
10 vidual.

11 “(h) PATENTS.—Chapter 18 of title 35, United
12 States Code, shall not apply if financial assistance is
13 awarded under this section solely for the purpose of plan-
14 ning, establishing, or supporting new or existing centers
15 for manufacturing innovation.

16 “(i) FUNDING.—

17 “(1) NETWORK FOR MANUFACTURING INNOVA-
18 TION FUND.—

19 “(A) ESTABLISHMENT.—There is estab-
20 lished in the Treasury of the United States a
21 fund to be known as the ‘Network for Manufac-
22 turing Innovation Fund’ (referred to in this
23 paragraph as the ‘Fund’).

24 “(B) ELEMENTS.—There shall be depos-
25 ited in the Fund, which shall constitute the as-

1 sets of the Fund, amounts appropriated or oth-
2 erwise made available to carry out the Program.

3 “(C) AVAILABILITY.—Amounts deposited
4 in the Fund shall be available to the Secretary
5 of Commerce, at the discretion of the Secretary,
6 or the Secretary’s delegee, to carry out the Pro-
7 gram without further appropriation and without
8 fiscal year limitation.

9 “(2) AUTHORIZATION OF APPROPRIATIONS.—
10 There is authorized to be appropriated
11 \$600,000,000 to the Secretary of Commerce to carry
12 out this section.

13 “(3) ADMINISTRATIVE EXPENSES.—The Sec-
14 retary of Commerce may use not more than 5 per-
15 cent of the amounts appropriated pursuant to para-
16 graph (2) to pay the salaries, expenses, and other
17 administrative costs incurred by the Secretary under
18 this section.

19 “(4) RESCISSION.—There is hereby rescinded,
20 from appropriated discretionary funds that remain
21 available for obligation as of the date of the enact-
22 ment of this Act, \$600,000,000.”

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