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OVERVIEW OF THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY BUDGET FOR FISCAL YEAR 2013

HEARING

BEFORE THE

SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

HOUSE OF REPRESENTATIVES

ONE HUNDRED TWELFTH CONGRESS

SECOND SESSION

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OVERVIEW OF THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY BUDGET FOR FISCAL YEAR 2013

TUESDAY, MARCH 6, 2012

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, DC.

The Subcommittee met, pursuant to call, at 11:00 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Benjamin Quayle [Chairman of the Subcommittee] presiding.

RALPH M. HALL, TEXAS
CHAIRMAN

EDDIE BERNICE JOHNSON, TEXAS
RANKING MEMBER

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515-6301
(202) 225-6371
www.science.house.gov

Subcommittee on Technology and Innovation Hearing

An Overview of the National Institute of Standards and Technology Budget for Fiscal Year 2013

Tuesday, March 6, 2012
11:00 a.m. - 1:00 p.m.
2318 Rayburn House Office Building

Witness

Dr. Patrick Gallagher, Under Secretary of Commerce for Standards and Technology and Director, National Institute of Standards and Technology

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

HEARING CHARTER

An Overview of the National Institute of Standards and Technology Budget for Fiscal Year 2013

Tuesday, March 6, 2012
11:00 a.m. - 1:00 p.m.
2318 Rayburn House Office Building

1. Purpose

On Tuesday, March 6, 2012, the Technology and Innovation Subcommittee of the House Committee on Science, Space, and Technology will hold a hearing to examine the Administration's proposed fiscal year 2013 (FY13) budget request for the National Institute of Standards and Technology (NIST). An Administration witness will review the proposed budget in the context of the President's overall priorities for NIST.

2. Witness

Dr. Patrick Gallagher, Under Secretary of Commerce for Standards and Technology and Director, National Institute of Standards and Technology

3. Hearing Overview

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 operates two main research laboratories in Gaithersburg, Maryland, and Boulder, Colorado, as well as radio stations in Hawaii and Colorado. NIST also maintains partnerships with the Hollings Marine Labs in Charleston, South Carolina, the JILA joint institute operated with the University of Colorado, and the Center for Advanced Research in Biotechnology (CARB) and the Joint Quantum Institute, both operated in conjunction with the University of Maryland.

NIST employs about 2,900 scientists, engineers, technicians, support, and administrative personnel. In addition, NIST annually hosts about 2,600 associates and facility users from academia, industry, and other government agencies. NIST also partners with 1,300 manufacturing specialists and staff at about 350 Manufacturing Extension Partnership (MEP) service locations around the country.[1]

National Institute for Standards and Technology (NIST) Spending

(dollars in millions)

Account	FY11 Actual	FY12 Enacted	FY13 Request	FY13 Request versus FY12 Enacted $	FY13 Request versus FY12 Enacted %
Scientific & Technical Research and Services (STRS)	**507.0**	**567.0**	**648.0**	**81.0**	**14.3**
Construction of Research Facilities (CRF)	**69.9**	**55.4**	**60.0**	**4.6**	**8.3**
Industrial Technology Services (ITS)	**173.3**	**128.4**	**149.0**	**20.6**	**16.0**
Technology Innovation Program (TIP) †	*69.9*	*0*	*0*	*0*	*0*
Manufacturing Extension Partnership (MEP)	*124.7*	*128.4*	*128*	*(0.4)*	*-0.3*
*Advanced Manufacturing Technology Consortia (AMTech) **	--	--	*21.0*	*21.0*	*100.0*
*Baldrige Performance Excellence Program***	*9.6*	*0*	*0*	*0*	*0*
Totals:	**750.2**	**750.8**	**857.0**	**106.2**	**14.1**

** new initiative*
***in FY11 funded under STRS account*
† termmated in FY12

NIST Budget Summary

The FY13 budget request for NIST is $857 million, an increase of $106.2 million or 14.1 percent from the FY12 enacted level. The budget for NIST is divided into three main accounts: Scientific and Technical Research and Services (STRS), Construction of Research Facilities (CRF), and Industrial Technology Services (ITS). The FY13 budget request also includes plans for two mandatory appropriations: The Wireless Innovation Fund (WIN), which will be provided up to $300 million from broadband spectrum auction proceeds; and the National Network for Manufacturing Innovation (NNMI), a legislative proposal for $1 billion in mandatory funding to promote the development of manufacturing technologies with broad applications.

NIST FY13 Budget Priorities

The budget request would provide $648 million for NIST's Core Laboratory research programs in the Scientific and Technical Research and Services (STRS), an increase of $81.0 million. The

[1] http://www.nist.gov/public_affairs/general_information.cfm (Updated February 3, 2012).

STRS request focuses on the following initiatives: supporting Advanced Manufacturing activities ($45 million); creating a competitive grant program for Universities to establish NIST Centers of Excellence ($20 million); addressing challenges within Forensic Science ($5 million), Advanced Communications ($10 million), and Disaster Resilience ($5 million); and continued support for National Strategy for Trusted Identities in Cyberspace (NSTIC) ($8 million).

The budget request provides $149 million for NIST's Industrial Technology Services (ITS) programs, including $128 million for the Manufacturing Extension Partnership (MEP) program, and $21 million for the creation of an Advanced Manufacturing Technology (AMTech) Consortia Program.

The breadth of technology in the U.S economy results in a broad technical portfolio for NIST. The NIST programs must maintain technical leadership in measurement science, while also responding effectively to the rapid pace of technological innovation. NIST uses a comprehensive annual planning process to develop program priorities that support NIST's mission to promote economic prosperity and job creation in a technology-based economy.[2] (See Appendix A for NIST Strategic Goals and Programmatic Planning Priorities.)

Scientific and Technical Research and Services (STRS)

The FY13 NIST budget request for Scientific and Technical Research and Services (STRS) is $648 million, an increase of $81 million or 14.3 percent over the FY12 level, and contains an increase of $45 million in measurement science research for advanced manufacturing. The budget request also includes $20 million to establish four competitively selected Centers for Excellence in measurement science areas defined by NIST. Under this program, grants would be awarded to multi or single university centers for five to seven years to provide an interdisciplinary environment where NIST, academic, and industry researchers can collaborate on basic and applied research focused on innovations in measurement science and new technology development.

In order to advance measurement science, standards, and technology, NIST currently operates six laboratory units:

- **Material Measurement Laboratory (MML):** The MML serves as the national reference laboratory for measurements in the chemical, biological, and material sciences. The MML provides measurement services used by a broad set of industries including but not limited to: healthcare (biomarkers), renewable energy (measuring the quality of fuels) and forensic science (biometric identification techniques).
- **Physical Measurement Laboratory (PLM):** The PLM develops and disseminates the national standards of measurement, e.g., length, mass, force and shock, acceleration, time and frequency, electricity, temperature, humidity and pressure. This information supports consistent timekeeping, on which many technologies like GPS rely, and underpins the safety of our national electricity grid.

[2] *National Institute of Standards and Technology Fiscal Year 2013 Budget Submission to Congress*, Overview p. 9.

- **Engineering Laboratory (EL):** The EL develops and disseminates advanced manufacturing and construction technologies, guidelines, and services to the U.S. manufacturing and construction industries. Examples of EL work include researching ways to reduce the spread of fire in residential buildings and developing performance metrics for advanced manufacturing processes.
- **Information Technology Laboratory (ITL):** The ITL develops and disseminates standards, measurements, and testing for interoperability, security, usability, and reliability of information systems, including cyber security standards and guidelines for federal agencies and U.S. industry. ITL works in areas such as cloud computing, health information technology, and advanced voting technologies.
- **Center for Nanoscale Science and Technology (CNST):** The CNST is the only national nanotechnology center focused on commerce. The facility offers shared space – utilized by a variety of public and private stakeholders – for nanoscale fabrication and measurement, and develops innovative nanoscale measurement and fabrication capabilities.
- **Center for Neutron Research (NCNR):** The NCNR provides a national user facility, utilized by universities, government and industry, to study neutron-based measurement capabilities. The level of measurement capabilities is unavailable anywhere else in the country, allowing researchers to answer questions in nanoscience and technology with a broad range of applications.

NIST Centers of Excellence

In FY13, NIST has requested $20 million to provide grants to establish four competitively selected Centers of Excellence (COE) in measurement sciences in areas defined by NIST, to leverage and expand NIST research capabilities. Each COE would provide an environment in which NIST, academia, and industry collaborate in pursuing early stage basic and applied research focused on innovations in measurement science and emerging technology areas.

Construction of Research Facilities (CRF)

The FY13 budget request for Construction of Research Facilities (CRF) is $60 million, an 8.3 percent increase over the FY12 enacted level. CRF funding would support maintenance and repair of existing NIST buildings ($48.2 million) as well as continue the interior renovation efforts of Building 1 on the NIST-Boulder campus ($11.8 million).

Industrial Technology Services (ITS)

In addition to the NIST laboratories, NIST manages several extramural programs supporting industry. The FY13 budget request for Industrial Technology Services (ITS) is $149 million, an increase of $20.6 million or 16 percent over the FY12 level.

The $128 million request for the Manufacturing Extension Partnership (MEP) program is a $0.4 million or 0.3 percent decrease from the FY12 level. The MEP program is a public/private partnership run by Centers in all 50 states and Puerto Rico that provides technical assistance for small and medium-sized manufacturers to modernize their operations and adapt to foreign competition. MEP Centers are supported by equal contributions from federal funds, state funds, and industry client fees.

The FY13 budget request includes $21.0 million for the proposed Advanced Manufacturing Technology Consortia (AMTech) Program. This program was also included in the FY12 budget request, but it did not receive funding. Modeled after the Nanoelectronics Research Initiative (NRI), a partnership between NSF, NIST, industry, and universities across the nation, the AMTech program would establish industry-led consortia to identify and prioritize research projects supporting long-term industrial research needs. The program would provide cost-shared funding to consortia that are focused on developing advanced technologies to address major technical problems that inhibit development and widespread adoption of advanced manufacturing capabilities in the United States.

National Network for Manufacturing Innovation (NNMI)

The FY13 budget request includes a proposal for $1 billion in mandatory funding to revitalize U.S. manufacturing through the establishment of a National Network for Manufacturing Innovation (NNMI). The NMMI would represent collaboration between NIST, the Department of Defense, the Department of Energy, and the National Science Foundation to promote the development of manufacturing technologies with broad applications and to support manufacturing technology commercialization by bridging the gap between the laboratory and the market.

Wireless Innovation (WIN) Fund

As part of the $7 billion National Wireless Initiative included in the American Jobs Act, the Administration has included a plan to invest broadband spectrum auction proceeds in a variety of areas, including providing NIST with up to $300 million for a Wireless Innovation (WIN) Fund to develop innovative wireless technologies. NIST would work with industry and public safety organizations to increase the interoperability of public safety communications within the future nationwide broadband network.

APPENDIX A: NIST Strategic Goals and Programmatic Planning[3]

NIST Strategic Goals

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. With this aim of promoting U.S. innovation and industrial competitiveness, NIST has established three overarching strategic goals to guide and align investments in its programs:

1. **Position NIST to accelerate technology development, promote advanced manufacturing, and promote industrial competitiveness.**
   - Accelerate and strengthen engagement in documentary standards.
   - Improve the development and delivery of measurement services.
   - Enhance user access and collaboration at our unique facilities.

2. **Strengthen our core technical and organizational capabilities.**
   - Invest in the basic research required to meet the NIST mission.
   - Improve facilities and equipment to ensure NIST maintains a leading measurement capability.
   - Develop world-class operations and support activities, especially in safety management.

3. **Promote innovation, commercialization, and business growth.**
   - Support the acceleration and promotion of innovation through AMTech and other programs.
   - Support business success through MEP.

NIST Programmatic Planning Priorities

Based on NIST's three strategic goals, and input from customers, stakeholders, Congress, and the Administration, NIST plans to continue to invest resources into six priority areas:

Manufacturing: Improve the competitiveness of U.S. manufacturers through the development and deployment of new, green technologies and better business practices. Efforts include focus on enhancing high technology manufacturing innovation in products and processes, especially nanomanufacturing, resulting in new jobs.

Information Technology and Cybersecurity: Help to develop more capable, secure, and interoperable information systems to ensure U.S. leadership in information technology. Provide technical support for successful deployment of next generation broadband. Supply measurement capabilities necessary for next-generation information technologies.

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[3] *National Institute of Standards and Technology Fiscal Year 2013 Budget Submission to Congress*, Overview p. 9-10.

Energy: Speed development of alternative, clean-energy energy sources, from production through storage to final distribution. Help to ensure interoperability of Smart Grid devices and systems (as assigned in the 2007 Energy Independence and Security Act).

Healthcare: Advance efforts aimed at achieving lower-cost, higher-quality health care, including development of technologies that ensure more accurate diagnoses, reduce medical errors, and improve the efficiency and effectiveness of therapies. Develop standards essential to interoperable health-care information systems that seamlessly and accurately share information among all health-care providers; and ensure security and privacy of information.

Environment and Consumer Safety: Promote efficient development of sustainable products and processes, from manufacturing to end-use by consumers. Help to establish the scientific measurement basis for accurate climate and greenhouse gas emissions measurements.

Physical Infrastructure: Develop the needed measurement solutions, models, calibration inspection methods, and technologies that can be used to predict the remaining life or margins of safety for infrastructure systems to prioritize and optimize infrastructure spending.

Chairman QUAYLE. The Subcommittee on Technology and Innovation will come to order.

Good morning. Welcome to today's hearing entitled "An Overview of the National Institute of Standards and Technology Budget for Fiscal Year 2013."

In front of you are packets containing the written testimony, biographies and Truth in Testimony disclosures for today's witness. I now recognize myself for five minutes for an opening statement.

Today we will be discussing the fiscal year 2013 budget request for the National Institute of Standards and Technology and gathering details about NIST's priorities. I would like to thank Dr. Gallagher for appearing before us today. NIST has been well served by your leadership.

Before getting into the specifics of NIST's request, I would like to briefly discuss the President's 2013 budget proposal. Unfortunately, the budget submitted by the Administration a few weeks ago continues to promote the same failed policies that have made our economic situation worse. The President's budget includes the most government spending in history, the biggest tax increase in American history, and the biggest debt in history. This proposal increases overall spending $200 billion, to a total of $3.8 trillion, nearly a quarter of our gross domestic product. The budget will increase taxes on American families and job creators by $1.9 trillion. While paying lip service to the need to cut debt and deficits, under the President's framework, our gross national debt will increase from $15 trillion today to approximately $26 trillion ten years from now. The Administration has failed to rein in spending and has failed to lay out a credible plan for bringing the deficit and debt under control. This is unsustainable and irresponsible.

Today, we examine one portion of that budget proposal, the President's fiscal year 2013 budget request for NIST. While NIST is a smaller agency, this request does not exist within a vacuum and must be weighed in the context of our fiscal situation. NIST is a non-regulatory laboratory of the federal government tasked with making contributions to our Nation's innovation and industrial competitiveness by advancing measurement science, standards and technology. NIST works closely alongside industry to make sure their activities improve the quality of life of Americans and the economic security of our Nation.

Although we may not be aware of NIST's impact in our lives, NIST research advances a variety of national priorities and challenges related to advanced manufacturing and materials, nanotechnology, cybersecurity, health information technology, advanced communications networks, and disaster resilience.

The fiscal year 2013 budget request for NIST totals $857 million, an increase of $106.2 million, or 14.1 percent, from the fiscal year 2012 enacted level. The Committee on Science, Space, and Technology has a long, bipartisan record of support for NIST and its contributions. Given the value of NIST research to our Nation's competitiveness, we are strongly supportive of NIST's scientific and technical research and services. We also recognize the work of NIST's industrial technology services. However, I believe we need to do a better job of prioritizing our investments, and a 14.1 per-

cent budget increase is simply unrealistic in our current fiscal environment.

While we can all agree that the research NIST conducts is important for our economy, we simply cannot afford to continue spending at these rates, given our current fiscal reality. I have every reason to believe that NIST will continue to conduct innovative research while seeking ways to improve the efficiency of its programs so that this research is undertaken in a fiscally responsible manner.

I am appreciative of the opportunity to learn more about how fiscal year 2013 funds will be prioritized by NIST, and I thank our witness, Dr. Gallagher for his time, today.

[The prepared statement of Mr. Quayle follows:]

PREPARED STATEMENT OF CHAIRMAN BEN QUAYLE,
SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES

Good Morning. I would like to welcome everyone to today's hearing. We will be discussing the fiscal year 2013 budget request for the National Institute of Standards and Technology (NIST), and gathering details about NIST's priorities. I would like to thank Dr. Gallagher for appearing before us today. NIST has been well served by your leadership.

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This proposal increases overall spending $200 billion, to a total of $3.8 trillion—nearly a quarter of our gross domestic product (23.3 percent). The budget will increase taxes on American families and job creators by $1.9 trillion. While paying lip service to the need to cut debt and deficits, under the President's framework, our gross national debt will increase from $15 trillion today to approximately $26 trillion ten years from now. The Administration has failed to rein in spending and has failed to lay out a credible plan for bringing the deficit and debt under control. This is unsustainable and irresponsible.

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Chairman QUAYLE. I now recognize the gentlelady from Maryland, the Ranking Member, Ms. Edwards, for her opening statement.

Ms. EDWARDS. Thank you, Chairman Quayle, and thank you very much for holding today's hearing to examine the Administration's fiscal year 2013 budget request for the National Institute of Standards and Technology, and I want to thank Dr. Gallagher also for appearing before us this morning and for your leadership at NIST. And while it would be interesting to hold a hearing about the overall budget priorities in the Administration's budget, our task today is really specifically with respect to NIST and putting that into a context in which we examine where we want to be in terms of our future in manufacturing and research and development and NIST's role in that. And so it is that framework from which I will be asking questions today because I am sure Dr. Gallagher doesn't have expertise on the larger federal budget.

And although NIST is a relatively small agency, it is an extremely important player in federal efforts to spur innovation and economic prosperity in the country, and for more than 100 years, NIST has supported the competitiveness of U.S. industry by advancing measurement science, standards and technology. NIST's broad and deep technical expertise, as well as its ability to serve as a bridge to U.S. businesses, is really unparalleled.

And I am pleased that the President's fiscal year 2013 budget request draws on the strengths of NIST and gives the agency a prominent role in the Administration's strategy to revitalize American manufacturing, and I think there is no one in this country who couldn't agree that we have to revitalize American manufacturing in order to be competitive for the 21st century, and NIST's role in that is really paramount.

Since 2000, the United States has lost over 650,000 high-tech manufacturing jobs. It is really shocking. Our trade deficit in advanced technology products is growing and China is now the world's biggest exporter of high-technology goods. The truth is that our position as the global leader in innovation and technology is being threatened as developing nations build up their capabilities to become not only the technology assembly line, but also the creator of new and innovative technologies, that is, linking manufacturing with their domestic production capacity.

The Administration's budget proposal includes a number of initiatives that can reverse these disturbing manufacturing trends. For example, the establishment of industry-led public-private consortia is exactly what "the doctor ordered" to address the pre-competitive challenges faced by U.S. companies. The Advanced Manufacturing Technology Consortia, or AMTech, program included in the budget request will tackle technical issues that are prohibiting the growth of advanced manufacturing here at home, and will provide a foundation for new and existing companies to flourish, producing high-quality, well-paying jobs which are key to the growth of our economy and the middle class.

I am interested in learning more today about the Administration's proposal to launch a National Network for Manufacturing Innovation. From what I gather, this proposal is based in part on a successful model, the Fraunhofer Institutes—we will have a chance

to talk about later—implemented in Germany with the support of its government. This is certainly a promising model that I believe we should fully explore in this country and I am eager to hear whether the network is in fact intended to spur these sorts of public-private research partnerships. Again, another example of the international community investing in advanced manufacturing and the United States taking a back seat. We hope to change that today and hope to do that with the President's budget.

And so whether you agree with it or not, the truth is, most of our competitors are putting significant and targeted resources towards helping businesses, small and large, accelerate commercialization of innovative technologies. The current budget request finalizes the termination of the Technology Innovation Program, or TIP. And it marks the first time in years that NIST—in 25 years in fact that NIST lacks a mechanism to provide competitive grants to U.S. companies to accelerate the development of promising technologies that hold the potential for significant commercial payoff and widespread benefits for the United States. I am troubled by the void that will be left by the termination of TIP and am interested in exploring with the Chairman and Under Secretary Gallagher the possibility of establishing a new program, or even reconstituting a previous one, at NIST for this important purpose.

I am also interested in learning more today about how the current budget request will advance NIST's efforts in forensic science. As you know, the National Research Council released a report in 2009 that highlighted the fragmented nature of forensic science in the United States, and expressed concern over the lack of a rigorous scientific base for the field. The NRC also emphasized the role NIST can and should play in addressing the identified weaknesses, and I applaud the strategic initiative outlined in NIST's budget proposal and look forward to hearing how this initiative will strengthen forensic science.

We could go on, but Mr. Chairman, I want to thank you again for holding the hearing and I look forward to working with you and our colleagues to ensure that NIST has the resources it needs to fulfill its critical role in promoting innovation, commercialization and business growth, and with that, I yield the balance of my time.

[The prepared statement of Ms. Edwards follows:]

PREPARED STATEMENT OF RANKING MEMBER DONNA EDWARDS, SUBCOMMITTEE ON TECHNOLOGY AND INNOVATION, COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY, U.S. HOUSE OF REPRESENTATIVES

Thank you, Chairman Quayle. And thank you for holding today's hearing to examine the Administration's fiscal year 2013 budget request for the National Institute of Standards and Technology. I'd like to thank Dr. Gallagher for appearing before us this morning and for his leadership at NIST.

Although NIST is a relatively small agency, it is an extremely important player in federal efforts to spur innovation and economic prosperity in this country. For more than 100 years, NIST has supported the competitiveness of U.S. industry by advancing measurement science, standards, and technology. NIST's broad and deep technical expertise, as well as its ability to serve as a bridge to U.S. businesses, is unparalleled.

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The Administration's budget proposal includes a number of initiatives that can reverse these disturbing manufacturing trends. For instance, the establishment of industry-led public-private consortia is exactly "what the doctor ordered" to address precompetitive challenges faced by U.S. companies. The Advanced Manufacturing Technology Consortia, or AMTech, program included in the budget request will tackle technical issues that are prohibiting the growth of advanced manufacturing here at home, and will provide a foundation for new and existing companies to flourish—producing high-quality, well paying jobs which are key to the growth of our economy and the middle class.

I'm interested in learning more today about the Administration's proposal to launch a National Network for Manufacturing Innovation.

From what I gather, this proposal is based in part on a successful model—the Fraunhofer Institutes—implemented in Germany with the support of its government. This is certainly a promising model that I believe we should fully explore in this country and I'm eager to hear whether the Network is in fact intended to spur these sorts of public-private research partnerships.

Whether you agree with it or not, the truth is most of our competitors are putting significant and targeted resources towards helping businesses—small and large—accelerate the commercialization of innovative technologies. The current budget request finalizes the termination of the Technology Innovation Program, or TIP. And it marks the first time in 25 years that NIST lacks a mechanism to provide competitive grants to U.S. companies to accelerate the development of promising technologies that hold the potential for significant commercial payoff and widespread benefits for the U.S. I'm troubled by the void that will be left by the termination of TIP and am interested in exploring with the Chairman and Under Secretary Gallagher the possibility of establishing a new program, or even reconstituting a previous one, at NIST for this important purpose.

I'm also interested in learning more today about how the current budget request will advance NIST's efforts in forensic science. As you know, the National Research Council released a report in 2009 that highlighted the fragmented nature of forensic science in the U.S., and expressed concern over the lack of a rigorous scientific base for the field. The NRC also emphasized the role NIST can and should play in addressing the identified weaknesses. I applaud the strategic initiative outlined in NIST's budget proposal and look forward to hearing how this initiative will strengthen forensic science in the U.S.

I am equally interested in NIST's cybersecurity activities and am interested in hearing more about how the FY 2013 request will help ensure that NIST continues to play an important role in the Federal Government's cybersecurity efforts, particularly as it relates to the development of cybersecurity standards and guidelines for Federal agencies and U.S. industry.

Mr. Chairman, thank you again for holding this hearing and I look forward to working with you and our colleagues to ensure that NIST has the resources it needs to fulfill its critical role in promoting innovation, commercialization, and business growth. I yield back the balance of my time.

Chairman QUAYLE. Thank you, Ms. Edwards.

If there are members who wish to submit additional opening statements, your statements will be added to the record at this point.

At this time I would like to introduce our witness. Our witness is Dr. Patrick Gallagher, the Under Secretary of Commerce for Standards and Technology and the Director of the National Institute of Standards and Technology. Thanks again to our witness for being here this morning.

As our witness should know, spoken testimony is limited to five minutes. After presenting your spoken testimony, members of the Committee will have five minutes each to ask questions. I now recognize our witness, Dr. Patrick Gallagher, for five minutes.

STATEMENT OF PATRICK GALLAGHER, UNDER SECRETARY OF COMMERCE FOR STANDARDS AND TECHNOLOGY, AND DIRECTOR, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

Dr. GALLAGHER. Thank you very much, Mr. Chairman and Ranking Member Edwards. I want to thank you both for your kind words and recognition of my leadership and the work of NIST. I want to recognize and thank all the members of the Subcommittee for your support to NIST and for the opportunity to testify today about the Administration's fiscal year 2013 request for NIST.

This year's request can be summarized in two words: advanced manufacturing. The President's request reflects his strong commitment to accelerate the pace of innovation and to better enable the transfer of technologies and products to help American manufacturers to, as Secretary Bryson put it, make it here and sell it everywhere.

NIST is an agency whose mission, rooted in the Constitution is specifically charged with supporting U.S. industry, especially the manufacturing sector, by advancing measurement science, supporting standards and testing, and accelerating commercialization of new technologies.

This year's request builds on our past successes and on your past support of our mission. The overall discretionary request for fiscal 2013 is $857 million. This is an increase of $106 from the fiscal year 2012 enacted level. And to just focus on the significance of manufacturing to our request, over $156 million in total is dedicated to areas specifically part of advanced manufacturing-related programs and activities.

NIST's discretionary budget contains three accounts, and let me briefly summarize them. The request for our laboratory programs, which is the largest program at NIST, is $648 million. This is an increase of $81 million. Over half of that proposed increased is focused specifically on advanced manufacturing. The remaining increase includes targeted areas of research in advanced communications, forensics, disaster resilience, and the National Strategy for Trusted Identifies in Cyberspace, or NSTIC, and for the establishment of Centers of Excellence to accelerate innovation through knowledge transfer and collaboration.

The request for the Industries Technology Services account is $149 million. This is an increase of $20 million over fiscal year 2012. Within that account is a request for $128 million for the Hollings Manufacturing Extension Partnership Program and $21 million for the Advanced Manufacturing Technology Consortia, or AMTech. AMTech will support R&D in advanced manufacturing and strengthen long-term U.S. leadership in critical and emerging technologies.

Our Construction of Research Facilities request is $60 million. This is an increase of nearly $5 million. The CRF account funds construction and facility maintenance and operations activities on both of our campuses. This request includes funds for the renovation of the 60-year-old Building 1 in Boulder, Colorado, which is completely inadequate and cannot support our scientific mission at this time.

The request also proposes two mandatory accounts. The first one would provide $300 million to address and support critical barriers to innovation and accelerate the delivery of new products and services for public safety communication. This program was included in the Middle Class Tax Relief and Job Creation Act of 2011, which was recently signed into law.

The second account would catalyze a National Network for Manufacturing Innovation. The President views this one-time investment of $1 billion as crucial to revitalizing U.S. manufacturing. This program would be in direct collaboration between NIST, the National Science Foundation, the Department of Defense and the Department of Energy, and we look forward to working with this Committee on the necessary legislation to establish this program.

Mr. Chairman, NIST's mission is to work with industry to benefit the competitiveness of American industry, and it could not be more relevant to today's challenges. This concludes my testimony, and I am looking forward to any questions you may have.

[The prepared statement of Dr. Gallagher follows:]

Testimony of

Patrick D. Gallagher, Ph.D.
Under Secretary of Commerce for Standards and Technology
United States Department of Commerce

Before the
United States House of Representatives
Committee on Science, Space, and Technology
Subcommittee on Technology and Innovation

An Overview of the Fiscal Year 2013 Budget for the National Institute of Standards and Technology

March 6, 2012

Chairman Quayle, Ranking Member Edwards, and members of the Subcommittee, thank you for the opportunity to appear before you today to present the President's Fiscal Year (FY) 2013 budget request for the National Institute of Standards and Technology (NIST). This budget reflects the important role that NIST plays as part of President Obama's "*Blueprint for an America Built to Last.*" As the President said recently in Annadale, Virginia, "*[An] economy built to last demands that we keep doing everything we can to.... keep strengthening American manufacturing.*" Secretary of Commerce John Bryson amplifies that message when he tells us that in order to create good paying jobs, we need to help more American businesses *"build it here and sell it everywhere."* The proposed FY 2013 budget reflects NIST's critical role in the Administration's efforts to strengthen manufacturing through critical investments in key research and development areas.

The NIST mission is to promote U.S. innovation and industrial competitiveness through measurement science, standards and technology. This mission is very well-aligned with the priority goals as articulated by the President. The FY 2013 budget for NIST reflects that alignment.

The NIST budget is comprised of three discretionary spending accounts and two new proposed mandatory spending accounts.

Mr. Chairman, the President's discretionary funding request for NIST is $857 million (excluding transfers), an increase of $106.2 million over FY 2012. More than half of the proposed increased funding would be focused on advanced manufacturing research both at NIST laboratories and through a new industry-led consortia program. This budget was carefully crafted to address pressing needs for standards and measurement work in emerging technology areas and provide seed funding to encourage industry and academia to come together to address common technology problems too large for individual institutions to tackle. Moreover, this budget is consistent with the President's Plan for Science and Innovation and the goals of the America COMPETES Reauthorization Act of 2010, both of which call for significant increases in basic federal R&D funding to make America more competitive.

For the NIST Scientific Research and Technical Services (STRS) account, which funds our laboratory programs, the budget requests $648 million to accelerate the development of standards, technology, and measurement science in areas as diverse as advanced manufacturing technologies, cybersecurity, forensics and interoperable communications. The request reflects a net increase of $81 million over the FY 2012 level. The request will help ensure that NIST research laboratories, facilities and service programs continue to work at the cutting edge of science to ensure that U.S. industry, as well as the broader science and engineering communities, have the measurements, data and technologies they need to further innovation and industrial competitiveness.

For the NIST Industrial Technology Services (ITS) account, the budget requests $149 million, an increase of $21 million over the FY12 enacted level. The account includes NIST's external programs: the Hollings Manufacturing Extension Partnership (MEP) program; and the proposed Advanced Manufacturing Technology Consortia (AMTech) program.

The request includes $128 million for the MEP program; a slight decrease from the FY 2012 enacted level. The MEP is a Federal-state-industry partnership that provides U.S. manufacturers with access to technologies, resources and industry experts. MEP's more than 1,400 field staff works with small- and mid-sized U.S. manufacturers to help them create and retain jobs, save time and focus on the bottom line to help increase profits. The request also includes $21 million for the AMTech program. This new program will establish industry-led consortia to identify and prioritize research projects supporting long-term industrial research needs. AMTech creates the incentive for manufacturers to share financial and scientific resources with universities, state and local governments and non-profits. The proposed program is a critical component of the Administration's emphasis on advanced manufacturing as a way to accelerate innovation and create high-quality U.S. jobs.

The budget requests $60 million for the Construction of Research Facilities (CRF) account; a $4 million increase over the FY 2012 enacted level. Within that request are two components: $48.2 million for NIST's routine maintenance and repair budget; and $11.8 million for the Boulder Laboratories Building 1 Wing 6 Renovation. Critically needed renovations to the 60-year-old Building 1 in Boulder began in FY 2010. The building houses the majority of research and measurement laboratories on the NIST-Boulder campus, supporting discovery and development in a number of critical areas, including public safety communications and telecommunications, precision timing, hydrogen energy sources, electromagnetic interference testing, and quantum computing.

The Administration's budget request for NIST also includes two mandatory funding initiatives. The first mandatory proposal is directed toward Public Safety Communications research and was included in the recently passed Middle Class Tax Relief and Job Creation Act of 2012 (PL 112-96). This legislation makes funds available from the Public Safety Trust Fund to NIST to help research and develop cutting-edge, interoperable wireless technologies for public safety users – the need for which was clearly demonstrated on September 11, 2001, during the rescue efforts at the World Trade Center towers. I will discuss this program in further detail later in my testimony.

Finally, as part of the Administration's efforts to revitalize manufacturing, the President's budget proposes a $1 billion mandatory account to establish a National Network for Manufacturing Innovation (NNMI), which aims to promote the development of manufacturing technologies with broad applications through collaboration between NIST, the Department of Defense, the Department of Energy, and the National Science Foundation.

Mr. Chairman, also included in this request are scientific and programmatic initiatives that are tied to the overarching themes of this budget: Advanced Manufacturing, Cybersecurity, Advanced Communications, Forensic Science, Disaster Resilience and Technology Transfer. These themes directly relate to the President's Blueprint for an America Built to Last – a blueprint for an economy built on American manufacturing.

Advanced Manufacturing – Building Prosperity Through Innovation

Manufacturing is critical to the U.S. economy. As President Obama said in his 2012 State of the Union address, "*We have a huge opportunity, at this moment, to bring manufacturing back. But we have to seize it.*" "*The blueprint for an economy build to last*," he said, "*begins with American manufacturing.*" By itself, if the U.S. manufacturing sector were a country, it would be the 9th largest economy in the world.[1] Over 11 million Americans have manufacturing jobs.[2] Many of these are high-quality jobs.[3] Total hourly compensation in the manufacturing sector is, on average, 21% higher than that in the services sector.[4] After ranking as the world's largest manufacturer for more than a century, the U.S. is facing some stiff competition and has lost ground to China on total volume of its manufacturing output. It has also slipped below Germany, Korea, and Japan in the rankings of research and development manufacturing intensity, a critical indicator of future job-creating innovation.[5]

However, during the past two years of the Obama Administration, we have begun to see positive signs in American manufacturing: the manufacturing sector adding more than 400,000 jobs since December 2009; and more companies "in-sourcing" - bringing jobs back and making additional investments in the United States. We are seeing, for the first time since the late 1990s, an increase in manufacturing jobs.[6]

Even so, today's challenges require stepping up efforts to enhance and strengthen the Nation's underlying technical infrastructure, which is integral to our innovation and advanced manufacturing capabilities. Thus, the NIST FY2013 budget lays out a robust set of initiatives that cover the range of the manufacturing lifecycle spectrum to reduce the gap between cutting-edge science and development and the deployment of advanced manufacturing technologies. Providing the measurement tools and other essential technical assistance that U.S. manufacturers need to invent, innovate, and produce—more rapidly and more efficiently than their competitors—is a top NIST priority.

To reap the economic benefits of our ability to innovate, our Nation's manufacturing sector must be able to renew itself by adopting new technology and developing new markets. The Nation's manufacturers must respond quickly and effectively to an ever-changing mix of requirements, risks, and opportunities, from new regulations to rising energy costs to emerging technologies and markets. The revitalization of the U.S. manufacturing base is critical to driving innovation and job creation in the future, and will play a major role in building an economy that can help raise the standard of living for all Americans.[7]

The recently released *National Strategic Plan for Advanced Manufacturing,* a robust interagency effort led by the Office of Science and Technology Policy in which NIST played a significant role, articulated a number of ways in which we as a Nation can accelerate innovation to benefit

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[1] Bureau of Economic Analysis Manufacturing Industry Data Tables 2010

[2] Bureau of Labor Statistics, 2011 *Employer Costs for Employee Compensation,* Table 6.

[3] NSTC *A National Strategic Plan for Advanced Manufacturing* February 2012 pg 2.

[4] Bureau of Labor Statistics, 2011 *Employer Costs for Employee Compensation,* Table 6.

[5] NSTC *A National Strategic Plan for Advanced Manufacturing* February 2012 pg 5.

[6] http://www.bradenton.com/2012/02/17/3882196/manufacturing-exporting-showing.html

[7] Overview to the National Science Board's *Science and Engineering Indicators 2012*; pp 16-20

advanced manufacturing and bridge the gaps in the present U.S. innovation system, particularly the gap between research and development (R&D) activities and the deployment of technological innovations in domestic production of goods. The plan lays out a robust innovation policy that would help to close these gaps and address the full lifecycle of technology.

The President's FY 2013 budget contains several initiatives focused on overcoming manufacturing-related barriers to innovation. We work very closely with numerous other Federal agencies in these efforts, including the Department of Energy's Advanced Manufacturing Office, the National Science Foundation, Department of Defense, and others.

Measurement Science for Advanced Manufacturing

The largest overarching NIST initiative is Measurement Science for Advanced Manufacturing. This $45 million dollar initiative would fund five specific focus areas and is part of a $135 million overall investment in manufacturing research at NIST. The focus under this initiative is under 5 specific areas.

- *Metrology Infrastructure and Standards to Support Biomanufacturing*

Under this $10 million initiative, working closely with industry, the Food and Drug Administration, and standards organizations, NIST will develop the measurement infrastructure needed to gain detailed understanding of biomanufacturing processes and design methods that yield higher-quality therapeutic products. Continuous improvements will enable manufacturing processes that are sufficiently adaptable to accommodate manufacture of next-generation treatments.

- *Measurement Science and Standards to Support Nanomanufacturing*

NIST will invest $10 million to develop measurement methods to help companies overcome technical barriers to cost effective, high-volume manufacturing of materials, devices, and systems that exploit the exceptional properties exhibited at the nanoscale. This initiative includes $2 million for nanotechnology related environmental, health, and safety research to address potential risks of nanotechnology based products.

- *Measurement Science and Standards to Speed Development and Industrial Applications of Advanced Materials*

This $10 million effort will accelerate NIST efforts in support of the national Materials Genome Initiative, an interagency program with the goal of significantly reducing the time from discovery to commercial deployment of new materials. NIST will focus on standard reference databases, data assessment and validation, standards development and implementation, and modeling and simulation tools.

- *Measurement Science and Standards to Support Smart Manufacturing*

$10 million is slated to support smart manufacturing to exploit advances in sensors, data analytics, modeling, and simulation and integrate these technologies to improve manufacturing performance at all levels, from equipment to factory to supply chain. NIST will develop measurement capabilities and standards for automated in-process quality monitoring and control

for factory-level production systems. NIST will also build a testbed to help industry, university, and government collaborators develop an open standards platform for facilitating the simultaneous engineering of the physical and virtual components of manufacturing systems.

- *NIST Manufacturing Fellowships Program*

The Manufacturing Fellowships program will be funded at $5 million to provide opportunities for engineers and scientists to work with NIST staff on the measurement and standards required to create cutting-edge tools for manufacturers. Fellowships will be available to qualified researchers from companies and non-profit organizations, as well as to recent recipients of bachelor's or master's degrees in relevant fields.

While the previous programs are supported under the STRS budget, the President's budget strongly supports manufacturing through the NIST Industrial Technology Services (ITS) programs as well, such as the Hollings Manufacturing Extension Partnership or MEP, and the Advanced Manufacturing Technology Consortia program, or AMTech.

Advanced Manufacturing Technology Consortia Program

The proposed $21 million AMTech program will provide cost-shared funding to industry-led consortia that are focused on developing advanced technologies to address major technical problems that inhibit development and widespread adoption of advanced manufacturing capabilities in the United States. By convening key organizations across the entire innovation lifecycle, AMTech will help to create the infrastructure necessary for more efficient technology transfer. These consortia will identify and conduct precompetitive research to address long-range basic R&D relevant to manufacturing, currently a weak link in the U.S. innovation ecosystem. AMTech will support high-value-added, knowledge-intensive U.S.-made products that respond to new market opportunities and generate high-skilled manufacturing jobs, discover cost-effective methods for making new products that safely exploit nanoscale materials; and develop new types of manufacturing tools and processes that allow cost-effective small batch production and create new market opportunities for small and mid-sized manufacturers.

Hollings Manufacturing Extension Partnership (MEP)

The MEP, a federal-state partnership, has a national network of MEP Centers located in all 50 states and Puerto Rico. There are over 1,400 technical experts associated with the Centers helping small- and medium-sized manufacturers navigate economic and business challenges and connecting them to public and private resources essential for increased competitiveness and profitability.

Focused on U.S. based manufacturers for the past 20 years, MEP continues to modify its suite of services to better serve America's manufacturing base. In support of the President's manufacturing strategy, MEP has recently developed a Supplier Scouting Program to support the current needs of the manufacturers they serve across the U.S. The Supplier Scouting Program is designed to help identify potential business opportunities for small U.S. manufacturers with specific capabilities and capacities that could be utilized by a larger domestic manufacturer. In response to the *Buy America* requirements of federal agencies and the supplier requirements of

the large manufacturers, MEP leverages its vast knowledge of local manufacturer capabilities to identify and pre-qualify supplier capabilities and capacities, and provide assistance to suppliers as needed. To further support this goal, MEP launched a new, searchable, web-based resource – the National Innovation Marketplace - to assist manufacturers in using emerging technologies and finding market opportunities or to move ideas from research in the labs to products. The site will enable businesses and entrepreneurs across the country to easily identify and contact more than 2,000 public-private organizations and initiatives designed to assist them.

In addition to focusing on manufacturing, the NIST FY2013 budget request also outlines investments that: broaden NIST's collaborations in measurement science with the academia and industry; strengthen and expand programs focused on emerging challenges in secure identification, cybersecurity, and advanced communications technologies; address measurement challenges in forensic science; and provide the measurements and standards to strengthen America's Physical Infrastructure.

NIST Centers of Excellence

The proposed $20 million will fund the NIST Centers of Excellence. The NIST Centers of Excellence support collaboration on the front end of the manufacturing spectrum that builds upon a legacy of successful consortia with universities. With the requested funding, NIST will provide grants to establish four competitively selected Centers of Excellence in measurement science areas defined by NIST. The grants to multi- or single-university centers are envisioned to be for multiple years, contingent upon available resources. Each Center of Excellence will provide an interdisciplinary environment where NIST, academic, and industry researchers would collaborate on basic and applied research focused on innovations in measurement science and new technology development.

NIST's mission to use measurement science and services to support innovation and industrial competitiveness covers an incredible breadth of topics—from pharmaceuticals based on nanotechnology to standards and fire codes for skyscrapers to quantum computers that use individual atoms to store information. To accomplish this mission efficiently, NIST must continually scan the horizons for emerging technologies and maintain excellent ties with both the industry and academic community. Currently, NIST has collaborative research centers—JILA with the University of Colorado, and the Joint Quantum Institute, and the Institute for Bioscience and Biotechnology Research with the University of Maryland. These centers have demonstrated how participation by NIST experts at multiple venues can leverage federal investments and enhance the value of public funding. Cutting-edge research requires detailed, one-to-one exchange of technical know-how and often familiarity with one-of-a-kind instrumentation. To ensure that NIST's work intersects with the nation's most productive regional innovation centers, it needs "on the ground" resources near or at those centers.

In addition to making significant discretionary investments to strengthen U.S. manufacturing, the Budget proposes a new, major initiative to catalyze a National Network for Manufacturing Innovation that will support the development of manufacturing technologies with broad applications through one-time mandatory funding of $1 billion. The President views this one-

time investment as crucial to revitalizing U.S. manufacturing. We look forward to working with the Congress on legislation to support this initiative.

Measurement Science and Standards in Support of Forensic Science

NIST has a long history of collaboration in the area of Forensic Science. This $5 million proposed initiative will enable NIST to create a strategic program to broadly address the most critical issues in forensic science today, such as new reference methods and technologies for understanding crime scenes and identifying criminals, including the uncertainty and standards associated with those techniques. A major outcome of this initiative will be to strengthen the utility and reliability of forensic evidence in the courtroom. This work also has the potential for significant cost savings for the U.S. justice system by reducing the number of mistrials or retrials related to questions about forensic analysis. One economic analysis of cost savings from forensic DNA testing alone estimated a cost savings of $35 for every dollar invested.

Public trust in the justice system relies on the validity and certainty of evidence presented to the courts. Increasingly that evidence is gathered and analyzed with innovative forensic technologies. Working with the National Institute of Justice and other agencies, NIST has measurement science research under way in chemical, biological, radiological, and nuclear detection and analysis; fire and explosives analysis; gunshot residue, latent fingerprints, and many other areas. NIST's work in DNA profiling and testing, for example, helped establish the methods now used by all crime laboratories to match individuals to evidence samples. NIST technical expertise would be brought to bear in other areas of forensic science to the benefit of all.

Measurement and Standards for Disaster Resilience and Natural Hazards Risk Reduction

A $5 million initiative will support the measurement and standards for disaster resilience and reduce the risk from natural hazards. With a large percentage of the nation's buildings and infrastructure clustered in disaster-prone regions, U.S. communities can and do suffer catastrophic losses from extreme events such as hurricanes, tornadoes, wildfires, earthquakes, and flooding. Despite significant progress in disaster related science and technology, natural and technological disasters in the United States are responsible for an estimated $55 billion in costs in 2011 terms of lives lost, disruption of commercial and financial networks, properties destroyed, as well as the cost of mobilizing emergency response personnel and equipment.[8] In 2011, three major incidents: the Joplin, Missouri, tornado; Hurricane Irene; and the Texas wildfires alone resulted in over 200 deaths and well over $10 billion in damages. Critically needed metrics, tools, and standards to ensure community-level resilience currently do not exist. These are needed to enable communities to minimize the impact of such disasters and to recover rapidly from them.

NIST has significant statutory responsibilities in this area, including the National Earthquake Hazards Reduction Program Reauthorization Act of 2004 (PL 108-360); the National

[8] http://www.ncdc.noaa.gov/oa/reports/billionz.html

Construction Safety Team Act (PL 107-231); the National Windstorm Impact Reduction Act of 2004 (PL 108-360); and the Federal Fire Prevention and Control Act of 1974 (PL 93-498).

The requested initiative will fund the development of a public-private partnership program strategy that will work with stakeholder interests in all hazard areas to develop and adopt a national resilience framework and associated resilience models, standards, and policies. Additionally, the funding will help address the R&D gaps to realize the full potential of national resilience. This initiative is focused directly on finding solutions to the six Grand Challenges identified by the President's National Science and Technology Council in June 2005.

Measurement Science to Support Advanced Communications Networks

This $10 million initiative will support the technological infrastructure, including standards, underpinning broadband communications networks, which have become as essential to today's economy as the electrical power grid was to the Industrial Revolution. To compete effectively in this global business environment, communities and companies will need reliable, secure access to huge amounts of data, available anytime, anywhere. However, the U.S. currently lacks the technology to ensure adequate capacity to achieve a large-scale network capable of this vision. There has been a 5,000 percent growth in demand for wireless internet data in the last three years. Currently, 3 percent of wireless smart-phone customers use up to 40 percent of the total available cell-phone bandwidth causing large bottlenecks in mobile broadband access. Services are striving to address the rapid increase in demand, but new technologies and approaches are needed. Incremental advances in broadband technology or network capacity will not be sufficient to meet the future needs of a hyper-connected world.

This initiative will help support continued operations of the 700 MHz Public Safety Broadband Demonstration (PSBD) Network and to make modifications to allow additional use as a platform for addressing interoperability and performance questions on non-PS next generation communications technologies. It will address three key areas to enable significant innovation in communications in both the commercial and public safety sectors. Benefits expected from funding of the advanced communications initiative include the development of a U.S. broadband network with greatly expanded capacity that requires only a marginal increase in capital and operating expenditures. In addition, it is expected to establish a testbed and build collaboration with the telecommunications industry to help lay the groundwork for an interoperable public safety communications network that seamlessly delivers voice, data, and video to first responders and other emergency personnel through whatever communication avenues are available.

Public Safety Communications Research and Development

In addition to the Advanced Communications initiative, the Middle Class Tax Relief and Job Creation Act of 2012 (PL 112-96) created a mandatory account to help research and develop cutting-edge technologies for public safety users. The September 11th attacks on the World Trade Center highlighted the inadequacies of our communications networks, more than 10 years after September 11th, the United States still lacks a wireless interoperable network capable of linking public safety organizations and workers. First responders and other emergency personnel nationwide currently use a patchwork of incompatible technologies and frequency bands. NIST

will use the funds to work with industry and public safety organizations on research and development of new standards, technologies, and applications that advance public safety communications. This initiative will establish a competitive grants program designed to support research, development, and demonstration projects. The overriding objective is to build a broadband system to allow first responders and other public safety personnel anywhere in the nation to send and receive data, voice, and other communications to work together effectively in response to crises.

National Strategy for Trusted Identities in Cyberspace

The Budget provides an increase of $8 million to the National Strategy for Trusted Identities in Cyberspace (NSTIC) which builds upon FY 2012 funding of $16.5 million. The initiative envisions an online environment—the "Identity Ecosystem"—that improves on the use of passwords and usernames, and allows individuals and organizations to better trust one another, with minimized disclosure of personal information. The Identity Ecosystem is a user-centric online environment, a set of technologies, policies, and agreed upon standards, that securely support transactions ranging from anonymous to fully authenticated and from low to high value. It would include a vibrant marketplace that allows people to choose among multiple identity providers—both private and public—that would issue trusted credentials that prove identity. Key attributes of the Identity Ecosystem include privacy, convenience, efficiency, ease-of-use, security, confidence, innovation, and choice. Creating this Identity Ecosystem will require input from the private sector, advocacy groups, public sector agencies and others. The request continues and expands existing efforts to coordinate federal activities needed to implement NSTIC.

Specifically, the FY 2013 request funds competitively selected pilot project grants that will enable the private sector to work with state, local, and regional governments to improve acceptance of Identity Ecosystem components. The selected NSTIC pilot programs will demonstrate innovative frameworks that can provide a foundation for more trusted online transactions and tackle barriers that have, to date, impeded the Identity Ecosystem from being fully realized. This initiative is expected to lead to the emergence of privacy-enhancing, trusted authentication solutions that lead to better protections against cybercrime; improved privacy and protection of data; improved security and interoperability of credentials; improve the resilience of data breach recovery; and a self-sustaining, private-sector-led Identity Ecosystem (by 2015) and its Steering Group that brings together all stakeholders—the private sector, advocacy groups, and public-sector agencies—to address authentication challenges and allow continued expansion of the nation's online economy.

Boulder Laboratories Building 1 Renovation

NIST is requesting $11.8 million in FY13 for the Construction of Research Facilities account for the renovation of the Boulder (CO) labs - Building 1. This initiative is part of a comprehensive, multi-year plan for the phased construction of new space and renovation of Building 1. As you may know, Building 1 is nearly 60 years old and houses the majority of NIST research and measurement programs on the agency's Boulder site. However, the aging building is simply inadequate for the kind of high-precision measurement work conducted there.

The poor condition of Building 1 causes an estimated loss in productivity of at least 20 percent due to the need to repeat experiments to produce quality research results and compensate for poor controls in other ways. Even with the completion of Boulder's Precision Measurement Laboratory later this year, many NIST research projects requiring tight environmental controls will need to continue in Building 1. Renovation of Wing 6, the portion of Building 1 addressed with this initiative, includes a number of laboratories engaged in essential research and technical services such as calibrations used for radio, microwave, and optical frequency equipment in the telecommunications, medical, and scientific fields.

Beyond large research inefficiencies, current laboratory conditions in yet to be renovated wings of Building 1 also pose safety concerns. Ventilation systems do not supply adequate fresh air for modern laboratory work, electrical systems contain asbestos and do not meet current codes, lighting is poor, and most of the building is not protected by a fire sprinkler system contributing to potential life and occupational safety hazards. The current Facility Condition Index for Building 1 is "poor." Extensive upgrades are essential to ensure that the Institute can perform the exacting, precision measurements required to meet its mission.

Summary

The FY 2013 NIST budget request reflects the Administration's recognition of the important role that NIST plays in innovation, as well as the impact that the research and services NIST provides can have on moving the Nation forward by laying the foundation for long-term job creation and prosperity.

More than half of the proposed increased funding in the NIST budget is focused on advanced manufacturing research at NIST laboratories and through new industry-led consortia programs. NIST will continue its mission to work with the private sector to ensure U.S. manufacturers have the research support they need to make the best products in the world and remain globally competitive. The NIST laboratory programs, along with its outreach efforts and standards development work, are dedicated to providing U.S. industry with the tools needed to innovate, compete and flourish in today's fierce global economy.

I look forward to working with you, Mr. Chairman and members of the Committee, and would be happy to answer any questions.

Chairman QUAYLE. Thank you, Dr. Gallagher.

Now I just want to remind members that the Committee rules limit questioning to five minutes. The Chair will at this point open the round of questions, and I recognize myself for five minutes.

I first want to—you know, at the end of your testimony, you said how NIST works well with industry, and you absolutely do and it is a great way to show how the regulatory body and also industry can actually work together to come up with the type of standards that will work for everybody, but I want to go to one of the mandatory programs that you were talking about, so the request proposed the creation of a mandatory $1 billion account to establish a multi-agency National Network of Manufacturing Innovation, aimed at bridging the gap between lab and the market, and I am a little skeptical of the proposal just because if I understand, NIST would be charged with leading a program with a funding level that is greater than its total annual budget. We haven't received any justification describing how this account may differ from the MEP or from AMTech program that the Administration is proposing. So could you please describe the reason for this new account and also what role NIST will play in managing it?

Dr. GALLAGHER. Thank you. The details of the National Network of Manufacturing Institutes has not been really announced except for this sort of framework that was included in the request. So I actually don't have a lot of detail at this time to share with you, and I understand that it is going to be announced quite shortly.

What I can tell you is that the program is specifically looking at stimulating private sector R&D, that advanced manufacturing, in particular, depends on a robust transfer of knowledge from research and development into industry, and the President laid out a goal when he first came into office that we had to increase the R&D intensity in the United States. Well, the majority of R&D in the United States is private sector, and so the focus here is really to create a venue where companies can pool resources and invest in that transfer of R&D to industry.

With regards to the capacity within NIST, you are quite correct, it would be a sizable account. It is one-time funding so it would be presumably available over some period of time so on an annual basis, this probably is not exceeding what we would have managed in the past. It certainly would not exceed what we have dealt with successfully under the Recovery Act. So I think we are comfortable there, and I think also the fact that all of the science agencies are directly involved—Defense, Energy. NSF also brings a lot of capacity to the table.

Chairman QUAYLE. Do you know or can you provide any insight into how the $1 billion number was chosen? I mean, we haven't gotten any of the details and I look forward to seeing what the details are, but when you have a mandatory program that is outside of the Congressional appropriation process, immediately you kind of start to raise some alarm bells just because the mandatory spending that we are incurring year over year, obviously this is a one-time expenditure but those things are troubling to me, especially without any of the details coming out of the Administration.

Dr. GALLAGHER. And it is hard for me to answer your question without any of those same details out there, and so I think we

would want to work closely with you as soon as those details are out. It would clearly require legislation to put into place, and I think the justification for the size is probably related to the intensity of effort, and again, I hope that is part of the announcements.

Chairman QUAYLE. I was just also—is there any duplication amongst them—we are talking about manufacturer programs. Is there any duplication amongst NIST extramural programs—the MEP and the proposed AMTech? I just want to make sure that we aren't overlapping in any areas that we don't need to and making things as efficient as possible.

Dr. GALLAGHER. So as you can imagine, looking at program overlap and program efficiency, particularly across agencies, has been a high priority so there has been a lot of effort at the interagency level making sure these things are not in duplication. Certainly in the context of NIST, this has really no resemblance at all to MEP. MEP is a public-private partnership, that is true. It also includes partnerships directly with the states. But the purpose of that program is to support small and mid-sized businesses, existing manufacturers, to make them more competitive, accelerate their adoption of new technologies. The innovation network is really about supporting advanced R&D efforts by industry in a collaborative way.

Chairman QUAYLE. Okay. Thank you very much.

I will now recognize the Ranking Member, Ms. Edwards, for five minutes.

Ms. EDWARDS. Thank you very much, Mr. Chairman, and thank you, Dr. Gallagher, for your testimony.

I am curious as to where you perceive the gaps that this budget attempts to fill with respect to pushing forward on the President's agenda for more advanced manufacturing and developing that capacity that is coupled with an R&D capacity, and I referred in my opening statement to the Fraunhofer Institutes. I wonder if you could discuss in this budget the relationship between what you see, for example, in Germany and other countries doing and where we are trying to get and how that what is accomplished in the budget.

Dr. GALLAGHER. So I think that as soon as you look at advanced manufacturing, it is really the intersection between our capacity to innovate new technologies and our capacity to produce and sell them. That is really the nexus we are talking about. So the role of NIST in that space, we don't produce anything so our real role is to work with industry to support what is really the advancement of the measurement capacity that enables those new technologies to move from a laboratory environment into the market—that is quite a transformation—and in some cases, the standards infrastructure or the standards framework that drives both those technologies and the markets that they go into. So the gaps that we are always looking at are the ones where there is an emerging technology arena, where the technology space is quite new and we want to advantage the producers in the United States to exploit those new technologies. So most of the increases that you see in our 2013 request are in emerging technology areas, looking at nanotechnology and biotechnology, looking at advanced smart manufacturing infrastructure that is needed.

With the context to Fraunhofers, I don't want to speculate on how much the Fraunhofers specifically have been a model for what has been proposed but there has been a lot of interest in looking at the German model of partnership because what is intriguing about the institutes is that they combine very efficiently, apparently, a federal government, state government, and industry partnership, and I think that is probably intrinsic to almost anything we do in manufacturing because you are coupling this public sector-funded R&D enterprise with a robust private sector-funded and carried out commercial activity, and making sure we don't have unnecessary barriers there is really the heart of the matter.

Ms. EDWARDS. Thank you. And I want to go for a minute to the TIP program. The budget for fiscal year 2013 doesn't include any funding for new projects within the Technology Innovation Program, which is aimed at speeding the development of industry-led high-risk transformative research. This decision comes on the heels of the previous budget, fiscal year 2012 appropriations bill, rather, that failed to provide any funding to TIP and forced NIST to begin the process of shutting the program down. I wonder if you could talk for a minute about the decision to end TIP and the void that is going to be left at NIST and the Federal Government as a whole by the termination of the program, and I wonder if you can relate that to the predecessor ATP program because I am looking at the Advanced Technology Program that existed and the number of successes that that program had, and can you relate the two and is this is an area that we need to reconsider?

Dr. GALLAGHER. So thank you. I think you are correct. The TIP program was defunded for 2012, and we are currently in the process of shutting that program down, and that is why it was not included in the 2013 request. The TIP program was a bipartisan effort that came out of the first America COMPETES Act. It specifically is looking at the gap of—it is in this valley of death space where it is even pre-angel and pre-VC where you are looking at taking a technological concept and turning into a pre-competitive technology. So while those private sector venture funds are really looking at the business risk, there is still this big problem of derisking the technology, getting it further down the path. This has been a very natural focus as soon as innovation became one of the main drivers for R&D investments: how do you efficiently move ideas further down the path so that they can be harvested and used and exploited commercially.

I think the ATP program, which was envisioned to be a civilian DARPA looking at this high-risk, high-payoff space was very successful, in terms of the value it generated. I think TIP, while a much younger program, was showing similar signs of targeting new technologies exceptionally well, and I think really what happened was, the scale of the program combined with the fiscal environment and the need to make priorities, and that is really what happened with regard to TIP.

Ms. EDWARDS. And then would you say—I mean, would you care to characterize it? Are we really missing something here?

Dr. GALLAGHER. Well, I believe everyone who is looking at this is quite concerned about the high friction between taking what we believe to be and what I believe to be the world's best R&D enter-

prise and making sure that we take every advantage to be able to leverage that in terms of creating new companies, developing new products and new technologies. And we have some points in that value stream, if you will, that are very inefficient, and these programs were specifically designed—these are proof-of-concept-type programs that are specifically designed to take a research result and demonstrate an actual concept, and you need that to be able to sort of begin the business process of developing a business.

So this is not a secret. I think every S&T agency in the Federal Government is looking at this. States are looking at this. Other countries are looking at this and investing a lot of money in this area, and it is something that I would like to continue to discuss and work with this committee in terms of how we effectively operate, but it is very much in this public-private space, and I think we have to get it right.

Chairman QUAYLE. Thank you, Ms. Edwards.

I now recognize the gentlelady from Illinois, Mrs. Biggert, for five minutes.

Mrs. BIGGERT. Thank you, Mr. Chairman, for holding this important hearing, and Dr. Gallagher, the mission of NIST is to promote U.S. innovation and competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life, and I think in this role, NIST has done a good job of coordinating the development and dissemination of codes and standards for use in the private sector.

I have heard that the implementation of codes and standards varies across sectors and municipalities sometimes becoming a barrier for innovation. For example, I have heard that the innovation in the commercial kitchen equipment and laundry sector is not largely being adopted for a variety for reasons like the cost to purchase the new standards or lack of training in enforcing them and the level of efficiencies in those products really could offer enormous savings to taxpayers in the energy or water bills if they were able to use them. Does NIST also hear the same thing, and if so, could you elaborate?

Dr. GALLAGHER. Yes. Thank you very much. We hear this type of claim all the time. The United States has a very interesting, and as a result, very complex standards framework so standards are the realm of the private sector. We are probably one of the only industrialized countries in the world where the standard setting is not done by government mandate. So the role of NIST is to coordinate, to make sure the best science is there, to make sure there is a sound foundation for this, to bring stakeholders together. I think it is one of the reasons our track record for working with industry is what it is, that we are above the technical but a non-regulatory agency. We can bring folks together.

And of course, you are right. Making a standard itself is not enough. It has to be put into meaningful practice at a broad enough cross-section of the market to make a difference, and that is often where I think the efforts flag. There is often competing interests. A standard is really a collective behavior on the part of often-competing interests and companies and so there is a lot of intrinsic tension in sort of pulling this together and yet the advantages, as you point out, can be considerable.

So we are always weighing what is our appropriate role. We don't want to supplant the natural forces in the market to make choices about what the right solutions are but there is always—very often strong public interest as well and it may be things like a municipal interest to provide safe and effective infrastructure, promote energy or water efficiency and so forth.

Mrs. BIGGERT. Thank you. The release of the latest smart grid framework updates the previous version. Can you explain NIST's role in the continued development of the smart grid and specifically what steps are being taken to ensure the safety and security of the smart grid technologies?

Dr. GALLAGHER. Thank you very much. So the smart grid effort was just released last week, a version 2.0—we are adopting IT terminology here—of the standards framework or roadmap for smart grid. The NIST efforts really have been overtaken by what is really an all-industry effort now. The NIST Smart Grid Interoperability Panel has over 700 direct participants in the process, and they have made enormous progress in identifying a framework, a set of priorities, and in particular working on these new technologies.

Very recently, I just received the first advisory committee report on smart grid. The keys I think moving forward are to develop testing and certification framework so very much to your first question so that the market understands that devices that are bought and put in practice in a grid or in a home or in a business are safe, interoperable and meet the requirements of this overall framework so that we turn what is really a disparate set of technologies into a functioning system, which was really the goal of the project.

Mrs. BIGGERT. In one of the communities in my district, they are putting in the home devices and there is a lot of concern from some members of the community that it is not safe or that it is Big Brother watching over the use of water and all the other things that they will be doing.

Dr. GALLAGHER. Well, you are right, and with any IT-related technology, you immediately get into very directly now concerns of cybersecurity because now it is not just data but it is control of electricity—the stakes are quite high—and also privacy. I mean, both the power of this technology to give consumers the information to make choices has the other side which is, there is a lot of data about what consumers are using with this and we have to make sure that the consumer and the public utility interests move—and that is why that stakeholder group was so large in smart grid. That is very important.

Mrs. BIGGERT. Thank you. I yield back.

Chairman QUAYLE. Thank you, Mrs. Biggert.

I now recognize the gentleman from Texas, Mr. Neugebauer, for five minutes.

Mr. NEUGEBAUER. Thank you, Mr. Chairman, and thank you for holding this hearing.

Dr. Gallagher, as you can imagine, right now it is budget season in the United States Congress. Your President has sent over his budget. We are going through the budget process and, you know, everybody that is testifying, as you can imagine, understands the depth of our deficit problem, but what we still see is people coming over and saying, you know, we still need more money. And I no-

ticed that the budget that we are looking at from NIST right now, basically you added some new programs but we really didn't see very much reduction in the existing programs. If we are going to prioritize, you know, how we spend the American taxpayers' money, by the way, and we don't have all the money we are spending, we are borrowing 40 cents for every dollar we are spending, when does a department like yours start to take that leadership role and say you know what, we are going to have to go in and prioritize our programs, we may not be able to do all the things that we have been doing and so we need to prioritize that. Did you go through that process?

Dr. GALLAGHER. Yes, sir, we did actually, and you are correct. In an environment like this, I would say that looking at internal efficiencies, looking at program efficiencies has been really unprecedented. I certainly appreciate the difficult task you have within Congress as this all comes up from different agencies to look at that.

From the NIST side, what I can tell you is that we have in fact made probably the most significant priority decisions we have ever made. Two of our four programs were terminated and defunded. In fact, one was terminated and one was moved entirely to private sector funding. We have reduced administrative programs by over $12 million within NIST and are continuing to make further cuts. We have been reprogramming activities within the agency. And I think the NIST budget request—and you are quite correct, it is significantly up—was done in the context of an overall discretionary budget request that was flat. So what the Administration has tried to do is make relative priorities within the Budget Control Act number that put a premium on some of the high growth and I think the science and technology agencies have been the beneficiary of that.

Mr. NEUGEBAUER. So when you say you went through a very rigorous process to evaluate and to prioritize, what measures are in place today to evaluate these programs? I mean, where can someone go and look at the documentation of the evaluations?

Dr. GALLAGHER. So NIST looks at—because of the heterogeneous nature of the NIST programs, we evaluate them differently. So in the case of some of the technology transfer programs we were talking earlier about, the TIP or Advanced Technology Program where NIST funded these high-risk payoffs, we actually have metrics that look directly at the value generation of the companies that were started, the new revenue, the new products, new services. I just looked at a review last week of the overall return on investment. For 36 companies we looked at it was something like 27 to 1.

In the case of our Manufacturing Extension Partnership program where we are providing services to small and mid-sized manufacturers, we look directly at jobs saved or created, we look at new investments, and there is a whole set of metrics that support that. We would be happy to provide that.

And the laboratory programs are a little bit more difficult because we are working farther upstream in the science and R&D side. We do a couple of things. One is to make sure that our work is meeting industry needs, so we do a lot of work looking at industry roadmaps and consortia and things of that type to make sure

that the NIST programs are there. We look at the things we sell. We actually sell primary calibration services and standard reference materials. We are looking very carefully at that. And lastly, we also do economic impact studies where we do selective retrospective studies to look at the value of those programs, and we would be happy to share all of that information with you.

Mr. NEUGEBAUER. Now, recently, I was at a firm that does a lot of high-tech work and actually participates in some of the programs that you are talking about, and I posed this question to them and I think it kind of caught them off guard, and the question that I asked them was what if instead of you leveraging federal dollars, because many of them, they put the public-private partnership, rather than leveraging a small amount of your money with a large amount of federal money, what if we changed the corporate tax structure in such a way that most of the money was your money, would you still be investing in those same kind of research, or because of the speculative level would you probably not. Because I think where we have to begin to look at it and when we prioritize how we spend American taxpayers' money, we have to make sure that we are investing it in places where we get high degrees of return, and I submit to you that I think a lower corporate tax structure and allowing these companies to invest in the technology they think has longer prominence puts a little of a market perspective over research and development rather than trying to put together academic standards that these may or may not be. What would be your response to that?

Dr. GALLAGHER. I would actually be in strong agreement. I think that in this space between the public sector and private sector, there is both pushes and pulls. I think that the market forces are incredibly important, possibly the most important. I think that is why the Administration has also supported the R&D tax credit and looking at corporate tax reforms for the very reasons you articulated.

I also think that there is in some cases push from the technology sector. What is happening in the labs opens up opportunities that the market may not see or understand, and so in some cases we have to make sure that those are made visible to them as well, and you are highlighting really one of the most important areas, which is this intersection, how do we make this operate effectively without getting in the way of the market itself.

Chairman QUAYLE. Thank you, Mr. Neugebauer.

I now recognized Mr. Hultgren for five minutes.

Mr. HULTGREN. Thank you, Mr. Chairman.

Just a couple questions dealing more with manufacturing and jobs. The President stated in his State of the Union address, and I know you have reaffirmed in your testimony—I apologize, we had a couple other meetings going on at the same time—but I know you testified that one of the goals of this budget is to encourage high-tech manufacturing in the United States. I certainly agree with this admirable goal and want to be fighting for that as well, but wonder if any amount of federal spending on science and technology will lead to more high-technology manufacturing without significant regulatory and tax reform.

So I wonder, can you 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 United States? Since the United States has one of the highest corporate tax rates, do you believe we can attract business to the United States and keep them here without reducing regulation and reforming the tax code?

Dr. GALLAGHER. Thank you very much. I certainly agree wholeheartedly that the set of conditions that a manufacturer will use to make a decision to site in the United States or to grow are more than just the R&D piece itself and it is going to be access to the workforce, it is going to look at the tax and cost structure, it is going to be a whole host of things, and I think the NIST manufacturing efforts should be viewed really in the fabric of a much larger effort that looks at how do we set the right macroeconomic conditions to support investments in advanced manufacturing and so forth. That includes trade, workforce, tax structure and so forth.

But I think that in the context of R&D-intensive industries, ones that are really dependent on the flow of new ideas, there is an important touch point and I think that setting the right structure is really about making sure that we both facilitate the scale-up problem, taking an idea from a lab and how does it look in full scale-up and which is often a very deep measurement problem, and the other one is getting the market right, and you are exactly right. Many of these new emerging technologies are touching potential regulatory issues. So if you look at biotech where we are looking at the promise of an incredibly fast production of new biomaterials and new bioproducts, everyone concludes in the sector that I have talked to that we have to do something to make sure the regulatory process that protects the safety and efficacy of these materials keeps pace with that. And so what we are trying to do in NIST is to make sure that to the extent that this can be done through measurement, and the way to think of that is through quality control and quality assurance processes within industry itself, that we might be able to set from the technology side a better barrier so that we have smart and nimble regulation or requirements.

One of the goals in standard setting is certainly if industry has broadly adopted a set of practices that are self-protective, that goes a long way to addressing the type of breakdowns or market breakdowns you would expect to look at and regulations, so that is true in our nanotechnology where we are looking at environment, safety and health issues, how do we measure with nanoparticles and also looking at biotech.

Mr. HULTGREN. You touched on this a little bit but I guess just to delve in a little bit deeper, you talked about a number of distinct manufacturing initiatives and programs that NIST supports. I wonder if you could give your view more broadly of the direction of concern about U.S. manufacturing and making sure that it is growing, that that is a vital part of our economy, always has been and I believe needs to be going forward. I wonder if you could kind of give your thoughts of how you see that going in the near future and then longer term from the work that you have been doing at NIST but also just recognizing, do you feel like there is enough leadership coming from Washington, from agencies, from the Administration on manufacturing and how could the Administration coordi-

nate manufacturing activities amongst the different federal agencies more effectively?

Dr. GALLAGHER. I have to tell you that in my 18 years in the Federal Government, I have never been more optimistic about manufacturing than I am today. I think a tone has changed. I think for a while there was a feeling that it was just inevitable, that we didn't have to worry about manufacturing, we could simply invent it here and it would go somewhere else and that was okay. I think that has changed. I think there has been recognition not just within the Federal Government but every discussion I have had in Congress has sort of reaffirmed this, and most importantly, the business community has really stepped up and begun to make the case very strongly that there is a deep interplay between our capacity as a country to innovate and our capacity as a country to produce a benefit from those innovations.

And in fact, we probably should have known this because our competitors were doing this to us. They would start with the low-end manufacturing, which had no R&D, and work their way up the value chain until they were eventually building out R&D infrastructure and so that interplay was obvious to them, and I think we may have just taken it for granted since it had been such a core part of our strength for so many years. But I think that has really changed. I think the dynamic, as I said, is as robust as I have ever seen it. Now I think what we have to do is use that window of opportunity wisely and begin to craft some programs that work effectively because, as I said, the Federal Government doesn't manufacture anything. What we want to do is make sure we are providing an environment that is conducive to that set of industries.

Mr. HULTGREN. Just real quickly on that, is there some coordinated effort going on again amongst—I am glad to hear of your optimism from your perspective but is there some coordination as far as making sure that the effort really is being productive among different agencies from what you have seen?

Dr. GALLAGHER. Yes. The answer is again as much I have ever seen, so when Secretary Bryson was confirmed as Commerce Secretary, he was made a co-chair of a new office called the Office of Manufacturing Policy. This was a Cabinet-level group. In fact, I was at the first meeting. I had the privilege of sitting on the side wall while they met. And in fact, we have had vigorous and active participation by most of the Cabinet actually. It has been remarkable. The President himself was personally engaged in manufacturing. And at the working level in the advanced manufacturing space, NIST was named as the coordination agency, so we were given what was called a National Program Office to specifically provide the support for robust, all-of-government effort, and I would say routinely every day one door down from my office, Mike Molnar, who heads that office, is coordinating with Defense and Energy and NSF. So it is extremely active at this time.

Mr. HULTGREN. My time is expired. I yield back. Thank you, Mr. Chairman.

Chairman QUAYLE. Thank you, Mr. Hultgren, and I want to thank Dr. Gallagher for his valuable testimony and the members for their questions.

The members of the Subcommittee may have additional questions for you, Dr. Gallagher, and we will ask you to respond to those in writing. The record will remain open for two weeks for additional comments and statements from members.

The witness is excused. Thank you all for coming. The hearing is now adjourned.

[Whereupon, at 11:45 a.m., the Subcommittee was adjourned.]

Appendix I

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by Dr. Patrick Gallagher, Under Secretary, Commerce for Standards and Technology and Director, National Institute of Standards and Technology

QUESTIONS FOR THE RECORD
THE HONORABLE BEN QUALYE (R-AZ)
U.S. House Committee on Science, Space, and Technology
Subcommittee on Technology and Innovation

An Overview of the Fiscal Year 2013 Budget Proposal at the National Institute of Standards and Technology

Tuesday, March 6, 2012

1. **The NIST budget requests $20 million to develop four Centers of Excellence. These Centers are intended to provide an interdisciplinary environment where industry and academia can collaborate on basic and applied research. What need are the Centers intended to address that is not currently being addressed by NIST? Could you please describe how the individual centers will be chosen and structured, and what role NIST will play in determining the focus of research in each center? What is the lifespan of these Centers, for example do you expect to re-compete the Centers every few years?**

Answer:

The National Institute of Standards and Technology (NIST) Centers of Excellence are intended to support NIST's laboratory mission by providing a vehicle for expanded collaboration in the areas of measurement science. The Centers will leverage NIST measurement science expertise with assets and resources of industry and academia to synergistically advance the United States' manufacturing sectors' ability to address challenges critical to competitiveness. NIST will expand our strategic planning processes to identify emerging areas of national need in measurement sciences that would benefit from this model.

Centers of Excellence will be selected through a competitive, merit-based process. NIST will continuously monitor the progress of the Centers of Excellence, and contemplates an in-depth review in the fourth year to determine the continuing need in the technical focus areas and the success of the specific Centers, as well as potentially select new focus areas, at which time grants will again be competitively awarded.

2. **The FY13 Federal R&D budget details efforts to strengthen our Nation's competitiveness and long-run economic growth. What is NIST doing to measure and evaluate the economic impacts of its basic research funding? What methods can the federal government use to prioritize funding areas of basic research, both within an area of science and across areas of science? Given limited resources during this difficult budget environment, would NIST determine to discontinue research in a certain area if a new field of research shows promise? In other words, how is the decision made about which research areas to prioritize?**

Answer:

NIST has conducted numerous economic impact studies to understand the return on investment

made in its research programs, as well as its extramural programs such as the Technology Innovation Program, and the Hollings Manufacturing Extension Partnership (HMEP) Program. In addition to those assessments, NIST uses other tools such as customer feedback on services provided through the MEP program, and objective peer-review of scientific proposals.

NIST works to continuously re-examine its research priorities to ensure that its research dollars are being spent consistent with its mission and potential for transformational impact. This process involves input from NIST's constituents in industry, associations, universities, and others. As a result, at times NIST must make decisions as to whether to continue to invest in a particular research activity in order to better allocate its research dollars.

How does NIST determine the balance of funding for basic research activities versus technology transfer activities? To what extent does NIST target specific industries for technology transfer programs and how is the decision made on which industry sectors to target? What does NIST view as the appropriate use of federal funding versus industry funding in technology transfer programs?

Answer:

NIST continually considers its priorities within the context of its mission 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. NIST does not specifically determine the balance of funding for basic research activities versus applied research activities. Technology transfer activities occur as an integral element of both basic and applied research activities with funding to match the activities considered necessary to maximize impact. NIST uses strategic planning processes to determine the industries that will have the greatest mission-related impact, and in many instances leverages NIST programs across industries. However, NIST considers technology transfer in all programs through a multitude of mechanisms and has partnerships with industry that maximizes impact.

On October 28, 2011, the President issued a Presidential Memorandum, "Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-growth Business," to improve results from technology transfer and commercialization activities from federal laboratories, including NIST. NIST has a lead role in coordinating, analyzing, and reporting on the performance of technology transfer for the Department of Commerce and across Federal agencies.

NIST's technology transfer activities are designed to disseminate the Institute's fundamental research results and its measurements and standards research results to industry and all other interested parties. In order to provide leading-edge scientific and technical work, NIST is required to have expertise in multiple disciplines, to maintain high levels of collaboration with organizations and people with diverse capabilities, and to have highly specialized facilities and tools. NIST uses numerous formal and informal mechanisms to promote innovation and ensure that the resulting technologies are broadly disseminated through collaboration. Technology transfer from NIST includes:

- Collaborations Cooperative Research and Development Agreements, Material Transfer Agreements, guest researchers, and informal exchanges of information

QUESTIONS FOR THE RECORD

- State-of-the-art user facilities
- Nurturing post-doctoral researchers in our laboratories
- Standard Reference Materials - objects or physical samples for which NIST has determined accurate property data
- Standard Reference Data - well-documented numeric data for use in technical problem-solving, research, and development
- Making other databases software available to the public through downloads from NIST websites
- Licensing of patented technology developed by NIST
- Documentary Standards Activities - NIST has nearly 400 staff involved with more than 100 standards organization.
- Journal articles and technical publications
- Calibrations
- Training, and
- Laboratory Accreditations

QUESTIONS FOR THE RECORD
THE HONORABLE DONNA EDWARDS (D-MD) U.S.
House Committee on Science, Space, and Technology
Subcommittee on Technology and Innovation

An Overview of the Fiscal Year 2013 Budget Proposal at the National Institute of Standards and Technology

Tuesday, March 6, 2012

1. The U.S. manufacturing sector, by itself, would represent the 9th largest global economy. However, U.S. manufacturing faces a significant number of challenges. For example, the U.S. share of the high-tech market has fallen from 34 percent in 1998 to 28 percent in 2010, and China has surpassed the U.S. as the leading manufacturing country. I am pleased to see the emphasis NIST is placing on addressing our manufacturing challenges, including through the proposed Advanced Manufacturing Technology Consortia program (AMTech). I was disappointed that AMTech was not funded last year, as requested by NIST, and hope that the proposal will garner more support this year. Can you tell us why AMTech is so important and how it will help bolster the competitiveness of U.S. manufacturers? Also, can you outline the specific objectives NIST has for AMTech in FY 2013?

Answer:

The Advanced Manufacturing Technology Consortia Program (AMTech) is an important component of a broad strategy needed to position U.S. manufacturers to be globally competitive. AMTech is designed to fill a critical funding gap in the innovation lifecycle by providing resources to establish industry-led consortia to prioritize and support basic and applied research on long-term, precompetitive technology developments. AMTech creates the incentive for multiple industry stakeholders to share financial and scientific resources, together with other partners including state and local governments as well as universities, community colleges, and federal laboratories. The need for partnerships and for research toward common, long-term research goals shared by many companies (including small and medium sized enterprises) has been noted by a number of recent reports, including the President's Council of Advisors on Science and Technology's "Report to the President on Ensuring American Leadership in Advanced Manufacturing" (June 2011).

As you noted, AMTech was originally put forward in the FY 2012 budget. In FY 2011, we initiated planning activities to help prepare for the possible implementation of AMTech. This includes the issue of a Request for Information on how to structure the proposed new program (AMTech), issued July 22, 2011. Additionally, the NIST Visiting Committee on Advanced Technology, NIST's primary Federal Advisory Committee, recently produced the report "Recommended Design Principles for AMTech" (February 2012). We will use this information to inform the programmatic design of AMTech if funded in FY 2013.

Specifically, in FY 2013 we would issue two types of funding competitions under the AMTech program. One competition would be for planning grants to new or existing consortia. These planning grants are intended to stimulate partners to come together and develop technology roadmaps that outline the needed technology developments that are

critical to the success of the consortia partners in the long run. A second competition would be launched for the award of implementation grants. These grants would be larger, and are to be awarded to existing consortia to provide additional funds to conduct research in line with a consortium's own technology roadmap.

2. A recent survey by the OECD shows that CEOs value access to a skilled workforce above the cost of labor and materials when determining where they'll locate their manufacturing facilities. This demonstrates the importance of having a highly-skilled workforce here in the U.S. How does the FY2013 budget request reflect NIST's efforts to improve science and math education, particularly as it relates to the skilled workforce required for advanced manufacturing?

Answer:

We agree that workforce development is a critical need for the future of advanced manufacturing in the U.S.

NIST has a number of efforts in the area of Science, Technology, Engineering, and Math (STEM) education. For example, NIST hosts an ongoing series of programs for undergraduate students and middle school science teachers designed to share the excitement of doing research at NIST. In the Summer Undergraduate Research Fellowships (SURF) program, students take part in an eleven-week summer research program, working side-by-side with NIST researchers. For teachers, a summer workshop and after-school events during the school year provide information on the latest research applicable to the middle school curriculum and offer the opportunity to try out activities and materials designed for use in the classroom.

The NIST postdoctoral program provides opportunities for outstanding young scientists to gain training in measurement science. The postdoctoral program is critical in bringing new ideas and approaches to NIST and for transferring measurement science and standards expertise to the next generation of scientists and engineers. The recently approved NIST FY 2012 spend plan assigns an additional $3M to support STEM activities. The funds will help provide opportunities for outstanding young scientists to gain training in measurement sciences. This training is critical to ensuring that NIST has access to the top quality technical talent necessary to maintain leading research programs that address national priorities. Of the FY 2012 STEM funds, $2M will fund an additional 10-12 researchers in the NIST postdoctoral program. The further $1M will support STEM-related grants to expand opportunities for minority and underrepresented populations.

New in FY 2013, the NIST Manufacturing Fellowships Program is intended to leverage the deep measurement science and standards expertise within the NIST laboratories to help transfer NIST knowledge to the private sector. The Manufacturing Fellowships Program will provide funding to support engineers and scientists to work on the NIST campus with NIST staff on the measurement and standards required for advanced manufacturing. This program is targeted at researchers from companies and non-profit organizations as well as recent job-seeking graduates with scientific and engineering degrees from academic institutions – including community colleges and universities.

QUESTIONS FOR THE RECORD

3. I'm worried about the void that will be left at NIST with the termination of the Technology Innovation Program and its predecessor, the Advanced Technology Program. These important programs funded the development of transformative technologies with the potential to spur economic growth and job creation. Were these programs effective at meeting their goal of accelerating the development of early-stage, innovative technologies? Does NIST have any data about the contribution of either of these programs to economic growth or job creation?

Answer:

Both the Technology Innovation Program (TIP) and its predecessor, Advanced Technology Program (ATP), were effective at meeting their goals of accelerating the development of early-stage, innovative technologies. TIP was a relatively young program (established under Section 3012 of the America COMPETES Act of 2007, Public Law 110-69), and today the projects of TIP awardees have not yet fully matured. Yet, based on its 22-year history of funding high-risk, high-reward research, NIST believes that the benefits accruing to the Nation from TIP-funded research will be realized after the projects end through the attraction of additional R&D, the hiring of additional staff, new revenues, and benefits to the consumers from new and improved products.

While it is too early to assess the economic impact of its investments, TIP has supported a substantial number of jobs. Based upon the budgets from the 38 TIP proposals receiving an award, approximately 600 positions (full- and part-time) were to be involved and supported through TIP funding. The number of actual positions is expected to be lower since the lack of an FY 2012 appropriation required TIP to terminate funding early for 12 of the 38 projects.

ATP had a much longer track record than TIP, and its impacts are more clearly documented. For example, ATP and its investments have resulted in billions of dollars of benefits. From a sample[1] of just 36 of the projects funded by ATP:

- $79.2M in government investment yielded revenues and savings resulting from products or processes incorporating technologies developed under ATP awards in excess of $2.7B.
- In many of the 36 investments, significant cost savings accrued to companies and/or customers
    - CombineNet, Inc., alone accounted for more than $1B in customer savings resulting from a $1.9M ATP investment

Additionally, ATP investments also addressed technical barriers that, when overcome, enabled new sub-industries such as "pharmacogenomics" (http://www.atp.nist.gov/clso/wp-04-01/dnadiag-final.pdf).

In aggregate, the 824 ATP-funded projects from 1990 through 2007 have resulted in:

[1] Unpublished findings based on ATP's *Business Reporting System* survey data with follow-up calls to award recipients.

- More than 1500 patents that have been issued based upon the ATP research
- More than 1800 publications that have shared the scientific approaches and findings from the ATP research
- Commercial outcomes (product sales, cost savings, or licensing revenues) in almost one-half (48%) of all projects
- Success in attracting additional external R&D support by more than half (60%) of ATP projects
- Rich partnerships with small businesses in more than three-fourths (76%) of ATP projects that involved a small business (fewer than 500 employees)

ATP also had a significant impact on employment growth in small businesses that pursued ATP-funded manufacturing projects. For example, an ATP study[2] that addressed employment growth in the 135[3] small companies leading single-company manufacturing projects between 1990 and 2004, demonstrates substantial and sustained employment growth:

- 78% of the companies gained employment
- The average gain in employment (including employment loss in the calculation) was 67 employees
- Since the average employment size at time of award for these projects was 54 employees, this average gain of 67 employees represents more than a 100% gain in employment for these small manufacturing companies

[2] Internal ATP Fact Sheet (2011) based on ATP's *Business Reporting System* survey data.
[3] This study had a survey response rate of about 50% (or 67 projects).

QUESTIONS FOR THE RECORD
THE HONORABLE JOHN SARBANES (D-MD)
U.S. House Committee on Science, Space, and Technology
Subcommittee on Technology and Innovation

An Overview of the Fiscal Year 2013 Budget Proposal at the National Institute of Standards and Technology

Tuesday, March 6, 2012

1. **Has there been interest from other agencies in entering into a 'Supplier Scouting' partnership, similar to that of the DoT, DoE, or DoD? Does MEP have plans on expanding the 'Supplier Scouting' program to leverage its success to date, perhaps scaling up the program so it could support all federal agencies with their contracting needs?**

Answer:

Yes. The Hollings Manufacturing Extension Partnership's (MEP) field network of 1600 people across the country who work with manufacturers every day, provide a powerful tool that has been turned to helping large original equipment manufacturers (OEMs) find the domestic suppliers for components and parts. Other agencies have taken notice of MEP's supplier scouting program. The Small Business Administration (SBA) is considering how the MEP supplier scouting efforts could play a role in SBA's American Supplier Initiative. MEP has also been discussing how to link its supplier scouting initiative with the DOD Connecting American Manufacturers (CAM) program.

2. **How can the 'Supplier Scouting' program better anticipate the supply chain needs of the federal government so as to relay those needs to U.S. manufacturers? Are there opportunities to better telegraph the federal government's future supply chain needs to U.S. manufacturers, allowing manufacturers the opportunity to expand their capability in advance of the federal government's demand?**

Answer:

Building on the activities with the Department of Transportation (DOT) around the Next Generation Rail forums, MEP is holding a business matching event at the MEP Manufacturing Innovations 2012 conference in May. Through this effort, MEP is bringing together manufacturers to meet with Federal agencies and original equipment manufacturers. This event will provide manufacturers with an understanding of the necessary certifications and agency requirements, as well as potential procurement opportunities.

3. **Within the $128 million MEP budget, what amount is devoted to the 'Supplier Scouting' program? Are these dollars statutorily dedicated to the 'Supplier Scouting' program or rather appropriated at Director Roger Kilmer's discretion?**

Answer:

QUESTIONS FOR THE RECORD

NIST MEP has two full-time employees dedicated to the supplier scouting program. They work with over 150 MEP Center and local partner staff, focusing their efforts through a designated point of contact in each of the 60 MEP Centers, and coordinating the overall effort with 10 regional MEP Center staff from across the MEP system. Funding for the supplier scouting initiative is determined by the MEP and NIST management based on opportunities NIST MEP staff identifies while working with OEMs and other Federal agencies. NIST MEP funding is supplemented with support from other Federal agencies based on specific requirements of each federal agency. As MEP continues discussion with other agencies around how supplier scouting can support their "Buy American" efforts, MEP will look to expand the program and the resources to support the supplier scouting initiative.

Appendix II

Additional Material for the Record

SUBMITTED BY DR. PATRICK GALLAGHER, UNDER SECRETARY OF COMMERCE FOR STANDARDS AND TECHNOLOGY AND DIRECTOR, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

In the case of our Manufacturing Extension Partnership program where we are providing services to small and mid-sized manufacturers, we look directly at jobs saved or created, we look at new investments, and there is a whole set of metrics that support that. We would be happy to provide that.

Information to provide -

MEP leverages over $100 million dollars of federal investment into a nearly $300 million dollar program by teaming with industry as well as state and local organizations. MEP provides access to a range of resources meeting the critical and often unique needs of America's manufacturers. The following documents show MEP's economic impact.

MEP – Making an Impact on U.S. Manufacturing -
http://www.nist.gov/mep/upload/MEP-PARTNERING-IMPACTS-2011-v2.pdf

And the laboratory programs are a little bit more difficult because we are working farther upstream in the science and R&D side. We do a couple of things. One is to make sure that our work is meeting industry needs, so we do a lot of work looking at industry roadmaps and consortia and things of that type to make sure that the NIST programs are there. We look at the things we well. We actually sell primary calibration services and standard reference materials. We are look very carefully at that. And lastly, we also do economic impact studies where we do selective retrospective studies to look at the value of those programs, and we would be happy to share all of that information with you.

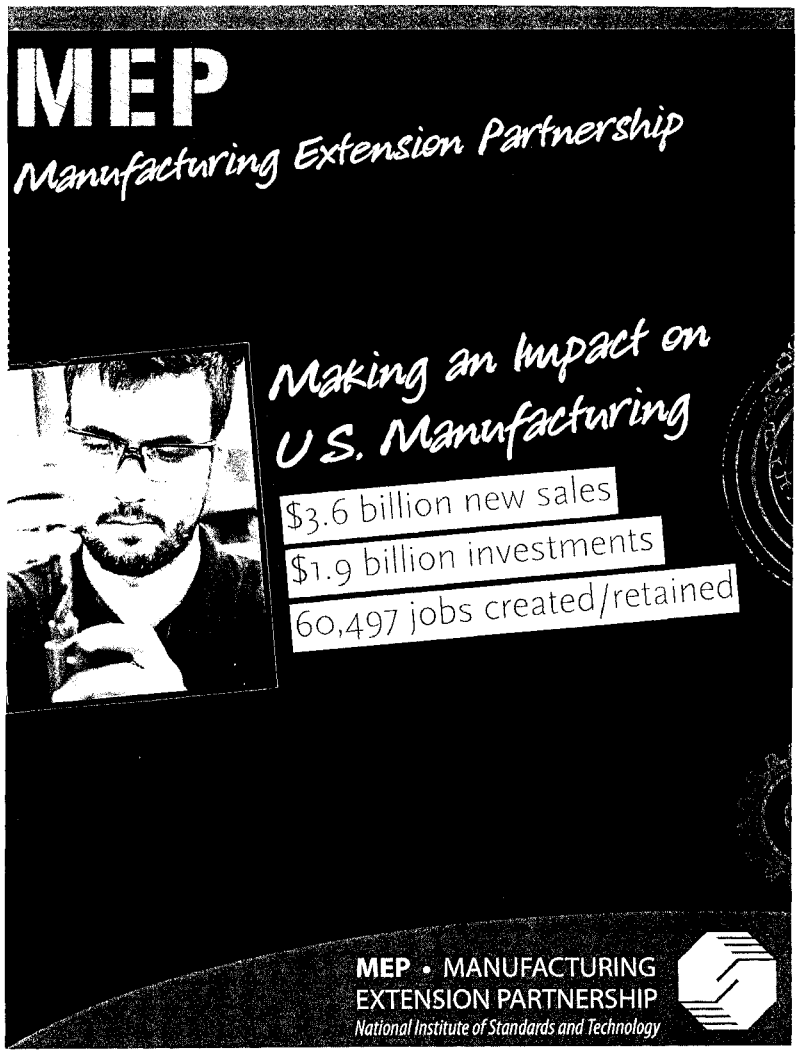
Information to provide –

Between 2000 and 2011, 16 economic impact studies have been conducted on NIST research programs selected based on perceived industry impact (not randomly selected), and covering a wide range of technologies and industries. These impact studies yielded an average benefit-cost ratio of 47:1, based only on industries receiving direct transfer of research output from NIST (i.e., no multiplier effect estimated). Collectively, they provide a good indicator of past and potential economic impact of these NIST programs.

NIST has done a relatively large number of impact studies covering a wide range of technologies and industries. These studies collectively can be viewed as a legitimate indicator of NIST industry impact. For access to individual studies, see list located at this website -
http://www.nist.gov/director/planning/summary-studies.cfm

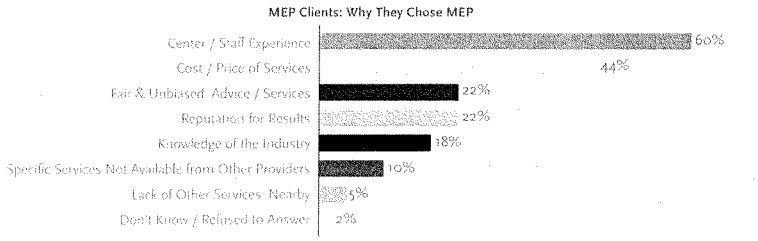
Note: a number of studies were conducted prior to 2000, but are not included in this list

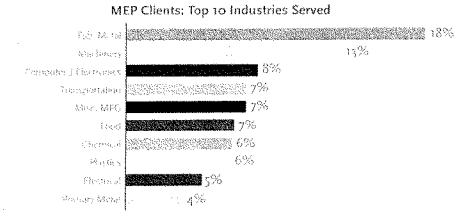
Year	***Industry***	***Project/Output***	***BCR***
2000	*Pharmaceuticals*	*cholesterol measurement/SRM*	*4*
2000	*Photonics*	*laser and fiber optic power and energy calibration/calibrations**	*7*
2000	*Chemicals*	*sulfur in fossil fuels/SRM*	*113*
2000	*Building Technology*	*construction system integration & automation technologies (industrial)*	*5*
2001	*Building Technology*	*Fire Dynamics Simulation*	*101*
2001	*Electronics*	*Josephson voltage standard/SRM*	*5*
2001	*Building Technology*	*construction system integration & automation technologies (commercial)*	*4*
2001	*Information Technology*	*data encryption standards/standard conformance test methods**	*102*
2001	*Information Technology*	*role-based access control/reference models (RBAC)*	*109*
2002	*Chemicals*	*National Traceable Reference Materials Program/SRD; calibration services*	*21*
2002	*Manufacturing*	*STEP/stds; conformance test methods & services*	*8*
2008	*Semiconductors*	*superfilling research techniques*	*6*
2008	*Semiconductors*	*low-k materials characterization*	*9*
2009	*Materials*	*consortium-based combinatorial methods development and transfer*	*9*
2010	*Information Technology*	*search engines (TREC)*	*5*
2010	*Information Technology*	*computer security (RBAC)*	*249*
16 total studies		*Average benefit-cost ratio: 47*	

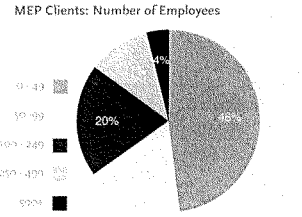

MEP
Manufacturing Extension Partnership
Making an Impact on U.S. Manufacturing
$3.6 billion new sales
$1.9 billion investments
60,497 jobs created/retained
MEP • MANUFACTURING EXTENSION PARTNERSHIP
National Institute of Standards and Technology

33,838
Manufacturers served in FY2011

MEP completed over 460,000 customer engagements since the program's inception including technical assistance projects, training programs, networking events and long-term strategic support. These customers are typically manufacturers with fewer than 500 employees in a broad range of industry sectors – from food processors to machine shops to solid state circuitry assemblers. They are companies that need help solving a specific problem, want to implement new technologies, or hope to grow their businesses through the development or improvement of products.







FY 2010* MEP CLIENT IMPACTS AS A DIRECT RESULT OF MEP ACTIVITIES

Increased/Retained Sales	$8.2 billion
New Sales	$3.6 billion
Retained Sales	$4.6 billion
Cost Savings	$1.3 billion
New Client Investments	$1.9 billion
Jobs Created	19,170
Jobs Retained	41,327

* Independent follow-up of clients with projects completed in FY2010. Of the 9,952 clients selected to be surveyed, 7,658 completed the survey in FY2011. Measures are a conservative snapshot of benefits. Recurring or cumulative benefits may be larger.

The NIST Manufacturing Extension Partnership is a nationwide system of resources, transforming manufacturers to compete globally, supporting greater supply chain integration, and providing access to technology for improved productivity. MEP is built around manufacturing extension centers locally positioned throughout the U.S. and Puerto Rico addressing the critical and often unique needs of America's manufacturers.

January 2012

WWW.NIST.GOV/MEP • 1-800-MEP-4MFG

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