

**AN OVERVIEW OF THE BUDGET PROPOSAL
FOR THE NATIONAL INSTITUTE OF STANDARDS
AND TECHNOLOGY FOR FISCAL YEAR 2017**

HEARING
BEFORE THE
SUBCOMMITTEE ON RESEARCH AND TECHNOLOGY
COMMITTEE ON SCIENCE, SPACE, AND
TECHNOLOGY
HOUSE OF REPRESENTATIVES
ONE HUNDRED FOURTEENTH CONGRESS

SECOND SESSION

March 16, 2016

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**AN OVERVIEW OF THE BUDGET PROPOSAL
FOR THE NATIONAL INSTITUTE OF
STANDARDS
AND TECHNOLOGY FOR FISCAL YEAR 2017**

WEDNESDAY, MARCH 16, 2016

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

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

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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***An Overview of the Budget Proposal for the National Institute
of Standards and Technology for Fiscal Year 2017***

Wednesday, March 16, 2016
10:00 a.m. - 12:00 p.m.
2318 Rayburn House Office Building

Witness

Dr. Willie E. May, 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 RESEARCH AND TECHNOLOGY**

HEARING CHARTER

***An Overview of the Budget Proposal for the National Institute of Standards and Technology
for Fiscal Year 2017***

**Wednesday, March 16, 2016
10:00 a.m. - 12:00 p.m.
2318 Rayburn House Office Building**

Purpose

On Wednesday, March 16, 2016, the Subcommittee on Research and Technology will hold a hearing to examine the Administration's proposed fiscal year 2017 (FY17) budget request for the National Institute of Standards and Technology (NIST).

Witness

Dr. Willie E. May, Under Secretary of Commerce for Standards and Technology and Director, National Institute of Standards and Technology

Hearing Overview

The National Institute of Standards and Technology (NIST) is a non-regulatory science agency within the Department of Commerce. The Institute'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 is recognized as a provider of high-quality information utilized by the private sector.

This hearing will examine NIST's funding priorities for FY17. The President's budget request for NIST is \$1.01 billion, an increase of \$50.5 million (5.2%) from the FY 2016 enacted level. Included in this number is a \$14.9 million increase for inflationary cost changes.

National Institute of Standards and Technology (NIST) Overview

The National Institute of Standards and Technology (NIST) was originally founded in 1901 as the National Bureau of Standards. A non-regulatory agency within the Department of Commerce, NIST works to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology. 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 where it employs nearly 3,000 scientists, engineers, technicians, and support administrative personnel. In addition, NIST hosts about 3,500 associates and facility users from academia, industry, and other government agencies each year.¹ At these locations, NIST Laboratories conduct research that advances the nation's technology infrastructure and helps U.S. companies continually improve products and services.

National Institute for Standards and Technology (NIST) Spending
(dollars in millions)

Account	FY15 Actual	FY16 Enacted	FY17 Request	FY17 Request vs. FY16 Enacted	
				\$	%
Scientific & Technical Research and Services (STRS)	675.5	690.0	730.5	40.5	5.9
Construction of Research Facilities (CRF)	50.3	119.0	95.0	-24.0	-20.17
Industrial Technology Services (ITS)*	138.1	155.0	188.9	33.9	21.9
<i>Manufacturing Extension Partnership (MEP)</i>	<i>130.0</i>	<i>130.0</i>	<i>142.0</i>	<i>12.0</i>	<i>9.2</i>
<i>Advanced Manufacturing Technology Consortia (AMTech)*As of January, 2016, AMTech and the NNMI have been merged.</i>	<i>11.7</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>
<i>National Network for Manufacturing Innovation</i>	<i>-</i>	<i>25.0</i>	<i>47.0</i>	<i>22.0</i>	<i>88</i>
Totals:	863.9	964.0	1,014.4	50.5	5.2

National Institute of Standards and Technology (NIST) Budget Summary²

The President's budget request for the National Institute of Standards and Technology (NIST) is roughly \$1.01 billion, an increase of \$50.5 million (5.2%) from the FY 2016 enacted level. Included in this number is a \$14.9 million increase for inflationary cost changes.

¹ <https://www.commerce.gov/directory/willieemay>

² <http://www.osec.doc.gov/bmi/budget/FY17BIB/AllFilesWithCharts2.pdf>

Scientific and Technical Research Services

The FY 17 Budget Request for NIST's Scientific and Technical Research Services (STRS) is \$730.5 million, an increase of \$40.5 million (5.9%) from FY 16 enacted levels. STRS includes NIST's laboratory programs, the national measurement and standards labs and user facilities, which would receive increased funding through the President's request. The Strategic & Emerging Research Initiative fund and postdoctoral research associates program would also be slightly increased in the request. The request includes increases for work conducted on measurement science for future computing technologies and applications, advanced sensing for manufacturing, biomanufacturing/engineered biology, addressing spectrum issues, neutron research, and lab to market/technology transfer promoting data sharing efforts.

Construction of Research Facilities

The FY 17 Budget Request for NIST's Construction of Research Facilities (CRF) is about \$95 million, a decrease of over \$24 million from FY 16 enacted levels (-20%). Base funds of \$40.0 million will continue the multi-year effort to renovate and modernize the Radiation Physics Building 245. The FY 2017 funding will allow NIST to begin the next phase of a multi-phased project for the Building 245 Modernization. NIST requests a \$4.751 million decrease to reduce the Safety, Capacity, Maintenance, and Major Repairs (SCMMR) program to approximately \$55 million for FY 2017, and a \$20 million decrease to reflect the completion of the initial efforts to improve the condition of the Gaithersburg Radiation Physics Building 245 with funding received in FY 2016.

Industrial Technology Services

NIST utilizes several programs to carry out its mission. The Hollings Manufacturing Extension Partnership (MEP) is a nationwide network of local centers offering technical and business assistance to smaller manufacturers to help them create and retain jobs, increase profits, and save time and money. NIST partners with 1,300 manufacturing specialists and staff at more than 400 MEP locations around the country.

Further, the National Network for Manufacturing Innovation (NNMI) aims to create a manufacturing research infrastructure for U.S. industry and academia to solve industry-relevant problems. In December 2014, the Revitalize American Manufacturing and Innovation Act of 2014 (RAMI Act), was signed into law as part of the Consolidated and Further Continuing Appropriations Act, 2015 (P.L. 113-235), which directed the Secretary of Commerce to establish a Network for Manufacturing Innovation program at NIST. Under this, NIST is authorized to use up to \$5 million per year of appropriated funds for FY2015-2024 to carry out its responsibilities under the act. This budget program was first explicitly appropriated funds in FY 2016 under the Consolidated Appropriations Act, 2016 (P.L. 114-113), which provides NIST with \$25 million in discretionary funds

The FY 17 budget request for NIST's Industrial Technology Services (ITS) is \$188.9 million, an increase of \$33.9 million or nearly 22 percent from FY 16 enacted levels. The Administration's request would zero out funding levels for the Advance Manufacturing Technology Consortia (AMTech) as AMTech has been merged with NNMI. The request includes \$142.0 million for the

Hollings Manufacturing Extension Partnership (MEP), a \$12.0 million increase from FY 16. The MEP will complete the effort started in FY 2014 to bring to a close the final round of competition of the MEP centers, maintain the funding of states previously competed, and provide funding for additional performance-based awards to high performing centers.

The ITS request also includes a \$22.0 million increase for NNMI, for a total of \$47.0 million (88% increase). The \$47 million request would be used to fund and maintain three institutes for up to seven years.

Chairwoman COMSTOCK. The Committee on Science, Space, and Technology will come to order.

Without objection, the Chair is authorized to declare recesses of the Committee at any time.

Welcome to today's hearing entitled "An Overview of the Budget Proposal for the National Institute of Standards and Technology for Fiscal Year 2017." I now recognize myself for five minutes for an opening statement.

I would first like to thank Dr. Willie May, Director of the National Institute of Standards and Technology (NIST), and Under Secretary of Commerce for Standards and Technology, for appearing today to discuss the NIST budget request for fiscal year 2017.

This Committee has a long, bipartisan record of support for NIST and its contributions to research and development. As a non-regulatory agency within the Department of Commerce that works closely alongside industry, NIST works to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology.

The fiscal year 2017 budget request for NIST totals \$1 billion, an increase of \$50.5 million or about five percent from the fiscal year 2016 enacted level. A large portion of this request is \$730.5 million for NIST's Scientific and Technical Research Services. The STRS request includes increases for work conducted on measurement science for future computing technologies and applications, advanced sensing for manufacturing, biomanufacturing or engineered biology, addressing spectrum issues, neutron research, and lab-to-market or technology transfer promoting data-sharing efforts.

The requested increases from NIST for fiscal year 2017 would also be devoted in large part to bolster advanced manufacturing initiatives at NIST. In fact, \$47 million dollars is requested for the National Network for Manufacturing Innovation. This program was authorized by the Revitalize American Manufacturing and Innovation Act of 2014 authored by Chairman Smith and approved by this Committee on a bipartisan basis.

NIST is authorized to use up to \$5 million per year of appropriated funds for fiscal year 2015 to fiscal year 2024, and the Department of Energy is authorized to transfer to NIST up to \$250 million of appropriated funds for that same period of time.

To administer NNMI, the RAMI Act also established strategic direction for the program and rules to assure fair competition for federal dollars. The fiscal year 2017 request for NNMI is an 88 percent increase from what was appropriated for fiscal year 2016, and my colleagues and I will be asking questions this morning about that increase and other aspects. We will also learn more today about the Institute's investment in cybersecurity and the NIST Cybersecurity Framework.

As you all know, one of the great challenges of the 21st century is cybersecurity. This committee has held multiple hearings on cybersecurity since the news over the summer that the OPM was the target of two massive data breaches, exposing the sensitive information of over 21 million Americans, including me and many of my colleagues and many of our staff here on Capitol Hill, as well as tens of thousands of our constituents.

More recently, we have seen the example of the security breach at the IRS, affecting hundreds of thousands of American taxpayers.

Considering the constantly evolving cyber threats and technology, it is imperative that we do everything that we can to protect our citizens. In order to ensure this, NIST plays a very important role by providing guidelines and standards to help reduce cyber risks to federal agencies and critical infrastructure.

Solutions are needed not only to prevent and detect cyber attacks, but also to bolster rapid response and recovery. Last week, I participated in several events on cybersecurity, and I'm very pleased that in my district this is an issue they are very much focused on, and certainly look forward to working with NIST to make sure that we are on top of all of these key issues.

I look forward to and am appreciative of the opportunity to hear from Dr. May on how NIST plans to prioritize and manage funding, as well as how it sets its budget.

[The prepared statement of Chairwoman Comstock follows:]



COMMITTEE ON
SCIENCE, SPACE, & TECHNOLOGY
 Lamar Smith, Chairman

For Immediate Release
 March 16, 2016

Media Contact: Zachary Kurz
 (202) 225-6371

Statement of Research & Technology Subcommittee Chairwoman Barbara Comstock (R-Va.)
An Overview of the Budget Proposal for the National Institute of Standards and Technology for Fiscal Year 2017

Chairwoman Comstock: I would first like to thank Dr. Willie May, Director of the National Institute of Standards and Technology (NIST) and Under Secretary of Commerce that works closely alongside industry, NIST works to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology.

This Committee has a long, bipartisan record of support for NIST and its contributions to research and development. As a non-regulatory agency within the Department of Commerce that works closely alongside industry, NIST works to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology.

The fiscal year 2017 budget request for NIST totals \$1 billion, an increase of \$50.5 million or about 5 percent from the fiscal year 2016 enacted level. A large portion of this request is \$730.5 million for NIST's Scientific and Technical Research Services (STRS). The STRS request includes increases for work conducted on measurement science for future computing technologies and applications, advanced sensing for manufacturing, biomanufacturing or engineered biology, addressing spectrum issues, neutron research, and lab to market or technology transfer promoting data sharing efforts.

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88 percent increase from what was appropriated for FY16, and my colleagues and I will be asking questions this morning about that increase and other aspects of NNMI.

We will also learn more today about the Institute's investment in cybersecurity and the NIST Cybersecurity Framework.

As you all know, one of the great challenges of the 21st Century is cybersecurity. This Committee has held multiple hearings on cybersecurity since the news over the summer that the Office of Personnel Management (OPM) was the target of two massive data breaches – exposing the sensitive information of over 21 million Americans, including me and many of my constituents.

More recently, we have seen the example of the security breach at the IRS affecting hundreds of thousands of American taxpayers.

Considering the constantly evolving cyber threats and technology, it is imperative that we do everything that we can to protect our citizens. In order to ensure this, NIST plays a very important role by providing guidelines and standards to help reduce cyber risks to federal agencies and critical infrastructure.

Solutions are needed not only to prevent and detect cyber-attacks, but also to bolster rapid-response and recovery. Last week, I joined the Northern Virginia Technology Council (NVTC) and many stakeholders in my district for a round table discussion. NVTC brings the best minds of the Northern Virginia Technology sector together to promote innovative policies in all sectors and grow our 21st century economy in our region. This is the kind of solutions we need to be working on together with the private sector to develop the programs, hardware, and strategies to make themselves and their customers safer and more secure.

We have a constitutional obligation and a responsibility to ensure every dollar earmarked is spent as effectively and efficiently as possible.

I look forward to and am appreciative of the opportunity to hear from Dr. May on how NIST plans to prioritize and manage funding as well as how it sets its budget.

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Chairwoman COMSTOCK. I now recognize the gentlewoman from Connecticut, Ms. Esty, for an opening statement.

Ms. ESTY. Thank you, Chairwoman Comstock, and thank you for holding today's important hearing to examine the fiscal year 2017 budget request for the National Institute of Standards and Technology, which we will refer to as NIST because it's a whole lot shorter.

Dr. Willie May, thank you so much for testifying this morning and for your leadership at NIST.

For more than 100 years, NIST has supported the competitiveness of American companies. NIST's broad and deep technical experience has advanced measurement science, standards, and technological innovation, creating a strong U.S. economy and improving our quality of life. And I'm pleased that the President's budget for NIST recognizes its importance to this country, enabling the agency to play a prominent role in revitalizing American manufacturing and expanding technology transfer activities.

The Administration's budget request proposes increases for two important manufacturing programs: the Manufacturing Extension Partnership, the MEP program; and, as was already referenced by Chairwoman Comstock, the National Network for Manufacturing Innovation.

MEP centers help manufacturers increase their profitability, streamline their processes, and adopt cutting-edge manufacturing technologies. The Connecticut State Technology Extension Program, or CONNSTEP as we call it, has helped numerous Connecticut manufacturing companies. For example, in my district, CONNSTEP helped Hologic, Incorporated, a leading developer and manufacturer of medical imaging systems, by working on one of their main manufacturing facilities. This facility, located in Danbury, employs more than 300 people and develops digital imaging technology for 3-D mammography. CONNSTEP helped this company optimize their shop floor layout in order to accommodate a new line of 3-D mammography equipment and develop new training.

After working with CONNSTEP, the manufacturing facility saw the following improvements: Their unit production increased by 11 percent, lead time reduced by 50 percent; they achieved \$280,000 in cost savings; they had an increase in sales of \$80 million and 100 percent on-time shipment rate. Those are real figures and real jobs and real savings for the American people. And they are pretty impressive results and represent only one example, one of many, where the MEP program has been serving communities and serving companies across this country.

The National Network for Manufacturing Innovation is a partnership among federal agencies, the private sector, and colleges and universities to create a national research and workforce training infrastructure for advanced manufacturing. At a time when American manufacturers face workforce challenges such as the growing skills gap, NNMI gives us a reason to be optimistic. And I am pleased that Congress funded NIST this year to establish the NNMI coordinating office.

I'm also happy to see that, last month, NIST announced an open-topic competition for the formation of two new institutes. As the

only agency that isn't limited to a single mission, NIST can invite a broad range of proposals to help grow America's manufacturing future.

Finally, I'm pleased that the Administration's budget request increases funding for technology transfer activities. Federally funded research has changed our society and our economy and has led to major job creation. It's difficult to imagine or even remember a world without the Internet, GPS, health- and life-saving technology that has all originated from federally funded research.

In this Subcommittee we often discuss the value of transferring federally funded research to the commercial marketplace, and I was pleased to see that this budget proposes developing and expanding platforms for sharing information and knowledge. These programs represent only a small fraction of the important work done at NIST.

NIST is a small federal agency with a grand purpose of promoting U.S. innovation and industrial competitiveness. At a time when U.S. leadership in these areas is being challenged, NIST is more important than ever.

Ms. Chairwoman, 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 role in promoting innovation, increasing our competitiveness, and enhancing our national security. Thank you again, and I yield back the balance of my time.

[The prepared statement of Ms. Esty follows:]

Opening Statement

Representative Elizabeth Esty (D-CT)

Committee on Science, Space, and Technology
Subcommittee on Research and Technology

*"An Overview of the Budget Proposal for the National Institute of Standards and Technology
(NIST) for Fiscal Year 2017"*

March 16, 2016

Thank you, Chairwoman Comstock. And thank you for holding today's hearing to examine the fiscal year 2017 budget request for the National Institute of Standards and Technology (NIST). Dr. Willie May, thank you for testifying this morning and for your leadership at NIST.

For more than 100 years, NIST has supported the competitiveness of American companies. NIST's broad and deep technical expertise has advanced measurement science, standards, and technological innovation—creating a strong U.S. economy and improving our quality of life.

I am pleased that the President's budget for NIST recognizes its importance, enabling the agency to play a prominent role in revitalizing American manufacturing and expanding technology transfer activities.

The Administration's budget proposes increases for two important manufacturing programs: the Manufacturing Extension Partnership (MEP) program and the National Network for Manufacturing Innovation (NNMI).

MEP Centers help manufacturers increase their profitability, streamline their processes, and adopt cutting-edge manufacturing technologies. The Connecticut State Technology Extension Program or CONNSTEP has helped numerous Connecticut manufacturing companies. In my district, CONNSTEP helped Hologic, Inc, a leading developer and manufacturer of medical imaging systems by working with one of their main manufacturing facilities. This facility, located in Danbury, employs more than 300 people and develops the digital imaging technology for 3-D mammography. CONNSTEP helped the company optimize their shop floor layout in order to accommodate a new line of 3-D mammography equipment, and develop new training.

After working with CONNSTEP, the manufacturing facility saw: unit production increase by 11 percent, lead time reduced by 50 percent, \$280,000 in cost savings, an increase in sales of \$80 million, and a 100 percent on-time shipment rate. Those are pretty impressive results and represent only one example of what the MEP program has accomplished.

The National Network for Manufacturing Innovation is a partnership among federal agencies, the private sector, and colleges and universities to create a national research and workforce training infrastructure for advanced manufacturing. At a time when American manufacturers face workforce challenges, such as the growing skills-gap, NNMI gives us a reason to be optimistic. I am pleased Congress funded NIST this year to establish the NNMI coordinating office. I was also happy to see that last month NIST announced an open-topic competition for the formation of two new institutes. As the only agency that isn't limited to a single mission, NIST can invite a broad range of proposals to help grow America's manufacturing future.

Finally, I'm pleased that the Administration's budget request increases funding for technology transfer activities. Federally funded research has changed our society and our economy, and has led to significant job creation. It is difficult to imagine (or remember!) a world without the internet, GPS, and numerous health saving treatments that all originated from federally funded research. In this Subcommittee, we often discuss the value of transferring federally funded research to the commercial marketplace. I was pleased to see that this budget proposes developing and expanding platforms for sharing information and knowledge.

These programs represent only a small fraction of the important work done at NIST. NIST is a small federal agency with the grand purpose of promoting U.S. innovation and industrial competitiveness. At a time in which our leadership in those areas is being challenged, NIST is more important than ever.

Ms. Chairwoman, 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 role in promoting innovation, increasing our competitiveness, and enhancing our national security.

I yield back the balance of my time.

Chairwoman COMSTOCK. Thank you.

And I now recognize the Ranking Member of the full Committee for a statement, Ms. Johnson.

Ms. JOHNSON. Thank you very much. Thank you very much, Madam Chairwoman, for holding this important hearing.

The National Institute of Standards and Technology, or NIST, is an agency that is central to the federal role in advancing science, promoting innovation, and creating a more prosperous nation. I look forward to hearing from our distinguished witness, Dr. May, this morning.

It would be almost impossible to overstate the importance of NIST, the federal agency that promotes U.S. innovation and competitiveness by advancing measurement science, standards, and technology. In his first address to Congress, President George Washington said, "Uniformity in the currency, weights, and measures of the United States is an object of great importance, and will, I am persuaded, be duly attended to."

This responsibility was first given to an office in the Treasury Department but then was moved over to the National Bureau of Standards, NIST's predecessor, in 1901. Every industry and nearly every technology relies on the measurement and standards work at NIST, from the smart electric power grid, to the computer chips, to building safety. NIST supplies industry, academia, and government and other users with thousands of standard reference materials in addition to doing much of the testing and validation work in their own laboratories.

Along with working with industry, academia, state and local governments, and consumer groups to develop U.S. standards, NIST accomplishes its mission of promoting U.S. innovation and competitiveness through their research laboratories, Centers of Excellence, and manufacturing programs.

I was happy to see the proposed increase in the fiscal year 2017 budget request for those programs, and I hope that Congress will fully support the request. In particular, I was happy to see the proposed increases in NIST's programs to develop the measurement tools needed to support the engineering biology research and biomanufacturing.

Engineering biology research and technologies are very exciting and have the potential to solve some of society's greatest challenges, including providing food for a growing population, improving human health, reducing our dependency on fossil fuels, and dramatically transforming manufacturing. Given the promise of this research and its applications, I introduced the Engineering Biology Research and Development Act of 2015 with my Science Committee colleague Mr. Sensenbrenner.

Additionally, I am pleased the President's budget recognizes the importance of NIST's role in American manufacturing. The budget proposes an increase for both the Manufacturing Extension Partnership, or the MEP program, and the National Network for Manufacturing Innovation, the NNMI.

Finally, I'm happy to see NIST leadership in the area of forensic science and standards. The partnership between NIST and the Department of Justice must continue to recognize NIST's critical role in the development of technical standards for forensic evidence.

However, I'd like to emphasize that NIST must ensure that forensic standards being developed are consistent with NIST's long-standing commitment to science and a fair and balanced standards-setting process.

As I have said in the past, NIST may be the most important federal agency that most people have never heard of. I appreciate that there are many worthy programs across the government, and we cannot fund everything, but supporting the agency that promotes U.S. innovation and competitiveness should be an easy choice.

Madam Chairwoman, I 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. I thank you and yield back.

[The prepared statement of Ms. Johnson follows:]

Opening Statement

Ranking Member Eddie Bernice Johnson (D-TX)

Committee on Science, Space, and Technology
Subcommittee on Research and Technology

*"An Overview of the Budget Proposal for the National Institute of Standards and Technology
(NIST) for Fiscal Year 2017"*

March 16, 2016

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Along with working with industry, academia, state and local governments, and consumer groups to develop U.S. standards, NIST accomplishes its mission of promoting U.S. innovation and competitiveness through their research laboratories, Centers of Excellence, and manufacturing

programs. I was happy to see the proposed increases in the FY 2017 budget request for those programs, and I hope that Congress will fully support the request.

In particular, I was happy to see the proposed increases for NIST's programs to develop the measurement tools needed to support engineering biology research and biomanufacturing. Engineering biology research and technologies are very exciting and have the potential to solve some of society's greatest challenges, including providing food for a growing population, improving human health, reducing our dependency on fossil fuels, and dramatically transforming manufacturing.

Given the promise of this research and its applications, I introduced the *Engineering Biology Research and Development Act of 2015*, with my Science Committee colleague, Mr. Sensenbrenner.

Additionally, I am pleased the President's budget recognizes the importance of NIST's role in American manufacturing. The budget proposes an increase for both the Manufacturing Extension Partnership (MEP) program and the National Network for Manufacturing Innovation (NNMI).

Finally, I am happy to see NIST's leadership in the area of forensic science and standards. The partnership between NIST and the Department of Justice must continue to recognize NIST's critical role in the development of technical standards for forensic evidence.

However, I would like to emphasize that NIST must ensure that the forensic standards being developed are consistent with NIST's long-standing commitment to science and a fair and balanced standards setting process.

As I have said in the past, NIST may be the most important federal agency that most people have never heard of. I appreciate that there are many worthy programs across the government and we cannot fund everything, but supporting the agency that promotes U.S. innovation and competitiveness should be an easy choice.

Madam Chairwoman, 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. Thank you and I yield back the balance of my time.

Chairwoman COMSTOCK. Thank you, Ms. Johnson.

And I now recognize the Chairman of the full Committee, Mr. Smith.

Chairman SMITH. Thank you, Madam Chair, and, Dr. May, thank you for being here today as well.

The National Institute of Standards and Technology supports fundamental scientific research that is critical to American innovation and competitiveness. NIST helps maintain industrial and technical standards and manages cybersecurity guidelines for federal agencies. Our challenge is to set funding priorities that ensure America remains a leader in the global marketplace of ideas and products, while also being able to balance the government's budget.

As Chairwoman Comstock pointed out, the area of proposed funding of \$47 million for the National Network of Manufacturing Innovation program is of particular concern with the NIST fiscal year 2017 budget request. In 2014, this Committee and the full House approved H.R. 2996, the Revitalize American Manufacturing Innovation Act of 2014, or RAMI Act.

The RAMI Act was subsequently included in the fiscal year 2015 omnibus bill and signed into law by the President. This bill authorized up to \$5 million per year for NNMI from NIST. The bulk of the program funding is to be transferred from the Department of Energy's Office of Energy Efficiency and Renewable Energy budget. Why hasn't this happened? It must if the program is to continue.

In addition, there are concerns surrounding the explosion at NIST that occurred when a senior officer with NIST Police Services attempted to manufacture meth in a NIST facility. It is surprising that a federal agency didn't know that a meth lab was being run on its property, and without an explosion, it might have never been discovered. The meth lab explosion and subsequent investigation have raised serious concerns about the safety and security of the entire NIST campus.

Information obtained during this Committee's investigation of the meth lab at NIST appears to show a culture of waste, fraud, abuse, and misconduct at NIST Police Services. For example, time and attendance fraud occurred regularly at NIST Police Services. In one instance, 84 hours of overtime was recorded during a two week period while a full-time shift was being covered. If accurate, that would mean the officer worked 16 hours a day, seven days a week. It also appears that police equipment worth tens of thousands of dollars is unaccounted for or missing from the police force.

These unfortunate examples undermine NIST's mission to promote U.S. innovation and industrial competitiveness, which enhances economic security and improves our quality of life.

I hope to hear what steps have been taken in the wake of the meth lab explosion to prevent further misuse of taxpayers' dollars. Just as important is to find out why NIST continues to ignore the RAMI Act.

I look forward to hearing from our witness today and yield back.
[The prepared statement of Chairman Smith follows:]



COMMITTEE ON
SCIENCE, SPACE, & TECHNOLOGY
Lamar Smith, Chairman

For Immediate Release
March 16, 2016

Media Contact: Zachary Kurz
(202) 225-6371

Statement of Chairman Lamar Smith (R-Texas)

An Overview of the Budget Proposal for the National Institute of Standards and Technology for Fiscal Year 2017

Chairman Smith: Thank you, Chairwoman Comstock, and thank you Dr. May for being with us today.

The National Institute of Standards and Technology (NIST) supports fundamental scientific research that is critical to American innovation and competitiveness. NIST helps maintain industrial and technical standards and manages cybersecurity guidelines for federal agencies.

Our challenge is to set funding priorities that ensure America remains a leader in the global marketplace of ideas and products, while also being able to balance the government's budget.

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This bill authorized up to \$5 million per year for NNMI from NIST. The bulk of the program funding is to be transferred from the Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) budget. Why hasn't this happened? It must if the program is to continue.

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It is surprising that a federal agency didn't know that a meth lab was being run on its property, and without an explosion, it might have never been discovered. The meth lab explosion and subsequent investigation have raised serious concerns about the safety and security of the entire NIST campus.

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I look forward to hearing from our witness today and yield back.

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Chairwoman COMSTOCK. Thank you.

Now, let me introduce our witness. Our witness today is Dr. Willie May, Under Secretary of Commerce for Standards and Technology and Director of the National Institute of Standards and Technology, NIST.

Prior to his Congressional confirmation, Dr. May served as Acting NIST Director and Acting Under Secretary of Commerce for Standards and Technology since June 2014. Prior to that assignment, Dr. May was Associate Director for Laboratory Programs where he was responsible for oversight and direction of NIST's seven laboratory programs and served as the Principal Deputy to the NIST Director. In addition, Dr. May has led NIST research and measurement service programs in chemistry-related areas for more than 20 years.

Dr. May received his undergraduate degree from Knoxville College and his Ph.D. in analytical chemistry from the University of Maryland.

I welcome you here today, and I now recognize Dr. May for five minutes to present his testimony.

**TESTIMONY OF DR. WILLIE E. MAY,
UNDER SECRETARY OF COMMERCE FOR STANDARDS
AND TECHNOLOGY AND DIRECTOR,
NATIONAL INSTITUTE OF STANDARDS
AND TECHNOLOGY**

Dr. MAY. First, good morning to Committee Chairwoman COMSTOCK.

Full Committee Chairman Smith and Ranking Member Johnson, Subcommittee Chairwoman Comstock and Ranking Member Esty and members of the Subcommittee, thank you for the opportunity to appear before you today to present the President's fiscal year 2017 budget request from the National Institute of Standards and Technology.

This budget request reflects the important role that NIST plays in American innovation, productivity, trade, and public safety. The measurement science and technology foundation that NIST provides is essential to accelerating American innovation through breakthroughs such as next-generation computing to strengthening the digital economy and more efficient wireless technology to overcome the spectrum crunch.

Additionally, researchers supported by this budget will help embed NIST industrial center technologies to the factory floor, thereby extending NIST's success with the electronics industry to applications such as laser welding and bioengineering.

To achieve our mission, the President has proposed a budget for us of slightly more than \$1 billion, a \$50 million increase over the enacted fiscal year 2016 budget. In addition to this discretionary request, the President has proposed an additional \$2 billion in NIST mandatory funding to fully fund a network of 45 institutes in the National Network for Manufacturing Innovation at \$1.9 billion and an additional \$100 million to renovate and modernize the NIST facilities.

The President's budget continues to recognize the important role that the NIST laboratory programs play by requesting \$730.5 million for our Scientific and Technical Research and Services account, basically our lab program. This is a \$4.5 million increase over the enacted fiscal year 2016 level. This increase will allow NIST to lay the foundation for next-generation computing and wireless revolution, transfer money-saving technology to the factory floor, and bring our precision engineering prowess to bear on emerging markets.

The fiscal year 2017 request will also continue to fund critical work that we are doing in the areas of cybersecurity and forensics but with no additional request. However, we are requesting increases of \$13.6 million for our Measurement Science for Future Computing Technologies and Applications program to position the United States to unlock the potential of future computing technologies.

We are requesting an additional \$2 million for advanced sensing manufacturing to accelerate research efforts targeting the development of advanced sensors, an additional \$2 million for biomanufacturing and engineering biology to assure the quality of predictability in the design of synthetic biological systems, and \$2 million for Advanced Communications Research to develop the measurement science and tools necessary to improve spectrum-sharing and increase spectrum efficiency of commercial wireless radiofrequency communication systems, an additional \$4.8 million to assure that NIST's world-class neutron facility can continue to purchase the fuel needed to operate this critical facility, and finally, \$2 million to expand our Lab-to-Market initiative, which focuses on transfer of technology from the government, the public sector through data-sharing and collaborative tools.

To support our outreach to the manufacturing industry, NIST is requesting \$189 million for our Industrial Technology Services account. That's an increase of \$34 million.

The requested \$12 million increase for MEP will be used in fiscal year 2017 to complete the final round of a multiyear competition of our MEP centers and \$22 million to support the NNMI program that would allow us to fund additional institutes and provide coordination for the network.

To support our aging facilities, our Construction of Research Facilities, our CRF account, the request is \$95 million. This is actually a decrease of \$24 million over fiscal year 2016.

And at this point I'd like to thank the Subcommittee for its continuing strong support of the renovations of our aging and deteriorating infrastructure that would otherwise threaten our ability to deliver our mission.

The CRF number is a decrease, as I said earlier, from the fiscal year 2016 enacted level, but it reflects a significant initial investment of \$119 million in fiscal year 2016 to begin the renovation of our Radiation Physics building. At least \$40 million of the '17 request will fund the second phase of the multiyear renovation of that building, and the remaining \$55 million of the request will be used to fund maintenance, repair, improvements, and major renovations of our facilities in Gaithersburg, Colorado, and Hawaii.

In conclusion, the fiscal year 2017 budget reflects the Administration's recognition of the important role that NIST plays in innovation, as well as the impact of the research that we do and the measurement services we provide in laying and maintaining the foundation for our nation's long-term job creation and prosperity.

Through our laboratory programs, our outreach efforts, and our standards development work, we are dedicated to providing U.S. industry with the tools it needs to innovate, compete, and flourish in this fierce global economy.

Madam Chairwoman, I look forward to continuing to work with you and Members of the Subcommittee, and would now be happy to answer questions.

[The prepared statement of Dr. May follows:]

Testimony of

Willie E. May, Ph.D.

Under Secretary of Commerce for Standards and Technology
and Director, National Institute of Standards and Technology
United States Department of Commerce

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

An Overview of the Fiscal Year 2017 Budget
for the
National Institute of Standards and Technology

March 16, 2016

Chairwoman Comstock, Ranking Member Lipinski, and other members of the Subcommittee, thank you for the opportunity to appear before you today to present the President's Fiscal Year (FY) 2017 budget request for the Department of Commerce's National Institute of Standards and Technology (NIST). This budget request reflects the important role that NIST plays in American innovation, productivity, trade, and public safety.

The President, in his FY 2017 budget message, observed that "*by accelerating the pace of American innovation, we can create jobs and build the economy of the future...*" The measurement science and technology foundation that NIST provides is essential to accelerating American innovation toward breakthroughs in areas such as next-generation computing to strengthen the digital economy, and more efficient wireless technology to overcome the "spectrum crunch." Additionally, research supported by this budget will help embed NIST industrial sensor technologies on the factory floor, thereby extending NIST's success with the electronics industry to applications such as laser welding and bioengineering. In support of the Administration's emphasis on serving industry through outreach services, this budget pushes NIST to further embrace its role as "Industry's National Lab" by keeping its facilities open to industry partners and extending the National Network for Manufacturing Innovation to tackle the manufacturing challenges that *industry* identifies as most in need of co-investment to nurture innovation and accelerate commercialization.

To achieve these goals, the President has proposed a budget for NIST of \$1.0 billion. This is \$50.5 million above the FY 2016 enacted level. These funds will support NIST's work to foster the innovation that creates jobs and strengthens the U.S. economy.

In addition to the discretionary request, the President has proposed an additional \$2.0 billion in NIST mandatory funds to fully fund a network of 45 institutes in the National Network for Manufacturing Innovation (\$1.9 billion) and to renovate and modernize NIST facilities (\$100 million). The latter is needed to complete the major renovation of the Radiation Physics Building - over a half-century old - that was begun in FY 2016 and that will create state-of-the-art laboratories for research in health, manufacturing, safety, and security. Mandatory funding is presented in the FY 2017 President's Budget throughout the Federal R&D enterprise to support research across a range of topics from health to clean energy technologies, reflecting the high priority of R&D in a time of limited discretionary funding.

Scientific and Technical Research and Services (STRS) Account (\$730.5M, +\$40.5M)

The NIST laboratory programs work at the frontiers of measurement science to ensure that the U.S. system of measurements is firmly grounded on sound scientific and technical principles. Today, the NIST laboratories address increasingly complex measurement challenges, ranging from the very small (nanoscale devices) to the very large (vehicles and buildings), and from the physical (renewable energy sources) to the virtual (cybersecurity and cloud computing). As new technologies are developed and evolve, NIST's measurement research and services remain central to innovation, productivity, trade, and public safety.

The President's budget continues to recognize this important role of NIST laboratory programs by requesting \$730.5 million for Scientific and Technical Research and Services, which is a \$40.5 million increase above FY 2016 and includes inflationary adjustments. This increase will allow NIST to lay the foundation for the next computing and wireless revolutions, transfer its money-saving technology to the factory floor, and bring its precision engineering prowess to bear on emerging markets.

The FY 2017 request also continues to fund critical NIST work in the areas of cybersecurity and forensic science at FY 2016 levels. In the area of cybersecurity NIST is investing a total of \$74.2 million with \$38.7 million supporting cyber R&D efforts at NIST, \$31.5 million supporting the National Cybersecurity Center of Excellence including work on Identity Management, and \$4M to support the National Initiative on Cybersecurity Education. In the area of forensic science NIST will continue to invest \$9.8 million to address forensic measurement and standards needs.

Information about each of the new FY17 initiative requests follows:

Measurement Science for Future Computing Technologies and Applications (+\$13.6M)

NIST has supported the U.S. semiconductor industry from its inception, providing measurement tools and scientific insights that have helped to drive a steady increase in computing power. As we reach the limits of today's semiconductor technology, this budget increase of \$13.6 million would position the U.S. to unlock the potential of future computing technologies to revolutionize and transform U.S. economic competitiveness.

Within that amount, \$8.8 million will support the development of measurement science, standards, tools, and technologies to advance new computing paradigms. NIST will develop, test, prototype, and benchmark potential types of logic, memory, and storage device concepts with the potential to become integral to a future "exascale" machine, some 30 times more powerful than today's most powerful computer.

The balance of the increase - \$4.8 million - will be used to develop and deploy measurement science for next-generation computing applications. NIST will develop frameworks for uncertainty quantification in scientific computing and for calibration of modeling and simulation. These will help increase the capacity and capability of an enduring national high-performance computing ecosystem.

This initiative recognizes NIST as an essential part of the National Strategic Computing Initiative because of its continued success in pushing measurement science forward to advance computing technologies. In a recent report¹ submitted to the Department of Commerce, the Council on Competitiveness made the following observation about the potential benefit from modeling, simulation and analysis, and high performance computing:

¹ Modeling, Simulation and Analysis, and High Performance Computing: Force Multiplier for American Innovation, Final Report to the US Department of Commerce Economic Development Administration, Council on Competitiveness, 2015.

"Widespread deployment across the U.S. industrial landscape would dramatically enhance the U.S. ability to innovate, accelerate the development and commercialization of new products, and improve manufacturing productivity, driving U.S. economic growth and global market competitiveness."

Advanced Sensing for Manufacturing (+\$2.0M)

A highly integrated effort across NIST laboratories in measurement science and standards will accelerate the design, development, and manufacturability of advanced electronic and photonic devices that require new concepts, architectures, materials, and manufacturing methods.

The budget requests an increase of \$2.0 million to accelerate research efforts targeting the development of advanced sensors needed to support the manufacture of advanced electronics and nanoengineered devices. With this increase, NIST will develop in-process imaging and analysis to enable improved process performance, quality control, and optimization.

The NIST laboratories have a long tradition of developing and delivering measurement science tools that support advanced manufacturing technologies. NIST will leverage its existing capabilities in materials modeling and simulation, in support of the Administration's Materials Genome Initiative, as well as its expertise in nanomanufacturing, digital design, chip-scale measurement technologies, robotics, additive manufacturing, and cyber-physical systems.

Biomanufacturing/Engineered Biology: Developing Engineering Principles for Efficient Biomanufacturing (+\$2.0M)

Biomanufacturing has the potential to usher in the next Industrial Revolution to many U.S. manufacturing sectors. However, for biomanufacturing to reach a sustainable maturity in all sectors, there are three main hurdles that need to be overcome: reducing the risk of contamination; maintaining high productivity and efficiency; and reducing product variability.

When techniques to provide accurate, quantitative measurements in biomanufacturing are not available, an inefficient trial-and-error approach is often employed. The biomanufacturing and engineering biology research communities have therefore requested NIST's help in providing confidence in these measurements and to establish robustness and harmonization of results.

The requested budget increase of \$2.0 million will ensure quality and predictability in the design of synthetic biological systems for efficient production of fuels, chemicals, pharmaceuticals, and medical therapies.

This funding increase will support development of a suite of quantitative methods for accurate measurement of biological systems and create the necessary tools to methodically design and test engineered organisms, and engage relevant stakeholders to develop and evaluate predictive models. While data generation is important, assessing the data quality is equally critical; therefore, NIST will develop methods for data validation, including relevant reference data and standards.

Advanced communications: Addressing the Spectrum Crunch (+\$2.0M)

The availability of secure, reliable, high-speed wireless communications is essential for the Nation's future economic health and security. Consumers and industry are becoming increasingly reliant on wireless devices to conduct their daily business and for the development of new technologies in areas as diverse as public safety communications, electrical power grid management, medical devices communications, and advanced manufacturing. While demand for wireless continues to grow, the available spectrum itself is a limited resource.

The proposed budget requests an increase of \$2.0 million to develop the measurement science and tools necessary to quantify spectrum sharing and measure the spectrum efficiency of commercial wireless radio-frequency communication systems. This investment will accelerate the deployment of future wireless communications systems.

A portion of the increase will be used to enable more efficient sharing of the currently allocated spectrum by extending NIST's antenna measurement capability to include leading-edge adaptive antenna systems, and to provide a facility where industry can test these systems prior to their deployment.

The remaining new funds will be used to analyze the effectiveness of spectrum sharing, as one means to overcome spectrum scarcity. The requested funds will bolster the development of performance metrics, measurement methods, and tools, and will allow their implementation in a test and evaluation environment. The dissemination of simulation models and software building blocks of key spectrum-sharing functions will facilitate research and development of innovative spectrum-sharing technologies and expedite product development.

Ensuring a World Class Neutron Facility (+\$4.8M)

Neutron scattering has been enormously successful as a unique probe of the structure and dynamics of materials for researchers from many different disciplines. One of NIST's top priorities this year is ensuring the continued operation and availability to industry and academic users of one of the world's foremost neutron research facilities - the NIST Center for Neutron Research (NCNR).

The NCNR is the sole facility of its kind in the United States with a focus on enhancing American industrial competitiveness. It is therefore essential to U.S. industry, and to our Nation's long-term economic growth, that the NCNR is optimally equipped to provide state-of-the-art measurement tools to the U.S. scientific and engineering community. The NCNR operates 24 hours a day, seven days a week, for approximately 250 days of the year to support experiments by over 2,000 research participants annually.

The budget proposes an increase of \$4.8 million to ensure that NIST continues to provide access to the sophisticated measurement tools available through the NCNR. NIST is requesting these

funds to account for continued price increases for fuel manufacturing and shipping, and is investing in a lifetime extension of the neutron source facility to maintain availability.

Lab-to-Market/Technology Transfer: Expand Technology Transfer Activities to Leverage Existing Authorities to Promote Data Sharing Efforts (+\$2.0M)

A wide range of life-changing commercial technologies has been nurtured by federally funded research and development (R&D), from the Internet, to the global positioning system (GPS), to life-saving vaccines. The federal R&D enterprise continues to support fundamental research and to expand the frontiers of human knowledge. One of the ways in which federal laboratories diffuse this knowledge is to make data and publications more easily accessible.

Federally funded R&D has historically led to dramatic economic growth, and there is significant potential to increase the public's return on this investment in terms of innovation, job creation, societal impact, competitiveness, and economic prosperity.

The proposed budget requests an increase of \$2.0 million to expand lab-to-market and technology transfer activities through the development and deployment of data-sharing and collaborative tools and services.

With this funding, NIST will lead the development of infrastructures for information sharing, data dissemination, and increased collaboration to address national priorities and enhance business competitiveness. NIST will work with the Federal Laboratory Consortium (FLC) and offices within the Executive Office of the President (EOP) in the development of digital platforms to enhance cross-agency collaborations on technology transfer and development.

These platforms will expand to enable data-sharing and synchronization across government, non-profit, and for-profit platforms. NIST will coordinate its efforts across all departments and agencies that fund research and development (both intramural and extramural), consistent with each agency's mission.

Industrial Technology Services (ITS) (\$189M, +\$34.0M)

More than ever before, national priorities require the united efforts of diverse participants. NIST's convening power and technical independence can help bring those participants together to meet those needs. NIST's Industrial Technology Services (ITS) appropriation supports its external partnership programs that are designed to enhance American innovation and global competitiveness through partnerships with State and local organizations.

The FY 2017 request of \$189.0 million, an increase of \$34 million above FY 2016, for the ITS appropriation is directed to two programs: the Hollings Manufacturing Extension Partnership (MEP); and the National Network for Manufacturing Innovation (NNMI).

Hollings Manufacturing Extension Partnership (MEP) (+\$12.0M)

The MEP program provides awards to a network of Manufacturing Extension Partnership Centers in every state and in Puerto Rico. These Centers work directly with local manufacturing companies to strengthen the competitiveness of our Nation's domestic manufacturing base, with particular focus on small and medium-size enterprises.

The requested \$12.0 million increase will be used in FY 2017 to complete the final round of the multi-year competition of the MEP Centers, maintain the funding of states previously competed, and provide funding for additional performance-based awards to high-performing Centers.

The increased funding will allow the program to allocate funds across the network to reduce the variation in funding across the system, and to target additional resources for key performance objectives including improved data collection and dissemination. The increase in funding for MEP Centers will allow them to work with more very small, rural, and start-up firms, and will significantly improve market penetration with manufacturers having 1 to 19 employees.

The expected economic impacts that will be generated as a result of this increased investment are highly leveraged, and include an additional \$800.0 million in new and retained sales, \$352.0 million in new investment, \$120.0 million in cost savings, and nearly seven thousand new and retained jobs.

National Network for Manufacturing Innovation (NNMI) (+\$22.0M)

The budget provides increased funds for federal investment in the National Network for Manufacturing Innovation program, which serves to create an effective manufacturing research infrastructure for U.S. industry and academia to solve industry-relevant problems. The NNMI consists of linked Institutes for Manufacturing Innovation with common goals, but unique concentrations. Within an Institute, industry, academia, and government partner to leverage existing resources, collaborate, and co-invest to nurture manufacturing innovation and accelerate commercialization.

Each Institute in the NNMI has a unique technology focus with the objective of creating self-sustaining regional manufacturing hubs that have national impact. The institutes help support an ecosystem of manufacturing activity in regions of the U.S. The manufacturing innovation institutes support manufacturing technology commercialization by helping to bridge the gap from the laboratory to the market and address core challenges in scaling manufacturing process technologies.

The FY 2017 President's Budget request includes a \$22.0 million increase for the program, for a total of \$47.0 million, to fund an additional Institute. Funds are also provided within the totals for NIST to coordinate network activities of all institutes in the NNMI. This additional funding will keep NIST on a path to build out the network, together with our federal agency partners.

The FY 2017 President's budget request also proposes a mandatory appropriations account beginning in FY 2018. The mandatory request includes an additional \$1.890 billion in one-time

mandatory appropriations in FY 2017 for this program, to be executed from FY 2018 to FY 2025, to complete the network of 45 institutes envisioned by the President.

Construction of Research Facilities (CRF) (\$95M, -\$24.0M)

Before I address the budget request for Construction of Research Facilities (CRF), I would like to take this opportunity to thank the Subcommittee for its strong support of critical renovations of aging and deteriorating infrastructure that would otherwise threaten NIST's ability to meet its mission. In particular, the FY 2016 appropriation has allowed NIST to begin work on our Radiation Physics Building, Building 245. The work conducted by NIST in Building 245, now over a half-century old, is essential to U.S. health and safety.

For example, some 39 million mammograms in this country every year are performed on machines, the reliability of which is traceable to calibrations performed in Building 245. Other examples of technologies relying on traceability carried out in this facility include: external radiation beam therapies (cancer treatment); internal radiation therapies; metabolic studies; nuclear imaging; portal monitoring; solar satellites; nuclear power safety; radiological emergency response; personnel monitoring; and medical device sterilization.

The FY 2017 CRF appropriation request of \$95 million supports both new construction and renovation efforts for NIST's physical plant and infrastructure. While the CRF number is a decrease from the FY16 enacted level, that reflects the significant initial investment in FY16 to begin the renovation of Building 245. Forty million dollars in this request will fund the second phase of the multiyear renovations of Building 245; specifically, excavation and waterproofing of existing subterranean laboratory spaces that, today, routinely flood, and construction of an addition to house modern environmental control systems, thereby eliminating ongoing delays in calibrations and research. The remaining \$55 million of the appropriation will be used to fund maintenance, repair, improvements, and major renovation of facilities occupied or used by NIST in Maryland, Colorado, and Hawaii, to protect the critical facility and infrastructure needs of the Institute.

In addition to the discretionary funding request for CRF, authorizing legislation will be proposed that would provide \$100.0 million in mandatory funds to renovate and modernize NIST facilities in order to maintain and enhance current research and development capabilities. NIST will use the funding to accelerate ongoing construction projects at our Gaithersburg and Boulder sites.

Summary

In conclusion, the FY 2017 NIST budget request reflects the Administration's recognition of the important role that NIST plays in innovation, as well as the impact of NIST research and services in laying, and building, the foundation for our Nation's long-term job creation and prosperity.

NIST will continue its work with the private sector to ensure U.S. manufacturers have the research support they need. Through its laboratory programs, outreach efforts, and standards

development work, NIST is 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 continuing to work with you, Madame Chairwoman and members of the Subcommittee, and would be happy to answer any questions.

Dr. Willie E. May



On May 4, 2015, Congress confirmed **Dr. Willie E. May** as the 15th Director of the National Institute of Standards and Technology (NIST). He also serves as Under Secretary of Commerce for Standards and Technology, a position created in the America COMPETES Reauthorization Act of 2010. Dr. May had served as Acting NIST Director and Acting Under Secretary of Commerce for Standards and Technology since June 2014. Prior to that assignment, he was Associate Director for Laboratory Programs, where he was responsible for oversight and direction of NIST's seven laboratory programs and served as the principal deputy to the NIST Director.

As NIST Director, Dr. May provides high-level oversight and direction for NIST. The agency promotes U.S.

innovation and industrial competitiveness by advancing measurement science, standards, and technology. NIST's FY 2016 Appropriation is \$964M. In addition, NIST receives an estimated \$50 million in service fees and approximately \$120 million for services rendered to other federal and state agencies on a cost reimbursable basis. NIST employs about 3,400 federal scientists, engineers, technicians, support staff, and administrative personnel at two main locations in Gaithersburg, MD, and Boulder, CO. NIST also hosts approximately 3,500 Associates from academia, U.S. industry, and other government agencies, who collaborate with NIST staff and access user facilities. NIST also partners with more than 1,300 manufacturing specialists and staff at more than 400 Manufacturing Extension Partnership locations around the country.

Dr. May led NIST's research and measurement service programs in chemistry-related areas for more than 20 years. Prior to that, his personal research activities were focused in the areas of trace organic analytical chemistry and physico-chemical properties of organic compounds, where his work was described in more than 85 archival publications.

Other National and International Responsibilities:

Dr. May has several leadership responsibilities in addition to those at NIST. He is Vice President of the 18-person International Committee on Weights and Measures (CIPM); President of the CIPM's Consultative Committee on Metrology in Chemistry and Biology; and an Executive Board Member for the Joint Committee on Traceability in Laboratory Medicine (JCTLM). He also serves on the External Advisory Boards for the UK's National Physical Laboratory (NPL) and Japan's National Institute of Advanced Industrial Science and Technology (NAIST).

Honors and Awards:

Department of Commerce Bronze Medal Award, 1981; National Bureau of Standards (NBS) Equal Employment Opportunity (EEO) Award, 1982; Department of Commerce Silver Medal Award, 1985; Arthur Flemming Award for Outstanding Federal Service, 1986; NOBCChE Percy Julian Award for Outstanding Research in Organic Analytical Chemistry and Presidential Rank Award of Meritorious Federal Executive, 1992; Department of Commerce Gold Medal,

1992; American Chemical Society Distinguished Service in the Advancement of Analytical Chemistry Award, 2001; Keynote Speaker-Winter Commencement Ceremonies, University of Maryland, College of Life Sciences, 2002; Council for Chemical Research Diversity Award; NOBCCHE Henry Hill Award for exemplary work and leadership in the field of chemistry; Science Spectrum Magazine Emerald Award, 2005; Alumnus of the Year Award from the College of Chemical and Life Sciences at the University of Maryland, 2007; Member of the first class of inductees into the Knoxville College Alumni Hall of Fame, 2010; Fellow of the American Chemical Society, 2011; Honorary Doctor of Science and Speaker at Graduate School of Arts and Sciences Commencement Exercises, Wake Forest University, 2012; Keynote Speaker-Winter Commencement Ceremonies, University of Maryland, College of Computer, Mathematical and Natural Sciences, 2015.

Employment History:

Worked as a senior analyst at the Oak Ridge Gaseous Diffusion Plant for three years prior to coming to the National Bureau of Standards in 1971. Led research activities in analytical chemistry for more than 20 years with his personal research being focused in the area of trace organic analytical chemistry, with special emphasis on retention mechanisms in liquid chromatography, the development of liquid chromatographic methods for the determination of individual organic species in complex mixtures (i.e., extracts of environmental, food, and clinical samples) and the determination of physico-chemical properties such as aqueous solubilities, octanol/water partition coefficients, and vapor pressures of organic compounds. This work is described in more than 100 peer-reviewed publications. More than 250 invited lectures have been presented at U.S. industrial sites, Colleges/Universities and Technical Meetings throughout the world.

Education:

1968	Knoxville College	B.S.
1977	University of Maryland	Ph.D.

Chairwoman COMSTOCK. Thank you very much.

As you discussed and we've discussed here, NIST will continue to fund the works in the areas of cybersecurity, and I've certainly been very interested in that given all of the recent problems that we're running into there. So I wanted to ask, of the \$74.2 million request in cybersecurity, more than half supports R&D efforts. Can you just give us a picture of some of that R&D taking place and how academia and industry are involved and just, you know, a little view on that if you could.

Dr. MAY. Well, we have a number of efforts in cybersecurity. First of all, we have a very robust laboratory-based research program in cybersecurity, but this is an area that is moving very, very rapidly, and we saw the need for reaching out and including industry in this. And we established our National Cybersecurity Center of Excellence where we work with 22 companies in that area to work on problems that they see as a priority and take our standards that we developed, based on our authority, and put them into practice, working with these 22 companies. That is working very well, and we expect that work to continue in the future.

We have a NICE program, which is the National Initiative on Cybersecurity Education, where we are trying to educate the next generation on the value of cybersecurity and actually provide training in that realm. And we are improving or increasing our bench depth in cryptography both from a defensive, as well as an offensive perspective if you will.

Chairwoman COMSTOCK. Okay. One of the things that I hear from the companies in my district is how difficult it is for people to get clearances. And, so oftentimes you get this talent, and these kids are really good and want to come out and work in this area so they can work for the government, but the clearance process takes forever. Have you found that a problem as you're trying to get talent within the government, too?

Dr. MAY. Well, certainly it's a challenge in that area because there's a limited supply. However, we are very aggressive and we are, I think, addressing that issue.

Chairwoman COMSTOCK. Are you able to shorten the time because the problem is, you know, these kids are coming out, they're getting recruited by a lot of private companies where they're going to make more money than in the government. So if we're going to get them into the government and have them working for us, we need to make sure we can streamline that process and not lose them because it's sort of bureaucracy within.

Dr. MAY. I could not agree more.

Chairwoman COMSTOCK. Right. All right.

Let's see. How do you, given the importance of cybersecurity and it's certainly in the forefront of our minds on a lot of these issues we're dealing with, how do you decide to increase spending in other areas and pick your priorities on this? And do you feel comfortable where we're at on the cybersecurity budget?

Dr. MAY. The Committee has been very generous to us over the last several years in cybersecurity, and certainly we think we have the resources now to deliver our mission in that area. And we look forward to continuing to work with you to make sure we can titrate this as we go forward to make sure that we maintain the resources

necessary to deliver our mission and work with both government and industry to improve the cybersecurity posture for our country.

Chairwoman COMSTOCK. Okay. Thank you. And I know that NIST is hosting its next Cybersecurity Framework Workshop on April 6 and 7. Can you give us a little insight into what changes to the cybersecurity framework that we might see featured there—

Dr. MAY. Well, we—

Chairwoman COMSTOCK. —give us a little preview of that?

Dr. MAY. We actually don't know.

Chairwoman COMSTOCK. Oh.

Dr. MAY. The reason for this meeting is to work with industry to determine what changes we might need to make to the Framework, how quickly we might do that, and how. So this is an information-gathering meeting so that we know how to blaze the path forward with the Framework.

Chairwoman COMSTOCK. All right. Thank you.

And I now yield to Ms. Esty for her five minutes.

Ms. ESTY. Again, thank you, Chairwoman Comstock, for holding today's hearing.

Dr. May, as a member of the Science Committee as well as the Transportation Committee, I understand the importance of reliable communications technology, particularly in our new, developing advanced transportation systems. From railroads to tech startups, our companies depend on advanced communications and spectrum to be able to communicate in real time.

Dr. May, NIST is asking for a \$2 million increase to \$15 million in funding for its Measurement Sciences program to support advanced communications networks. Can you please describe for us the challenges we face with the rapid advances we're experiencing on our communications technologies and how NIST intends to address these challenges through the proposed increase?

Dr. MAY. Well, these activities will be focused primarily in our newly—or recently created Communications Technologies Laboratory. And we have three main work streams within that laboratory. One is public safety communications to improve the technology and provide the standards necessary to build out the nationwide LTE network for first responders. So we're responsible for the measurement standards and testing to make sure that we can do this and do this in a manner that we provide open competition for the vendors of devices that would want to play in that space. Obviously, there are some measurement and standards issues associated with with spectrum-sharing and spectrum efficiency.

And finally, we are working with players around the world to define what 5G will look like and to implement that to sort of make sure that the United States is not left behind when it comes to next-generation communications technologies.

Ms. ESTY. Thank you. That's very helpful. And this is ongoing, particularly on the public safety front. I can tell you in the 41 cities and towns I represent, this is an ongoing challenge about interoperability and their ability to communicate with each other and coordinate, so I hope we can move rapidly forward.

So those investments the taxpayers are making on the local level are really wise investments that are going to be good for a number

of years and they're not going to have to, two years from now, change their whole systems out again, which will be very challenging.

Connecticut has a thriving manufacturing community in my district. From Jonal Labs, which does aerospace and work for NASA, to United Technologies Corporation, to Click Bond, to Becton Dickinson Connecticut. Companies manufacture a broad range of products, aerospace and bond fasteners. Through my conversations with these companies, one common theme emerges, and that is a concern about workforce readiness. Do our young people have the skills necessary to compete in modern manufacturing?

As you know, a strong domestic manufacturing base is essential for high-quality jobs and for a living wage for many people in this country. Can you explain to us a little bit how the MEP's ExportTech program operates and what it's doing to expand overseas markets and tech transfer for U.S. companies and the goals of this program in the fiscal year 2017 budget?

Dr. MAY. Well, what we want to do is work with other entities within government to 1) demonstrate that manufacturing in fact is a viable career path for young folks and get the word out. We have established a National Manufacturing Day that takes place in early October every year where we point to the future, at least try to get the young folks to see and visualize the future that manufacturing is cool; there are good, high-paying jobs; but more than that, working in manufacturing is really being truly American because we need to bring manufacturing jobs back to the United States. We need to be an exporter and not only an importer of goods. So we are working with the entire community to try to strengthen manufacturing and make sure that we get the word out that there is a future in manufacturing, and it's critical to our country.

Ms. ESTY. Thank you very much. And I suspect that the Ranking Member of the full Committee will pick up with biomanufacturing, which I would love to ask some questions about, but my time is expired. Thank you very much, and I yield back.

Chairwoman COMSTOCK. Thank you. And I now recognize Mr. Palmer for five minutes.

Mr. PALMER. Thank you, Madam Chairman.

Dr. May, NIST has its own police force. How much do you spend each year for that group?

Dr. MAY. About \$8 million, sir.

Mr. PALMER. About \$8 million. What activities or investigations justify having a police unit within NIST?

Dr. MAY. Well, primarily, we've historically had a police force at NIST, and the Federal Protective Service has granted us the ability to maintain that on our campus. We also have some fairly sensitive assets that I won't go into detail about here—but I will do in private conversations with the committee—that have to be maintained.

Mr. PALMER. Well, is it a—

Dr. MAY. So that was the historical basis.

Mr. PALMER. Is it a police force or a security force?

Dr. MAY. Actually, we have both. We have a perimeter security force that guards the perimeter, and we actually have a police force that is responsible for policing the campus.

Mr. PALMER. What do you spend on this perimeter security force?

Dr. MAY. The exact numbers I'll have to get to you, but that is a contract police force.

Mr. PALMER. It's a contract——

Dr. MAY. Yes.

Mr. PALMER. —force? All right. Does your police force have the authority to make arrests?

Dr. MAY. They do have the authority to make arrests, and they have made arrests.

Mr. PALMER. Okay. How many officers does NIST employee in that force?

Dr. MAY. As I said, I don't have the numbers right before me, but I would imagine with the police force, if we were fully staffed, 15 to 20, and the external security, probably another dozen. But I will get those numbers to you specifically.

Mr. PALMER. Okay. And I assume they're armed?

Dr. MAY. Well, I just don't know that it's appropriate for me to discuss that operation in detail——

Mr. PALMER. Well, you're——

Dr. MAY. —but I can provide those numbers to you.

Mr. PALMER. I don't think there's any issue here with that. I think it's pretty evident that they are armed, and what I want to know is, is it side arms, is it small arms, is it military-style weapons? How are they equipped?

Dr. MAY. Sir, I'll be happy to provide that as a matter of record to the Committee.

Mr. PALMER. Okay. How long would that take?

Dr. MAY. We can get that to you by the end of the day if you want.

Mr. PALMER. You outsourced your security. Why don't you outsource your police force?

Dr. MAY. Well, we are a science and technology agency, and knowing that, I've recently asked for an assessment of our overall security posture by three external security experts. They have given us their thoughts on the rightsizing and nature of security force for our campus, and the questions that you ask are being considered.

Mr. PALMER. Do you have them on one campus or do you have multiple locations where your police are employed?

Dr. MAY. We have police on our Gaithersburg campus and on our Boulder campus.

Mr. PALMER. You know, I——

Dr. MAY. Boulder, Colorado.

Mr. PALMER. I believe we have 70-something federal agencies that have armed agents, including the EPA that has spent several million dollars, and I don't know if it bothers anybody else but it seems that it's almost like we've militarized federal agencies. And I just don't understand why we have to have so many agencies with their own armed agents providing security when you could outsource that.

And I commend you for outsourcing your security force. I understand you have certain specific issues that would require protection, but I am very concerned about so many federal agencies having armed agents and being armed with military-style weapons. So

if you would get back with that information, and I think it will be helpful if you look at outsourcing your police force.

Dr. MAY. Certainly, that issue is among the recommendations that we've gotten from our three security experts, and we are mulling over that issue now exactly how to move forward to improve the security posture for both of our campuses.

Mr. PALMER. Well, thank you for your answers, Dr. May.

I'll yield back, Madam Chairman.

Chairwoman COMSTOCK. Thank you. And I'll now recognize Ms. Bonamici, who is also sitting in as our Ranking Member now. Thank you.

Ms. BONAMICI. Thank you, Madam Chair.

And, Dr. May, welcome back to the Committee. I want to start by thanking you and your team at NIST for working with Oregon's Manufacturing Extension Partnership OMEP. I know they appreciate the collaboration. And since 2003, OMEP has helped with creating or maintaining more than 15,000 manufacturing jobs in Oregon. And you talked about the importance of getting the word out there that these are good jobs. I think you said cool, cool jobs, and I want to mention that I went out to tour Fort George Brewery in my district. They got some help with OMEP to help with their canning process. That was pretty cool.

I also have in my district A.R.E. Manufacturing. That's a contract shop in Newberg, Oregon, that specializes in making precision equipment components for manufacturers. By working with OMEP to develop a job-training program for their employees, they were able to increase their entry-level hiring pool and hire more qualified people, and so I appreciate all the work that NIST has done with the MEP programs across the country but particularly those I'm familiar with in Oregon.

Dr. May, over the past several years, our nation has experienced historic and devastating natural disasters, and numerous communities across the country are still recovering and rebuilding. NIST is the lead agency for two important natural disaster programs, the National Earthquake Hazards Reduction Program and the National Windstorm Impact Reduction Program. Now, the Pacific Northwest is especially prone to earthquakes. We are sitting off the Cascadia subduction zone in the Northwest, and we are overdue, so it's not a question of if there will be an earthquake; it's when. So can you describe the role that NIST plays in these programs both as the lead agency, as well as your role in working on research to improve the performance of buildings and infrastructure in the face of a disaster?

Dr. MAY. Well, we have a major program in our Engineering Laboratory, a part of which used to be a Building and Fire Research Laboratory, to provide the basic science and engineering technology to modify the construction of buildings for the areas to the hazards in that geographic locale. And that's a longstanding program, and with support for this Committee, we have been able to strengthen the program.

But we also coordinate NEHRP where we work with other agencies to develop new standards and codes based on knowledge that we gain from natural disasters that we actually can't control that

we can sort of try to respond to them and make our built environment more resilient and resistant to things that we can't control.

Ms. BONAMICI. Thank you. Certainly, more investment at the front end saves lives and property later.

Also, Dr. May, federally funded research has led to many innovations. We've heard about some of those today: GPS, barcodes, life-saving medications and treatments. In this Committee we often hear about the challenges and obstacles to successfully transferring federally funded research from the lab to the private marketplace. The budget proposes an increase in technology transfer activities to develop data-sharing and collaborative tools and services. So can you elaborate, please, on the efforts, how these efforts would help enable the transfer of the federally funded research to the marketplace?

Dr. MAY. Well, certainly, as you mentioned and others have mentioned, there are a lot of very important technologies and tools that are being developed in our laboratories, but it's a very large enterprise and we don't right now have ready access to the information of the various components. For example, if I'm in the private sector and I want to make something, there might be inventions across several federal agencies where I could pull that together if I only knew that they were there. So our primary effort is to develop a resource, one-stop shopping if you will, to look at the investments and the technologies that are being developed in the public sector that can be brought to bear to develop new technologies, new inventions in the private sector.

Ms. BONAMICI. Terrific. Thank you very much.

I yield back. Thank you, Madam Chair.

Chairwoman COMSTOCK. Thank you.

And I now recognize Mr. Loudermilk for five minutes.

Mr. LOUDERMILK. Thank you, Madam Chairwoman. And, Dr. May, thank you for being here.

During my first year in Congress here, I've been quite amazed. You know, we live in reality TV show, conspiracy TV show, those things dominate our culture today, but the more I've been here, the more I see that a lot of things that happen in the federal government would make—we feed a lot of the information to these. But can we bring up the first slide here?

[Slide.]

Mr. LOUDERMILK. I want to bring up an incident that I'm sure you're aware of that happened in May of 2015 where one of the senior NIST police officers was operating a meth lab that apparently there was an explosion at the agency. He was using a vacant building to actually cook meth. Of course, thankfully, that police officer is currently in jail for manufacturing methamphetamine, but the fact that he was able to smuggle the necessary materials into a vacant NIST building is embarrassing, but it also raises serious questions about safety and security of the whole facility, as well as the people who live and work in Gaithersburg. I'm sure you, too, would agree that the meth lab explosion was a serious incident. I'm sure you're aware of that incident. Do you feel that was a serious—

Dr. MAY. It certainly was, sir.

Mr. LOUDERMILK. It was. Is that one of the most serious incidents that has ever happened at NIST?

Dr. MAY. From a perspective of the—

Mr. LOUDERMILK. Since you've been there?

Dr. MAY. —of embarrassment—I've been there 45 years.

Mr. LOUDERMILK. Yes.

Dr. MAY. I've been there a long time. On an embarrassment scale, yes. In terms of actual structural damage, no, because the structural damage was very, very minimal. We had a fire in one of our laboratories. So in terms of destruction of property, this ranks very low because the building that this activity took place in was designed for hazardous—it used to be called a Hazards Lab as a matter of fact, and it has blowout panels in case there is a pressure buildup. The panels behaved as they should. They were placed back in the next day, and there was minimal structural damage to the building.

Mr. LOUDERMILK. So the primary thing, though, is an embarrassment?

Dr. MAY. Yes.

Mr. LOUDERMILK. So you don't feel that there's a security concern or that the money you're spending on the officers, law enforcement officers at NIST actually committing felonies on property, that's not a concern?

Dr. MAY. Oh, that is a big concern.

Mr. LOUDERMILK. Okay.

Dr. MAY. That is a big concern. As I had mentioned before you came in, after this incident took place, I requested input from security experts from three other sources that—

Mr. LOUDERMILK. Okay.

Dr. MAY. that operate environments like us to give us their input—

Mr. LOUDERMILK. Okay.

Dr. MAY. —on how we can strengthen the security posture of our campus beyond this, and all indicated that in a situation similar to this it would be hard to anticipate what a trusted member of your security staff might do.

Mr. LOUDERMILK. And I understand it, and I apologize for just popping in, but I am dealing with homeland security issues as well, which is very important.

But after the explosion, you briefed this Committee staff on the incident. In the briefing you referred to the explosion as a near miss. You stand by that characterization that it was, you know, a near miss since no one was hurt or—

Dr. MAY. Well, it opened our eyes and made us—well, for one, it compelled me to get some outside expertise or input on how we might strengthen our security posture and to take a deep dive—

Mr. LOUDERMILK. Okay.

Dr. MAY. —actually. So I guess near miss—

Mr. LOUDERMILK. Yes.

Dr. MAY. —that no one was seriously hurt. And again, it opened our eyes that we needed to take a deep look and investigation into our security personnel.

Mr. LOUDERMILK. Okay. Can we bring up slide two? I want to make sure we get to this, too, as our time is running down.

[Slide.]

Mr. LOUDERMILK. This is an email from your Chief of Staff Kevin Kimball in the aftermath of the meth lab explosion. Referring to the explosion, Mr. Kimball writes, “Can’t see how this rises to an audit risk. Don’t remember briefing the auditors after the plutonium”—assume incident—“and that was a thousand times more of a risk.” What incident is he talking about that was a thousand times worse than a meth lab exploding?

Dr. MAY. Well, that was an incident that took place in our Boulder laboratory, I think, in 2007 where a small amount of plutonium was released into the sewer system based on some research that we were doing out there.

Mr. LOUDERMILK. Into the sewer system?

Dr. MAY. Yes.

Mr. LOUDERMILK. Do you agree that that was a thousand times worse than the meth lab?

Dr. MAY. Well, I had not thought about how I would quantify that, but certainly I think that in fact in terms of danger to the public, yes, that was more serious than that particular incident.

Mr. LOUDERMILK. So was this plutonium incident released—or reported to this Committee or any Members of Congress or—

Dr. MAY. It was, and in fact the then-Acting Director testified before this Committee about that incident.

Mr. LOUDERMILK. Okay. Are there any other incidents that we should know about that are a thousand times or a hundred times worse than the meth lab?

Dr. MAY. Not that I am aware of.

Mr. LOUDERMILK. Okay. Well, I think the other questions I have have already been answered, Madam Chairwoman, and so I yield back. Thank you.

Chairwoman COMSTOCK. Okay. I now recognize Mr. Tonko for five minutes.

Mr. TONKO. Thank you, Madam Chair. And welcome, Dr. May.

As a representative for the capital region of New York, I realize that moving toward an innovation economy is the key to our economic growth. With that in mind, I’m pleased to witness our nation’s renewed desire to invest in high-tech manufacturing and in innovation economy. I see great hope for these efforts, especially inspired by the formulation of the National Network for Manufacturing Innovation, or NNMI.

I have some questions this morning that aim to seek clarity in the NIST NNMI selection process as we move forward.

In December of 2015, NIST published a notice of intent that indicated that NIST was especially interested in two areas of focus, including collaborative manufacturing robots and biopharmaceuticals manufacturing. However, in the Federal Funding Opportunity, the FFO, neither topic was mentioned.

This year, the Department of Defense issued a request for information for new manufacturing innovation institutes, and the Department of Defense listed six technical focus areas under consideration, including two topics: one, the assistive and soft robotics; and bioengineering for regenerative medicine as another, which are similar to NIST’s area of focus. Presumably, NIST and DOD would not want to select areas, I would imagine, that are too much alike.

So, Dr. May, can you further discuss the process that NIST would use or will use to select a proposal?

Dr. MAY. Well, please excuse the colloquialism, but for the December announcement I'll just say my bad. What we intended to do was address the concern that you've expressed that we were looking in our Institutes that we would sponsor to the Department of Commerce not to duplicate anything that was ongoing or planned by the Department of Energy or the Department of Defense or any other federal agency that would be standing up a manufacturing institute. And we gave two examples, the examples of biomanufacturing and engineering robotics were just two examples.

And in retrospect, they probably should not have been called out because it did cause confusion. But I am here to guarantee to you that our process and the process that we launched about a week ago, week-and-a-half ago, is one that will be truly open, and we will not support any institute that is already in existence or planned by any other federal agency.

Mr. TONKO. So, as you go forward, the coordination with DOD would be—

Dr. MAY. Yes.

Mr. TONKO. —a very strong part of your interoperations?

Dr. MAY. It will be, it has been, and through our Advanced Manufacturing Program Office, we actually provide the coordination and glue for the network, so we are in constant contact there. There is a call that I'm a part of, and with our representatives from the National Economic Council, as well as DOE and DOD on a regular basis, so we are in constant communication.

Mr. TONKO. And could one agency decide to not select a proposal that was too similar to a proposed—a proposal that another agency is considering?

Dr. MAY. As a matter of fact, I think we have a process in place where it wouldn't be just the agency decides. We would decide as a collective because we are trying to operate a network, although it has individual nodes, but we're trying to work on behalf of this again is a cliché, but the American people, and certainly we don't want to have any duplicative activities.

Mr. TONKO. Well, I know a number of institutions in my district have specific abilities in these disciplines, so I'm just concerned. Is NIST planning sequential awards?

Dr. MAY. Can you explain what you mean by sequential?

Mr. TONKO. Well, as you go forward, will there be additional awards that NIST is looking at where you would use the initial pool of proposals for future awards?

Dr. MAY. Yes. What we are planning to do is to, with this call, essentially establish a queue, and we have resources to fund one institute from our fiscal year 2016 funds. The funds requested in the '17 budget should allow us to establish two additional ones, and we would establish the queue based on the call that is out at present.

Mr. TONKO. Okay. I would strongly encourage the continuation of some of these thematics that you've outlined. I think they're critical to our manufacturing base, and certainly, I think that there's a great contribution that many of our higher ed centers and private

sectors could offer through a collaborative. So I'm a very strong fan of NNMI and hope it continues in a way that's targeted to the strength that we have in our nation——

Dr. MAY. Okay. Thank you.

Mr. TONKO. —to strengthen us across the board.

Dr. MAY. Thank you.

Mr. TONKO. Thank you.

Chairwoman COMSTOCK. Thank you.

Mr. TONKO. And with that——

Chairwoman COMSTOCK. And I now recognize Mr. Hultgren for five minutes.

Mr. HULTGREN. Thank you, Chairwoman. I appreciate it so much.

And thank you, Dr. May, for being here. I do really appreciate the work at NIST and see how important cooperation is, communication is, and wanted just to ask you a few questions. I apologize. I've got a couple hearings going on at the same time, so if any of this has been covered, I'm sorry. I wasn't able to hear about it, but I did want to get some answers on this.

I wondered, have any program funds come from DOE's EERE program, as was stipulated in the bipartisan RAMI Act, which was something I supported and cosponsored? If not, why not, and is there any plan for funds to be transferred from EERE to the Department of Commerce to carry out NNMI in the future?

Dr. MAY. Well, first of all, we are very appreciative of your support of the RAMI bill because that authorized us to, one, to sponsor institutes from the Department of Commerce, and it also gave NIST the authority to set up our Advanced Manufacturing Program Office to coordinate the activities for the network.

However, that was an authorization bill and not an appropriation bill, and the bill says the Secretary of Energy may, it didn't say shall, and to this date, this hasn't happened. But we have gotten an appropriation in '16 for \$25 million to begin this process, and we're going use funds from that to support at least one network in '16, and with the request in '17, two more, and to begin activities of coordination, information-sharing within the network.

Mr. HULTGREN. Well, I do hope it moves forward. Were you involved in or were you aware of any discussions between the Commerce Department and the Energy Department about carrying out the RAMI Act after it was signed into law? It sounds like there was some conversations there. Were you a part of those?

Dr. MAY. Yes, I was.

Mr. HULTGREN. Okay. And that was really what you're referring to now where it was the difference between whether it was appropriations or an act?

Dr. MAY. Yes.

Mr. HULTGREN. Okay. Well, again, hopefully, that can be clarified. Hopefully, these important programs, some in Illinois, can move forward and absolutely will be making a difference.

I wonder, how will NIST evaluate competing proposals from different industry sectors? Will NIST treat each industry as equal and decide on the basis of the proposal details and private financial contributions when you're looking at the RAMI Act?

Dr. MAY. Well, in short, I think we are going to cut the best deal for the American people.

Mr. HULTGREN. What does that—

Dr. MAY. I—

Mr. HULTGREN. Can you explain it a little bit better for me?

Dr. MAY. Well, what we're looking for in these institutes are institutes that have the potential to be sustainable. They need to address one of the needed areas in the advanced manufacturing domain. And we will look at all proposals and select the one based, one, on no duplication of activities currently ongoing within other institutes and address the greatest need, the strongest partnership among industry and academia.

Mr. HULTGREN. So your plan is to treat each industry as equal and truly decide on the basis of proposal details and private financial contributions and not have a preset agenda—

Dr. MAY. Exactly.

Mr. HULTGREN. Okay. And how do you plan to integrate new centers with existing ones?

Dr. MAY. Well, new centers will be a part of the network, and they will have the services of the NIST Advanced Manufacturing Office to provide them with best practices, information-sharing, so they will again be a member of the team.

Mr. HULTGREN. Okay. So, again, the RAMI Act, again, I was proud to support that, proud to be a cosponsor of it, but also a big reason why I support it was my understanding was it was a merit-based, nonpolitical process for—

Dr. MAY. Yes.

Mr. HULTGREN. —soliciting, evaluating, and competitively funding new manufacturing innovation centers. That's still your commitment to—

Dr. MAY. That's still our commitment.

Mr. HULTGREN. Okay. And we want to obviously see that happen. Hopefully, this will continue to move forward. We all agree it's important. It's been a little disappointing and frustrating on our part that it hasn't moved more quickly, and my hope is that that will happen soon and that the commitment that you've made today and previous commitments of keeping politics out of this and really looking at industries that are best fit and can put the best proposals together will be the ones that are receiving the opportunity in the centers.

So I'm out of time. I will yield back to the Chairman. Thank you.

Dr. MAY. And, sir, that is our commitment to you and to the Subcommittee.

Chairwoman COMSTOCK. Thank you, Dr. May.

And I'd like to thank you also for your testimony and the members for their questions. And the record will remain open for two weeks for additional written comments and written questions from members. We appreciate your work on this important subject and look forward to continuing to work with you, Dr. May.

The hearing is adjourned.

Dr. MAY. Thank you.

[Whereupon, at 11:07 a.m., the Subcommittee was adjourned.]

Appendix I

ANSWERS TO POST-HEARING QUESTIONS

ANSWERS TO POST-HEARING QUESTIONS

*Responses by Dr. Willie E. May***House Committee on Science, Space and Technology
Subcommittee on Research and Technology***"An Overview of the Budget Proposal for the National Institute of Standards and Technology for Fiscal Year 2017"*Representative Barbara Comstock, Chairwomen, Subcommittee on Research and Technology

Question #1: NIST's role in cyber-related standards is important, not only for the Institute's work on the Framework for Risk Management for federal information systems, but also for the Framework for Improving Critical Infrastructure Cybersecurity for industry.

- a. Do federal agencies report significant external attacks to NIST? If so, would you please furnish information about the most significant attacks?**

Answer:

Federal agencies do not report information regarding attacks to NIST. NIST's role is to produce standards, guidelines, tests, metrics and other reference materials for the protection of non-national security federal information systems. These reference materials are informed and continuously updated and improved by information and lessons learned from interagency partners, including the US Computer Emergency Readiness Team (US CERT, in addition to the National Cybersecurity and Communications Integration Center, and through direct engagement with agencies.

- b. Do private organizations that use the Framework report results and problems to NIST? If so, would you please furnish non-confidential information and feedback from private users?**

Answer:

There is no obligation for private organizations to report to NIST. However, private organizations sometimes offer NIST observations regarding Framework use, value, and challenges. Generally, private organizations have used the high-level vocabulary of the Framework – Identify, Protect, Detect, Respond, Recover – and the Framework's methodology as a basis to prioritize their cybersecurity activities and resources. Private sector users have found value in the common vocabulary and catalog of cybersecurity outcomes.

- c. What are some suggested improvements or changes to the Framework that came out of the Cybersecurity Framework Workshop that took place on April 6th – 7th? What are the next steps? Has NIST received any additional suggestions outside of the Workshop? If so, how do those recommendations compare to what was discussed at the Workshop?**

Answer:

Among other recommendations, workshop attendees suggested that NIST clarify use of the Framework's Implementation Tiers and make the placement of Cyber Threat Intelligence more prominent. Prior to the workshop, NIST issued a Request for Information (RFI) to gather feedback on

the Framework from the public. Similar recommendations were received in the preceding RFI responses and also through informal discussions over the past year. RFI respondents also requested that any near-term updates to the Cybersecurity Framework cause 'minimal disruption' to use of the current version, 1.0. NIST intends to accommodate these requests via refinements and clarifications commensurate with a minor update over the upcoming year.

- d. Does the federal government do a good job at adhering to the NIST Cybersecurity Framework? Please explain.**

Answer:

The Framework for Improving Critical Infrastructure Cybersecurity is directed to private sector owners and operators of the Nation's critical infrastructure. It is aimed at reducing and better managing cybersecurity risks through voluntary adoption and use, and is not a one-size-fits-all approach. While some Federal agencies have found the Framework useful, no organization, private or public, is obligated to "adhere" to it. Organizations will continue to have unique risks – different threats, different vulnerabilities, different risk tolerances – and how they implement the practices in the Framework will vary.

- e. What are the costs associated with maintaining and updating the Cybersecurity Framework?**

Answer:

NIST currently administers the Cybersecurity Framework program with \$2.4M annually.

Question #2: The NIST Cybersecurity Framework is meant to be a living document, undergoing modification to accommodate feedback.

a. How often is the Framework updated, and is this adequate?

Answer:

There is no set update schedule for the Cybersecurity Framework. The decision to proceed with an update to the Cybersecurity Framework is heavily informed by stakeholder input through various engagement methods including workshops and RFI responses.

b. Are proactive actions being incorporated into Framework updates?

Answer:

The Cybersecurity Framework is a risk-based approach to managing cybersecurity risk, which can facilitate the ability of organizations to take action on cybersecurity outcomes before issues occur. Since many effective cybersecurity implementation approaches preexisted, Cybersecurity Framework was architected to not replicate those approaches, and is technology-neutral. The Framework exists at a higher level of abstraction than implementation approaches. Discrete actions to fulfill Cybersecurity Framework outcomes are, and will be, left to those cybersecurity implementation approaches.

c. Is there a method to evaluate the Framework to know how effective it is?

Answer:

Yes. Asking users whether they receive value from the Cybersecurity Framework is the most straightforward and comprehensive method of determining effectiveness. The value of the Cybersecurity Framework is frequently expressed in terms of business process and group dynamics. For example, effectiveness may be expressed in terms of enhanced communications, better team function, clarity regarding cybersecurity requirements, or efficient prioritization of resource decisions.

Question #3: In 2013, amidst community concerns that a cryptographic algorithm in a NIST standard had been deliberately weakened, then-NIST Director Patrick Gallagher requested a Visiting Committee on Advanced Technology (VCAT) review of NIST's cryptographic standards and guidelines development process. One of the report's recommendations states, "NIST may seek the advice of the NSA [National Security Agency] on cryptographic matters but it must be in a position to assess it and reject it when warranted."

a. What is the relationship between NIST and NSA today relative to cryptographic standards?

Answer:

NIST is committed to ensuring that its internal capabilities are strong and effective, and that it has access to highly-capable external cryptographers. NIST's research investment in the cryptographic arena helps to ensure that the algorithms and schemes in its standards and guidelines are secure. This research also aids in building the foundation for standards and guidelines, whether they are developed by NIST or by other organizations, including NSA.

Multiple federal agencies contribute to NIST's cryptography efforts in research and in developing standards and guidelines. Consultation with several of those organizations – OMB, the Departments of Defense, Homeland Security and Energy, the NSA, and the Government Accountability Office– is mandated by the Federal Information Security Modernization Act (FISMA) in order to avoid unnecessary and costly duplication of effort, and to assure that NIST's standards and guidelines are complementary and compatible with those employed for the protection of national security systems and information contained in those systems.

As part of NSA and other agencies' collaboration with NIST, their staff may assist in the development of new standards and guidelines. This may take the form of coauthoring publications with NIST staff, providing comments on draft documents, or submitting cryptographic algorithms for consideration by NIST. All contributions that significantly affect the content of any standard or guideline – particularly normative statements – will be clearly and publicly acknowledged. In accordance with NIST's authorship policy, NIST will identify the names of any authors of standards or guidelines. If a NIST standard or guideline contains an algorithm that was designed by another agency's employees, NIST will acknowledge that agency as the designer, even though NIST may not be able to list specific individuals. 2 As is the case with private sector organizations, NIST will consider and acknowledge other agencies' comments, whether they are provided during the formal public comment period or other stages of development. That includes information that may be provided during monthly NIST meetings with NSA. Comments from federal agencies received during the public comment period will be posted and adjudicated in the same way as those submitted by the public.

Another venue where NIST interacts with NSA about cryptography is the Committee on National Security Systems (CNSS), where NIST is an observer. The CNSS is chaired by the Department of Defense, while the NSA staffs the CNSS Secretariat. The CNSS mission is to set national-level information assurance policies, directives, instructions, operational procedures, guidance and advisories for United

States Government departments and agencies for the security of national security systems. NIST reviews and comments on drafts of proposed CNSS documents, including policies, directives, instructions and standards. The CNSS policy CNSSP- 15 specifies the use of NIST standardized cryptographic algorithms for the protection of national security information.

NIST understands that having its own independent cryptographic expertise is essential in order to carry out its statutory responsibility to develop strong cryptographic standards and guidelines to protect non-national security federal information systems. Moreover, this capability is vital to NIST's development of standards and guidelines that promote economic development and protect sensitive personal and corporate information.

b. How is NIST incorporating the VCAT report's recommendations – specifically, has NIST rejected any NSA advice since the publication of the report?

Answer:

In response to VCAT recommendations, NIST engaged in its public process to formalize its approach to development of cryptographic standards, culminating in the publication in March of NISTIR 7977, "NIST Cryptographic Standards and Guidelines Development Process." NISTIR 7977 sets forth formal processes which NIST considers necessary in developing robust, trustworthy, and effective cryptographic standards and guidelines.

Ultimately, the final decision about what to include in a cryptographic standard or guideline rests with NIST. NIST understands that any such decision must reflect a high degree of integrity to ensure the support of cryptographic experts regardless of affiliation. NIST's mission includes the rigorous development of strong cryptographic standards for meeting U.S. federal security needs and promoting the U.S. economy and public welfare by providing technical leadership for the Nation's measurement and standards infrastructure. In order to make independent decisions, NIST stresses the importance of its access to sufficient expertise, both from within NIST and from organizations and individuals external to NIST.

Question #4: In a November 2015 review of authentication processes at the IRS, the Treasury Inspector General for Tax Administration (TIGTA) noted that the agency's "Get Transcript" application, which was hacked last year, did not require multi-factor authentication to access the site. The report explains that the IRS did not rate the risks associated with "Get Transcript" at NIST level three, which would require multifactor authentication.

- a. Should a level three designation be applied when the information at risk is very important, e.g., taxpayers' names, addresses, dates of birth, Social Security Numbers, wages, incomes, tax account and tax returns?

Answer:

Risk Levels for identity proofing, identity credentials and authorizations are outlined in the Office of Management and Budget (OMB) memo 04-04, E Authentication Guidelines for Federal Agencies. NIST provides the technical guidance for agencies to implement security controls after an agency complies with OMB 04-04 and determines the risk level associated with that specific system.

- b. Did the IRS ask for NIST advice about the question of appropriate cyber security precautions for the "Get Transcript" application? If so, what advice did NIST give? Was that advice given in writing?

Answer:

IRS and NIST have consulted generally on the issues of identity proofing, issuing authentication credentials and authentication mechanisms. IRS and NIST have discussed NIST guidance in these areas as well, specifically, the written guidance NIST provides agencies in NIST Special Publication 800-63, Electronic Authentication Guidance.

- c. Did the IRS ask NIST for advice about the question of appropriate cyber security precautions for the Identity Protection Personal Identification Number (IP PIN) application? If so, what advice did NIST give? Was that advice given in writing?

Answer:

The IP PIN application was discussed with the IRS in the general context of applying NIST written guidance in NIIT SP 800-63 for implementation at the different risk levels specified in OMB 04-04.

Question #5: According to a Treasury Inspector General for Tax Administration (TIGTA) report issued on November 19, 2015 (Reference Number: 2016-40-007), the IRS received guidance from NIST at the time the e-Authentication framework was being developed indicating that a Taxpayer Identification Number (TIN) was an acceptable form of identification. However, as the report further notes, in August 2015, NIST informed TIGTA that a TIN is not currently an acceptable Government identification number for the purpose of authentication. Please explain the discrepancy between guidance NIST provided to IRS and the response NIST provided to TIGTA. As part of this response, please provide all documents relative to this discrepancy that NIST sent to and received from the IRA and TIGTA.

Answer:

NIST guidance highlights the important distinction between identification and authentication, which are distinct steps in the overall identity management process. This process begins by first verifying the identity of a user through a process known as "identity proofing." The proofing process establishes confidence that the user is in fact the person he or she claims to be. As part of this process, a trusted authority will collect and verify evidence sufficient to uniquely identify the individual and that demonstrates that he or she holds that identity. NIST guidance describes different forms of evidence that can be used in this process, including tax identification numbers.

Once the identity of an individual is confirmed through the proofing process, he or she will be issued a token that is unique to that individual. In the authentication process, individuals use their respective tokens to demonstrate they are who they claim to be. NIST guidance describes different types of tokens that provide varying levels of security. However, this guidance does not recommend the use of identification numbers, including the TIN, as authentication tokens.

NIST Special Publication 800-63-2, Electronic Authentication Guide (<http://dx.doi.org/10.6028/NIST.SP.800-63-2>) specifically addresses the identity management process for identity proofing, token and credential issuance, and user authentication.

Question #6: The Department of Commerce Budget in Brief FY 2017 states, "NIST will continue its outreach efforts associated with educating the public to reduce cyber risks to critical infrastructure as part of its follow-up actions after releasing the Framework for Improving Critical Infrastructure Cybersecurity."

- a. How much does NIST spend on educating the public in cybersecurity?**

Answer:

NIST currently spends \$500K annually on educating the public through our small business outreach and the National Initiative for Cybersecurity Education efforts.

- b. What measures has NIST already taken to educate the public about cybersecurity outside of the Framework?**

Answer:

NIST has several outreach programs intended to raise awareness of cybersecurity standards, guidelines, and practices to many constituencies including small and medium-sized businesses, educational institutions, state, local and tribal governments, and federal agencies.

NIST standards and guidelines are developed in an open, transparent, and collaborative manner that enlists broad expertise from around the world. While developed for federal agency use, these resources are voluntarily adopted by other organizations because they are effective and accepted globally. These resources are disseminated through a variety of means that encourage the broad sharing of information security standards, guidelines, and practices, including outreach to stakeholders, participation in government and industry events, and online mechanisms.

- c. Are there any ways that public education in cybersecurity could and should be improved? Please explain.**

Answer:

Educating the public on cybersecurity requires a concerted effort and sustained focus from government and industry. NIST continues to produce guidelines, practices, and tools to help stakeholders improve their ability to understand and manage cybersecurity risk. NIST will continue to identify and implement ways to improve the usability and accessibility of its guidelines, practices, and tools.

- d. Will there be any new approaches implemented in FY2017 to better educate the public to reduce cyber risks?**

Answer:

NIST will continue working with interagency partners, industry, and academia to identify opportunities to engage the diverse cybersecurity stakeholder community. This engagement may utilize a variety of mechanisms including new cybersecurity guidelines and practices, implementation tools and resources, and in-person and virtual outreach, awareness, and education events.

Question #7: The Revitalize American Manufacturing and Innovation Act of 2014 (RAMI Act) states that “except as provided in paragraph (2), no funds are authorized to be appropriated...”. Paragraph (2) goes on to say that “the Secretary [of Commerce] may use not to exceed \$5,000,000 for each of the fiscal years 2015 through 2024 to carry out this section from amounts appropriated to the Institute for Industrial Technical Services.”

NIST FY16 appropriations from Congress included \$25 million for the purpose of establishing Institutes for Manufacturing Innovation and coordinating their activities.

- a. Does NIST plan to follow the RAMI Act and spend no more than \$5 million per fiscal year for implementation and administration of the NNMI program? If not, under what legislative or legal authority does NIST plan in FY2016 to exceed the \$5 million annual limitation under the RAMI Act and/or ignore the RAMI Act stipulation that NIST use appropriated funds only for implementation and administration (i.e., not for the federal share for a new NNMI center)? If so, please furnish a legal memo to the Committee which sets forth (any) legislative authority for these actions.

Answer:

The RAMI Act was enacted within Division B, Title VII of the Consolidated Appropriations Act of 2015, Pub. L. No. 113-235, 128 Stat. 2130, 2220-34 (2014). Section 703 of the RAMI Act amended the National Institute of Standards and Technology (NIST) Act by inserting within it a new Section 34, authorizing NIST to establish a “Network for Manufacturing Innovation Program.” Section 34(e) provides that “[t]o the extent provided for in advance by appropriations Acts, the Secretary may use not to exceed \$5,000,000 for each of the fiscal years 2015 through 2024 to carry out this section from amounts appropriated to the Institute for Industrial Technical Services” (ITS). (emphasis added).

NIST understands this language as precluding it from incurring obligations to carry out Section 34 of the NIST Act in the absence of a prior and specific appropriation for that purpose. NIST also interprets this language as precluding it from incurring obligations in excess of \$5 million from amounts appropriated for each of the covered fiscal years. Given the “no-year” nature of the ITS appropriation, amounts appropriated to carry out Section 34 not obligated in the year for which appropriated may be carried over and obligated in subsequent fiscal years. For this reason, and because Section 34 does not prohibit NIST from incurring obligations exceeding \$5 million to carry out Section 34 *during* a given fiscal year if amounts have been appropriated for that purpose, NIST may be in a position where amounts made available for one fiscal year are not obligated during that fiscal year and are instead obligated during a subsequent fiscal year. This, we believe, is consistent with the terms of the statute. Moreover, it is our further understanding that if a subsequent Appropriations Act provides for a given fiscal year (thereby authorizing incurrence of obligations) a specific earmarked amount to carry out Section 34 in excess of the \$5 million cap in Section 34(e) (thereby authorizing incurrence of obligations in the earmarked amount), this later-in-time enactment controls, and NIST may incur obligations from that fiscal year’s appropriation not-to-exceed the amount so earmarked whether such obligations are incurred during or after the given fiscal year.

The fiscal year 2016 Appropriations Act, Pub. L. No. 114-113, Div. B, Title I, provided NIST with specific authority to obligate funds from its ITS appropriation “for the National Network for Manufacturing Innovation” as authorized by Section 34. The FY 2016 Appropriations Act not only provided NIST the authority to incur obligations against the ITS appropriation to carry out the program, it also appropriated a specific earmarked amount for that purpose, \$25 million, to remain available until expended. This later-in-time enactment authorizes NIST to obligate \$25 million from amounts otherwise appropriated under the ITS appropriation for fiscal year 2016 whether such obligations are incurred during or after fiscal year 2016. NIST, of course, understands that it may not incur obligations against amounts appropriated for fiscal year 2017 (or for each fiscal year through 2024) unless and until an Appropriations Act is enacted which specifically authorizes it to use ITS appropriations provided for thereunder to carry out Section 34, and further understands that, regardless of an Appropriations Act’s specific authorization, it may not incur obligations in excess of \$5 million to implement Section 34 unless appropriated a specific earmark that is in excess of that cap.

b. How much of the appropriated \$25 million has been spent, and what has it been spent on?

Answer:

As of April 14, 2016, approximately \$1.25 M has been spent for implementation and administration of the NNMI program, and \$20 M has been committed to the on-going NIST competition to stand up an institute within NNMI, as required in the budget appropriation.

c. In NIST’s FY17 budget request, the Institute seeks nearly \$50 million as the federal share for additional NNMI centers. Does this signal that NIST and the Department of Commerce intend to ignore the law and implement the program as the Administration sees fit?

Answer:

As explained in response to Question 7a, Section 34(e) of the NIST Act precludes NIST from incurring obligations to carry out that Section in the absence of a prior and specific appropriation for that purpose. Even if such authority were provided within its ITS appropriation, NIST may not incur obligations in excess of \$5 million from amounts provided in an Appropriations Act for a given fiscal year covered by Section 34 unless specifically provided an earmarked amount exceeding that cap. The fiscal year 2016 Appropriations Act, in fact, appropriated \$25 million “for the National Network for Manufacturing Innovation” as authorized by Section 34. The budget request for fiscal year 2017 recognizes that unless and until additional amounts are appropriated specifically to carry out Section 34, or unless otherwise authorized by law, NIST may not incur obligations in excess of the \$25 million appropriated for fiscal year 2016. NIST is committed to compliance with the law. NIST’s FY17 budget request seeks a specific appropriation of \$47,000,000 to carry out Section 34. Absent specific authority within the FY17 ITS appropriation to use those funds to carry out Section 34, NIST will not incur any obligations for that purpose from the account. Absent such an appropriation with an earmarked amount in excess of \$5 million, NIST will not incur obligations to carry out Section 34 in excess of that limit from amounts appropriated for FY17.

d. Why should Congress appropriate any more money for NNMI under the RAMI Act authorization?

Answer:

The NNMI Program operationalizes the purposes and requirements set forth in the RAMI Act and implements the recommendations made by the President's Council of Advisors on Science and Technology (PCAST). The structure of the NNMI Program is built around the recognition that investment in early stage basic research, while important, is not sufficient to ensure that new technologies progress smoothly from invention to product development or that they will eventually be scaled up for manufacturing in the United States. The NNMI Program aims to promote stable and sustainable domestic innovation ecosystems and the training of a skilled workforce to accelerate the development, scale-up, and deployment of promising advanced manufacturing technologies.

The RAMI Act was very clear as to the importance of revitalizing the U.S. manufacturing sector and restoring leadership in advanced manufacturing, assigning eight critically important purposes for the NNMI Program:

- To improve the competitiveness of United States manufacturing and to increase the production of goods manufactured predominantly within the United States;
- To stimulate United States leadership in advanced manufacturing research, innovation, and technology;
- To facilitate the transition of innovative technologies into scalable, cost-effective, and high-performing manufacturing capabilities;
- To facilitate access by manufacturing enterprises to capital-intensive infrastructure, including high-performance electronics and computing, and the supply chains that enable these technologies;
- To accelerate the development of an advanced manufacturing workforce;
- To facilitate peer exchange of and the documentation of best practices in addressing advanced manufacturing challenges;
- To leverage non-Federal sources of support to promote a stable and sustainable business model without the need for long-term Federal funding; and
- To create and preserve jobs.

Continuing additional appropriations are essential for the program to meet these purposes. The FY 2016 NIST ITS budget is the first appropriation expressly for the NNMI Program, providing, as the accompanying Explanatory Statement notes, "\$25,000,000 for the National Network for Manufacturing Innovation (NNMI), to include funding for center establishment and up to \$5,000,000 for coordination activities." This coordination funding of up to \$5 million is the sole and initial provision of funds for the

program office to support the network of institutes, provide common services and best practices, and coordinate and report on the program. The first year of institute funding has enabled NIST to hold the first "open topic" institute competition and begin the establishment of the first Institute. \$70 million in public funding over a five- to seven-year period is the minimum amount needed to establish an individual institute. \$47 million is needed in FY17, of which \$14 million is needed to continue funding for the first Institute, \$5 million is needed to enable NIST to carry out its mandate to plan, manage, and coordinate the National Network for Manufacturing Innovation and \$28 million is requested to make awards for additional two additional Commerce-led Institutes.

Question #8: The RAMI Act also states that “The Secretary of Energy may transfer to the Institute not to exceed \$250 million for the period encompassing fiscal years 2015 through 2024 for the Secretary [of Commerce] to carry out this section from amounts appropriated for advanced manufacturing and development within the EERE program of the Department of Energy”. At our March hearing, Dr. May said that he has been part of discussions with the Department of Energy (DOE) about this, but no funding has come from DOE as the RAMI Act says “may transfer” instead of “shall” and therefore does not require DOE to provide support.

- a. Please provide the date, location and specifics of what was discussed at that meeting.

Answer:

To clarify, Dr. May’s testimony pertained only to his general awareness of discussions between the Departments of Commerce and Energy on this issue. Dr. May does not recall any particular meetings where such conversations occurred.

- b. Will there be additional discussions with the Department of Energy about transferring money from the EERE program to the Institute for the federal share of new manufacturing innovation institutes to be established under NNMI? If not, why not?

Answer:

Paragraph 2 of Section 34(e) provides that “[t]o the extent provided for in advance by appropriations Acts, the Secretary of Energy may transfer to the Institute not to exceed \$250,000,000 for the period encompassing fiscal years 2015 through 2024 for the Secretary to carry out this section from amounts appropriated for advanced manufacturing research and development within the Energy Efficiency and Renewable Energy account for the Department of Energy.” (emphasis added). To the extent that authority to carry out a transfer of funds from the Department of Energy as contemplated by Section 34(e) is authorized by an appropriations Act, further discussions will follow.

Question #9: What metrics will NIST use to evaluate the success of the National Network of Manufacturing Innovation? How long will it take to receive results?

Answer:

The overarching goal of an NNMI institute is to grow existing or establish new manufacturing hubs in the United States, via advancements in applied research and workforce skills. These hubs represent the advanced manufacturing jobs of the future, and as such represent long-term successes. There are many actions and results in that pathway which are medium- and short-term. Therefore, the best approach is a set of performance measures and metrics covering short-, medium- and long-term impacts. Although NNMI is very new, there are several significant successes already achieved.

Pursuant to the Revitalize American Manufacturing and Innovation (RAMI) Act, NIST has the responsibility of providing detailed reports on Institutes funded by the Department of Commerce, as well as an assessment of the participation in, and contributions to, the network by any Institute not receiving financial assistance under the NNMI program. The program today includes seven institutes funded by the Department of Defense or the Department of Energy. In accordance with these reporting responsibilities NIST prepared two reports to Congress:

The first NNMI Program Annual Report – this documents the activities and success of the NNMI Program to date <http://www.manufacturing.gov/files/2016/02/2015-NNMI-Annual-Report.pdf>

The first NNMI Program Strategic Plan – this documents the NNMI program plans and metrics for meeting the objectives as defined by RAMI <http://www.manufacturing.gov/files/2016/02/2015-NNMI-Strategic-Plan.pdf>

Question #10: What does NIST view as the appropriate use of federal funding versus industry funding in technology transfer programs?

Answer:

NIST has a variety of mechanisms to transfer our research results and technology from our laboratories to industry as an important part of our mission. Our technology transfer efforts are focused on making connections with industry to ensure our work is available to the public through the many ways we partner with industry, such as through standards, standard reference material, training, cooperative research and development, licensing, and other forms of knowledge transfer. These programs involve efforts on the part of NIST to provide results to industry for their use and hopefully, continued development as a part of our Nation's economy.

Our Nation invests approximately \$140 billion dollars annually in federal research and development, and as a leader in this area across government agencies, we are committed to helping not only NIST, but all agencies transition technology to the marketplace. While we believe NIST and other government research programs are a valuable resource, technology transfer programs generally do not involve providing government funding to the private sector. Like other agencies, NIST does fund some extramural research focused on commercialization of program priorities through our Small Business Innovation Research (SBIR) Program and considers activities such as prize competitions under recent changes from the Congress, but we believe that it is private investment from industry that is needed to fuel economic growth for new businesses, products, and services that result from government research programs.

Question #11: It was noted at the hearing that three external security experts have been brought in to help NIST reevaluate its security controls in the wake of the lab explosion at the NIST Gaithersburg campus?

- a. How were these external security experts selected? Are you able to share who those experts are?**

Answer:

Two of these experts (one being the Chief Security Officer for a major defense contractor and the other, an Associate Director for Security and Emergency Response at another federal agency) were selected based on their specific experience in protecting a research, campus-like setting in Federal and private environments. The third was recently assigned to the Department of Commerce, Office of Security (OSY), and was selected due to his extensive physical security background. Each was asked to conduct an independent individual review of NIST's security posture, including staffing and processes.

- b. What suggestions have these external security experts made? Is there a specific timeline to implement these suggestions?**

Answer:

The experts offered independent observations and suggestions for consideration by the NIST Director. Their feedback was shared with the Department of Commerce Security Director and is currently being reviewed and validated along with a recently received Federal Protective Service (FPS) audit report. Recurring themes from these experts included the organization and bifurcation of security functions, resourcing of security/police services, risk management, strategic planning, fostering a culture of security awareness at NIST, and oversight of the security contract and Federal Police training and certification programs. Based on these inputs, the Office of Security along with NIST is developing a security action plan to supplement existing security protocols and policies.

- c. Have NIST officials held meetings with these security experts? If so, when did these meetings take place, who attended, and what was discussed? Are there future meetings planned?**

Answer:

The security experts interviewed various NIST personnel during site visits to the Gaithersburg and Boulder campuses the week of November 30, 2015. The experts met with NIST leadership (including the Director's Chief of Staff, the Associate Director for Management Resources, and the Acting Associate Director for Laboratory Programs), as well as the relevant personnel responsible for managing security, policing, and visitor access at both facilities (including the Acting Chief of the PSG, the OSY Director of Security at NIST, Chief of the Emergency Services Division, and Chief of the Security Systems and Access Controls Group). At both campuses, the experts discussed with the relevant personnel staffing, operations, inspections, and access controls.

- d. Have these external security consultants been paid for their expertise? If so, how much, and where in the NIST budget did that come out of? In addition, will they continue to be paid, or is this a one-time expense?**

Answer:

The experts received no payment for their time. NIST covered travel expenses for the site visits for the two experts who were federal employees. These one-time only expenses were covered by the Director's office.

e. What changes has NIST made to its physical security since the incident last summer to avoid future incidents? Where in the budget do we see these investments being made?

Answer:

Even prior to last summer, NIST had begun taking steps to enhance campus security, working closely with the Department's Office of Security (OSY). At the recommendation of OSY, a new NIST Security Director position was created and filled in June 2014. The Security Director is an OSY employee, funded by NIST, hired to assist with the transition of police services from NIST to OSY and to assume operational control for the Police Services Group and contract security operations once transferred. This transfer took place formally in November 2015.

Following the incident last summer, the NIST Security Director also implemented enhanced patrol staffing requirements to ensure that at least two patrols and a supervisor are assigned each day.

Also, a security contract was pursued to re-balance the policing and security functions at NIST, Gaithersburg, as had previously been done at Boulder. This contract provided relief for police manpower demands and aided in reducing overtime costs. OSY assisted with the contract, which incorporates the Interagency Security Committee (ISC) and FPS contract security standards.

Acknowledging the need for improvements in training and qualification of both the police and contract security staff, OSY worked with NIST to hire a dedicated training manager. This position has recently been filled and will result in the tracking and oversight of critical program training requirements. In the immediate term, NIST is also funding several new security activities in Gaithersburg, including a pilot program to determine which advanced locking solution or solutions will best enhance the protection of our laboratories, upgrades to the physical access control system (PACS) server, and a study of how best to enhance security screening at the Gaithersburg main entrance /visitors center.

These investments are funded through the NIST Working Capital Fund, specifically, via funds collected to cover general administration expenses.

The NIST Director has directed the establishment of a Security Advisory Council to execute his vision for maintaining a collegial atmosphere conducive to research while ensuring the safety and security of both campuses and to provide advice and input to both OSY and the NIST Security Director on the implementation of security policy and procedures. The NIST Security Director, with support from the Council, will be tasked with developing a five-year security management strategy/sustainment plan (FY17-21). The Security Director will also develop a 5-year business plan that identifies the capital investments necessary to sustain and improve the NIST security infrastructure. This will include a comprehensive life cycle management plan/program for security programs and systems.

- f. Are there changes being made to the NIST police force in policy or procedure in light of recent events? If so, please explain.

Answer:

As noted above, a number of actions have already been taken and more are planned for the future to enhance the law enforcement and security functions at NIST. Since assuming operational control of law enforcement and security functions at NIST, OSY has also already reviewed a number of checklists and operating procedures and made improvements to these. These reviews are ongoing and are part of a continuing program to test, review and improve security operations.

- g. Has NIST compared the costs and benefits of having its own police force and having security contractors performing all of NIST's security needs – not just to staff gate access, visitor centers, and the police/fire dispatch? If so, what would the cost difference be?

Answer:

The Department of Commerce Director of Security has been in discussions with Federal Protective Service (FPS) management regarding this issue. NIST requires some level of law enforcement support and response and the costs associated with this may vary depending on the decision to deploy: a reduced law enforcement footprint at NIST, i.e. substation; an FPS dedicated on-site or limited off-site response; or, local police support. In addition, any change in the security response needs to be fully coordinated to ensure the current law enforcement and security response plans fully support security requirements under Nuclear Regulatory Commission licensing of the Gaithersburg facilities. Given the recent reviews, OSY will gather data in order to carefully weigh and recommend a prudent security posture that balances protective needs against costs, while also assessing federal police personnel considerations.

- h. How many NIST police officers and contract security are on duty at a time at the Gaithersburg and Boulder campuses? Is this sufficient?

Answer:

The manning of police and contract security positions varies depending upon the shift. As a general rule, police and security presence is increased during daytime hours as this is when the majority of the campus population requires these services.

At Gaithersburg, this would include a total of six police personnel and ten contract security officers who perform functions ranging from entry control to visitor processing. Call-offs could reduce the policing level, but the contractor level remains constant since these are hours required under the contract. At Boulder, the daytime staffing is a total of three police personnel and five contract security officers.

As the workforce transitions to a swing shift, and then to a midnight shift, the positions gradually reduce to reflect the law enforcement or policing need. In all cases, the minimum manning remains one police

patrol and one police supervisor, and contract officers sufficient to man the entry gate(s) that may be open.

OSY has taken steps to improve manning with the recent selection of a Police Chief and Training Coordinator. In addition, the hiring of eight officers is pending a decision on whether to transition to a contract security force or maintain a Federal police presence.

- i. **What were the total expenses associated with the damage from the lab explosion last summer?**

Answer:

NIST facilities personnel repaired the damage to the laboratory room, at a total estimated cost (time and materials) of \$1430.10. NIST also contracted with a DEA-approved firm to clean the fume hood in the laboratory, at a cost of \$3,320.00.

Question #12: At the FY2016 NIST budget hearing, Dr. May mentioned that NIST employs fewer federal employees than non-federal “associates.” Does NIST continue to see a transition toward a small ratio of federal employees to academic and private sector partnerships at its facilities?

- a. If so, what changes, if any, in terms of employee and NIST campus management have been made to accommodate this trend?**

The work of NIST’s federal scientists is augmented by collaborations with non-federal associates that enable NIST to better meet the broad and complex technical requirements of its stakeholders. These associates work with NIST through a variety of collaborative arrangements, from post-doctoral associates from U.S. universities to industry partners working on Cooperative Research and Development Agreements with NIST, to contractors, to users at NIST’s two designated User Facilities.

While NIST has more associates now than it did forty-five years ago, the number of associates on the NIST campus hasn’t increased significantly over the past 10 years. Between FY 2005 and FY 2015, the number of associates on the NIST campus increased less than 1% from 3,431 to 3,463. Over the same 10 years, except for a blip in 2005 caused by a reduction in funding, the number of NIST federal employees has remained relatively stable and is today at 3,394.

NIST benefits greatly from the flexibility, expertise, and perspective provided by these associates. Associates provide the NIST Laboratories with enough agility to pursue short-term research endeavors, as well as to build and explore competence in new areas. Associates bring with them the expertise and knowledge of their home institutions, and serve as an exceptional mechanism for technology transfer. NIST expects to continue to require both federal employees and associates to meet its mission, and continues to examine how to optimally manage its workforce.

Question #13: The Hollings Manufacturing Extension Partnership (MEP), over the past four or five years, has encountered some instances of wasteful spending, including on lavish conferences and improper overreliance on one particular contractor to fulfill its mission.

More recently, in June 2015, the U.S. Attorney's Office in South Carolina announced that the former NIST grantee in that state pled guilty to wire fraud. Essentially, this individual was submitting false claims to the government and once the government paid the claim, this individual would pay friends, family and herself for work that was never completed.

- a. What steps are being taken to ensure that these kinds of taxpayer abuse are no longer happening?

Answer:

NIST takes its role as a steward of federal taxpayer dollars and financial accountability very seriously. In fact, the MEP program has one of the best return on investments in the federal government for program operations. MEP has taken a hard look at its controls and processes, and implemented a series of reforms designed to ensure continued financial accountability of the program. Notably, MEP has put into place policies and procedures addressing external meeting operations, strengthened the internal contract review process, instituted mandatory training on travel-related processes and developed a Financial Management Analysis Pilot Project to look deeper into Center financial operations.

It is important to note that the South Carolina MEP issue was the result of a South Carolina MEP subrecipient submitting false claims to the Center, not to the federal government. MEP has since developed Conflict of Interest Policies for Centers and their governance Boards to ensure proper oversight of the Centers to eliminate any misunderstanding of roles.

- b. How would the \$12 million increase for the MEP program be used?

Answer:

The increase will be used in FY 2017 to complete the final round of the multi-year competition of the MEP centers, and maintain the funding of states previously competed, as well as provide funding for additional performance-based awards to high-performing centers. This increase will allow Centers to work with more very small, rural and start-up firms and significantly improve market penetration with manufacturers with 1-19 employees, which are currently the most underserved client population.

- How does this program support NIST's underlying mission?

Answer:

MEP's network of Centers in every state and Puerto Rico provide direct access to manufacturers and shares the mission of NIST . . . "to enhance the productivity and technological performance of U.S. Manufacturing." NIST carries out part of its mission through MEP, which offers, through its network of Centers technical and business assistance to smaller manufacturers to help them create and retain jobs, increase profits, and save time and money.

In particular, the MEP program has a significant focus on technology acceleration to ensure that small and medium-sized manufacturers are aware of the technologies emerging from NIST, other federal laboratories, and universities. MEP is working with its network of Centers to better connect them with technology sources as well as the National Network for Manufacturing Innovation (NNMI) Institutes.

Question #14: How does NIST balance short-term, low-risk, low-reward research projects versus long-term, high-risk, high-reward research projects when making funding decisions?

Answer:

NIST is committed to providing a stable environment for world-class basic and applied research, though we do not limit high-risk, high-reward research to long-term projects only. Furthermore, it should be noted that just because a project is low-risk or short in duration does not mean that it will have insignificant impact.

As the National Metrology Institute for the U.S., NIST works at the frontier of measurement science and develops, maintains, and disseminates measurement tools, standards, and services to help America compete. To do so, NIST must maintain a strong fundamental base of long-term research programs while supporting the continuous and improved delivery of products and services. The reward to the nation from these programs is high, as NIST programs evolve to meet national needs – such as the ability to carry out interstate and international commerce based on trusted weights and measures, including the digital economy; real-time metrology for manufacturing, including additive manufacturing; and the foundation for effective building and fire codes, including new construction.

At the same time, NIST maintains programs that fund high-risk short-term research. For example, the Innovations in Measurement Science (IMS) Program provides initial funding enabling NIST scientists to explore high-risk, leading-edge research concepts in order to position NIST to successfully address the future measurement and standards needs of industry and science. These funds are a principal tool to enable the kind of research agility that NIST requires in order to keep pace with technology development.

a. How does NIST determine the proportion of basic research versus applied research projects when allocating funding?

Answer:

The NIST structure creates the necessary stable environment proportioning funding to basic and applied research, with the NIST Metrology Laboratories driving innovation through measurement science, Technology Laboratories accelerating the adoption and deployment of advanced technology, and National User Facilities providing world class, unique research facilities to industry, academia and government.

Although NIST basic research is primarily carried out by the Metrology Laboratories, both basic and applied research are integrated across the laboratory structure. For example, basic research in neutron physics is carried out by the NIST Physical Measurement Laboratory (PML) at the NIST Center for Neutron Research (NCNR) user facility. Likewise, PML, and NCNR scientists collaborate to apply basic physics in the design of new neutron scattering and imaging instruments in the NCNR used by industry researchers in support of applied materials research, neutron imaging, chemical and biological analysis. Completing the cycle, the NIST Materials Measurement Laboratory also uses the NCNR to carry out NIST material science research, for instance to support the creation of NIST Standard Reference Materials needed by the biologic drug industry.

Furthermore, NIST maintains strategic partnerships to broaden both ends of its basic-to-applied research spectrum. NIST partnerships with academia, such as the Joint Quantum Institute (JQI) and the Institute for Bioscience & Biotechnology Research (IBBR) in Maryland, and JILA in Boulder, foster interdisciplinary research and train the next generation of world class scientists dedicated to precision and novel measurement at NIST and elsewhere. The basic research at these institutes feeds into applied research projects, for example basic atomic physics research at JILA has been leveraged by other groups at NIST to develop atomic clocks.

On the other end of the spectrum, private-public partnerships provide an avenue for NIST to develop ways to directly support and transfer technology to industry. For example, NIST is working with Intel and other companies to develop X-ray measurements that enable the manufacturing of next-generation electronics. To further address real world needs, NIST funds Centers of Excellence as private-public partnerships. For example, in September 2014, NIST launched the first Federally Funded Research and Development Center (FFRDC) solely dedicated to enhancing the security of the nation's information systems. That National Cybersecurity Center of Excellence develops sector-specific cybersecurity problems defined by a community of sector technical professionals and business leaders, and building blocks, which address technology gaps affecting multiple sectors.

b. Is there a balance that should be maintained across NIST activities between more fundamental vs. more applied type of work that NIST funds?

Answer:

NIST is a unique Federal scientific institution, in that our focus is on measurement science, or metrology. Because measurement is at the foundation of science itself, it is natural that successful fundamental research has the potential to be applied to practical measurement solutions at NIST and beyond. It is therefore necessary to maintain a balance between fundamental and applied research and development, and to enable research endeavors to evolve from fundamental to applied. This balance varies across the NIST portfolio and will vary over time with specific projects.

Question #15: What is the status of renovation and modernization of the NIST Radiation Physics Building 245? When do you expect this construction to be complete?

Answer:

Engineering and planning studies were completed utilizing the \$2.0 million approved for the project in FY 2015. A contract is anticipated to be awarded in the fourth quarter of FY 2016.

Building 245 modernization needs to be accomplished in phases since portions of the building will remain occupied while the construction takes place. Phase 1 is to design and construct additions to the existing building that provide strict environmental tolerances for critical research being undertaken in the building. When these Phase 1 additions are completed, the research in other sections of Building 245 requiring this type of space will be relocated. Once the research has been relocated, Phase 2 will modernize the areas in the building that were vacated. The final phase, Phase 3, will modernize those laboratories that contain unique and custom instruments that cannot be relocated. In Phase 3, these instruments will be shut down, protected, and the laboratory space will be modernized around the instruments.

FY16 appropriations provided \$60 million for this project and the FY17 Budget's request for an additional \$40 million in discretionary funds. Combined, these will be used to complete the A/D and B/C wing additions that make up Phase 1 and Phase 2 of the project. Additional funds required to complete modernization of Building 245 will be determined in future budget requests.

Question #16: Can you please speak to the specific costs and timeline for the renovation work taking place at the NIST Boulder campus?

Answer:

To date, including the FY 2016 NIST Appropriation, the total funding for the Building 1 Renovation (B1R) project is \$91.5 million.

Phase 1, the exterior renovations, was completed in the third quarter of FY 2014. Phases 2 and 3, the interior fit-out of Wings 3 and 6, were awarded in September 2013. Wing 6 is currently scheduled to be completed in the third quarter of FY 2016, with Wing 3 completed in the fourth quarter of FY 2016.

In FY 2015, the B1R project was re-phased in an effort to create swing space and to accommodate the space requirements of the newly created Communication Technology Laboratory. To this end, the Building 3 Renovation (B3R) was inserted into the plan. B3R was procured using a design-build approach and was awarded in February 2016 with the Notice to Proceed issued in March 2016. The renovation of B3R is expected to be substantially completed by the end of FY 2017.

The FY 2016 B1R appropriated funds are being used for the completion of B3R and the renovations of Wing 5. In FY 2017, the \$10.0 million in the President's Request will continue renovations on B1R Wing 5. Additionally the President's FY17 Budget recognized that discretionary levels set by the Bipartisan Budget Act are not sufficient for the nation to take full advantage of the opportunities for R&D investments, and includes a mandatory funding proposal throughout the Federal R&D enterprise. As such NIST's FY17 budget presents \$100 million in mandatory funds to further renovate and modernize NIST facilities.

Question #17: While the FY17 request for the Construction and Research Facilities account is a decrease of over \$24 million from FY16 enacted levels, do you anticipate a need for increased funding in the near future? If so, what would that funding be used for?

The FY 2016 enacted level of \$119.0 million for Construction of Research Facilities (CRF), includes \$60.0 million to begin work on the Gaithersburg Building 245 Modernization (B245M) project. We are also funding a major project at the Boulder site from NIST's yearly Safety, Capacity, Maintenance, and Major Repair (SCMMR) budget and allocated \$15.0 million from that fund in FY2016 for this work. Future funding will be necessary to complete both of these major projects.

The B245M project is a multi-year effort comprised of three major phases consisting of: (1) construction of new laboratory and laboratory support space that meet the required tight environmental controls required for today's science onto the existing building; (2) modernization of vacated laboratory and laboratory support space in the existing building; and (3) modernization of laboratories that contain unique scientific equipment that can't be relocated. The FY 2016 enacted funds for B245M in the amount of \$60.0 million provide for the design and construction of Phase 1a (B/C Wing addition). Phase 1b (A/D Wing addition) will complete Phase 1 of the B245 project with \$40.0 million included in the FY 2017 President's Request.

For the Boulder renovation project, the allocated FY 2016 enacted funds are being used for the completion of Building 3 Renovation (B3R) and concept development for the renovations of Wings 4 and 5 and the Center Spine. The B3R project is needed to create swing space for the Boulder 1 Renovation (B1R) project and to accommodate the space requirements of the newly created Communication Technology Laboratory. The FY 2017 President's Request of \$10.0 million provides sufficient funds to continue with the design effort.

NIST is continually working to ensure that NIST is equipped with the infrastructure necessary to meet the needs of the precision research being conducted in the NIST laboratories. NIST will be evaluating how best to address these needs in future years.

Question #18: What issues, if any, were encountered with the operation of NIST labs in the previous fiscal year and what changes will be made in the organization and management of the laboratories in FY 2017?

Answer:

In FY 2015, the NIST Laboratories continued their work developing the measurement science, standards, and technology necessary to support U.S. economic competitiveness, especially in areas of recent NIST priority including advanced manufacturing, bioengineering, cybersecurity, precision measurement, advanced communications, disaster resilience, and forensics. To support this work, the NIST Laboratories held workshops to solicit industry input, hired new scientific and technical staff, and developed new partnerships through the Center of Excellence program.

The NIST Laboratories also saw some change in management. In April 2015, Gordon Gillerman was selected to be the Director of the NIST Standards Coordination Office, which works closely with the NIST Laboratories to support and coordinate work in documentary standards. In November 2015, Dr. Kent Rochford, previously the Director of the Communications Technology Laboratory (CTL), was selected to be the Associate Director of Laboratory Programs of NIST. Dr. Rochford's selection in NIST's most senior career position will provide stable leadership for the NIST laboratory program.

In the next year, the NIST Laboratories will be working to fill the Director position of the NIST Communications Technology Lab, vacated by Dr. Rochford.

Question #19: What improvements are planned for the operation of NIST labs to support the FY 2017 program priorities, i.e., advanced manufacturing and precision metrology, biosciences, built environment, and digital economy?

- a. Will buildings dedicated to former priority research areas be repurposed for current program priorities?

Answer:

NIST is prepared to support the FY 2017 program priorities with its existing laboratory buildings and infrastructure, using the requested funds to enable NIST to grow beyond current capabilities in each of the priority areas. The request will significantly increase NIST's level of competence in these critical areas, by partnering with experts and in some cases hiring new full time employees. In some of these program areas, for example the largest requested increase in future computing technologies, the new funds will also allow NIST to purchase technical equipment required to accomplish the program goals described in the President's Budget Request. This growth can be accommodated in the existing buildings on the NIST campus.

Question #20: The fiscal year 2017 request includes a \$40.5 million increase for the Scientific and Technical Research Services (STRS) account.

- a. What are the priorities for the proposed STRS increase? How would NIST plan to use the additional \$40.5 million it has requested?**

Answer:

The NIST STRS account supports the work of the NIST Laboratory programs, a broadly diverse research organization that plays an important role within the nation's innovation infrastructure. NIST research in advanced measurement science, and work in standards help U.S. industry manufacture superior products and to provide services more reliably. Besides helping enable innovation and efficient trade, NIST's measurement science research impacts the daily well-being of our citizens. The quality of the water we drink, the air we breathe, and the food we eat depends in part on that work. NIST measurement technologies and processes ensure that consumers are confident of the quantity and quality of the product purchased, whether it is a gallon of gasoline or the amount of electricity used and stated in the monthly bill. They protect our banking at ATMs and our online purchases. They improve the accuracy of our medical tests and treatments and help to make sure that we know the nutritional content of what we are eating. They help to convict criminals and free the innocent through more accurate and faster DNA tests. They provide crucial timekeeping that we depend upon for navigation, telecommunications, financial transactions, and basic research. Lastly, they improve the equipment and tools used by first responders and homeland security. The President's FY2017 budget request recognizes the important role of the NIST laboratory programs and contained a request of \$730.5 million in FY2017, which is \$40.5 million above FY 2016 funding levels.

As was outlined in the budget request, the written testimony, and explained to Committee staff through in person briefings, the \$40.5 million increase in STRS funds over the FY 2016 appropriated budget will be used in the following manner:

\$26.4 million will support 6 new initiatives:

- \$13.6 million will support NIST measurement science research focused on future computing technologies and applications in support of the National Strategic Computing Initiative. With these funds NIST will support the development of measurement science, standards, tools and technologies to advance new computing paradigms. This includes measurements so fast that they can watch a single computer switch as it switches. NIST will develop, test, prototype, and benchmark potential types of logic, memory, and storage device concepts that are likely to become integral to a future "exascale" machine. In addition, NIST will develop frameworks for uncertainty quantification in scientific computing and for calibration of modeling and simulation. These will help increase the capacity and capability of an enduring national high-performance computing ecosystem.
- \$2 million will support increased NIST activities focused on developing advanced sensing technologies needed for advanced manufacturing. The new funds will accelerate research efforts targeting the development of advanced sensors needed to support the manufacture of advanced electronics and nanoengineered devices. With this increase, NIST will develop in-process imaging and analysis to enable improved process performance, quality control, and optimization.

- \$2 million will support additional NIST work in the area of engineering biology and biomanufacturing. The work enabled by this new funding will ensure quality and predictability in the design of synthetic biological systems for efficient production of fuels, chemicals, pharmaceuticals, and medical therapies. This funding increase addresses the technical challenges facing the biomanufacturing industry by developing a suite of quantitative methods for accurate measurement of biological systems, creating the necessary tools to methodically design and test engineered organisms, and, by engaging relevant stakeholders, developing and evaluating predictive models. While data generation is important, assessing the data quality is equally critical. Therefore, NIST will develop methods for data validation, including relevant reference data and standards.
- \$2 million will support increased NIST efforts in the area of advanced communications. Specifically, with the new funds NIST will develop the measurement science and tools necessary to improve spectrum sharing and increase spectrum efficiency of commercial wireless radio-frequency communication systems. This investment will accelerate the deployment of future wireless communications systems.
- \$4.8 million is requested to procure additional fuel for the NIST Center for Neutron Research (NCNR), one the nation's premier scientific user facilities. NCNR is the only neutron facility in the U.S. with a focus on enhancing industrial competitiveness. It is therefore essential to U.S. industry, and the long-term economic growth of the U.S., that the NCNR is optimally equipped to provide state-of-the-art measurement tools to the U.S. scientific and engineering community. The NCNR operates 24 hours a day, seven days a week for approximately 250 days of the year to support experiments by over 2,000 research participants annually.
- \$2 million will be used to expand federal technology transfer activities under the Lab to Market Initiative. With this funding, NIST will lead the development of infrastructures for information sharing, data dissemination, and increase collaborations to address national priorities and enhance business competitiveness. This initiative will strengthen NIST and Federal Technology Transfer activities. NIST will work with the Federal Laboratory Consortium (FLC) and offices within the Executive Office of the President (EOP) in the development of digital platforms to enhance cross-agency collaborations on technology transfer and development.

The remaining \$14.1 million will be used to address increased inflationary costs (labor, utilities, etc.) and to cover additional shared service investments within the DOC Working Capital Fund including network security initiatives and replacement of degrading IT infrastructure.

Question #21: What is the status of the three joint research institutes, or Centers of Excellence?**Answer:**

NIST has three operational Centers of Excellence, each targeting a different technical focus area. In order of their establishment they are: The Center for Hierarchical Materials Design (CHiMaD), the Center for Risk-Based Community Resilience Planning, and the Center for Statistics and Applications in Forensic Science (csafe). For details, see <http://www.nist.gov/coe/>. Each is functioning effectively, generating new knowledge and research collaborations in each of the three respective areas. NIST has ongoing and close interaction with the centers.

a. What direction does NIST plan to take these institutes in 2017?**Answer:**

There are ongoing discussions between center members and NIST about the current and future research directions of each center. For example:

- CHiMaD held its second annual meeting at headquarters on the Northwestern University Campus in March 2016, reporting on progress in a number of use case projects that involve NIST researchers working together with scientists and engineers affiliated with the CHiMaD partners.
- The community resilience center of excellence held a gathering of all members in November 2015 in Gaithersburg, MD, and is holding the next meeting at the end of April in Fort Collins, CO where the lead institute for the center, Colorado State University, is located.
- The forensic science center, csafe, held a kickoff event at Iowa State University in October 2015. The csafe members gathered on the NIST campus in Gaithersburg, MD in January 2016 to further develop relationships with NIST staff and advance the research directions of the center.

b. Does NIST plan to establish additional joint institutes to enable innovation in other specialized areas?**Answer:**

At this time NIST has no plans to establish additional institutes. The 3 existing institutes described above will be evaluated near the end of their initial 5-year award to determine whether to extend those awards for an additional 5 years, or whether to establish a Center in a new topic area of importance to NIST.

Representative Eddie Bernice Johnson, Ranking Member, Committee on Science, Space, and Technology

Question #1: I was pleased to see the increase in the budget for supporting engineering biology and biomanufacturing. In your testimony, you describe efforts that would ensure quality and predictability in the design of engineered biological systems for producing fuels, chemicals, pharmaceuticals, and medical therapies. These efforts are aligned with the guidance in H.R. 591, the *Engineering Biology Research and Development Act of 2015*, introduced by myself and Mr. Sensenbrenner. Could you please expand on NIST's efforts in biomanufacturing and how these activities will help the nation attain the benefits of the engineering biology?

Answer:

NIST has leveraged our expertise in the quantitative physical sciences to provide the measurement infrastructure to underpin innovation in the biosciences by strengthening our partnerships, growing our in-house capabilities in interdisciplinary bio-related fields, and engaging our federal and private partners in biotechnology and biomedicine. We perform cutting edge measurement science research to support better measurements and we develop the highest quality measurement science and standards for confidence in biological data.

In biomanufacturing, NIST has established a program to support the US biopharmaceutical industry's delivery of high quality protein drugs around the world. We develop standards, measurement science, and state of the art tools that support advances in development, characterization and manufacturing of protein drugs and biosimilars (generic versions). The program was developed through close working relationships with members of the US biopharmaceutical industry, the FDA and international standards organizations (i.e. NIBSC, USP) to assess and authenticate current unmet and future measurement needs related to the manufacturing of protein drugs.

NIST is working to connect the tools for designing, measuring, and testing synthesized biological systems with predictive testable models. NIST is doing this by strategically growing its engineering biology program with the goal of harnessing the power of biological systems for a variety of manufacturing applications including advanced therapeutics, sustainable fuels, feedstocks, and advanced materials. The technologies for designing organisms with specific functions are advancing rapidly, and assuring that the organism produced is designed as intended is critical. Also, currently much of the design of biological systems is done through trial-and-error, which is costly and inefficient. Improved fundamental understanding of cellular control mechanisms will enable greater predictability of the impact of genetic modifications, but will also require precise and relevant data, based on sound measurement strategies. The principles arising from this data/theory pipeline will drive understanding of the fundamental regulatory systems of biological organisms and will advance engineering biology.

Question #2: A few years ago, this Administration took the very important step of developing a partnership between the Department of Justice and NIST in order to strengthen the scientific basis for forensic evidence presented in courtrooms around the country. This effort was in part a response to the 2009 National Academies report on the status of forensic science. The report's conclusions have been validated time and time again as significant and widespread cases of improper forensic science and forensic testimony have been uncovered.

- **What is the status of your partnership with DOJ?**

Answer:

NIST has had a Memorandum of Understanding (MOU) with DOJ since February 2013 that recognizes and addresses the responsibility and expertise of the two agencies to provide national leadership in the Federal government's role in strengthening the practice of forensic science. The MOU provided the foundation for the creation of the DOJ-Federal Advisory Committee known as the National Commission on Forensic Science and the NIST-administered Organization of Scientific Area Committees (OSAC). Although the current version of the MOU is set to expire in April 2017, DOJ and NIST will continue to work together for the foreseeable future, because both agencies are committed to bringing their perspectives, experience and expertise to the critical effort of strengthening forensic science.

- **What is the status of your efforts to lead the development of voluntary consensus standards for forensic evidence through the organization of Scientific Area Committees, or O-SAC?**

Answer:

The OSAC organization was created in 2014 and populated with 542 members from the stakeholder community, including forensic science service providers, academic researchers, quality managers, and members of the legal community. OSAC efforts in 2015 have involved coordination of this large and diverse organization, beginning the vetting process of existing documentary standards, identifying gaps in standards, and starting the process of drafting new standards to meet the needs of stakeholders. A monthly OSAC newsletter was begun in August 2015 to inform members of the OSAC community and other interested parties about progress being made. In March 2016, the first document placed on the OSAC Registry of Approved Standards – an existing document regarding seized drug analysis – was the subject of some concerns to NIST, based on its own extensive experience in documentary standards. NIST is working with OSAC leadership to learn from that process and to strengthen the approach to populating the registry, so that the OSAC Registry of Approved Standards can become be a valuable and trusted resource of information to help move the forensic science community forward on a solid scientific foundation.

Question #3: I was very concerned to learn that a NIST police officer was arrested, charged, and sentenced to prison for attempting to make methamphetamine in a NIST building on the Gaithersburg campus.

- **What has NIST learned from that incident?**

Answer:

Unfortunately, a situation in which a trusted and fully vetted employee in a position of responsibility violates that trust is exceedingly difficult to anticipate and among the most difficult threats faced by the private and public sectors. But this experience underscores the value of a prompt and active response in addressing head-on the lessons of this violation of trust. Following the July 18, 2015, incident, the NIST Director mandated an immediate review with NIST research managers to ensure that current protocols were being uniformly implemented to ensure appropriate use and security of laboratory spaces. Unlike the laboratory spaces in Building 236, the great majority of NIST laboratory spaces are in active use daily. NIST holds regular safety inspections and requires hazard reviews for every approved activity in every laboratory.

NIST also conducted an internal review of actions taken in the immediate aftermath of the explosion. While the response was generally handled effectively, and even courageously, by NIST first-responders, NIST has identified some opportunities for improvement and has taken actions to address these. Specifically, we have reinforced that the NIST Dispatch Center performs as a focal point for all security and emergency notifications and response efforts. To support this expanded role, we are increasing Dispatch Center staffing to two personnel on duty during peak hours and are improving our quick reaction checklists. We have also installed four surveillance cameras at Building 236, with three providing external views and one located at the entrance to the building.

- **Has NIST conducted any security reviews of the campus in the wake of this incident?**

Answer:

Yes. In addition to our own internal review, the NIST Director asked three external security experts to conduct independent, individual reviews of NIST's security posture, including its staffing, processes, policies and procedures. These experts offered observations and suggestions for consideration by the NIST Director. Their feedback was shared with the Department of Commerce Security Director and is currently being reviewed and validated. In addition, in September, the Department and NIST were notified of a Federal Protective Service (FPS) audit, conducted in conjunction with the FPS law enforcement authority delegation to the Department for security on the NIST campuses. This audit took place from Nov 2015 – Jan 2016, and the Department received the audit results on 25 March, 2016. The audit results, independent security reviews and the internal review conducted, are all under active consideration by NIST and the Department as we formulate an action plan to address key opportunities to improve NIST's security.

- **If so, what, if any, new policies have or will be implemented to strengthen security at NIST?**

Answer:

Even prior to the explosion incident, NIST had begun taking steps to enhance campus security, working closely with the Department's Office of Security (OSY). At the recommendation of OSY, a new NIST Security Director position was created and filled in July 2014. The Security Director is an OSY employee, funded by NIST, hired to assist with the transition of police services from NIST to OSY and to assume operational control for the Police Services Group and contract security operations once transferred. This transfer took place formally in November 2015.

A contract for security guard services is in place in both Boulder and Gaithersburg. This contract incorporates current Interagency Security Committee (ISC) and FPS contract security standards and enables us to balance the policing and security functions at both campuses. Following the July 2015 incident, the NIST Security Director implemented enhanced patrol staffing requirements to ensure that at least two patrols and a supervisor are assigned each day. Acknowledging the need for improvements in training and qualification of both the police and contract security staff, OSY worked with NIST to hire a dedicated training manager. This position has recently been filled and will result in the tracking and oversight of critical program training requirements.

We are in the process of reorganizing our security and emergency services, as recommended by the external security reviewers, and are evaluating other recommendations along with other inputs as we make necessary changes to strengthen NIST's security posture.

In the immediate term, we funding several new security activities in Gaithersburg, including a pilot program to determine which advanced locking solution or solutions will best enhance the protection of our laboratories, upgrades to the physical access control system (PACS) server, and a study of how best to enhance security screening at the Gaithersburg main entrance/visitors center.

The NIST Director has directed the establishment of a Security Advisory Council to execute his vision for maintaining a collegial atmosphere conducive to research, while ensuring the safety and security of both campuses, and to provide advice and input to both OSY and the NIST Security Director on the implementation of security policy and procedures. The NIST Security Director, with support from the Council, will be tasked with developing a five-year security management strategy/sustainment plan (FY17-21). The Security Director will also develop a long range business plan (5 years) that identifies the capital investments necessary to sustain and improve the NIST security infrastructure. This will include a comprehensive life cycle management plan/program for security programs and systems and the necessary funding to execute it.