

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

HEARING CHARTER

***NIST's FY 2009 Budget Request: What Are the Right Technology Investments to
Promote US Innovation and Competitiveness?***

**Tuesday, March 11, 2008
2:00 p.m. – 4:00 p.m.
2318 Rayburn House Office Building**

1. Purpose

On Tuesday, March 11, 2008, the Technology and Innovation Subcommittee of the House Committee on Science and Technology will hold a hearing to consider the President's fiscal year 2009 (FY09) budget request for the National Institute of Standards and Technology (NIST). An Administration witness will review the proposed budget in the context of the President's overall priorities for NIST. In addition, there will be four witnesses who will comment on the budget request, NIST's strategic plans, and the future direction of the agency.

2. Witnesses

Dr. James Turner, Acting Director
National Institute of Standards and Technology

Dr. James Serum, Chairman
NIST Visiting Committee on Advanced Technology

Dr. Mary Good, Founding Dean
George W. Donaghey College of Engineering and Information Technology
University of Arkansas at Little Rock, Little Rock, AR

Dr. Peter Fiske, Vice President for Research and Development
PAX Scientific, Inc.

Mr. Michael Coast, President
Michigan Manufacturing Technology Center
Chairman of the Board, American Small Manufacturers Coalition

3. NIST Overview

The National Institute of Standards and Technology (NIST) is a non-regulatory agency of the Department of Commerce. Founded in 1901, NIST's mission is to promote US

innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. NIST helps U.S. industry, workers, and consumers by ensuring that technical standards are used in a way that creates a level playing field for global trade, rather than a barrier to commerce.

NIST operates research facilities at Gaithersburg, MD, and Boulder, CO, and radio stations located at Kauai, HI, and Fort Collins, CO. NIST has partnerships with and personnel located at the Hollings Marine Labs in Charleston, SC, the JILA joint institute in Boulder, CO (operated jointly with the University of Colorado), and the Center for Advanced Research in Biotechnology (CARB) in Rockville, MD (operated jointly with the University of Maryland).

NIST employs approximately 2,800 scientists, engineers, technicians, and support personnel. NIST also hosts approximately 2,600 research associates and facility users from academia, industry, and other government laboratories. NIST partners with about 1,600 manufacturing specialists and staff at affiliated centers around the country. In recent years, NIST staff members have earned three Nobel Prizes, the National Medal of Science, a MacArthur Fellowship, the L'Oréal-UNESCO Women in Science Award, and numerous other honors.

NIST operates four major cooperative programs to carry out its mission:

- **NIST laboratories and user facilities.** NIST's internal laboratories conduct basic and applied research in a wide array of fields to support the U.S. technology infrastructure. This research focuses on developing tools to measure, evaluate and standardize, which enable U.S. companies to innovate and remain competitive. NIST's user facilities provide industry, academic and government researchers with access to advanced technical equipment for research and development.
- **Baldrige National Quality Program.** The Baldrige program promotes excellence among U.S manufacturers, service companies, educational institutions, health care providers, and non-profit organizations by conducting outreach programs and managing the annual Malcolm Baldrige National Quality Award recognizing performance excellence and quality.
- **Manufacturing Extension Partnership.** The MEP program offers services in business and process improvements to modernize the operations of small- and medium-sized manufacturers and enhance their competitiveness. MEP distributes its services through a nationwide network of local centers in all 50 states and Puerto Rico, which receive equal funding from federal sources, state and local sources, and fees charged for services.
- **Technology Innovation Program.** The TIP (formerly the Advanced Technology Program) supports and accelerates the development of high-risk, innovative

technologies that promise broad benefits for the nation by awarding cost-shared grants to small- and medium-sized companies, and to joint ventures between industry, academia, non-profit research institutes and national laboratories.

NIST Legislative Background

On April 17, 2007, Reps. David Wu and Phil Gingrey introduced H.R. 1868, the Technology Innovation and Manufacturing Stimulation Act of 2007, with bipartisan cosponsorship. H.R. 1868 authorized appropriations for NIST's programs in fiscal years 2008 through 2010 (see Table 1). The authorization levels placed the overall NIST budget on a ten-year path to doubling. Within this envelope, the bill doubled NIST's laboratories over ten years, doubled the Manufacturing Extension Partnership (MEP) over ten years, replaced the Advanced Technology Program (ATP) with the Technology Innovation Program (TIP) and provided funding for \$40 million in new TIP awards per year, and funded the completion of existing laboratory construction projects.

H.R. 1868 also required NIST to deliver a 3-year programmatic planning document to Congress with the annual budget request. This document must address all of NIST's programs. NIST's external industrial advisory committee, the Visiting Committee on Advanced Technology (VCAT), is directed to comment on the document in its annual report.

H.R. 1868 was reported unanimously by the Committee on Science and Technology on April 30 and passed the House on May 3 by a vote of 385-23. It was subsequently incorporated into H.R. 2272, the America COMPETES Act (P.L. 110-69), which became law on August 9, 2007.

NIST Program Details

The **NIST laboratories** are comprised of seven labs and a technical program, and are funded under the Scientific and Technical Research and Services (STRS) account.

- **Building and Fire Research Laboratory (BFRL)** works to improve quality and productivity in the U.S. construction industry and reduce loss of life and property damage from fires, earthquakes, wind, and other hazards, by studying building materials and fire safety engineering.
- **Chemical Science and Technology Laboratory (CSTL)** conducts research in measurement science and develops the chemical, biochemical, and chemical engineering measurements, data, models, and reference standards necessary for enhancing the competitiveness of the U.S. chemical industry, and improving public health, safety and environmental quality.
- **Electronics and Electrical Engineering Laboratory (EEEL)** provides the technical basis for all electrical measurements in the U.S.
- **Information Technology Laboratory (ITL)** conducts research and develops test methods and standards for emerging and rapidly changing information

technologies, focusing on technologies that will improve the usability, reliability and security of computers and computer networks for work and home use.

- **Manufacturing Engineering Laboratory (MEL)** develops measurement methods, standards and technologies to enhance U.S. manufacturing capabilities and to improve manufacturing efficiency and productivity.
- **Materials Science and Engineering Laboratory (MSEL)** researches materials that are needed by industry sectors including microelectronics, automobiles, and healthcare.
- **Physics Laboratory (PL)** provides measurement services and research for electronic, optical, atomic and radiation technology. PL also maintains the NIST F-1 atomic clock, the primary frequency standard in the United States.
- **Technology Services (TS)** provides support for NIST programs to calibrate industry equipment, to sell standard reference materials, to train foreign technical standards officials, to accredit private testing laboratories, and other technical standards services.

In addition, the STRS account funds the Baldrige National Quality Program (described above) and NIST's two national research facilities.

- **NIST Center for Neutron Research (NCNR)** provides facilities for outside researchers to study the structure and dynamics of a wide range of materials. This facility is used heavily by industry. In fiscal year 2007, researchers from 59 U.S. companies, 40 national labs, and 137 U.S. universities conducted research at the facility in collaboration with NIST staff.
- **Center for Nanoscale Science and Technology (CNST)** leverages the unique capabilities of the NIST Advanced Measurement Laboratory complex, providing state-of-the-art facilities for nanomanufacturing and nanometrology where industry, universities, and other federal laboratories can collaborate in solving critical measurement and fabrication issues that are necessary to convert nanoscale science and technology research into usable commercial products.

NIST also manages two programs that support small businesses, which are funded under the Industrial Technology Services (ITS) account.

- The **Manufacturing Extension Partnership (MEP)** is the only federal program that specifically targets small- and medium-sized manufacturers to help them modernize their operations, improve their competitiveness, and reduce or reverse job losses. A proven public/private partnership, MEP operates a network of 59 centers in all 50 states and Puerto Rico, whose mission is to improve the competitiveness of small and medium-sized manufacturers. The centers are funded through equal contributions from federal sources, state and local sources, and fees for service. Clients who used MEP services in fiscal year 2006 reported that they created or retained over 52,000 jobs, increased or retained sales of \$6.8 billion, leveraged \$1.7 billion in new private-sector investment, and generated cost savings of \$1.1 billion.

- The **Technology Innovation Program (TIP)** was created by the America COMPETES Act (P.L. 110-69) to replace the **Advanced Technology Program (ATP)**. TIP's purpose is to support, promote, and accelerate innovation in the United States through high-risk, high-reward research in areas of critical national need. Through private/public partnerships, TIP's early-stage investments will accelerate the development of high-risk, broadly enabling technologies and help bridge the gap between the laboratory and the market place. Through September 2007, TIP's predecessor, ATP, co-funded 824 projects with 1,581 participants. Eighty percent of single-applicant ATP awards were made to small businesses (fewer than 500 employees) while more than 170 different colleges and universities have participated in ATP projects. Benefit-cost studies from approximately 40 projects indicate an 8 to 1 return on investment. The 56 ATP grants awarded in the final round of the program's existence (September 2007) will be continued to completion under TIP.

NIST Strategic Planning Documents

The America COMPETES Act created a requirement for NIST to deliver a 3-year programmatic planning document to the Congress at the time of the submission of the President's budget. This document is to address NIST's programs under the Scientific and Technical Research and Services, Construction of Research Facilities, and Industrial Technology Services accounts. The Act also requires the NIST Visiting Committee on Advanced Technology (VCAT, a FACA advisory committee) to comment on the document. NIST delivered the first iteration of this document in February 2008.

NIST previously developed the *NIST 2010 Strategic Plan*, released in its final form in June 2004, which outlined strategic drivers, NIST responses to these drivers, and potential impacts on the economy. The plan included technical areas of importance for NIST investments, and strategies that would be pursued by all of NIST's programs to achieve its overall mission.

In August 2006, NIST released *An Assessment of the United States Measurement System: Addressing Measurement Barriers to Accelerate Innovation*, which identified gaps in measurement technology and standards through a process of stakeholder discussions and workshops. This document included high-level judgments on where measurement technology gaps are impeding innovation in specific technology areas, and included a discussion of possible NIST responses to these gaps.

NIST Budget Summary

The enacted, COMPETES-authorized, and requested levels for FY07 to FY09 are summarized in the table below.

Table 1. NIST FY07 - FY09 Budget.

\$ millions Budget line	FY07 Enacted	FY08 Request	FY08 Auth.	FY08 Enacted	FY09 Auth.	FY09 Request	FY09 Request v. Auth.	FY09 Request v. Auth. %
STRS	434.3	500.5	502.1	440.5	541.9	535.0	-6.9	-1.3%
Construction	48.3	93.9	150.9	160.5	86.4	99.0	+12.6	+14.6%
ATP/TIP	79.0	0.0	100.0	65.2	131.5	0.0	-131.5	-100%
MEP	104.6	46.3	110.0	89.6	122.0	4.0	-118.0	-96.7%
Total	666.2	640.7	863.0	755.8	881.8	638.0	-243.8	-27.6%

Figures may not add due to rounding.

Figures do not include funds transferred from other agencies or fees for calibration and other services.

Authorization figures are from the America COMPETES Act (P.L. 110-69).

STRS: Scientific and Technical Research and Services (includes NIST laboratories, Technical Services, National Research Facilities, and the Baldrige National Quality Program).

ITS: Industrial Technology Services

TIP/ATP: Technology Innovation Program/Advanced Technology Program

MEP: Manufacturing Extension Partnership

4. NIST Budget Highlights

NIST's Laboratory Programs

The FY09 budget requests \$638 million for NIST, \$243.8 million (27.6 percent) lower than the amount authorized in COMPETES and \$117.8 million (15.6 percent) lower than the FY08 enacted amount. The request comes close to the authorized level for NIST's laboratories and user facilities, proposing a number of new research initiatives in cybersecurity, biotechnology, nanotechnology, and other areas. However, it eliminates all funding for the Technology Innovation Program (TIP), and provides only nominal funds for the Manufacturing Extension Partnership (MEP) program to cover the costs of eliminating federal support. The request includes construction funds for several laboratory facility upgrades that total \$12.6 million (14.6 percent) above the authorized level.

The increase in laboratory programs and user facilities account (STRS) for FY09 includes 14 new research initiatives, ten of which are carried over from the FY08 request.

- **Environment, Health and Safety Measurements and Standards for Nanotechnology** (requested increase of \$12 million, new in FY09) will provide standards and characterization methods to enable the assessment of the potential environmental, health and safety impacts of nanotechnology.
- **Measurement and Standards to Accelerate Innovation in the Biosciences** (requested increase of \$10 million, new in FY09) will expand NIST's work in the biosciences, with a focus on developing measurement technologies, standards,

and data to enable faster and more efficient research and development by the biotechnology and pharmaceutical industry.

- **Cyber Security: Leap-Ahead Security Technologies for Interconnected Systems** (requested increase of \$5 million, new in FY09) will expand NIST's work in computer security. This initiative is part of the multi-agency Comprehensive National Cybersecurity Initiative.
- **Going at Light Speed: Optical Communications and Computing** (requested increase of \$5.84 million, new in FY09) will accelerate the adoption of high-speed networks by developing methods for diagnosing faults in optical networks.
- **NIST Center for Neutron Research Expansion and Reliability Improvements** (requested increase of \$2 million, continued from FY08) will enable the installation of instruments at the upgraded NCNR neutron source.
- **Enabling Nanotechnology from Discovery to Manufacture** (requested increase of \$7 million, continued from FY08) aims to advance scientific understanding of engineered nanotechnology materials and help US industry develop manufacturing technologies for these materials. This initiative is a component of the National Nanotechnology Initiative (NNI).
- **Quantum Information Science** (requested increase of \$7 million, continued from FY08) will increase NIST's research in high-risk quantum technologies, including nanoscale electronics and new kinds of computer memory devices.
- **Measurements and Standards for the Climate Change Science Program** (requested increase of \$5 million, continued from FY08) will enhance the NIST component of the multi-agency U.S. Climate Change Science Program (CCSP) to study the climate-relevant properties of aerosols and develop methods for improving satellite measurements of the sun.
- **Innovations in Measurement Science** (requested increase of \$3 million, continued from FY08) allows NIST to pursue the development high-risk, high-reward technology to improve the precision of a variety of measurement tools.
- **National Earthquake Hazards Reduction Program Initiative** (requested increase of \$3.25 million, continued from FY08) will fund research into technologies for retrofitting or otherwise protecting buildings against earthquake damage. NIST is the lead agency of the multi-agency NEHRP program.
- **Disaster Resilient Structures and Communities** (requested increase of \$4 million, continued from FY08) will develop technologies for improving the resilience of structures and communities to natural disasters such as fires, wind storms and tsunamis. NIST will conduct this work in partnership with NOAA, FEMA, and insurance industry organizations.
- **Enabling the Hydrogen Economy** (requested increase of \$4 million, continued from FY08) will fund research into fuel-cell design and high-volume manufacturing by developing technologies for measuring hydrogen fuel cell performance and hydrogen transportation.
- **Biometrics: Identifying Friend or Foe** (requested increase of \$2 million, continued from FY08) will develop technologies and standards for testing and evaluating biometric identification systems, in partnership with DHS, the FBI, and the State Department.

- **Manufacturing Innovation through Supply Chain Integration** (requested increase of \$1 million, continued from FY08) will expand NIST's efforts to move industry towards seamless global supply chains by developing open manufacturing standards, measurements, and testing tools.

The FY09 request for the construction and maintenance account (CRF) includes funds for two major construction projects and an increase to the maintenance funds for NIST facilities.

- **Boulder Building 1 Extension** (requesting \$43.5 million) is the final year of requested funding for the construction of a new laboratory building on the Boulder campus with high-performance facilities.
- **JILA Expansion: Preparing the Next Generation of Physicists** (requesting \$13 million) is the first year of funding requested to expand laboratories at the JILA joint institute operated by NIST and the University of Colorado. The expansion will allow JILA to expand its research capabilities in atomic, molecular and optical physics and train 30 percent more students in these fields.
- **Safety, Capacity, Maintenance, and Major Repairs (SCMMR) Increase** (requesting increase of \$5.15 million) will permanently increase the NIST budget for maintenance and repair of laboratory facilities. NIST uses the SCMMR account to modernize aging infrastructure and repair damage to its buildings.

The FY09 request for the industrial technology services account (ITS) proposes elimination of both programs in the account.

- The **Technology Innovation Program (TIP)** (formerly the Advanced Technology Program, ATP): The FY09 budget request eliminates TIP, which was funded at \$65.2 million in FY08. Under the provisions of the COMPETES Act, TIP will continue to support the final round of ATP grants, awarded in 2007.
- The **Manufacturing Extension Partnership (MEP)**: The FY09 request for MEP is \$4 million to cover close-out costs. The budget proposes that MEP Centers become self-sustaining, as was intended in the original legislation that created the program. However, the Technology Administration Act of 1998 (P.L. 105-309) amended this original sunset provision, extending federal support for MEP Centers indefinitely so long as they receive a positive evaluation through an independent review.

5. Issues

- Does the 3-year programmatic planning document establish a good strategic plan for NIST?
- Does the FY09 budget request set the appropriate priorities to achieve NIST's mission of improving U.S. competitiveness?
- What stakeholder outreach did NIST conduct to develop its budget initiatives?

- What would be the impact on small manufacturers if federal support for MEP is eliminated?
- Is eliminating TIP a good idea in today's global innovative environment? Does a competitiveness initiative in the beginning of the 21st century make sense without programs like TIP?