

**Department of Commerce
National Institute of Standards and Technology
Three Year Programmatic Plan**

Introduction

The America COMPETES Act outlines major roles for the Commerce Department’s National Institute of Standards and Technology (NIST) in promoting national competitiveness and innovation. The Act also calls for NIST to submit a three-year programmatic plan concurrent with the submission of the President’s budget request to Congress. This document is in response to that requirement and covers Fiscal Years 2010-2012. This document is a product of a still-evolving strategic program planning process at NIST, but is not intended to serve as a strategic plan. Rather it aims to summarize the focus, priorities and structure of the NIST programs over this three-year period. NIST will continue to refine this plan as it works with the Administration to address important national priorities and as it continues to improve its programmatic planning process.

NIST: Providing Tools Vital to U.S. Innovation and Competitiveness

NIST Mission

To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve the quality of life.

The NIST 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. Since 1901, NIST has been supplying the measurements and tools—from standardized high-precision gage blocks needed to manufacture interchangeable parts to the world’s most accurate atomic clock—to help American industry compete successfully through innovation. Over the last several decades, NIST has been assigned important new roles and responsibilities: competitive grants to foster development of promising, high-risk technologies; diffusion of advanced technologies and business practices to smaller manufacturers; and promotion of quality management methods in key sectors, including manufacturing, education, and health care. Old and new, all NIST programs support the nation’s vast innovation system.

As an experienced partner of industry and as the Federal research agency specifically focused on promoting U.S. economic competitiveness, NIST is well positioned to help American business and government succeed in the 21st century.

What We Do: Promote the Health and Vitality Of the U.S. Innovation Infrastructure

NIST carries out its mission through four major programs:

NIST Laboratories

For more than 100 years, NIST, a non-regulatory agency, has maintained the national standards of measurement, a role that the U.S. Constitution assigns to the Federal government to ensure fairness in the marketplace. Today, the NIST Laboratories address increasingly complex measurement challenges. For example, NIST develops measurements focusing on the very small—nanotechnology devices—and the very large—skyscrapers, develops methods for characterizing strands of DNA for forensic testing, and tests the performance of walk-through metal detectors such as those used at airports, among many other activities.

The high quality of NIST measurement science research is reflected in the award-winning work of NIST scientists and engineers for developing new measurement tools and techniques. An example of the impact and utility of NIST measurement research was given in a recent National Research Council report¹, which described a NIST-developed measurement tool aimed at furthering the development of hydrogen fuel cells as “*one of the most significant analytical advances in the membrane fuel cell field realized in decades.*”

NIST is the nation’s measurement laboratory, providing the United States with unmatched measurement capabilities and unique tools and facilities for measurement. The NIST Laboratories work at the frontiers of measurement science to ensure that the U.S. system of measurements is firmly grounded on a sound scientific and technical foundation. The measurement science research at NIST is foundational, interdisciplinary, and useful to all other science and engineering disciplines. The NIST Laboratories directly support U.S. innovation and industrial competitiveness by developing new measurement instruments and facilities to address new and critical measurement barriers to innovation, disseminating validated measurement methods and protocols, providing reference data and materials and calibration services to ensure that industry-performed measurements are traceable to NIST standards, and developing testing protocols and supporting laboratory accreditation programs for test laboratories. NIST works actively with other metrology institutes from around the world to ensure that the global market place is supported with sound measurements and standards based on the best science. NIST promotes the use of measurements based on the international system of units (SI).

The NIST Laboratories also support the development of the written standards and specifications that define the technical and performance requirements for most goods and services in the market place. These standards – often called *documentary standards* – are often developed collaboratively in the private market through an open, consensus-based process. NIST scientists and engineers lend their expertise to these standards development efforts in order to promote standards that are based on good science and to ensure that they are supported by effective

¹ NRC Review, *The Research Program of the FreedomCAR and Fuel Partnership*, 2005.

measurements and testing for conformity to the standards. In addition, NIST is designated under the National Technology Transfer Advancement Act as the coordinator for all federal agencies using documentary standards.

Technology Innovation Program

Launched in 2008, the Technology Innovation Program (TIP) was created by Congress under the America COMPETES Act to support innovative, high-risk, high-reward research in areas of critical national need where the government has a clear interest because of the magnitude of the problems and their importance to society. The merit-based competitive program funds cost-shared² R&D projects by single small or medium-sized businesses as well as joint ventures, which may include institutions of higher education, non-profit research institutes, national laboratories, government laboratories, and other organizations.

In its first competition, the program awarded in January 2009 nine cost-shared grants that will result in nearly \$90 million worth of research over five years. The funding will help stimulate efforts to develop advanced sensing technologies for timely, detailed monitoring and inspection of the structural health of the nation's public infrastructure: bridges, roadways, and utility systems.

Hollings Manufacturing Extension Partnership

Through partnerships between Federal and state governments and non-profit organizations, NIST's Hollings Manufacturing Extension Partnership—MEP—provides technical and business assistance to smaller manufacturers through a nationwide network in all 50 states and Puerto Rico. Field agents and special programs are helping manufacturers understand, adopt, and apply new technologies and business practices, as well as reap the benefits through increased productivity, better performance, cost savings, waste reduction, and, most important, creation and retention of manufacturing jobs.

Baldrige National Quality Program

The Baldrige Program promotes proven performance management practices to strengthen U.S. companies, educational organizations, and health care providers. The program promotes organizational excellence through education, outreach, and through an annual awards program. The program is recognized worldwide. More than 40 states and over 80 countries participate in programs modeled after the Baldrige Program. The heart of the program—the Baldrige criteria—have been requested or downloaded millions of times, and in the view of one chief executive is “*probably the single most influential document in the modern history of American business.*”³

The Baldrige Award is given to organizations in six categories: manufacturing, service, small business, health care, education, and nonprofit. The recent addition of health care and education has invigorated performance improvement efforts in sectors that are especially important to the nation's economic performance and to the quality of life enjoyed by U.S. citizens.

Addressing National Priorities

² TIP funds no more than 50% of the total project direct costs, but not indirect costs (such as overhead), profits, or management fees.

³ Gordon Black, chairman and chief executive officer of Harris/Black International Ltd

Technological innovation drives economic growth, sustains U.S. competitiveness in the global economy, and supplies solutions to critical national needs and global challenges. “Economic studies conducted even before the information-technology revolution has shown that as much as 85% of measured growth in US income per capita was due to technological change.”⁴ NIST programs support and enhance the nation’s innovative capacity, and help to promote an effective marketplace for new technological innovations—new applications and capabilities—by ensuring sound, science-based measurements and standards.

With a more than century-long tradition of collaborating with industry and supplying essential measurement know-how and tools to businesses, universities, and government agencies, NIST is a proven partner strategically positioned to help the nation improve its innovation performance and address urgent national priorities. The America COMPETES Act recognizes that superior innovation performance has been the primary source of our nation’s competitive advantage in the global economy. It also recognizes that NIST is a key component of the nation’s innovation infrastructure and outlines major roles for NIST in promoting national competitiveness and innovation. Our mission, capabilities, and experience complement the President’s Agenda (<http://www.whitehouse.gov/agenda/>). NIST programs can help the nation’s public and private sectors respond efficiently to energy, environmental, and other challenges where scientific discoveries and technological advances can contribute significantly to solutions.

The breadth of technology in the U.S. economy results in a broad technical portfolio for NIST. The NIST programs must maintain technical leadership in measurement science, but must also respond effectively to the rapid pace of technological innovation. This combination poses a major challenge for NIST management. To meet this challenge, NIST is developing a robust, multi-year planning process to support program and budget development, and to effectively establish priorities to meet national priorities. Aiming to maximize the value and usefulness that NIST programs deliver to the nation, the agency’s planning process is guided by three major goals:

- To focus on our mission role to promote innovation and industrial competitiveness;
- To focus new NIST activities on national priorities; and
- To maximize the efficiency and effectiveness of NIST programs.

This planning process is still under development, and early emphasis has been placed on establishing an agency-wide planning framework to establish clear priorities for new major programs and to support budget development which is the focus of this 3-year programmatic planning document. NIST programs supported from our base budget are managed at the Operating Unit (OU) level (e.g., Physics Laboratory and the MEP are each an OU) and most decisions on specific projects and programs, including termination of less effective projects, or beginning new projects, are made at this level. The program and project management of NIST

⁴ *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Future*, Committee on Prospering in the Global Economy of the 21st Century: An Agenda for American Science and Technology, The National Academies, p. 1 (2007).

programs are routinely reviewed by NIST management and independently by assessment panels of external experts formed by the National Research Council.

Recent steps taken at NIST to strengthen our programmatic planning include:

- Established a set of broad strategic planning goals and program investment priority areas to guide the development of new programs and budget initiatives (the focus of this document).
- Established discretionary funding from the Director's Office through the creation of a Strategic and Emerging Research Initiative (SERI) to support the development of potential new program areas.
- Refocused the US Measurement System (USMS) process to support NIST programmatic planning by developing specific studies to assess critical measurement barriers in specific priority investment areas.

In this document, we detail the high level programmatic planning priorities for NIST and identify the investment priority areas we established for new programs. NIST developed these priorities after evaluating potential focus areas on the basis of the following criteria: addresses urgent and compelling national needs and priorities; demonstrates a compelling innovation or competitiveness issue; clearly matches NIST's mission and goals; represents previously identified NIST priorities that remain important; and is part of a coordinated national policy focus. National needs and priorities are identified in the President's Agenda (<http://www.whitehouse.gov/agenda/>). Senior NIST management and technical staff evaluated potential focus areas against these criteria to develop the final list. These planning objectives and investment priority areas were also discussed and reviewed by NIST's Visiting Committee on Advanced Technology.

NIST Programmatic Planning Priorities

NIST priorities at a Glance

With the aim of promoting U.S. innovation and industrial competitiveness, NIST has established four overarching priorities to guide and align investments in its programs:

- **Focus new activities on critical national priorities:**
 - Energy
 - Environment
 - Health Care
 - Information Technology
 - Manufacturing
 - Physical Infrastructure

- **Strengthen NIST's Laboratories and facilities to ensure U.S. leadership in measurement science and focus this capability on addressing key measurement barriers.**
 - Promote cutting-edge measurement research at the frontiers of science and technology.
 - Enhance the NIST facilities and equipment that enable cutting-edge research.
 - Improve strategic planning and responsiveness to stakeholders to optimize program effectiveness and efficiency.

- **Stabilize, fortify, and fully leverage the Technology Innovation Program, the Hollings Manufacturing Extension Partnership, and the Baldrige National Quality Program to promote innovation, industrial competitiveness, and sustainable economic growth.**

- **Maximize NIST's impact through effective collaboration and coordination.**
 - Expand collaboration with companies, universities, and states to leverage NIST capabilities and advance innovation at regional and national levels.
 - Enhance support of other Federal agencies in meeting U.S. Government needs for voluntary consensus standards.

Focus new NIST activities on critical national priorities

NIST has identified six areas where it can have the greatest impact in addressing national priorities:

Energy: Speed development of alternative, clean-energy sources, from production through storage to final distribution, with each stage posing special challenges.

- *Energy distribution:* Help ensure interoperability of Smart Grid devices and systems (as assigned in the 2007 Energy Independence and Security Act).
- *Energy efficiency:* Measurement research for advanced high-performance, net-zero energy buildings, energy-efficient lighting, and advanced, lightweight materials for higher-performing vehicles and other applications.
- *Enable and support new energy technologies:* Measurement research to enable and support new technologies for the efficient production, storage, and distribution of energy.

Environment: Promote efficient development of sustainable products and processes, from manufacturing to end consumer use, and help to establish the scientific measurement basis for accurate climate monitoring.

- *Sustainability:* Measurement science to accelerate sustainable product and building design and effective management and use of products over their life cycle.
- *Climate Mitigation:* Measurement science necessary to enable effective reduction of greenhouse-gas emissions.
- *Climate science:* Measurement science needed for near-term and long-term accurate and reliable monitoring of climate and greenhouse gases.

Health Care: Support nation-wide provision of lower-cost, higher quality health care.

- *Improved diagnosis and treatment:* Measurement science to enable the manufacture and effective use of advanced technologies that enable more accurate diagnoses, reduce medical errors, and improve the efficiency and effectiveness of therapies.
- *Health-care information systems:* Research and voluntary consensus standards to enable the development of health-care information systems that seamlessly and accurately share information among all health-care providers, ensure security and privacy of information, and support health-care providers in making more accurate diagnostic and therapeutic decisions.
- *Health-care management:* The Baldrige National Quality Program will research and promote best management practices in health-care organizations to reduce costs and improve effectiveness.

Information Technology: Help develop more capable, secure, and interoperable information systems to ensure U.S. leadership in information technology.

- *National cybersecurity program:* Measurement research to develop the tools, technologies, documentary standards, and support for policies needed to secure U.S. information systems against increasingly sophisticated threats.
- *Future of cybersecurity:* Research into future high-performance information technologies and applications, such as quantum information systems, complex systems, and networks to manage their impact on cybersecurity.

- *Broadband deployment:* Measurement research, physical standards, and voluntary consensus documentary standards to enable deployment of world-leading broadband internet systems throughout the nation.

Manufacturing: Improve the competitiveness of U.S. manufacturers through the development and deployment of new technologies and better business practices, to enhance the innovation of new products and improve competitiveness.

- *Support for manufacturers:* Expand the nationwide MEP delivery network to help U.S. smaller manufacturers succeed with new technologies, including green, sustainable manufacturing processes, faster and easier introduction of innovative manufacturing processes and products, and development of a 21st century U.S. manufacturing workforce prepared to succeed.
- *Advanced manufacturing:* Measurement science to overcome barriers to successful nanomanufacturing, biomanufacturing, and other advanced manufacturing technologies.
- *Advanced Materials:* As part of its 2009 competition the Technology Innovation Program will make awards to promote the utilization of advanced materials in manufacturing.
- *Manufacturing efficiency:* Measurement research to improve sustainable manufacturing processes, and to ensure interoperability of manufacturing information and control systems to reduce costs and improve efficiency.

Physical Infrastructure: Strengthen the nation's transportation systems (bridges, roads, tunnels, etc.), utilities (water, electric, natural gas, etc.), and buildings.

- *Infrastructure monitoring and improvement:* Measurement research and sensor technologies to more accurately and cost-effectively assess the status of physical infrastructure and to improve its long-term performance and reliability.
- *Resilient and sustainable structures:* Measurement research for construction products and processes that make buildings and other infrastructure more resistant to damage from disasters, and promote the use of sustainable materials and methods in their development.
- *Innovation of new infrastructure technologies:* As a result of its 2009 competition the Technology Innovation Program will make additional awards to develop new technologies in support of the nation's physical infrastructure challenges.

Strengthen and focus NIST's Laboratories and facilities to ensure U.S. leadership in measurement science and standards.

The strength and vitality of the NIST Laboratories are crucial to meeting the ever more complex and demanding measurement challenges associated with new technology. High-performing facilities, equipment, and personnel, combined with effective program planning and management, are crucial to NIST's efforts to build a world-class measurement infrastructure so that the United States remains the world's innovation leader.

Improve NIST facilities and equipment: State-of-the-art facilities, equipment, and infrastructure (including information systems) are essential to the capabilities of the NIST

Laboratories. NIST user facilities in neutron science and nanofabrication serve thousands of researchers each year from industry and universities, and NIST capabilities must be maintained at the highest levels to meet the increasingly stringent needs of their users. Obsolete facilities and equipment impact safety, limit NIST productivity, and hinder NIST's ability to meet the ever-more demanding measurement requirements of U.S. industry. NIST will prioritize efforts to improve and upgrade facilities and equipment to promote the capability, safety, and effectiveness of the laboratories.

Promote measurement research at the frontiers of science and technology: NIST leadership in measurement science research ensures that U.S. industry and universities will have the tools they need to remain at the leading edge of innovation and to secure “first-mover advantage” in bringing new technology to market. NIST will invest in high-risk, high-payoff projects that advance the state-of-the-art in measurement science and that focus measurement capability on critical measurement barriers.

Improve strategic planning and responsiveness to stakeholders to optimize effectiveness and efficiency: NIST is committed to improving strategic planning, increasing its responsiveness to stakeholders, ensuring efficient and effective execution of plans, and measuring program performance and impacts. NIST's continued attention to these matters will ensure that current and future programs are managed for maximum impact and efficiency and will better position the organization to address national needs.

Stabilize, fortify, and fully leverage NIST programs.

NIST's Technology Innovation Program, Hollings Manufacturing Extension Partnership Program, and Baldrige National Quality Program provide services and resources directly to researchers, businesses, manufacturers, health-care providers and other key stakeholders. NIST will strengthen these programs and align them with national needs to increase their impact and effectiveness.

Technology Innovation Program: This new program strives to galvanize private and public-sector innovation to address critical national needs with dramatic benefit to U.S. society. The inaugural competition of this merit-based program is focusing American innovation repairing the nation's deteriorating physical infrastructure. TIP's second competition is currently open and in addition to targeting the critical national need of physical infrastructure TIP will also be looking for proposals that support the utilization of advanced materials in manufacturing. NIST will pursue obtaining full and stable support for the new TIP so that this program can meet its full promise and have a significant impact on critical national needs in areas such as energy, the environment, health care, and other areas where technology breakthroughs can make a significant difference.

Hollings Manufacturing Extension Partnership: The national network of the Hollings Manufacturing Extension Partnership (MEP) connects U.S. manufacturers with Federal, state, and local organizations to promote this critical sector of our economy. Today, U.S. manufacturers face unprecedented challenges, and the MEP can provide critical technical and

business support to help them compete in the global marketplace. NIST plans to expand the program to create and retain more U.S. manufacturing jobs. MEP will develop new programs to help manufacturers adopt green and clean technologies, support manufacturers in deploying new technologies to improve productivity and competitiveness, and improve manufacturing workforce training. For more detailed information on the future strategic directions of MEP please see the plan, *The Future of the Hollings Manufacturing Extension Partnership* at http://www.mep.nist.gov/documents/pdf/about-mep/Next_Gen_MEP_Strategy.pdf.

Baldrige National Quality Program: NIST's Baldrige National Quality Program will continue to work closely with manufacturers, service companies, and educational, health-care and non-profit organizations to develop and disseminate proven best practices for management and operation, leading to companies that are more competitive and organizations that deliver better services. NIST plans to increase its focus on the health-care, education, and non-profit sectors. It also plans to exploit 20 years worth of best practice and quality-improvement data from the program to identify strategies and practices that are most likely to strengthen the innovation performance and competitiveness of U.S. companies and organizations.

Maximize NIST's impact through effective collaboration and coordination.

NIST will play a significant role in marshaling the collaborative responses required to meet the national and global challenges represented by its Investment Priority Areas: Energy, Environment, Information Technology, Health Care, Manufacturing, and Infrastructure. Leveraging its reputation for impartiality and technical expertise, its international standing, and decades of experience as an effective partner, NIST can build on its cooperative relationships with Federal agencies, industry, academia, state and local governments, other national laboratories, and international organizations. For example, about one quarter of the measurement science work under way in the NIST Laboratories involves direct collaborations with other Federal agencies seeking measurement expertise and capabilities in support of their missions.

NIST collaborates extensively with universities in both research and training. Examples include several highly successful joint institutes: JILA (with the University of Colorado), the Joint Quantum Institute (with the University of Maryland), Hollings Marine Laboratory (with NOAA's National Ocean Service, the Medical University of South Carolina, College of Charleston, and other organizations) and the Center for Advanced Research in Biotechnology (with the University of Maryland). In addition, NIST hosts more than 2,500 visiting researchers each year, and it is engaged in more than 100 Cooperative Research and Development Agreements, most with U.S. businesses and industrial organizations. NIST scientists and engineers also participate on nearly 1,000 documentary standards committees representing more than 100 standards developing organizations.

Success in addressing national priorities through innovation requires integrating the contributions of many different public and private organizations. NIST has a proven track record in initiating and sustaining effective collaboration and coordination.

Expand collaboration to leverage NIST capabilities and advance innovation at regional and national levels: NIST will continue to expand and strengthen its partnerships with industry,

academia, other Federal agencies, and state and local governments to enable innovation that will address the critical national priorities singled out in the NIST Investment Priority Areas. NIST will work closely with other Federal agencies to develop strategies to address national priorities where NIST can have a significant impact. NIST will focus a significant share of new resources on expanding and strengthening partnerships with industry, academia, and government (Federal, state, and local), and developing new partnerships. It also will expand efforts to increase access and improve the utility of two major user facilities that support national innovation efforts in materials science, nanotechnology, and other emerging technology areas: the NIST Center for Neutron Research and the NIST NanoFab, which houses advanced tools for making and measuring materials and devices with nanometer-scale structures.

Enhance support of other Federal agencies in meeting U.S. Government needs for voluntary consensus standards. The National Technology Transfer and Advancement Act (NTTAA) directs all Federal agencies to use voluntary consensus standards as a means of carrying out policy objectives and activities, and it directs NIST to coordinate the use of such standards by the agencies. Because Federal agencies are increasingly in need of documentary standards to meet their needs—in areas such as health-care information systems, interoperability of Smart Grid devices and systems, and delivery of secure and reliable broadband services to every community in America—NIST plans to strengthen its role under the NTTAA to enhance its support of these agencies. NIST will leverage its knowledge of the documentary standards arena to develop approaches to accelerate the development and adoption of voluntary consensus standards and to work with other agencies to identify and help to implement the best options.

Summary of NIST FY 2010-12 Budget Structure:

NIST budget planning and development for FY 2010 thru FY 2012 is focused on addressing the three planning priorities that have been described earlier in this document:

- Strengthening and focusing NIST Laboratories and facilities to assure U.S. leadership in measurement science.
- Focusing activities on critical national priorities
- Stabilizing, fortifying, and fully leveraging all NIST programs

NIST's FY 2010 budget request totals \$846.1 million. The request is designed to boost the nation's innovation capacity and long-term economic performance. It includes: an increase of \$48.4 million for three construction initiatives targeted at strengthening and improving the NIST labs and facilities, an increase of \$59.9 million for the NIST Laboratories to support 11 new initiatives targeting critical national priorities, and a combined request of \$194.6 million to stabilize and fortify the TIP and MEP.

The \$48.4 million for construction will support three facilities projects: 1) the initial renovation of Building 1 at NIST's Boulder, Colorado, campus (\$26,000,000), which will significantly improve productivity and enable new measurements and research to support emerging industry needs; 2) planning and design for the renovation of general purpose laboratories (GPLs) at NIST headquarters in Gaithersburg, Maryland, (\$14,400,000), which is a necessary step toward systematic renovation of obsolescent GPLs; and 3) NIST Center for Neutron Research Reliability Improvements (\$8,000,000) will fund construction fit-up costs associated with configuring and occupying the completed Guide Hall facility and Technical Support Buildings.

The \$60.4 million increase for laboratory research at NIST will focus directly on eliminating measurement-related barriers and other technical challenges relevant to critical national priorities in the following investment priority areas:

Energy

- Measurements and standards to support the accelerated deployment of an interoperable Smart Grid (\$5 M)
- Measurement science to support the development of advanced solar energy and storage devices (\$7.5M)
- Measurements for net-zero energy, high-performance green buildings (\$7M)

Environment/Climate Change

- Greenhouse Gas Emissions Measurements (\$7M)
- Physical and chemical characterization of nanoparticles to support nanotechnology environment, health and safety activities (\$3M)

Healthcare

- The development of measurement and validation protocols to support the implementation of a nationwide healthcare information infrastructure (\$5M)
- The development of measurements and standards to improve the efficacy and accuracy of clinical diagnostics and medical imaging (\$9M)

Physical Infrastructure

- The development of measurement tools and standardized data to enable more efficient and effective infrastructure remediation operations (\$4.5M)

Information Technology

- Measurements and standards necessary for the development and implementation of leap-ahead security technologies for interconnected systems (\$5.5M)
- Continued funding to support advances in quantum information science (\$1.5M)

NIST's FY 2010 request also includes \$5.4 million in funding to support advances in quantum-based measurements. These efforts are at the frontiers of science and technology and will be the sources of innovations in measurement science and technology for decades to come. This funding is part of NIST Strategic and Emerging Research Investment (SERI) fund, which provides the director with a flexible mechanism to focus additional support on promising areas of research and other emerging priorities. Potential target areas for NIST outyear research efforts can be seen in Table I.

FY 2010 seeks a total request of \$69.9 million for TIP an increase of \$4.6 million over 2009 levels. TIP supports collaborative high-risk, high-reward technology development projects that focus a critical mass of talent in industry, academia, and government to address important national challenges with clear technology needs. FY2010 funds will support new competitions in areas of critical national need and will be applied to any remaining mortgage commitments from prior year's competitions. TIP is evaluating options for potential new critical national need areas that might include areas such as energy, green chemistry, complex systems, or personalized medicine.

In FY2010 \$124.7 million is requested for *MEP*. These funds will expand the resources of the program to provide additional services to help small- and medium-sized manufacturers prevail against unprecedented overseas competition. With the requested funding MEP will be able to increase activities related to green manufacturing technologies and the acceleration of technology adoption and deployment by manufacturers. MEPs efforts in green manufacturing will focus on:

- Supporting Energy Efficient Production:
 - Work with manufacturers to reduce demand for water, electricity, and fuel, to reduce waste and contaminants of water, air and soil in the production process, and to incorporate green design in component parts.

- Analyze supply chains to identify opportunities for reducing the energy footprint at all tiers of the production process.
- Supporting Production of Renewable Energy:
 - Assist manufacturing companies (especially auto suppliers) in market diversification efforts, to transition from supplying declining industries to making components for growing industries such as renewable energy providers and medical devices.
 - Help renewable energy providers to identify new technologies from federal labs and universities (technology scouting) and new suppliers (supplier scouting) to assist them with increased production demands.

Table I. Potential NIST Research Efforts by IPA	
Investment Priority Area	Potential Research Areas for FY 2011-12
<i>Energy</i>	<ul style="list-style-type: none"> • Characterization of next generation biofuels • Nanoengineered materials for energy storage technologies • Materials research to improve vehicle energy efficiency
<i>Environment/Climate Change</i>	<ul style="list-style-type: none"> • Greenhouse Gas Emissions Measurements • Nanoparticle EHS measurements – environmental characterization • Remote monitoring of climate change
<i>Healthcare</i>	<ul style="list-style-type: none"> • Measurements to support biosimilar characterization and quality assurance • Measurements to support personalized medicine • Measurements to support food health and safety
<i>Information Technology</i>	<ul style="list-style-type: none"> • Cloud computing • Measurement science for complex information systems
<i>Manufacturing</i>	<ul style="list-style-type: none"> • Agile manufacturing • Nanomanufacturing • Biological manufacturing processes • Green manufacturing processes
<i>Physical Infrastructure</i>	<ul style="list-style-type: none"> • Measurements to support broadband deployment