Department of Commerce

National Institute of Standards and Technology

Three-Year Programmatic Plan

FY 2012 – FY 2014

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Introduction

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 our quality of life.

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 presents the NIST programmatic plan covering fiscal year (FY) 2012 through FY 2014. It is a product of the strategic planning processes at NIST, but it is not intended to serve as a strategic plan. Rather, it aims to summarize the focus and priorities of the NIST programs over this three-year period. NIST will continue to refine this plan as it works with the Administration to address national priorities.

This plan includes the following:

- An overview of NIST's mission and a description of major programs
- Information on NIST's programmatic planning process
- NIST program plan

NIST: Promoting U.S. Innovation and Industrial Competitiveness

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, a non-regulatory agency, 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 U.S. industry compete successfully through innovation. Over the last few decades, NIST has been assigned important new roles and responsibilities, including awarding competitive grants to foster development of promising, high-risk technologies; diffusing advanced technologies and business practices to smaller manufacturers; and promoting quality management methods in key sectors. Old and new, all NIST programs support the nation's agility, innovation, and competitiveness.

NIST Laboratory Program

For more than 100 years, NIST has maintained the national standards of measurement, a role that the U.S. Constitution assigns to the Federal Government. Today, the NIST Laboratories address increasingly complex measurement challenges. For example, NIST develops measurements focusing on the very small (e.g., nanotechnology devices) and the very large (e.g., skyscrapers), the physical—methods for characterizing strands of DNA for forensic testing and the virtual—methods for testing electronic health record systems, and tests the performance of walk-through metal detectors.

- 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. NIST promotes the use of measurements based on the international system of units (SI). The measurement science research at NIST is useful to all science and engineering disciplines.

- The NIST Laboratories work to assure that the U.S. realization of the basic and derived measurement units is consistent with the realization in other nations. NIST Laboratories engage in a number of international activities to support trade and global science, and to promote the international acceptance of U.S. measurement standards

- The NIST Laboratories provide industry and academia with unique user facilities that support innovation in materials science, nanotechnology, and other emerging technology areas through the NIST Center for Neutron Research, which provides world class neutron measurement capabilities to the U.S. research community, and the NIST Center for Nanoscale Science and Technology, which supports nanotechnology development from discovery to production.

- The NIST Laboratories also support the development of standards and specifications that define technical and performance requirements for goods and services. These standards—also known as documentary standards—are often developed collaboratively with the private sector through an open, consensus-based process. NIST scientists and engineers lend their expertise to these efforts in order to promote standards that are based on sound science, and to ensure that the standards are supported by effective measurements and testing methods for conformity. In addition, NIST is designated under the National Technology Transfer Advancement Act (NTTAA) as the coordinator for all

Federal agencies using documentary standards that are developed by private-sector consensus bodies to carry out their policy objectives.

Innovation and Industry Services

Technology Innovation Program

The Technology Innovation Program (TIP) was established by Congress in the America COMPETES Act of 2007. Its purpose is to assist U.S. small and medium size businesses, institutes of higher education, national laboratories, and non-profit research organizations to conduct research that has the potential for yielding transformational results with far or wide-reaching implications in areas of critical national need. TIP grants provide cost-shared funding opportunities for high-risk, high-reward research. TIP only funds projects that have a promising technological solution for problems that are not being addressed, for which funding is not reasonably available through other public or private sources, and that are within NIST's areas of technical competence.

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 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 creation and retention of manufacturing jobs. MEP acts as a strategic advisor to promote business growth and innovation and to connect manufacturers to public and private resources essential for increased profitability and competitiveness in the global marketplace.

Baldrige Performance Excellence Program

NIST's Baldrige Performance Excellence Program (BPEP) promotes proven performance management practices to strengthen U.S. organizations.[1]The program promotes organizational excellence through a wide range of education, outreach, and professional development activities. Supporting these educational activities is the identification of role model organizations through the annual awards program. The Baldrige Award is given to organizations in six categories: manufacturing, service, small business, health care, education, and nonprofit. The recent pressures on health care and education cost and performance have invigorated improvement efforts in these sectors that are especially important to the nation's economic performance and the quality of life enjoyed by its citizens.

[1] Prior to FY 2011, the Baldrige Performance Excellence Program (BPEP) was known as the Baldrige National Quality Program (BNQP).

NIST Strategic Goals and Programmatic Planning

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

Strategic Goals

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

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

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

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

Programmatic Planning Priorities

Program planning for NIST seeks to align with our strategic goals and to focus on the most critical national priorities and challenges. To identify important trends, NIST continually gathers and assesses input from customers, potential stakeholders, Congress and the Administration. This input is integrated into the annual program planning process that forms the basis of this plan. Currently the programmatic plans are organized across six investment priority areas (IPAs):

- Manufacturing
- Information Technology & Cybersecurity
- Energy
- Healthcare
- Environment & Consumer Safety
- Physical Infrastructure

The Laboratory Program Plan Summary table on the next page provides selected highlights of NIST's current and planned future efforts for the programs relevant to the IPAs listed above. Bars indicate planned areas of focus and potential initiatives over the next three years. The programs outlined in this table represent potential new efforts and are not comprehensive. NIST will continue to refine its plans for future years as appropriate, such as responding to emerging national priorities or major scientific and technological advances, and all items listed as examples of planned efforts for FY 2012 through FY 2014 are subject to change.

Laboratory Program Plan Summary 2012 - 2014

Investment Priority Areas	Program Area	Examples of Planned Efforts FY 2012 / FY 2013 / FY 2014
Energy	Advanced Alternative Energies	3rd generation photovoltaics Solar storage/batteries
	Net-Zero Energy Buildings	Building system intelligence In-situ performance measures Sustainable Building Mateirals Sustainability Performance Evaluation
	Smart-Grid	Power systems Building interface Industry to grid interface Cybersecurity and Communications
Environment and Consumer Safety	Greenhouse Gas Measurements and Climate Change	Calibration Testbed Optical remote GHG measurement tools Traceable Reference Material Program Gap and flux identification
	Nanomaterial Environmental Health and Safety	Physical and chemical characterization of nanomaterials Fate and transport of nanomaterials
Manufacturing	Green and Sustainable Manufacturing	Characterization of alternative source materials Sustainability metrics and recognition Information supply chain infrastructure
	Smart Manufacturing	Additive Manufacturing processes Standards to support interactive robotic platforms
	Advanced Materials	Integrated database of NIST standard reference data Validated data assessment tools Model development and application to advanced materials
	Nanomanufacturing	Metrology for carbon nanotube composite material fabrication Testbed for roll to roll nanomanufacturing
	Biomanufacturing	Test-bed bioreactor facility Sensors/bioprocess monitoring Safety and efficacy measurements
Healthcare	Clinical Diagnostics and Laboratory Medicine	Standard reference materials for clinical diagnostics Multiplex disease signature analysis
	Medical Imaging	Standards and calibrations for medical imaging platforms
	Health Information Technology	Usability Standards Telemedicine Testing and validation infrastructure
Information Technology and Cybersecurity	Scalable Cybersecurity for Emerging Technologies and Threats	Cryptographic practices Security automation and usability Secure online transactions Multifactor authentication
	Cloud Computing	Roadmap for cloud computing Cloud computing conformance testing
Physical Infrastructure	Infrastructure Development and Remediation	Disaster Resilience – multihazard databases Advanced condition assessment methodologies Sustainable materials for construction Application of intelligent systems to infrastructure delivery

Innovation and Industry Program Summary 2012-2014

Technology Innovation Program

TIP funds high-risk, high-reward research in areas of critical national need. To date, TIP has offered competitive funding opportunities to develop advanced sensing technologies and advanced repair materials for the civil infrastructure, development of industrial scale manufacturing processes and predictive modeling tools for advanced materials, and innovations in critical processes for manufacturing and biomanufacturing. In 2012, TIP plans to continue and expand investment in these critical areas, while introducing new opportunities for investment in areas such as technologies to enable the smart grid, advanced automation and robotics, technologies to enable personalized medicine, and technologies to ensure the nation's water availability. Future interest areas also include sustainability and complex networks. Final decisions on areas of investment will be publicly announced and based upon the availability of funding.

Hollings Manufacturing Extension Partnership

MEP funds 60 centers nationwide to provide manufacturers implementation services focused on creating new products, expanding into new markets, developing efficient processes and training an advanced workforce. Recently, MEP issued competitive awards focused on projects that will expand the range of services available to manufacturers. The new projects have a specific focus on:

- responding to evolving supply chains;
- accelerating the adoption of new technology to build business growth;
- implementing environmentally sustainable processes;
- establishing and enabling strong workforces for the future, and;
- encouraging cultures of continuous improvement.

These projects will support the creation and adoption of improved technologies and provide resources to develop new products that respond to changing market needs. In 2012, MEP plans to continue and expand investment in these areas, further leveraging the national network of Centers to focus on innovation and export opportunities for manufacturers, connect U.S. manufacturers to new technologies and commercialization opportunities, and to lay the foundation for a clean energy economy. Specific investment opportunities will be publicly announced based upon the availability of funding.

Baldrige Performance Excellence Program

BPEP provides the resources necessary for organizations in all sectors of the economy, including those in all six of the IPAs, to conduct self-assessment and improvement activities utilizing the Baldrige Criteria for Performance Excellence. The most innovative and robust implementations of these activities are recognized with the Presidential Malcolm Baldrige National Quality Award, and their practices are then shared nationally. In 2012 BPEP will evaluate alternative sources of funding and alternative cost models, consistent with the Administration's goal of transitioning the program out of Federal funding. BPEP will continue development of the Baldrige Program Criteria, dissemination of best practices, and the annual awards process in 2012.