UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-
OFFICE OF THE DIRECTOR

NOV 0 9 2012

MEMORANDUM FOR NIST Leadership Board

FROM: Patrick Gallagher
Director, National Institute of Standards and Technology

SUBJECT: NIST Technology Transfer Policy Committee Recommendations

I am pleased to transmit the Final Report of the NIST Technology Transfer Policy Committee. This Report represents nine months of diligent work by the members of the committee:

Robert Celotta
Katharine Gebbie
George Jenkins
Roger Kilmer
Mary Saunders
Phillip Singerman, chair
Shyam Sunder
Henry Wixon

I want to thank the Committee members for their service and the staff of the Technology Partnerships Office for supporting the Committee's activities.

Pursuant to its charge, the Committee developed a comprehensive definition of technology transfer, identified 15 mechanisms which NIST uses to transfer technology, and proposed improvements in our procedures. The Committee endorsed a detailed implementation plan that will be used to implement the NIST goals and establish metrics to assess the impact of NIST's activities on the economy and society.

As a direct result of the Committee's work, we have already witnessed changes in our IP review process, our SBIR program, and our CRADA documents – resulting in a doubling of our invention disclosures from last year, an increase in the acceptance rate of SBIR proposals, and the development of a streamlined CRADA process.

The next step in our implementation is to systematically review our technology transfer mechanisms to determine the feasibility of applying rigorous analytic measurement techniques. I encourage and expect the full and enthusiastic cooperation of all NIST personnel in this important enterprise.

I have asked the Committee to continue to provide guidance to these efforts and to periodically report to me on our progress.

cc:
Membership, NLB

NIST

UNITED STATES DEPARTMENT OF COMMERCE
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MEMORANDUM FOR Patrick Gallagher
Director, National Institute of Standards and Technology

FROM: Philip Singerman
Associate Director for Innovation & Industry Services

CC: Members, Technology Transfer Policy Committee

SUBJECT: NIST Technology Transfer Policy Committee Recommendations

I am pleased to send you the final recommendations of the NIST Technology Transfer Policy Committee. The Committee has worked diligently to complete these recommendations and develop an implementation plan. In transmitting these recommendations, I would like to recognize the dedication and efforts of the Committee and the support of the Technology Partnerships Office to the benefit of NIST and our future progress.

In response to the October 2011 Presidential Memorandum, *Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-Growth Businesses*, you established the NIST Technology Transfer Policy Committee in December, 2011. This Committee was tasked to develop a more comprehensive approach to technology transfer, and to identify improvements to processes and metrics that would more accurately capture the full impact of NIST's scientific enterprise. The Committee forwarded their Preliminary Report on policy recommendations for your review in May of 2012.

On June 1, 2012, you distributed a memorandum to the NIST Leadership Board in which you directed the Associate Director for Innovation and Industry Services to develop implementation plans and directed the Policy Committee to review the plans, track progress, and prepare a Final Report by September 30, 2012. We have prepared a detailed implementation plan that was approved by the Committee along with their Final Report. I am happy to report we have already made significant progress implementing many of the action items in the plan. Among these are:

- The expanded NIST Patent Criteria are now being used by the Patent Review Committee;
- CRADA language has been reviewed, a shortened template developed, and streamlined processes implemented;
- SBIR improvements have been put in place and implemented in the past award cycle; and
- New technology licenses have been put in place to encourage greater interest in licensing.

The Committee also discussed the timeliness of the Final Report's recommendation of a formal NIST policy statement addressing the incorporation of technology transfer activities into the performance plans of science and technical employees. This recommendation aligns NIST policy with the Stevenson-Wydler Act that states that "technology transfer, consistent with mission responsibilities, is a responsibility of each laboratory science and engineering professional in the Federal government." To be consistent with the broad definition of technology transfer adopted by NIST, the Committee recommended that there should not be a separate standard element for technology transfer but, instead, responsibilities should be tailored to the duties of the individual staff member.

NIST Technology Transfer Policy Committee - Final Report

Background: On October 28, 2011, the President issued a Presidential Memorandum - *Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-growth Business* – directing the heads of executive departments and agencies to improve results from technology transfer and commercialization activities. Specifically, the President directed that Federal laboratories take actions "to establish goals and measure performance, streamline administrative processes … in order to accelerate technology transfer and support private sector commercialization." The NIST Director established the NIST Technology Transfer Policy Committee and directed it to "develop a more comprehensive definition of technology transfer, and to identify improvements to processes and metrics that would more accurately capture the full impact of our scientific enterprise." (Memorandum of December 23, 2011, from the NIST Director)

The Committee members are: Phillip Singerman (Associate Director, Innovation and Industry Services, *chair*), Robert Celotta (Director, CNST), Katharine Gebbie (Director, PML), George Jenkins (Chief Financial Officer), Roger Kilmer (Director, MEP), Mary Saunders (Director, SCO), Shyam Sunder (Director, EL), and Henry Wixon (NIST Chief Counsel).

The Committee submitted a Preliminary Report to the NIST Director containing recommendations for NIST policy regarding technology transfer. On June 1, 2012, the NIST Director delivered a Memorandum to the NIST Leadership Board to prepare implementation plans for the recommendations contained in the Preliminary Report. The NIST Director's Memorandum also directed the Technology Transfer Policy Committee to prepare a final report by September 30, "with recommendations, if any, for further action for my consideration." This final report contains no further recommendations than those of the preliminary report and it describes the current status of implementation of the policy changes.

Broad Policy Issues

As a first step, the Committee reviewed definitions of technology transfer used by NIST, other agencies, and the Federal Laboratory Consortium. The Committee recommended a new, broader definition of technology transfer for NIST, which is given below, to reflect the realities of the many ways that NIST reaches external partners.

The Committee reviewed NIST's policies governing formal, statutory means of technology transfer and discussed the many other, less-formal means by which NIST transfers technology to benefit the Nation. For example, NIST makes substantial use of collaborations, both formal and informal, to transfer NIST-developed technology. The Committee discussed the need to encourage and facilitate formal mechanisms of technology transfer when these best suit the mission of NIST and the approach of the Operating Units. The Committee also advocated collecting measures of informal collaborations, when appropriate, as these are no less significant to NIST's mission.

The Committee reviewed the performance metrics that NIST collects now, and/or could collect in the future. The Committee recognized the need to measure technology transfer activities more accurately and endorsed efforts to broaden the collection of performance metrics that will

efficiently measure technical and economic impacts. The Committee also recommended that additional resources be made available to more widely apply economic evaluation methods to the assessment of the impact of NIST research. The Committee recommended using existing metrics, whenever possible, such as those developed for the NIST Balanced Scorecard, rather than developing unique metrics.

The Stevenson-Wydler Act states that technology transfer, consistent with mission responsibilities, is a responsibility of each laboratory science and engineering professional in the Federal government. The Committee recommended that NIST policy reflect this statute. The Committee recognized that many employee performance plans already include technology transfer criteria. However, a formal NIST policy statement implementing the statute would also meet NIST's need to address the requirements of tracking and gathering technology transfer outcomes and impacts. Technology transfer would not typically be a separate element in a performance plan, but rather would be included in the way staff approach their work and be tailored to duties assigned.

The Committee also discussed matters of ethics that affect NIST research personnel in regards to their involvement in technology transfer. Such issues are decided largely by the interpretations of statutes and directives by legal counsels of the Department of Commerce, and the Office of Government Ethics. Subsequent to the preliminary report, NIST engaged the DoC Ethics Division. The DoC Ethics Division provided NIST management with guidance on how to ensure that NIST staff conducts their work in an ethical manner while providing the flexibility need for innovation. This guidance has been endorsed and implemented by NIST management.

A summary of recommendations contained in the Committee's preliminary report, developed during the Committee's deliberations to date, is provided below.

NIST Definition of Technology Transfer:
The Committee recommended that NIST adopt the following definition of technology transfer, one that encompasses the broad range of formal and informal ways in which NIST transfers its research results to industry, academia and government 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.

"Technology transfer is the overall process by which NIST knowledge, facilities, or capabilities in measurement science, standards and technology promote U.S. innovation and industrial competitiveness in order to enhance economic security and improve quality of life."

The proposed NIST definition of technology transfer encompasses many means of transferring technology. The Committee recognized the definition includes: 1) knowledge transfer, the act of transferring knowledge from one individual to another by means of mentoring, training, documentation, or other collaboration, and 2) commercialization, the adoption of a technology into the private sector through a business or other organization.

Recommendations on NIST Technology Transfer Goals and Metrics:
The Committee reviewed metrics currently collected for the Department of Commerce's annual Technology Transfer report, as well as metrics that were described by representatives of the OUs

in meetings with the Technology Partnership Office. Whenever possible, the metrics will be synchronized with metrics collected by NIST OUs, Programs, and other reporting tools to allow consistency in NIST reports and reduce the burden of information collection. The Committee's recommendations supported two overarching goals: 1) improving the transfer of NIST technology and work products, and 2) improving NIST technology transfer through collaborations. Specific metrics were recommended to evaluate progress towards these goals. The recommended metrics can be sorted into three categories: 1) expansion of metrics on outcomes that NIST currently tracks, 2) measurement of technology transfer outcomes that NIST does not currently track as part of its technology transfer reporting, and 3) the retention of metrics as they are currently being collected by NIST. The recommended metrics follow:

Goal: Improve Transfer of NIST Technology and Work Products

Expanded Metrics

1. Documentary Standards Activities
   Documentary standards are shared sets of rules that specify, as examples, a test method, a product's properties, a practice. Documentary standards are intrinsic to trade, safety, health and environmental protection – standards are essential to manufacturing and commerce locally and internationally. NIST has nearly 400 staff involved with more than 100 standards organizations. The Standards Coordination Office (SCO) maintains the Standards Committee Participation Database for employees to self-report their involvement, and leadership positions, within standards organizations. NIST does not currently have a detailed accounting of the contributions that NIST staff makes to individual documentary standards. SCO has been proactively expanding the database to collect information on staff tenure on a standards committee, standard(s) developed with NIST staff participation, and other information relevant to NIST's contributions to creating new documentary standards and the maintenance of the Nation's catalog of existing documentary standards. The Committee endorsed these activities initiated by SCO. Database work is to be completed by end of the first quarter of FY 2013. OUs have assumed responsibility to ensure employees accurately enter their relevant data.

2. Standard Reference Data Products (SRDs)
   Many engineering, science, and technical activities require reliable sources of chemical and/or physical property data. NIST's data evaluations are supplied to NIST customers through the Standard Reference Data Program. The Committee recommended expansion of the current metric, which is the number of available of SRDs. The Committee also recommended that a study be conducted by the end of FY 2013 to determine whether information regarding usage of databases is sufficiently centralized, and whether more comprehensive metrics for judging impact can be obtained. MML has assumed responsibility for implementation.

3. Standard Reference Materials (SRMs) and Related Artifacts.
   Standard Reference Materials are artifacts (objects or physical samples) for which NIST has determined accurate property data. SRMs serve as means to, among other things, calibrate instruments, develop new test methodologies for standards, or qualify laboratory personnel as a quality control test. The Committee recommended that information on the number of

SRMs sold and new SRMs developed continue as metrics, with a feasibility study to be conducted by the end of FY 2013 on whether meaningful impact information can be/should be developed using existing customer data. The customer information is available from MML.

4. Patents and Licenses
   The Committee recommended that the statutorily required metrics on patents and licenses be maintained. Additional information collection is recommended such as the ages and sizes of licensees and the number of jointly-owned inventions. TPO has implemented the recommendations.

New Metrics

5. Software Downloads
   NIST provides software that is downloadable and databases that are internet accessible. These applications are an important means that NIST uses to disseminate research results and technical information. However, these down-loadable NIST products are scattered across NIST web pages. NIST does not have a centralized download server, and NIST collects measures of downloads or page hits for only some products. The Committee recommended that a new metric (or metrics) that reflects the significant technology transfer contribution made through downloads of NIST software and data will be implemented by creating a NIST-wide group to exchange effective practices (end of first quarter of FY 2013). This group will study appropriate metrics for assessing the impact of NIST published software to be completed by the end of first quarter of FY 2014. TPO has been involved with a group at NIST, the Scientific Data Committee, which would undertake this task. This NIST-wide group of experts on computer data is awaiting NIST management approval of their charter. The Technology Transfer Policy Committee recommends the NIST approve the charter of the Scientific Data Committee so that they can begin work on these tasks.

Retained Metrics

6. Technical Publications
   The Committee recommended retaining as metrics the number and publication quality factor, whether the latter is h-index or other measure. TPO is looking at ways of improving the assessment of bibliometric data in conjunction with the Information Services Office (Library) and complete its examination by the end of FY 2013.

Goal: Improve NIST Technology Transfer Through Collaborations

Expanded Metrics

7. Formal and Informal Collaborations
   The Committee recommended that the existing collaboration metric (essentially the number of CRADAs) be expanded into a comprehensive metric that encompasses the broad range of NIST formal and informal collaborations by (i) developing a definition of a credited "collaboration" by end of FY 2013, (ii) developing processes and procedures to capture credited collaborations by the end of the first quarter of FY 2014, and (iii) conducting a feasibility study on whether impact data can be generated (end of FY 2014.) Information on

formal collaborations is available from TPO. TPO will work with OUs to develop methods to identify informal collaborations.

8. User Facility Research Participants
NIST's two User Facilities, CNST and NCNR, are a vibrant means by which NIST customers tap directly into NIST measurement expertise to solve their problems. The metric currently reported in the annual Department of Commerce Technology Transfer report is the number of those who are registered in the NIST Associates database to be on the NIST campus to use the facilities. For a variety of reasons, this metric currently undercounts both the utilization and direct impact of the facilities. The User Facilities have for many years used the "number of Research Participants," as a fundamental measure of their productivity. NIST User Facility "Research Participants" are those who directly participate in an NCNR experiment or CNST project. Participants include those who use the facility on-site or remotely, and their collaborators on the experiment or project. The Committee recommended changing the metric to "number of Research Participants." The Committee also recommended that, during FY 2013, NCNR and CNST discuss the feasibility of collecting additional data on the impact of the facilities.

New Metrics

9. Postdoctoral Researchers
NIST OUs cite training postdoctoral researchers as an important means of technology transfer. The Committee recommended that NIST identify post-NIST employment as an additional metric. The Committee recommended the use of NSF's description of a postdoctoral researcher, namely, "Post-doctoral researchers are a temporary position taken after the completion of a doctorate … as a period of apprenticeship for the purpose of gaining scientific, technical, and professional skills" (NSF Science and Engineering Indicators 2012) combined with the NRC-NIST's stipulation of five years since the Ph.D. date, to define a postdoctoral researcher. The Committee recommended that the Technology Partnerships Office (TPO), in conjunction with the Office of Workforce Management (OWM), the International and Academic Affairs Office (IAAO), and the OU Directors develop a comprehensive definition and information on the full range of postdoctoral researchers engaged in research at NIST or in Joint Institutes; complete by end of FY 2012. Tracking systems to be in place by the end of FY 2013 and initial impact analysis studies implemented by the end of FY 2014.

10. Non-NIST Employees on NIST Campuses Engaged in Research
NIST engages large numbers of guest associates in its research. The Committee recommended significantly expanding the relevant information mined from existing sources of information and studying the linkages between this data and other metrics with the goal of providing better impact measures by the end of FY 2014. Responsibility is shared among TPO, through the NAIS database, IAAO, and the OUs.

11. Start-ups and Young Entrepreneurial Companies
NIST has several different means by which it and its Joint Institutes nurture young companies, not just "start-ups," in high-growth technology areas. The Committee recommended that TPO, with OU involvement, develop a list of start-up and NIST-related

young technology companies by end of first quarter of FY2014. The Committee also recommended that by the end of FY 2013 metrics that gauge NIST's support of these young entrepreneurial companies be developed. Such metrics, with inclusion of anecdotal information, are anticipated to track these companies over a period of time. TPO will work with the OUs to obtain the information.

Retained Metrics

12. Calibration Services
    The Committee recommended that the number of calibrations be retained as a metric. The number of calibrations is obtained from PML and MML.

13. STEM Education and Other Training
    The Committee recommended that STEM education activities be retained as a metric. STEM education metrics will include SURF, SHIP, and the Pathways Program. These numbers are available through OWM and IAAO.

14. Accreditation Services
    The Committee recommended that the number of accreditations granted by the National Voluntary Laboratory Accreditation Program (NVLAP) be retained as a metric. This number is available from SCO/NVLAP.

15. Conferences, Workshops, and Inquiries
    The Committee recommended that current information on metrology training be retained as a metric and expanded to include additional information on OU-specific training activities that is routinely conducted for facility users. Currently collected inquiry information is incomplete; full collection, namely, logging all incoming questions to staff, would be burdensome without significant returned value. Responsibility for collecting information on OU-specific training activities would reside with OUs – in place by end of FY 2012.

Table 1: Summary of Technology Transfer Metrics and Schedule of Action Items

	FY 2012	FY 2013	FY 2014
Improve Transfer of NIST Technology and Work Products			
Documentary Standards		X	
Standard Reference Data		X	
Standard Reference Materials		X	
Patents and Licenses		X	
Software Downloads		X	X
Technical Publications		X	
Improve NIST Technology Transfer Through Collaborations			
Formal and Informal Collaborations		X	X
User Facility Research Participants		X	
Postdoctoral Researchers	X	X	X
Non-NIST Employees on NIST Campus			X
Startups and Young Companies		X	X
Calibration Services	X		
STEM Education	X		
Accreditation Services	X		
Conferences, Workshops, and Inquiries	X		

NIST Intellectual Property Recommendations

The Committee recommended changing the policy from the practice of patenting when doing so is the only way to increase the potential for commercialization of the invention to a broader set of criteria as follows.

1. The Committee recommended modifying the NIST policy on when NIST will seek patent protection to include furthering U.S. manufacturing and potential commercial licensing as criteria. Under these criteria, NIST will seek a patent when a patent would fulfill at least one of the following:
    a) Increase the potential for current or future commercialization of the technology
    b) Have a positive impact on a new field of science or technology, and the visibility and vitality of NIST
    c) Further the goals of a CRADA or other collaborative agreement
    d) Further U.S. manufacturing*
    e) Is likely to lead to a commercialization license.*
    (*newly added)

2. The Committee recommended that the current NIST Patent Policy and NIST Patent Criteria be combined into a single policy document and updated to emphasize the importance of intellectual property protection.

3. The Committee recommended that the NIST patent procedures be updated to emphasize the importance of intellectual property protection. Changes are (i) that inventions are considered positively in employee performance plans and reviews when appropriate to the position, (ii) that OUs should give preference to Patent Review Committee (PRC) nominees who have had significant industry and/or patent experience, (iii) and that OU PRC nominees should have a term limit of three consecutive years; a minimum one-year hiatus should exist before appointment to a new term on the PRC. TPO will re-emphasize that the OU Director may provide two additional subject-matter experts when an invention is being reviewed by the PRC. The Committee recommended that the current PRC procedure be changed so that these subject-matter experts do not have a vote on the PRC. The Committee recommended retention of the current policy in which the responsible OU Director makes the final decision on whether NIST will seek a patent. The existence of the PRC does not preclude OU Directors from obtaining additional information to guide their decisions.

4. The Committee recommended that NIST retain the current policy of sharing 30% of patent licensing revenue with inventors. However, rather than the remaining funds being directed to the NIST Working Capital Fund, the Committee recommended that these funds be provided to the OU, preferably at the level of the group(s) responsible for the patent from which the invention originated to further technology transfer.

The Committee recommended that TPO, the Acquisition Management Division (AMD), and the Office of Chief Counsel of NIST (OCC/NIST), collectively shorten by 25% the time required from disclosure being submitted to the filing of a non-provisional patent application.

The Committee recommended that TPO create a short-term working group of NIST Staff to review the current TPO IP website and provide comments on how it can be made more useful.

The Committee recommended that TPO and the OCC/NIST offer training on the aspects of the America Invents Act that impact NIST inventors well in advance of the implementation of the relevant parts of the Act (this is the impending change from "first to invent" to "first to file").

The Committee recommended that TPO implement several new licensing programs to improve transfer of NIST-patented technologies. These programs are to be used as an incentive to small businesses and entrepreneurs, and to create interest in NIST technologies that may be overlooked.

Table 2: NIST License Initiatives

Science/Technology Advancement Research (STAR) License	**Small Business Innovation Research - Technology Transfer (SBIR-STAR) License**	**Technology Acceleration and Growth (TAG) License**	**Science/Technology for Entrepreneurship Program (STEP) License**
• No-cost, non-exclusive field-of-use research license to explore and advance the development of NIST technologies for eventual commercialization. • No fees or payments for research purposes. • Can be converted to a commercialization license (exclusive or non-exclusive). Financial terms negotiated. • NIST may issue licenses to another party for research or commercialization.	• Available through the NIST SBIR Program. • Subtopics designated as "TT" for technology transfer. • SBIR awards resulting from "TT" subtopics will include, as necessary, a STAR license for work identified within the "TT" subtopic being awarded. • Awardees will be given the opportunity to negotiate a commercialization license to background inventions.	• NIST technology not licensed within five years of the patent issue date. • Only available to domestic businesses or organizations. • Designated technologies available under this program at: http://tsapps.nist.gov/techtransfer/ . • One-year, field of use-limited, exclusive commercialization license for a $1,000 execution fee. • Convertible into an exclusive license for the term of the patent life upon negotiation of fees and terms.	• Small business exclusive license agreement to help attract investors and develop early-stage technologies. • Domestic companies that are less than 5 years old, have fewer than 25 employees and less than $2M in capital (does not include subsidiaries of larger companies). • • Non-exclusive commercialization license at no cost for the first year. • Exclusive licenses per TAG requirements, but $500 execution fee. • Flexibility to meet the needs of growing companies in developing terms.

Collaboration Policy

Formal and informal collaborations are an important method of transferring NIST technology. The Committee recommended that formal transaction processes be reviewed in order to make them less burdensome and time consuming.

1. The Committee recommended that the standard NIST CRADA and CRADA approval procedures closely reflect the statutory requirement that, when deciding what CRADAs to enter into, the OU Director should (i) give special consideration to small business firms and consortia involving small business firms, (ii) give preference to business units located in the United States which agree that products embodying inventions made under the CRADA or produced through the use of such inventions shall be manufactured substantially in the United States and, (iii) in the case of a collaborator subject to the control of a foreign company or government, take into consideration whether or not such foreign government permits U.S. agencies, organizations or other persons to enter into CRADA-like agreements or licensing agreements. The Committee recommended that NIST seek early advice from the U.S. Trade Representative when making a determination as to whether the latter consideration is met for a specific collaboration.

2. The Committee recommended that, by the end of FY 2012, OCC/NIST and TPO conduct a detailed review of the Standard NIST CRADA with a view toward eliminating any unnecessary restrictions or hindrances to acceptance by U.S. industry (completed in FY 2012) and to find efficiencies to accelerate the time to process CRADAs by a minimum of 10% by the end of the first quarter of FY2013. This task has been completed.

3. The Committee recommended that by the end of the first quarter of FY 2013, OCC/NIST and TPO review processes that may eliminate or reduce barriers that exclude NIST Associates from NIST CRADA project teams, to the extent possible. One such process would be exploring a Determination of Exceptional Circumstances (DEC) on the research support contract with Dakota Consulting Inc. and others.

4. The Committee recommended that NIST recognize both formal and informal collaborations as important components of NIST technology transfer. Efforts to identify and better track informal collaborations are addressed under the Metrics section of this report.

Small Business Innovation Research Program (SBIR) Improvements

The Committee endorsed the following steps to improve and streamline SBIR practices. These changes to administrative practices and to proposal solicitation and review practices will reduce the administrative burden on small businesses and will reduce the time needed to process and issue awards. All of these improvements have now been implemented.

In FY 2012, NIST:

1. Streamlined administrative practices to reduce the administrative burden on small businesses and reduce the time needed to process and issue awards.
2. Reduced the number of topics and subtopics to balance the work required to obtain proposals and increase the selection rate for worthwhile proposals. The former streamlines the process and the latter reduces burdens on small businesses of preparing proposals that are not funded because of limited resources. NIST Programmatic Investment Priority Areas in the NIST Three Year Programmatic Plan serve as Topics to align SBIR priorities to NISTs mission. The goal was to bring the Phase 1 SBIR award rate up to the national average of 17%.
3. Implemented a two-step review process to evaluate technical feasibility and to maximize investments, catalyze commercialization, and achieve a strategic focus. The first step is a technical evaluation conducted by the NIST laboratories. The second step is prioritization of proposals considered meritorious in the laboratory review through the use of criteria based on the overall NIST strategy and SBIR program goals.
4. Reduced by 10% the time from close of solicitation to award issuance.

Economic Analysis of NIST Investments

Improved Measurement and Analysis

Federal laboratories generate knowledge, skills, processes, and technical outputs that are adopted by others in innovation processes that promote broad economic and public benefits. Measurement and analysis of this adoption process and of the resultant benefits that flow from Federal laboratory research is inexact.[1] Difficulties arise in determining a benefit that resulted from one technological improvement, when that technological improvement conflates with other technological improvements. The diversity of processes that are used for transferring different technological innovations from Federal research further complicates any effort to assess a laboratory's social or economic impact.[2] Clearly, improved measurement and analysis of the connections between research and economic benefits are timely and critical to provide a realistic quantification of the results of Federal investments in research.

The Presidential Memorandum explicitly calls on the Secretary of Commerce – with NIST taking a leadership role – to "improve and expand" technology transfer measurements and metrics. In response, NIST has revised its definition of technology transfer to better capture the breadth and diversity of NIST's technology outputs and will engage in efforts to analyze the impacts of innovations that result from its research.

[1] Science and Technology Policy Institute (2011), "Technology Transfer and Commercialization Landscape of the Federal Labs."
[2] Barry Bozeman (2000), Technology Transfer and Public Policy: A Review of research and Literature," Research Policy, vol. 29: 627-655.

Assessing the Economic Impact of Technology Transfer

As a Federal research organization, NIST provides a wide range of public goods that would otherwise be inadequately provided or not be provided at all by private sector sources. While such public sector investments in areas of measurement science, standards and innovative technology solutions are deemed to be critical for the Nation's sustained economic security and growth, there is a continuing need to demonstrate the value of NIST's investments.

Over the past 15 years, NIST has commissioned numerous studies that analyze the development and impact of selected technologies transferred from the NIST laboratories to U.S. industries such as electronics, healthcare, information technology, and advanced manufacturing. These studies have been very effective in helping to explain how public institutions such as NIST can quantify the social contribution of their activities, provide important lessons to management about the effectiveness of resource allocation decisions, and provide guidelines for future strategic planning efforts.[3]

NIST has established the Economic Analysis Office (EAO) to manage the development of prospective and retrospective economic impact studies that evaluate the effectiveness of NIST's investments.

The Committee recommended that EAO will:

1) establish data collection methodologies and make recommendations to NIST management regarding efforts to improve the collection of technology transfer metrics;
2) establish criteria to evaluate the feasibility of performing economic impact studies;
3) investigate novel sources of research data such as the National Science Foundation's Star Metrics project[4] and other methods that quantitatively analyze technical publications; and
4) develop training materials that explain how economic data are gathered, how the results of economic impact studies should be interpreted, and how these studies can be used to justify public sector investments in R&D.

The Committee also recommended that EAO is to commission a series of studies to assess economic impact utilizing the wider range of technology transfer metrics identified in this report and will initiate novel attempts to measure the broad impacts of critical outputs such as, standard reference materials, standards committee participation, CRADA participation, etc. These studies will begin during the initial years of the proposed five year plan.

Working closely with staff from the NIST laboratories and building on ongoing analytic efforts by the Standards Coordination office, NIST management will increase the regularity with which it implements lessons learned from these studies. In addition, NIST will engage with other bureaus within the Department of Commerce that have analytic capabilities and relevant

[3] Albert Link and John Scott, "The Theory and Practice of Public Sector R&D Economic Impact Analysis", NIST Planning Report 11-1, January, 2012.
[4] Julia Lane and Stefano Bertuzzi, 'The STAR METRICS Project: Current and Future Uses for S&E', National Science Foundation, September 8, 2011.

responsibilities such as, the Economic and Statistics Administration (ESA) and the Patent and Trademark Office (PTO). NIST will also continue to engage with, participate in, and benefit from the work conducted by other federal agencies and nonfederal stakeholders such as the Association of Public and Land-grant Universities (APLU) and the Association of University Technology Managers (AUTM) that are expanding the measurement and analysis of the impacts associated with university-based technology transfer.

Along with providing an effective response to the PM, NIST's efforts will address the Office of Science and Technology Policy's request to support the development and use of the "Science of Science Policy Roadmap" that calls on agencies to work together to develop new tools, methods, data, and data infrastructure to help science and technology policy makers make better decisions.[5]

Through all of these efforts, NIST will improve its ability to measure and analyze the economic impact of its funding decisions and will work to remove barriers that prevent the efficient and timely transfer of technologies to industry.

[5] National Science and Technology Council, November 2008.