PERFORMANCE INFORMATION

STATUS REPORT ON FY 2010-2011 PERFORMANCE ASSESSMENT FRAMEWORK

FY 2010 and FY 2011 will be transitional years for performance assessment and reporting at NSF. A number of recent developments and ongoing activities directly affect both NSF's current and future approach to these activities.

- The NSF Strategic Plan is being updated for FY 2011 to FY 2017. The new plan is expected to be completed by the summer of 2010.
- New approaches and methods are now available for assessing the performance of NSF's investments in science and engineering research and education. Many of these new approaches draw upon work supported by the NSF program in the Science of Science and Innovation Policy (SciSIP).
- NSF is also addressing recommendations from the FY 2009 report of the Advisory Committee for GPRA Performance Assessment (AC/GPA).   The committee specifically examined alternative methods alternative approaches to performance assessment at NSF, and it recommended that NSF "c*onsider an assessment framework that uses multiple measures and methods, applied over various time scales.*"

In light of these developments, a number of changes are already underway in FY 2010. Of particular note is that in FY 2010 NSF is employing a simplified and streamlined performance framework to meet the assessment and reporting requirements established by the Government Performance and Results Act (GPRA). This framework is presented in the next section of this chapter.

In addition, NSF is pursuing a number of activities to pilot and review new approaches to the assessment and evaluation of NSF's programs. These activities will be pursued in conjunction with the update of the NSF Strategic Plan. Examples of these activities include:

- The STAR METRICS project (Science and Technology in America's Reinvestment – Measuring the Effect of Research on Innovation, Competitiveness and Science). NSF is working with OSTP and other agencies of the National Science and Technology Council (NSTC) to develop a data-driven analytical capability for assessing impacts of federal investments in science and engineering research and education. For additional information, please see the Integrative Activities chapter.
- Initial planning activities related to establishing an NSF-wide capability for assessment and evaluation, as requested in FY 2011 under Agency Operations and Award Management. This centralized capability would bring greater attention and analysis to such areas as comparing different types of programmatic investments and identifying the most effective means for continuous improvement across the NSF portfolio. This effort is part of the Administration's government-wide initiative to build capacity within agencies to strengthen their program evaluation. NSF's development plan was approved by the Office of Management and Budget for FY 2011, and NSF will work with evaluation experts at OMB and the Council of Economic Advisers during the planning, design, and implementation stages.
- The continued development of goals and metrics for activities under the NSF learning portfolio (see next page).

NSF will also continue to engage external experts in keeping with the recent work of the AC/GPA on improving the NSF performance framework. Issues and questions likely to be addressed include:

- Which emerging approaches and methods provide the most useful insights into the performance of NSF's investments?
- What considerations should be incorporated into the new Strategic Plan to encourage the appropriate implementation of these new approaches?
- What key factors should be considered as NSF develops an agency-wide capability for evaluation and assessment?

The results of these FY 2010 activities will help to determine the NSF performance framework for FY 2011 and future years.

Development of Goals and Metrics: NSF Learning Portfolio

NSF's Directorate for Education and Human Resources (EHR) has strengthened internal capacity in STEM education program evaluation, and has continued to continue to increase expectations for the field that evaluation is central in the research and development work funded by EHR.

- All EHR programs are concerned with building knowledge of effective practices for improving STEM learning and require evidence at the project level, as appropriate, to both measure impact and to understand the impact of programmatic innovation on learning.
- A directorate working group has developed metrics for all EHR programs, and will continue to expand and refine those efforts in FY 2010 and FY2011.
- EHR will extend the internal professional development workshops that have been conducted for the staff to build understanding about the range of techniques appropriate for evaluation of STEM education research and development projects.
- EHR is launching several new program evaluations, and preparing to catalyze, through existing programs, increased research, theory-building, and tool development to advance the science of STEM education program evaluation.

In FY 2010, as noted in the Revised GPRA Performance Plan (see next section), goals and metrics will also be developed for R&RA-funded activities in the Learning portfolio.

Following are examples of the ways in which EHR is using metrics to assess programs and how results of a range of evaluation processes are being used to inform program improvements and new directions. A full list of EHR programs for which metrics have been devised can be found at www.nsf.gov/about/budget/fy2011.

PROGRAM	Integrative Graduate Education and Research Traineeship Program (IGERT)
EVALUATION APPROACHES	Annual on-line surveys Annual comprehensive external evaluations Input from Committees of Visitors (COV)
FINDINGS	- Surveying recent IGERT graduates provides information on the workforce outcomes of IGERT participation. A survey of over 800 graduates found that name recognition of the program and their interdisciplinary training gave graduates a competitive edge in the workforce and helped them obtain their current positions. - In response to COV input, the program is tracking the quality of publications at a greater level of detail, and reports that changes in data collection for this area are leading to improved data integrity.

IMPLICATIONS	The findings suggest that "number of contributions to the research enterprise" and "number and/or percentage of graduate traineeship recipients who complete a STEM graduate program" may be relevant metrics. This information is being used to inform the improvement of monitoring systems.

DIVISION: Human Resource Development. HRD sees evaluation as critical to the ongoing improvement of programs and its efforts to determine its effectiveness in addressing its key programmatic goals.

PROGRAM	Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)
EVALUATION FINDINGS	Independent evaluation of the HBCU-UP program reveals that HBCU-UP graduates outperform samples of STEM baccalaureate degree holders in degree completion and participation in the STEM workforce with graduate degrees.
IMPLICATIONS	Therefore, assessment of these programs has the potential to identify which strategies and interventions are most successful. Assessment of this program's success could also contribute to the body of scholarly work about theories and practice related to diversity in the scientific workforce.

PROGRAM	• Increasing the Participation and Advancement of Women in Academic Science and Engineering Careers (ADVANCE) • Alliances for Graduate Education and the Professoriate (AGEP) • Centers of Research Excellence in Science and Technology (CREST) • Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) • Tribal Colleges and Universities (TCUP)
EVALUATION APPROACH	Coordinated evaluations of these programs will yield important information for continued program realignment and improvement, in part by helping determine which metrics in which measures are most relevant to the goal of building the STEM workforce.
FINDINGS	Findings are not yet available, but some sample metrics might be: • the number of students who complete a STEM degree program (AGEP) • the retention rates of women faculty in STEM disciplines (ADVANCE) • the number of new STEM curricula, courses, and infusion of technology that enhance instruction (TCUP)

FY 2010 REVISED GPRA ANNUAL PERFORMANCE PLAN

As required by the Government Performance and Results Act, NSF will measure its performance in FY 2010 by working to achieve the following goals. These goals can be achieved with NSF's requested FY 2010 staff and budgetary resources.

NSF by Strategic Goal

Dollars in Billions

Discovery: Foster research that will advance the frontiers of knowledge, emphasizing areas of greatest opportunity and potential benefit, and establishing the nation as a global leader in fundamental and transformational science and engineering.

Research & Related Activities	Education & Human Resources
$3,978.94 million	$191.44 million

Performance Goal	Measure		FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Time to decision*	For 70 percent of proposals, be able to inform applicants whether their proposals have been declined or recommended for funding within six months of deadline, target date, or receipt date, whichever is later.	**Target**						70%
		Result	73%	76%	75%	76%	89% in Q1**	

Potentially transformative research	As described in the FY 2011 NSF-Wide investments chapter, each R&RA directorate will invest a minimum of $2 million per research division to leverage and facilitate activities to foster potentially transformative research. The total NSF-wide investment in FY 2010 is projected to be $94 million.	New goal in FY 2010	$94 million

*Reported under "Stewardship" prior to FY 2010.

**In FY 2009, this goal was in effect only for the period October 1 through December 31, 2008 (Quarter 1, FY 2009). The goal was suspended for all actions taking place between January 1, 2009 and September 30, 2009 to allow for a greater number of proposals to be processed with the additional funds from the American Recovery and Reinvestment Act of 2009.

Learning: Cultivate a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens.

Research & Related Activities	Education & Human Resources
$342.40 million	$668.73 million

Performance Goal	Measure		FY 2009	FY 2010
Develop goals and metrics for NSF's programmatic investments in its Learning portfolio.	Percent of NSF Learning portfolio with established metrics.	**Target**	80%	100%
		Result	80%	

Research Infrastructure: Build the nation's research capability through critical investments in advanced instrumentation, facilities, cyberinfrastructure, and experimental tools.

Research & Related Activities	Education & Human Resources	Major Research Equipment & Facilities Construction
$1,593.17 million	$15.71 million	$165.19 million

Performance Goal	Measure		FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Major Research Equipment and Facilities Construction*	For all MREFC facilities under construction, keep negative cost and schedule variance at or below 10 percent	**Target**	100%	100%	100%	100%	100%	100%
		Result	79%	73%	90%	80%	100%	
Operational facilities*	For facilities in the operational phase, keep scheduled operating time lost to less than 10 percent for 90 percent of those facilities	**Target**	90%	90%	90%	90%	90%	90%
		Result	100%	95%	94%	100%	100%	

*Reported under "Stewardship" prior to FY 2010.

Stewardship: Support excellence in science and engineering research and education through a capable and responsive organization.

	Research & Related Activities	Education & Human Resources	Agency Operations & Award Management, National Science Board, Office of the Inspector General
	$104.32 million	$16.12 million	$348.38 million

Performance Goal	FY 2007-FY 2009 Results	FY 2010 Measure
Management of Large Facilities	New goal in FY 2008 FY 2008: Successful FY 2009: Successful	Conduct a Business System Review at least once per 5-year award cycle for all institutions hosting NSF-supported large facilities, with a planned schedule of three to four reviews per year. Target: 3 BSRs will be performed.
Merit Review	FY 2007: Successful FY 2008: Successful FY 2009: Successful	Provide a written context statement to the Principal Investigator (PI) whose proposal is awarded or declined that describes the process by which the proposal was reviewed and the context of the decision (such as the number of proposals and awards, information about budget availability, and considerations in portfolio balancing). Target: 95% of PIs will receive context statements.
		Continue analyzing Committees of Visitors reports in order to identify issues of quality and the transparency of the merit review process Target: An assessment of the methods and results relating to this goal will be made at the end of FY 2010.
Post-Award Monitoring	FY 2007: Successful FY 2008: Successful FY 2009: Successful	Appropriately apply NSF's risk assessment strategy to ensure adequate post-award financial and administrative monitoring of NSF's riskiest awards. Targets: • Complete 95% of projected 30 site monitoring visits. • Complete desk reviews for 95% of projected 73 desk reviews. • Complete 95% of projected FFR transaction testing. • Maintain ARRA recipient reporting rate at 98% for each quarter.* • Maintain the uncorrected significant error rate on ARRA award recipients on Day 30 under one percent after federal review.**
* The rate would is calculated by dividing the number of received reports by the total number of reports due each quarter. ** Day 30 is when the recipient reports become public and the federal review and recipient correction period ends. The rate is calculated by dividing the number of missing and erroneous reports by the total number of reports due each quarter.		

FY 2010 HIGH PRIORITY PERFORMANCE GOAL

As part of developing the FY 2011 budget and performance plan, the National Science Foundation has identified a high priority performance goal focused on evidence-based approaches to our *Science, Technology, Engineering, and Mathematics (STEM) workforce* development programs that will be a particular focus over the next two years. In addition to this high priority performance goal, there are a number of other goals used to regularly monitor and report performance. To view the full set of performance information please visit www.nsf.gov/about/performance/.

Goal: Improve the education and training of an innovative Science, Technology, Engineering, and Mathematics (STEM) workforce through evidence-based approaches that includes collection and analysis of performance data, program evaluation and other research.

> **Measure:** By the end of FY 2011, at least six major National Science Foundation STEM workforce development programs at the graduate/postdoctoral level have evaluation and assessment systems providing findings leading to program re-design or consolidation for more strategic impact in developing STEM workforce problem solvers, entrepreneurs, or innovators.

FY 2009 ANNUAL PERFORMANCE REPORT

Funding by Strategic Goal, FY 2005-FY 2010
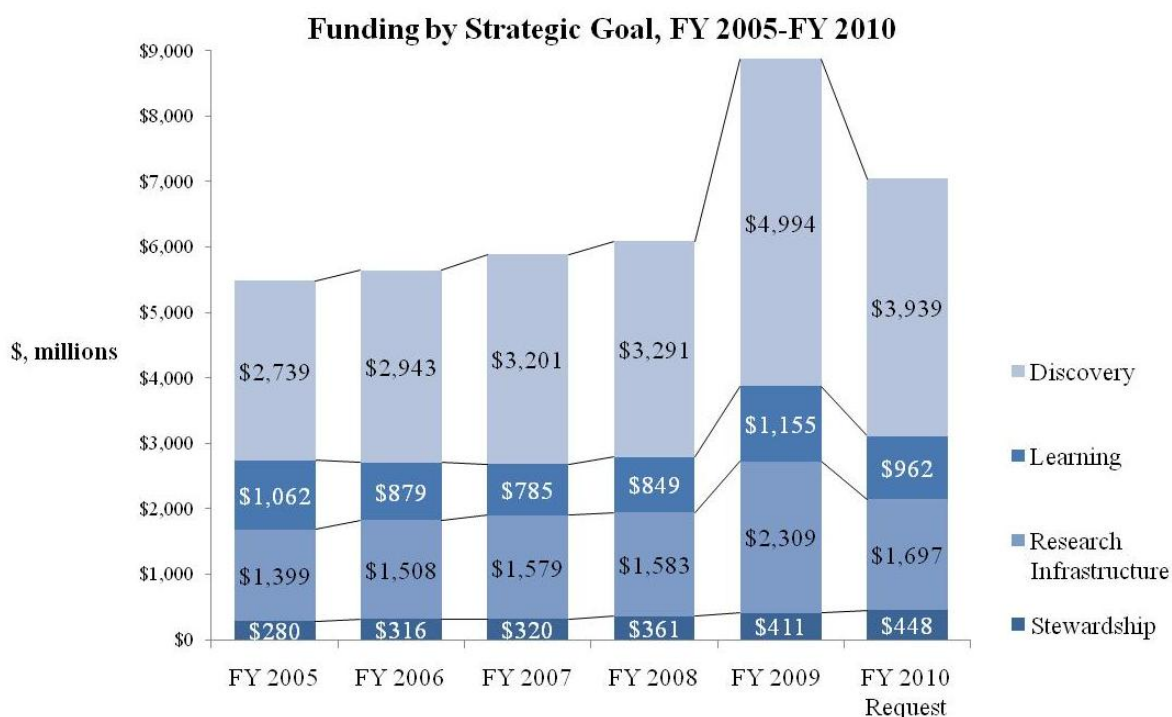
NSF's Strategic Plan for FY 2006–2011 established four long-term strategic outcome goals for the agency's activities and performance: *Discovery, Learning, Research Infrastructure*, and *Stewardship*. The first three goals focus on NSF's long-term investments in science and engineering research and education. The fourth goal—*Stewardship*—is internally focused and emphasizes improving the effectiveness and efficiency of the agency's management practices. NSF's uses a combination of internal and external assessments to determine whether it is achieving its annual performance goals.

NSF by Strategic Outcome Goal
(Dollars in Millions)

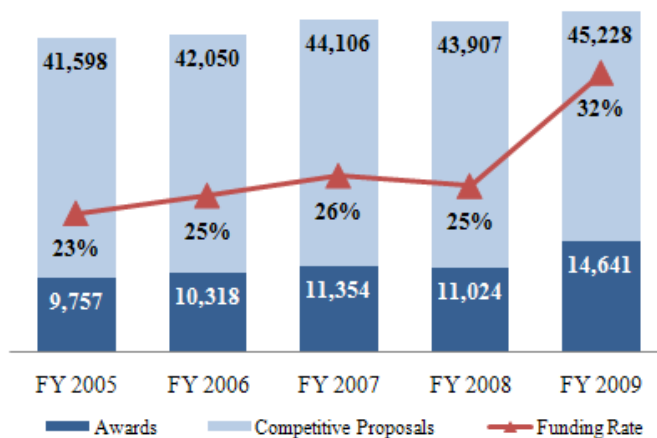|	FY 2009 Omnibus Actual	FY 2009 ARRA Actual	FY 2010 Estimate	FY 2011 Request	Change Over FY 2010 Estimate Amount	Change Over FY 2010 Estimate Percent
Discovery	$3,448.63	$1,546.60	$3,813.20	$4,170.38	$357.18	9.4%
Learning	905.12	249.37	967.38	1,011.13	43.75	4.5%
Research Infrastructure[1]	1,703.57	605.68	1,662.18	1,774.07	111.89	6.7%
Stewardship	411.44	0.02	429.75	468.82	39.07	9.1%
Total, NSF	**$6,468.76**	**$2,401.66**	**$6,872.51**	**$7,424.40**	**$551.89**	**8.0%**

Totals may not add due to rounding.

[1] Funding for Research Infrastructure for FY 2010 excludes a one-time appropriation transfer of $54.0 million to U.S. Coast Guard per P.L. 111-117.

In this report, NSF summarizes the results of the strategic outcome goals, as well as its performance on two other sets of goals which measure the performance of K-12 Math and Science Education programs and of the American Recovery and Reinvestment Act (ARRA) of 2009. More information on all of these goals may be found on NSF's Budget and Performance website: www.nsf.gov/about/performance.

In FY 2009, the National Science Foundation:

➢ **Demonstrated *significant achievement* for the three long-term strategic outcome goals in its 2006-2011 Strategic Plan: *Discovery*, *Learning*, and *Research Infrastructure*, according to an independent evaluation by the NSF Advisory Committee for GPRA Performance Assessment,**

➢ **Achieved all annual performance milestones and measures under the fourth strategic outcome goal of *Stewardship*,**

➢ **Achieved one out of the two performance measures reportable in FY 2009 for the K-12 Math and Science Education evaluation,**

➢ **Achieved four out of the five performance measures reportable in FY 2009 for the programs under the American Recovery and Reinvestment Act (ARRA) of 2009.**

Number of NSF Competitive Proposals and Awards and Funding Rates

	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009
Competitive Proposals	41,598	42,050	44,106	43,907	45,228
Awards	9,757	10,318	11,354	11,024	14,641
Funding Rate	23%	25%	26%	25%	32%

Legend: Awards, Competitive Proposals, Funding Rate

Long-Term Strategic Goal Results

The Advisory Committee for GPRA Performance Assessment (AC/GPA) determined that in FY 2009 NSF demonstrated significant achievement for the three long-term, qualitative, strategic outcome goals in the 2006–2011 Strategic Plan: *Discovery, Learning*, and *Research Infrastructure*. The AC/GPA made this determination at its June 2009 meeting and issued a report to the Director, which is available at: www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf09068.

During its deliberations, the Committee discussed how NSF might undertake alternative methods of performance assessment in the future, focusing on producing a more holistic view and longer-term evaluation of achievement of its strategic goals. The Committee recommended that NSF:

- *Consider an assessment framework that uses multiple measures and methods, applied over various time scales. Use both quantitative and qualitative evidence, including highlights.*
- *Emphasize the dynamic relationships among strategic goals and outcomes.*
- *Use performance assessment as an opportunity and means to document the strategic value of NSF's science investments to the nation and the public.*
- *Engage the scientific community as a partner in performance assessment.*
- *Build assessment into the organizational and programmatic infrastructure of NSF.*

The timing of these recommendations coincides with the rewriting of NSF's Strategic plan in FY 2010. A discussion of NSF's response to these recommendations is located in the "Status Report" section of this chapter.

Long-Term Strategic Goal	Performance Goal	Results
DISCOVERY	Foster research that will advance the frontiers of knowledge, emphasizing areas of greatest opportunity and potential benefit, and establishing the nation as a global leader in fundamental and transformational science and engineering.	FY 2005: Successful FY 2006: Successful FY 2007: Successful FY 2008: Successful FY 2009: Successful
LEARNING	Cultivate a world-class, broadly inclusive science and engineering workforce, and expand the scientific literacy of all citizens.	
RESEARCH INFRASTRUCTURE	Build the nation's research capability through critical investments in advanced instrumentation, facilities, cyberinfrastructure, and experimental tools.	

At the programmatic level, NSF directorates, divisions, and programs use the recommendations of external experts in its decision-making (see Appendix, "Qualitative Information"). The benefits of the evaluations can be seen in the rich feedback produced, which informs decision-making in programmatic areas as well as at broad strategic levels. These evaluations can also facilitate ongoing feedback and rapport within new or existing scientific communities.

During FY 2009, seventeen external evaluations of NSF's existing programs and strategic investments were published and include the results of studies, reports, and workshops commissioned by various programmatic offices within the National Science Foundation. Examples of the types of results such evaluations can produce are listed below.

Programmatic Evaluations: Letter Report Assessing the WATERS Network Science Plan

- The National Resource Council's Water Science and Technology Board reviewed and evaluated the WATERS Network Science Plan, with a focus on whether the project should be established within the Major Research Equipment and Facilities Construction (MREFC) framework or not. The committee requested a stronger justification for a national network of environmental observatories aimed at studying water and also recommended considering an alternative mechanism rather than an MREFC.

Programmatic Workshops

- A workshop report prepared by Westat, Carol Van Hartesveldt, and Judith Giordan on the Integrative Graduate Education and Research Traineeship (IGERT) Program was conducted to define the progress of interdisciplinary research and graduate education and their impacts on academic institutions. The workshop report will be referenced as important guidance to both proposers and their institutions in the next IGERT solicitation.

Research-Focused Evaluations and Workshops

- A study was conducted by the World Technology Evaluation Center to assess international research and development activities in the field of simulation-based engineering and science (SBE&S), in order to benchmark NSF's related programs and provide input into to planning for the future of these programs. Study results are being used to conceptualize potential programs within NSF as well as collaborations with other agencies.

American Recovery and Reinvestment Act of 2009 (ARRA) Program Goal Results:
Research and Related Activities

Account	Program/Activity	Metric	Target	Result	Rationale
Research and Related Activities (R&RA)[1]	Core Research, Facilities, and Infrastructure Investments Major Research Instrumentation Academic Research Infrastructure	Number of competitive awards[2]	4,000	4,599	This target was based on a formula taking into account the amount of funding and the average award size and duration. It assumed a $155,000 average annual award size and a three-year duration.
		Number of investigators supported on competitive awards	6,400	6,762	The target for the number of investigators was based on a ratio of 1.6 principal investigators per award, according to FY 2008 figures.
		Number of new investigators supported on competitive awards[3]	2,400	2,352[4]	The target for new investigators was adjusted upward from the ratio from FY 2008 to take into account the emphasis on supporting first-time investigators with ARRA funds.[4]

[1]"Research and related activities" include investigator-initiated research projects, postdoctoral fellowships, instrumentation awards, workshop and planning grants, and cooperative agreements for centers and facilities.

[2]ARRA enabled the funding of 318 of these awards (7 percent) that had been declined earlier in the year due to budgetary constraints even though they were rated very good to excellent.

[3]New investigators are those who have not served as the principal investigator or co-principal investigator on any award from NSF, with the exception of doctoral dissertation awards; graduate or postdoctoral fellowships; research planning grants; or conference, symposia, and workshop awards.

[4]NSF reached 98 percent of this goal. In FY 2008, the ratio of new investigators per award was 0.5, which would have led to a target of 2,000 new investigators. NSF chose to set a more ambitious target using a ratio of 0.60 new investigators per award, or 2,400 new investigators. The FY 2009 result of 2,352 new investigators corresponds to a ratio of 0.59 new investigators per award.

**American Recovery and Reinvestment Act of 2009 (ARRA) Program Goal Results:
Education and Human Resources**

NSF achieved the FY 2009 goals for the numbers of Noyce and MSP program awards. Other program goals focus on the number of participants supported over the five-year period of the awards, and reporting on them will begin in FY 2010.

Account	Program/Activity	Metric	Target	Result	Rationale
Education and Human Resources (EHR)	Robert Noyce Scholarship Program[1]	Number of awards	67	67	Reporting will begin on the following goals in FY 2010: • Number of new pre-service teachers and teacher participants over five years. • Number of new teachers in high-need districts over five years.
	Math and Science Partnership Program[2]	Number of awards	9	9	Reporting will begin on the following goals in FY 2010: • Number of MSP teacher leader/master teacher participants over five years. • Number of post-baccalaureate credential or master's degree recipients over five years.
	Science Masters' Program[3]	*To be determined in FY 2010.*			

[1]The Robert Noyce Teacher Scholarship Program aims to encourage talented Science, Technology, Engineering, and Mathematics (STEM) majors and professionals to become K-12 mathematics and science teachers.

[2]The Math and Science Partnership (MSP) Program focuses on the development of STEM K-12 master teachers and school-based instructional leaders in mathematics and science education. It supports three kinds of efforts: new Teacher Institutes, new MSP-Start partnerships, and Phase II awards to existing MSP projects.

[3]The Science Masters' Program is new in FY 2010.

Stewardship Goal Results

Stewardship is defined in the NSF Strategic Plan as *supporting excellence in science and engineering research and education through a capable and responsive organization*. The performance areas under *Stewardship* focus on the agency's efficiency and effectiveness not only in its internal operations and management but also in delivering essential services to its constituents in the science, engineering, and education community. NSF has been measuring Stewardship performance areas since FY 2007.

In FY 2009, NSF achieved all of its annual milestones and measures associated with the following eight performance areas under Stewardship:

Goal Name	Description	Result
Time to Decision	For 70% of proposals, be able to inform applicants of a decision within six months.	FY 2007: Successful FY 2008: Successful FY 2009: Successful
Merit Review	Improve the quality and transparency of the merit review process.	FY 2007: Successful FY 2008: Successful FY 2009: Successful
Customer Service	Improve customer service to the science, engineering, and education communities.	FY 2007: Successful FY 2008: Successful FY 2009: Successful
Broadening Participation	Expand efforts to increase participation from underrepresented groups and diverse institutions throughout the United States in all NSF activities and programs.	FY 2007: Successful FY 2008: Successful FY 2009: Successful
Management of Large Facilities	Ensure the effective management of the construction and operation of large facilities.	FY 2007: Not Successful FY 2008: Not Successful FY 2009: Successful
Post-award Financial Monitoring	Fully implement NSF's program of post-award and financial administrative monitoring.	FY 2007: Successful FY 2008: Successful FY 2009: Successful
Strategic Information Technology (IT) initiatives	Provide new tools /capabilities.	FY 2007: Successful FY 2008: Successful FY 2009: Successful
IT Security	Conduct a successful Federal Information Security Management Act (FISMA) IT program review.	FY 2007: Successful FY 2008: Successful FY 2009: Successful

Detailed results on each of these performance areas may be found on www.nsf.gov/about/performance.

Goal Name	Detailed Results
Time to Decision	Every year since 2002, the Foundation has exceeded its Time to Decision goal of informing at least 70 percent of principal investigators about funding decisions within six months of receipt of their proposals. In FY 2009, the Foundation adopted this goal, but amended it to take into account the greater number of proposals to be processed with the additional funds from the American Recovery and Reinvestment Act (ARRA) of 2009. The goal was in effect only for the first quarter of FY 2009, before the ARRA funds were received. The result for that quarter was 89 percent, well above the target.
Merit Review	• Instituted a new staff seminar on specific and timely issues involved in the merit review process, designed for new program officers as well as experienced staff. The course content will be updated on a regular basis. • Continued to analyze the external Committee of Visitors (COV) reports to identify common issues and concerns. Because COV reports are highly specific to each NSF program, identifying common issues raised by external experts helps the Foundation monitor and improve the COVs process. A primary issue of concern to most COVs is how to account for the broader impacts of NSF's research and education awards.
Customer Service	• Completed qualitative analysis of FY 2007 survey responses from the scientific community to assist NSF in assessing perceptions of the quality and fairness of the merit review process; • Released FAQs for the scientific community, and training materials for new NSF program officers, on potentially transformative research (PTR); • Implemented two new programs to replace the Small Grants for Exploratory Research (SGER) Program: (1) Early-concept Grants for Exploratory Research (EAGER) to support exploratory work in its early stages on untested, but potentially transformative, research ideas or approaches; and (2) RAPID awards to support projects requiring a rapid release of funds and thus an expedited merit review process; and • Held focus groups and town hall meetings to foster discussion among program officers about how to manage PTR and interdisciplinary research proposals within the Foundation.
Broadening Participation	• Published a broadening participation Framework for Action; • Developed a new Research.gov Program Desktop to provide tools to help program officers manage portfolios of proposals and awards and to find reviewers for NSF proposals from a broad range of institutions and fields of study. By increasing the diversity of the reviewer pool, especially for review panels, NSF hopes to increase the number of people from underrepresented groups and diverse institutions who receive awards; and • Continued to update its Broadening Participation portfolio, giving the public information on Foundation programs that have a focus or special

	emphasis on broadening participation.

Management of Large Facilities	• For all Major Research Equipment and Facilities Construction (MREFC) facilities under construction, negative cost and schedule variance was kept at or below 10 percent.
	• For facilities in the operational phase, operating time lost was kept to less than 10 percent for 90 percent of those facilities.
	• Conducted Business System Reviews for the following major NSF-supported facilities:
	  • EarthScope;
	  • USArray;
	  • Institutions affiliated with the Incorporated Research Institutions for Seismology (IRIS) in Socorro, NM and Seattle, WA; and
	  • The National High Magnetic Field Laboratory in Tallahassee, FL.

Post-award Financial Monitoring	Risk assessments, desk reviews, and site visits are post-award monitoring activities used by NSF to assess administrative regulations and public policy requirements; special and general terms and conditions, including those contained in NSF program solicitations and grants or cooperative agreements; and the award letter. NSF conducts an annual risk assessment of awards and grantee institutions to determine the level of risk. • Applied the risk assessment results in order to develop the FY 2009 monitoring plan (on-site visits, desk reviews, and FCTR sampling efforts; • Completed 100 percent of projected FY 2009 on-site monitoring visits; • Completed 100 percent of projected FY 2009 desk reviews; and • Completed 100 percent of projected FY 2009 FCTR/FFR transaction testing.
Strategic Information Technology (IT) initiatives	• Delivered initial new Research.gov tools and resources for NSF staff; • Developed "Division Director Concur" functionality in eJacket; and • Posted 100 percent of discretionary grant applications on Grants.gov.
IT Security	• NSF successfully completed its FISMA (Federal Information Security Management Act) IT program review, which ensured that 100 percent of the Foundation's major applications and general support systems are certified and accredited; • 100 percent of NSF's IT systems are installed in accordance with security configurations; and • 100 percent of NSF's IT systems have undergone privacy impact assessments.

APPENDIX: TYPES, SOURCES, AND QUALITY OF DATA AND INFORMATION

Quantitative Data

Most of the information that informs the external expert review and assessment of outcomes under the strategic outcome goals originate outside the agency and are submitted to NSF by principal investigators through the Project Reporting System, which includes annual and final project reports for all awards. Through this system, information and data relevant to performance are available to program staff, third party evaluators, and other external committees.

Examples of types of information used to assess each Strategic Goal are:

Discovery
- Published and disseminated results, including journal publications, books, software, audio or video products;
- Contributions within and across disciplines;
- Organizations of participants and collaborators (including collaborations with industry);
- Contributions to other disciplines, infrastructure, and beyond science and engineering
- Use beyond the research group of specific products, instruments, and equipment resulting from NSF awards; and
- Role of NSF-sponsored activities in stimulating innovation and policy development.

Learning
- Student, teacher, and faculty participants in NSF activities;
- Demographics of participants; descriptions of student involvement;
- Education and outreach activities under grants;
- Demographics of science and engineering students and workforce;
- Numbers and quality of educational models, products and practices used/developed;
- Number and quality of teachers trained; and
- Student outcomes, including enrollments in mathematics and science courses, retention, achievement, and science and mathematics degrees received.

Research Infrastructure
- Published and disseminated results;
- New tools and technologies; multidisciplinary databases;
- Software, newly-developed instrumentation, and other inventions;
- Data, samples, specimens, germ lines, and related products of awards placed in shared repositories;
- Facilities construction and upgrade costs and schedules; and
- Operating efficiency of major multi-user facilities.

Most of the data supporting the annual quantitative performance goals may be found in NSF's central systems. These central systems include the Enterprise Information System; FastLane, with its Project Reporting System and its Facilities Performance Reporting System; the Program Information Management System (PIMS); the Proposal and Reviewer System; the Awards System; the Electronic Jacket; and the Financial Accounting System. These systems are verified and validated annually for accuracy and reliability.

Qualitative Information

In its annual review, the AC/GPA examines recent Committee of Visitor reports and program assessments conducted by external expert panels, principal investigator project reports, and award abstracts. Because it is impractical for an external committee to review the contributions to the performance goals by each of the more than 20,000 active awards, NSF program officers provide the Committee with summaries of notable results each fiscal year. These summaries of results, or "highlights," from awards, are a primary source for the AC/GPA determination of whether NSF demonstrated significant achievement in the strategic outcome goals of *Discovery, Learning,* and *Research Infrastructure*. The approach to highlights collection is a type of non-probabilistic sampling, commonly referred to as "judgmental" or "purposeful" sampling, which is best designed to identify notable examples and outcomes resulting from NSF's investments. It is the aggregate of collections of notable examples and outcomes that can, on their own, demonstrate significant agency-wide achievement of the strategic goals. Nevertheless, taken together, the highlights, COV reports, project reports, award abstracts, and other reports of notable accomplishments covers the entire NSF portfolio.

Committees of Visitors

The following Committees of Visitors were convened in FY 2009. COV reports can be found at nsf.gov/about/performance/.

Committees of Visitors, FY 2009	
DIR	**Program**
BIO	Environmental Biology
	Emerging Frontiers
CISE	Computing & Communication Foundations
	Computer & Network Systems
	Information & Intelligent Systems
EHR	Discovery Research K-12 (DRL)
	Research & Evaluation on Education in Science & Engineering (DRL)
	Advanced Technological Education
	Course, Curriculum, and Laboratory Improvement
	NOYCE Scholarships
	STEM Talent Expansion Program (STEP)
	Graduate Research Fellowships
	Gender Diversity in STEM Education
	Program on Research in Disabilities
	National SMETE Digital Library
ENG	Chemical, Bioengineering, Environmental and Transport Systems
	Civil, Mechanical and Manufacturing Innovation
GEO	Marine Geosciences Section
	Ocean Section
	ATM: UCAR and Lower Atmospheric Facilities Oversight Section
	OCE: Ocean Education
MPS	Physics
SBE	Behavioral and Cognitive Sciences
	Science of Learning Centers (OMA)
	Science Resource Statistics
OIA	Experimental Program to Stimulate Competitive Research

External Evaluations

In FY 2009, the following seventeen external evaluations of NSF's existing programs and strategic investments were published, including the results of studies, reports, and workshops commissioned by various programmatic offices within the National Science Foundation. Information on scope, findings, recommendations, and NSF's follow-up on all evaluations will be posted at nsf.gov/about/performance/.

External Evaluations, FY 2009			
DIR	**DIV (or Field)**	**Subject**	**Evaluator**
BIO	(Integrative Organismal Systems)	Exploring Science Needs for Predicting Organismal Responses to Rapid Directional Environmental Change	Workshop
EHR	Graduate Education	Integrative Graduate Education and Research Traineeship Program	Westat
EHR	Undergraduate Education	Noyce Scholarships	Noyce Program Evaluation Project
EHR	Research on Learning in Formal and Informal Settings	Learning science in informal environments	National Academies
ENG	Engineering Education and Centers	Research Experiences for Undergraduates: EEC Sites, ERC Supplements, ENG Supplements	SRI International
		ENG Research Experiences for Teachers Program	SRI International
		Bioengineering and Bioinformatics Summer Institutes	SRI International
		Faculty Early Career Development (CAREER)	Abt Associates Inc.
		EEC program areas	Science and Technology Policy Institute
GEO	Ocean Sciences	MARGINS program	MARGINS Decadal Review Committee
GEO	Office of the Assistant Director	Opportunities for Enhancing Diversity in the Geosciences (OEDG)	American Institutes for Research
ENG-GEO-SBE		WATERS Network Science Plan	National Academies
MPS	(Materials Research)	Polymer Science and Engineering	Interagency committee
MPS-ENG	(Civil, mechanical, and Manufacturing Innovation)	International Assessment of Research and Development in Catalysis by Nanostructured Materials	World Technology Evaluation Center

MPS-ENG	(Civil, mechanical, and Manufacturing Innovation)	International Assessment of Research and Development in Simulation-Based Engineering and Science	World Technology Evaluation Center
MPS	(Materials Research)	Inspired by Biology: From Molecules to Materials to Machines	National Academies
OD	(Office of Cyberinfrastructure)	Sustainable Software as Cyberinfrastructure	Workshop

Verification and Validation of Data Quality

As in prior years, NSF engaged an independent, external consultant to conduct a validation and verification (V&V) review of its annual performance information and data. IBM Global Business Services (IBM) completed a V&V review of the performance data and information reported for all the FY 2009 goals.

For the strategic outcome goals, IBM reviewed the processes NSF used to obtain external assessment of its goals. IBM's V&V review is based on guidelines issued by GAO that require federal agencies to provide confidence that the policies and procedures underlying performance reporting are complete, accurate, and consistent. (See *GAO Guide to Assessing Agency Annual Performance Plans,* GAO/GGD-10.1.20.) IBM assessed the validity of the data and reported results as well as verified the reliability of the methods used to collect, process, maintain, and report data. IBM also reviewed NSF's information systems based on GAO standards for application controls. The FY 2009 Performance Measurement Verification and Validation Report, dated October 23, 2009, Executive Summary concludes:

> As a federal agency, the National Science Foundation (NSF or Foundation) is subject to performance reporting requirements established by the Government Performance and Results Act (GPRA) of 1993 and Office of Management and Budget (OMB). With the passage of the American Recovery and Reinvestment Act (ARRA) of 2009, NSF and recipients of Foundation funds are subject to additional reporting requirements—as outlined in OMB guidance—to track and monitor all ARRA dollars in a manner that provides transparency and accountability to Congress and taxpayers.[1] NSF has developed a performance assessment and reporting framework to meet these reporting requirements and help the Foundation achieve its mission, goals, and objectives. Government Accountability Office (GAO) auditing standards indicate that federal agencies should provide confidence that the policies and procedures that undergird performance reporting are complete, accurate and consistent. As such, NSF tasked IBM Global Business Services with assessing the validity of the data and reported results of its performance goals and verifying the reliability of the methods used to compile and report data for these goals.
>
> NSF reports its performance though four long-term Strategic Outcome Goals and 15 annual performance goals. The Advisory Committee for GPRA Performance Assessment (AC/GPA) evaluates three of the four Strategic Outcome Goals—Discovery, Learning, and Research Infrastructure. For these Strategic Outcome Goals, IBM reviewed the reliability of the assessment processes. NSF evaluates the remaining Strategic Outcome Goal—Stewardship—through eight performance areas. Based on our FY 2009 V&V review, IBM verified and validated the reliability of the assessment processes for the three Strategic Outcome Goals evaluated through the AC/GPA. We

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[1] OMB, *Updated Implementing Guidance for the American Recovery and Reinvestment Act of 2009*, M-09-15, (Washington, D.C.: April 3, 2009): www.whitehouse.gov/omb/assets/memoranda_fy2009/m09-15.pdf

also verified the reliability of the processes and validated the accuracy of the results for the eight Stewardship performance areas.

Further, IBM verified the reliability of the processes and validated the accuracy of the results for five of the 15 annual performance goals. For the remaining 10 annual performance goals, NSF requested that IBM review the proposed process to collect, process, maintain, and report future results. We were not, however, asked to verify and validate results as it is too early for NSF to report actual results at the time of this report. We were, however, able to verify that NSF is making progress towards achieving these goals in FY 2009.

Overall, we verify that NSF relies on sound business practices, internal controls, and manual checks of system queries to ensure accurate performance reporting. NSF maintains adequate documentation of its processes and data to allow for an effective V&V review. Based on our comprehensive review, IBM has confidence in the systems, policies, and procedures used by NSF to generate the described performance measures. NSF continues to take concerted steps to improve the quality of their systems and data. We commend NSF for this effort to confirm the reliability of its GPRA data and results, and the quality of its processes for collecting, processing, maintaining, and reporting data for its performance goals.[2]

Information on Use of Non-Federal Parties

The NSF Annual Performance report was prepared solely by NSF staff. External, non-federal sources of information used in preparing the report include:

- Reports from awardees demonstrating results
- Reports from facilities managers on construction cost and schedules and operations.
- Reports prepared by Committees of Visitors assessing NSF programs
- Reports prepared by an external, independent management consulting firm to validate and verity the procedures used to collect, process, maintain, and report performance goals. In Fiscal Year 2009 that firm was IBM Global Business Services.

Classified Appendixes Not Available to the Public

None

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[2] The Executive Summary of the FY 2009 IBM Global Business Services *NSF Performance Measurement Verification and Validation Report* is available at www.nsf.gov/about/performance/FY 2009 _V_and_V_Exec_Summary.pdf.