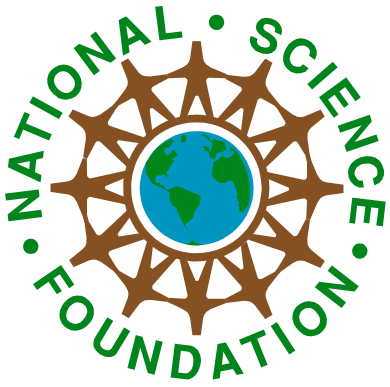
National Science Foundation

FY 2003 GPRA
Revised Final Performance Plan



December 30, 2002

Note: This GPRA performance plan was developed solely by NSF staff. It reflects discussions of general principles with elements of the research and education communities, the administration, and congressional staff.

ABOUT NSF

Created in 1950, NSF is an independent U.S. government agency responsible for advancing science and engineering in the United States across a broad and expanding frontier. NSF operates no laboratories itself, but rather carries out its mission primarily by making merit-based grants and cooperative agreements to individual researchers and groups, in partnership with colleges, universities, and other institutions – public, private, state, local, and federal – throughout the U.S.

NSF invests in the best ideas from the most capable people, as determined by competitive merit review. NSF evaluates proposals for research and education projects using two criteria: the intellectual merit of the proposed activity and its broader impacts. NSF uses merit review to select about 10,000 new awards each year from about 30,000 competitive proposals submitted by the science and engineering research and education communities.

NSF provides funding to sustain the advance of many research fields and thus, to expand the boundaries of knowledge. Equally important, the agency provides seed capital to catalyze emerging opportunities in research and education. NSF supports a portfolio of investments that reflects the interdependence among fields and between research and education. It promotes disciplinary strength while embracing interdisciplinary research and education activities. Agency investments promote the emergence of new disciplines, fields, and technologies, along with the development of scientists and engineers able to embrace them and create the next generation of results. By providing these resources, NSF contributes to the health and vitality of the U.S. research and education enterprise. NSF resources enable and enhance the nation's capacity for sustained growth and prosperity.

EXECUTIVE SUMMARY

The National Science Foundation's (NSF) continuing mission, as set out in the preamble to the National Science Foundation Act of 1950, reads, "To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."

With this mission and within the framework established by the FY 2001 - FY 2006 NSF Government Performance and Results Act (GPRA) Strategic Plan, the National Science Foundation presents its FY 2003 GPRA Performance Plan. Such annual plans, required by the Government Performance and Results Act of 1993, provide an agency-wide picture of programs and management activities planned for a given year.

NSF's strategic activities align with its three outcome goals:

- PEOPLE – Developing "a diverse, internationally competitive and globally engaged workforce of scientists, engineers, and well-prepared citizens";
- IDEAS – Enabling "discovery across the frontier of science and engineering, connected to learning, innovation and service to society"; and
- TOOLS – Providing "broadly accessible, state-of-the-art and shared research and education tools."

NSF's management goals, which enable the Foundation to make progress toward attainment of its strategic outcome goals, are organized into five performance areas:

- Proposal and award processes;
- Award portfolio;
- Award oversight and facilities management;
- Business practices; and
- Human resources and workplace.

To facilitate success in achieving its FY 2003 GPRA goals NSF developed a set of means and strategies. These means and strategies include programmatic approaches that focus on specific NSF programs and on the resources needed to support them. They also include process-based approaches – such as integrating research and education or promoting partnerships.

Goals in the FY 2003 GPRA Performance Plan contain either new or re-developed sections related to data/data sources/data limitations. A discussion of data verification and validation activities for NSF is contained in a separate section. Additionally, a short "resources required" section has been developed for a number of management goals. The financial and human resource needs identified in each section support the NSF Administration and Management Strategic Plan.

In FY 2003, approximately 95 percent of NSF's budget request ($5,036M) is designated for investments the agency makes in support of its goals for strategic outcomes – People ($1,087M), Ideas ($2,559M), and Tools ($1,122M). The remaining 5 percent of the budget request ($268M) is requested for Administration and Management, which provides operating support for the immediate activities of the agency such as processing proposals, issuing awards and overseeing projects.

The deployment of funds into the conceptual People, Ideas, or Tools area is done on a program-by-program basis – based on each program's principal objectives. Such deployment de-emphasizes a key facet of NSF's approach – the multiple purposes each investment serves. For example, research projects in programs categorized under the Ideas strategic outcome almost always provide funds to involve graduate students, thus contributing to the People outcome.

GOALS FOR STRATEGIC OUTCOMES

NSF is the only agency of the federal government exclusively devoted to promoting basic research and education at all levels and across all fields of science and engineering. NSF does not conduct research and education activities directly, but supports others who do so. External factors related to institutional partners, the private sector, and government affect how individuals and groups are able to respond in proposing and conducting research, which in turn impacts NSF's success in achieving its GPRA strategic outcome goals.

In addition to investing in core research and education activities, NSF annually identifies and invests in emerging opportunities in priority areas that hold exceptional promise to advance knowledge. For example, FY 2003 areas of emphasis for investment related to the PEOPLE goal focus on a Math and Science Partnership, increasing graduate stipends for selected fellowship and traineeship programs, and Centers for Learning and Teaching.

FY 2003 priority areas for investment related to NSF's IDEAS goal include Biocomplexity in the Environment (BE); Information Technology Research (ITR); Nanoscale Science and Engineering (NSE); Mathematical Sciences; and Social, Behavioral and Economic Sciences. The ITR and NSE activities are highly coordinated, cross-agency programs in which NSF chairs the working group or is designated the lead federal agency.

FY 2003 investment priorities related to the TOOLS outcome goal focus on two major new investments within the Major Research Equipment and Facilities Construction Account:

- developing EarthScope instrumentation to study aspects of the North American continent; and
- establishing two prototype National Ecological Observatory Network observatories.

As with all basic research, the outcomes associated with NSF research and education investments in FY 2003 are likely to be unpredictable in substance and timing. Many of these activities will require years to develop and the outcomes can only be judged retrospectively. For such research activities, it is difficult to link long-term outcomes directly to annual budgets. In the short-term, investment in diverse portfolios can be described and identified, and it is these investments that will determine whether outputs and outcomes resulting from the package of current awards will be as significant as past outcomes and outputs.

FY 2003 goals, indicators, and areas of emphasis for *investment in emerging opportunities and for GPRA reporting* are included in the summary goal table in the performance plan. In order to facilitate and focus reporting activities, the People, Ideas, and Tools outcome goals in the FY 2003 plan have fewer indicators than did the FY 2002 outcome goals. The new set of indicators is largely derived from the FY 2002 set. In addition, the third indicator on both the People and Tools list is intentionally non-specific. In practice, these indicators will provide an opportunity to present results unique to organizational units undergoing assessment or will highlight creative approaches or new paradigms not covered by other indicators.

GOALS FOR MANAGEMENT

NSF management goals for FY 2003 support the agency's mission of promoting the progress of science, engineering, and education by making merit-based grants to individuals or groups. Excellence in managing NSF underpins all of the agency's activities.

The process of developing annual management goals is informed by the NSF Strategic Plan, previous agency performance plans, internal deliberations, past performance, and reasonable projections for future

levels of performance. In developing the FY 2003 portfolio of goals, NSF limited the number of goals while focusing on those of fundamental importance to the Foundation. The portfolio focus is on activities that have agency-wide impact. In general, management issues related to one NSF organizational unit are not included as GPRA goals, but rather are addressed through internal management activities and procedures.

Embedded within the FY 2003 portfolio of goals is a set that responds to management challenges and reforms highlighted in the FY 2002 President's Management Agenda or otherwise identified for NSF (and other federal agencies) by the Office of Management and Budget, the General Accounting Office, and the NSF Office of the Inspector General. NSF recognizes the importance of the issues identified and has addressed a significant number through GPRA goals included in this document. The remaining challenges are handled with internal management controls and processes under the purview of the internal NSF Management Controls Committee (MCC), chaired by the Chief Financial Officer. That committee provides continuing and long-term senior executive attention to NSF's management challenges and reforms (detailed in Appendix B).

Many of NSF's FY 2003 management goals represent steps on the way to longer-term goals for stronger security in IT systems, better alignment between NSF workforce and agency needs, and improved working conditions within the Foundation. Other goals continue to address quality issues through merit review, efficiency and effectiveness with expansion in FastLane capabilities and systematic studies of award size and duration, and customer service with "time to prepare proposals" and "time to decision" goals. Still others address the President's government-wide initiatives. For example, the new and modified goals in the sections on "Business Practices" (e.g. electronic business) and "Human Resources and Workplace" respond to the President's Management Agenda.

The FY 2003 NSF Performance Plan addresses management of human capital in four GPRA goals, including: a strategic business analysis, an increase in the number of appointments to NSF science and engineering positions from underrepresented groups, preparation of a diversity plan, and development of a NSF training academy. In FY 2003, expansion of E-government capabilities to support the Foundation's core processes of merit review and award management and oversight continue to emphasize streamlining of FastLane's web-based system and development of an integrated suite of systems referred to as an electronic jacket.

Finally, a number of topics in this FY 2003 Plan are highly developed in an effort to prepare a resource document useful for a variety of NSF GPRA activities. This performance plan not only reflects the breadth of NSF activities but also its priorities.

TABLE OF CONTENTS

I. INTRODUCTION

In response to the mandate provided by the Government Performance and Results Act of 1993 to account for program results through the integration of strategic planning, budgeting, and performance measurement, the National Science Foundation presents this fifth GPRA Performance Plan. It is based on NSF's updated GPRA Strategic Plan FY 2001 - 2006[1], finalized in September 2000.

In developing this revised final plan, NSF made several changes that are reflected in outcome and management goals and associated indicators. The changes in goal statements are based on aspects of FY 2002 performance and on NSF's interest in accelerating implementation of new goals prior to FY 2004. In some cases, goal statements were revised slightly to improve clarity. Congressional action on the NSF budget request has not been completed and therefore the goals and indicators in this plan are contingent upon a FY 2003 appropriation that is commensurate with the Foundation's Budget Request to Congress. This version of the FY 2003 Performance Plan also incorporates minor corrections, additions, and deletions made to the February 4, 2002 copy. Performance results for FY 2002 were not included.

A. NSF MISSION

NSF's continuing mission is set out in the preamble to the National Science Foundation Act of 1950 (Public Law 810507):

To promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes.

The Foundation's organic legislation authorizes it to engage in the following activities, among others:

- Initiate and support scientific and engineering research, and programs to strengthen scientific and engineering research potential, and education programs at all levels, and appraise the impact of research upon industrial development and the general welfare;
- Award graduate fellowships in the sciences and engineering;
- Foster the interchange of scientific information among scientists and engineers in the United States and foreign countries;
- Foster and support the development and use of computers and other scientific methods and technologies, primarily for research and education in the sciences;
- Evaluate the status and needs of the various sciences and engineering and take into consideration the results in correlating research and educational programs with other federal and non-federal programs;
- Maintain a current register of scientific and technical personnel, and in other ways provide a central clearinghouse for the collection, interpretation, and analysis of the scientific and technical resources of the United States, and provide a source of information for policy formulation by other federal agencies;
- Initiate and support specific scientific and engineering activities relating to international cooperation, national security, and the effects of scientific and technological applications upon society;
- Initiate and support scientific and engineering research, including applied research, at academic and other nonprofit institutions;
- Strengthen research and education innovation in the sciences and engineering, including independent research by individuals, throughout the United States; and

[1] For convenience, we will refer to the NSF GPRA Strategic Plan FY 2001 - 2006 as the Strategic Plan in the remainder of the document.

- Support activities designed to increase the participation of women and minorities and others under-represented in science and technology.

The NSF Act confers on the Presidentially-appointed National Science Board the responsibility for establishing the policies of the Foundation and serving as its governing board. The Act also directs the Board to advise the President and Congress to assure the productivity and excellence of the nation's science and engineering enterprise.

B. NSF GOALS

NSF's primary function is to make merit-based grants and cooperative agreements to individual researchers and groups, in partnership with colleges, universities, and other institutions – public, private, state, local and federal – throughout the U.S. By providing these resources, NSF contributes to the health and vitality of the U.S. research and education enterprise, which enables and enhances the nation's capacity for sustained growth and prosperity.

NSF has organized its annual performance goals for FY 2003 in two categories – Strategic Outcomes and Management (see table in Section II). Goals associated with the strategic outcomes anticipate long-term results derived from NSF awards. The management goals focus on factors and strategies that enable the Foundation to successfully implement and work toward attainment of its strategic outcomes.

GOALS FOR STRATEGIC OUTCOMES

To accomplish the NSF mission to promote the progress of science, NSF invests in the most capable people, supporting their creative ideas, and providing them with cutting-edge research and education tools. NSF's outcomes from its grants and cooperative agreements provide evidence of the success of its investments in People, Ideas, and Tools. In developing the FY 2003 NSF award portfolio, NSF staff will be guided by the Strategic Plan and this GPRA Performance Plan, which includes outcome goals related to:

- **People** – *Developing "a diverse, internationally competitive and globally engaged workforce of scientists, engineers, and well-prepared citizens."*

  NSF invests in the best and brightest students, researchers, and educators to ensure a well-prepared workforce and citizenry. It provides support for formal and informal science, technology, engineering and mathematics (STEM) education at all levels – preK-12, undergraduate, and graduate – in addition to professional development and public science literacy projects. Investments aimed at the People strategic outcome relate to the parts of NSF's mission directed at strengthening scientific and engineering research potential and science and engineering education programs at all levels.

- **Ideas** – *Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."*

  NSF invests in ideas to provide a deep and broad fundamental science and engineering knowledge base. It provides support for creative, cutting-edge research that yields new and important discoveries and promotes the development of new knowledge and techniques within and across traditional boundaries. This strategic outcome derives from the part of NSF's mission directed at initiation and support of scientific and engineering research.

- **Tools** – *Providing "broadly accessible, state-of-the-art and shared research and education tools*."

  NSF invests in tools to provide widely accessible, up-to-date science and engineering infrastructure. It provides support for a wide range of instrumentation, multi-user facilities, digital libraries and computational infrastructure. This strategic outcome derives from the parts of NSF's mission directed at programs to strengthen scientific and engineering research potential, to support the development and use of computers and other scientific methods and technologies, and to provide an information base on science and engineering appropriate for development of national and international policy.

These three broad strategic outcomes are presented in a format that requires *qualitative* assessment of associated achievements. Long-term outcomes identified for each goal provide the basis for retrospective, results-oriented performance assessment.

GOALS FOR MANAGEMENT

Excellence in management underpins all of the agency's activities. The framework for developing management goals is guided by the Strategic Plan, previous Performance Plans, internal deliberations, past performance, and reasonable projections for future levels of performance. In developing the FY 2003 portfolio of management goals, NSF limited the goals to those of fundamental importance to the Foundation.

Embedded within the FY 2003 portfolio of goals is a set that addresses the President's Management Agenda and focuses on management challenges and reforms identified for NSF (and other federal agencies) by the Office of Management and Budget (OMB), General Accounting Office (GAO), and the NSF Office of the Inspector General (OIG). The actions the Foundation is taking to address each challenge or reform are discussed in Appendix B. NSF recognizes the importance of the issues identified and has addressed a significant number through GPRA goals included in this document. The remainder is addressed through management activities not described in this plan.

The FY 2003 management goals are organized into five performance areas: proposal and award processes, award portfolio, award oversight and facilities management, business practices, and human resources and workplace. These are introduced below, along with a limited number of examples of management goals related to each. A complete set of management goals is presented in the table in Section II.

- **Proposal and Award Processes:**
  - > Merit review – e.g., appropriate use of both review criteria; and
  - > Customer service – e.g., addressing concerns of the NSF community regarding the time required by NSF to complete proposal review and notify proposers about a decision to award or decline a proposal.

- **Award Portfolio:**
  - > Efficiency – e.g., award size and duration.

- **Award Oversight and Facilities Management:**
  - > Facilities – e.g., effective management of construction and upgrade projects and of facility operations.

- **Business Practices:**
  - > Electronic business – e.g., award transfers and creation of an electronic jacket; and
  - > IT security.

- **Human Resources and Workplace:**
  - > Diversity of NSF staff; and
  - > Staff training and development.

Management goals are, in most cases, presented in a format that enables quantitative assessment of progress toward goal achievement.

C. MEANS AND STRATEGIES

The means and strategies NSF uses to accomplish its mission of promoting the progress of science and engineering have both process and programmatic components. The Strategic Plan identifies three *process-based strategies* – developing intellectual capital (i.e., investing in projects that enhance individual and collective capacity to perform), integrating research and education (i.e., investing in projects that infuse learning with the excitement of discovery), and promoting partnerships (i.e., investing in projects that optimize the impact of People, Ideas, and Tools on the economy and on society) – that cut across all NSF activities. They guide the agency in establishing priorities, identifying opportunities, and designing new programs and activities. Projects that embody these core strategies and promise to help the Foundation achieve its outcome goals are identified via the NSF merit review process.

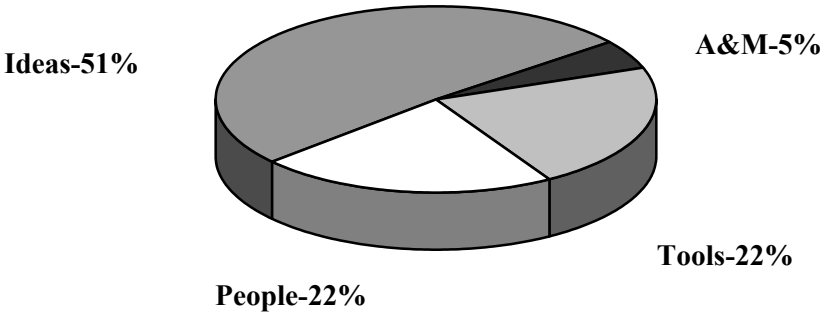
Programmatic strategies focus on specific NSF programs and activities, and on the funding needed to support them. These activities reflect the Foundation's funding priorities. They show how the agency balances its highly targeted investments with its broad-based, disciplinary support in order to address workforce issues, maintain the nation's capacity to produce new discoveries, and identify areas of unmet opportunities in which future investments will be productive.

The Strategic Plan for NSF gives priority to: (1) support for competitive investigator-initiated research and education along a broad, expanding frontier of science and engineering; (2) identification of and support for "unmet opportunities" that will strengthen and cross-fertilize the science and engineering disciplines and promise significant future payoffs for the nation; and (3) emphasis on several "transcendent" areas of emerging opportunity that enable research and education across a broad frontier of science and engineering. The transcendent areas identified in the Strategic Plan are Information Technology, Biocomplexity in the Environment, Nanoscale Science and Engineering, and 21st Century Workforce.

D. RESOURCES AND BUDGET / PERFORMANCE ALIGNMENT

Approximately 95 percent of NSF's budget goes directly to the investments it makes in support of its goals for the strategic outcomes – People, Ideas, and Tools. The remaining 5 percent of the budget goes toward Administration and Management, which provides operating support for the immediate activities of the agency: processing proposals, issuing awards, and overseeing projects.

FY 2003 BUDGET REQUEST OF $5.04 BILLION



The NSF budget justification contains information on the amount and range of activities covered by support for People, Ideas, and Tools. For the FY 2003 budget request, resources related to the People outcome goal total $1,087 million (cf. $1,013 million for FY 2002 and $894 million in FY 2001); those related to the Ideas goal total $2,559 million (cf. $2,431 million for FY 2002 and $2,297 million in FY 2001); and those for Tools goal total $1,122 million (cf. $1,145 for FY 2002 and $1,055 million in FY 2001).

The table below shows how NSF's five budget accounts are aligned with the People, Ideas, and Tools strategic outcome areas. Note that the R&RA (Research and Related Activities) and EHR (Education and Human Resources) accounts have components distributed among all three areas. The deployment of funds in these two budget accounts to the conceptual People, Ideas, or Tools areas is done on a program-by-program basis. In practice, each of NSF's several hundred *programs* is assigned to one of the People, Ideas, or Tools areas based on the *program's* principal objective. A list of programs associated with each strategic outcome area is presented in the NSF Strategic Plan (Appendix 7).

FY 2003 BUDGET / PERFORMANCE ALIGNMENT

(Estimated Millions of Dollars)

	STRATEGIC OUTCOMES			
Account[a]	**PEOPLE**	**IDEAS**	**TOOLS**	**A&M[c]**
R&RA	354	2,422	972	35
EHR	733	137	24	15
MREFC	0	0	126	0
S&E	0	0	0	210
OIG	0	0	0	8
Total[b,c]	$1,087	$2,559	$1,122	$268

[a] R&RA = Research & Related Activities; EHR = Education and Human Resources; MREFC = Major Research Equipment and Facilities Construction; S&E = Salaries and Expenses; and OIG = Office of Inspector General.
[b] Numbers may not add due to rounding.
[c] The figures shown for Administration and Management (A&M) include pension and health costs as proposed by the Administration's Cost Integration Legislation, requiring agencies to pay their full share of accrued cost of retirement beginning in FY 2003. Net of these additional amounts, the adjusted totals for FY 2003 are $261 million for A&M, and $5,028 million for the NSF total.

This view of how NSF deploys its budget de-emphasizes a key facet of NSF's approach – the multiple purposes each investment serves. For example, research *projects* in programs categorized under the Ideas

strategic outcome almost always provide funds to involve graduate students, thus they contribute to the People outcome. Such indirect investments are important to the attainment of the Foundation's goals, and NSF program officers are expected to take such potential contributions into account in making awards. The crosswalk in the table below provides further information on deployment of People-Ideas-Tools resources among individual budget lines – i.e., among the nine directorates and offices.

PROGRAMMATIC CROSSWALK FOR FY 2003 STRATEGIC OUTCOMES

(Estimated Millions of Dollars)

	STRATEGIC OUTCOMES				
	PEOPLE	IDEAS	TOOLS	Administration & Management [c]	Total[c,d]
BIO[a]	50	419	52	4	526
CISE	53	329	139	6	527
ENG	78	399	4	6	488
GEO	35	413	235	8	691
MPS	117	597	222	5	942
SBE	11	143	38	3	196
OPP	5	74	223	3	304
IA	5	48	58	0	111
EHR	733	137	24	15	908
Other[b]	0	0	126	218	345
Total[c,d]	$1,087	$2,559	$1,122	$268	$5,036

[a] BIO = Biological Sciences; CISE = Computer and Information Science and Engineering; ENG = Engineering; GEO = Geosciences; MPS = Mathematical and Physical Sciences; SBE = Social, Behavioral, and Economic Sciences; OPP = Office of Polar Programs; IA = Integrative Activities; EHR = Education and Human Resources.

[b] Other budget items include Major Research Equipment and Facilities Construction ($126 million, Tools); Salaries and Expenses ($210 million, Administration and Management); and Office of Inspector General ($8 million, Administration and Management)

[c] The figures shown for Administration and Management (A&M) include pension and health costs as proposed by the Administration's Cost Integration Legislation, requiring agencies to pay their full share of accrued cost of retirement beginning in FY 2003. Net of these additional amounts, the adjusted totals for FY 2003 are $261 million for A&M, and $5,028 million for the NSF total.

[d] Numbers may not add due to rounding.

The Administration and Management (A&M) Request of $268 million in the FY 2003 budget provides support for salaries and benefits of persons employed at NSF; general operating expenses, including key activities to advance the agency's information technology systems and to enhance staff training; and audit and Inspector General activities. During the fall of 2000, NSF initiated development of an Administration and Management (A&M) Strategic Plan. The plan is based on enterprise-wide resource planning, with large components focused on the NSF workforce and information technology. The document addresses resource needs and conveys the critical role of administration and management in ensuring continuing success in the agency's outcomes. A revised version was submitted to OMB in Spring 2002.

Human resources utilized in fulfilling the NSF mission include a staff of about 600 scientists and engineers (65% of whom are permanent government employees), 450 business operations personnel, 350 program support personnel, and 200 on-site contractors who support the agency's work. Additionally, NSF contracts for approximately 1,200 contractor FTEs to perform work associated with its programmatic responsibilities. Members of the science and engineering community who provide expert evaluation of proposed projects in the more than 250,000 reviews they prepare each year are another

critical human resource component. They donate tens of thousands of hours each year to assist NSF Program Officers in evaluating the research and education proposals submitted to NSF.

NSF's outstanding information management systems are critical in enabling the agency to effectively and efficiently process approximately 30,000 competitive proposals, 10,000 new awards and 10,000 continuing awards annually. NSF information and data sources include central databases such as the Proposal, PI, and Reviewer System (PARS), the Awards System, the Enterprise Information System (EIS), FastLane (including the Project Reporting System), the Integrated Personnel System (IPERS), the Financial Accounting System (FAS), and the Online Document System (ODS).

E. CROSS-CUTTING ACTIVITIES AND PROGRAMS

Collaboration and partnerships between disciplines and institutions and among academe, industry, and government enable the transfer of people, ideas, and tools throughout the public and private sectors. NSF's Strategic Plan (Appendix 4) emphasizes the importance of partnerships as a core strategy for enabling Foundation activities. It describes and acknowledges the importance of cooperation between NSF and other agencies in addressing a broad spectrum of activities while avoiding duplication and inappropriate overlap.

Federal agencies whose mission and general goals specify certain research and education activities may at times define similar strategic objectives. NSF often jointly funds research and education activities with other agencies when there are shared interests. NSF staff actively participate in numerous interagency initiatives, both in planning the activities and in review of proposals, to ensure that the role of each agency is clearly identified and supported appropriately.

The crosscutting activities summarized below provide examples of initiatives where cross-agency coordination and cooperation is especially well developed. Each activity has developed a strategic plan, a science plan, or a supplement to the President's Budget that details the research and education contributions of each agency to the overall effort. Additional examples are included in Appendix C.

- **Networking and Information Technology Research & Development (NITRD):** NSF has been designated the lead federal agency for NITRD, a collaborative research framework for twelve agencies that addresses a broad range of IT research questions across the spectrum of human uses of information technology. NSF is a lead supporter of research in the following program component areas: Large Scale Networking, High End Computing, High End Computation and Infrastructure, High Confidence Software and Systems, Human Computer Interaction, Information Management, Software Design and Productivity, and Social, Economic and Workforce Implications of IT and IT Workforce Development. A recent discussion of the overall NITRD effort can be found in the most recent annual "Blue Book": "Networking and Information Technology Research and Development, Supplement to the President's Budget for FY 2002" (available from the National Science and Technology Council, http://www.ccic.gov).
  (AHRQ/DARPA/DOE-NNSA/DOE-SC/EPA/NASA/NIH/NIST/NOAA/NSA/NSF/DOD)

- **Nanoscale Science and Engineering (NSE):** In FYs 1999, 2000 and 2001, NSF worked in partnership with other federal agencies in planning nanoscale science and engineering activities. NSF chairs an interagency Subcommittee on Nanoscience, Engineering and Technology, in cooperation with the Department of Defense, the Department of Energy, the National Institutes of Health, the National Aeronautics and Space Administration, the Department of Commerce, the National Institute of Standards and Technology, the Environmental Protection Agency, the Department of Transportation, the Department of Justice and the Department of Treasury. A recent discussion of

thematic interests and responsibilities of participating agencies is included in the document "NATIONAL NANOTECHNOLOGY INITIATIVE – Leading to the Next Industrial Revolution" (NSTC Subcommittee on Nanoscience, Engineering and Technology (http://www.nsf.gov/home/crssprgm/nano/nni2.htm)) (CIA/DOD/DOE/DOJ/DOC/DOS/DOT/ DOTreas/EPA/NASA/NIH/NIST/NRC/NSF/USDA)

- **National Earthquake Hazards Reduction Program (NEHRP):** Congress has mandated that NSF and three other federal agencies participate in NEHRP to develop coordinated activities that include research, technology development, deployment and implementation to improve the nation's understanding of earthquake hazards and to mitigate their effects. NSF's George E. Brown, Jr. Network for Earthquake Engineering Simulation (NEES) is a NEHRP project currently under construction through FY 2004 that will provide a national cyber-network resource for earthquake engineering and hazard mitigation. NEES will include approximately 20 geographically distributed, shared-use next generation earthquake engineering equipment installations for experimental and analytical research, providing telepresence and visualization capabilities, all networked together through the high performance Internet. NSF's contributions to the NEHRP mission support a broad range of basic research covering the geoscience, engineering, economic and social aspects and impacts of earthquakes. Contributions of all NEHRP agencies are presented in "Expanding and Using Knowledge to Reduce Earthquake Losses: The National Earthquake Hazards Reduction Program Strategic Plan 2001-2005" (November 2000). (DOI-USGS/FEMA/NIST/NSF)

- **Interagency Arctic Research and Logistics:** NSF is one of twelve federal agencies supporting Arctic research and logistics. NSF provides interagency leadership (as chair agency of the Interagency Arctic Research Policy Committee) for research planning as directed by the Arctic Research and Policy Act of 1984. The most recent biennial revision to the United States Arctic Research Plan 2002-2006 (*Arctic Research of the United States*, Fall/Winter 2001) includes three special focus interagency research programs agreed to by the federal agencies. These are the Study of Environmental Arctic Change (SEARCH), Bering Sea Research, and Arctic Health Research. Federal agencies also support research on the Arctic Ocean and Marginal Seas, Atmosphere and Climate, Land and Offshore Resources, Land-Atmosphere-Water Interactions, Engineering and Technology, Social Sciences, and Health. Agencies also coordinate multi-agency crosscutting issues such as research support and logistics, facilities, international activities, and data and information. (DOD/DOI/NSF/NASA/NOAA/DOE/HHS/SI/DOT/EPA/USDA/DOS)

- **Large Hadron Collider (LHC):** The European Organization for Nuclear Research, CERN, in collaboration with the U.S. and other non-member states, has undertaken construction of a new high-energy physics research facility, the LHC, at its laboratory site outside Geneva, Switzerland. This facility, scheduled for completion in 2005, will include the LHC accelerator and two very large detectors. CERN has responsibility for the construction and operation of the LHC accelerator. In addition CERN is contributing to the construction of, and is providing coordination and administrative support for, the two detectors and their research programs. There is a formal agreement between the U.S. Department of Energy (DOE) and NSF on behalf of the U.S. and CERN concerning U.S. participation in the construction. DOE is solely responsible for providing funding of $200 million for goods and services for the LHC accelerator construction. In addition, DOE and NSF are responsible for providing funding of $250 million and $81 million, respectively, for goods and services toward the fabrication of the detectors. NSF will provide funds for the active participation of the U.S. scientific community in the physics research to be carried out with the two detectors. (DOE/NSF/CERN)

- **Global Change Research:** NSF's research on global change is supported in conjunction with the agency's participation in the U.S. Global Change Research Program. Research activities address the dynamics of natural and human systems and generate the knowledge needed to preserve, manage and

enhance the natural environment. NSF supports "research and related activities to advance the fundamental understanding of dynamic physical, biological and socioeconomic systems and the interactions among them. The programs encourage interdisciplinary activities with particular focus on Earth system processes and the consequences of change" (*Our Changing Planet: The FY 2002 U.S. Global Change Research Program;* NSTC supplement to the President's Fiscal Year 2002 Budget). NSF will also participate in the FY 2003 Climate Change Research Initiative, with responsibilities related to carbon cycle science and climate change risk management. (USDA/DOC-NOAA/DOE/HHS-NIH/DOI-USGS/EPA/NASA/NSF/SI)

F. External Factors Affecting Success

External factors bearing on NSF's ability to achieve its strategic outcomes are discussed in Appendix 2 of the Strategic Plan. These factors stem largely from the fact that NSF does not conduct research and education activities directly (e.g., NSF does not manage its own laboratories) but supports others who do so. In particular, the circumstances of institutional partners in academe, the private sector, and the government affect how individuals and groups are able to respond in both proposing and conducting research and education. The information used by external committees of experts in evaluating NSF's progress toward attainment of its outcome goals is derived primarily from reports submitted by awardees.

Additionally, NSF cannot regulate the current condition and quality of research and education facilities and platforms throughout the country, even though it may support the infrastructure. Likewise, the characteristics of the science and engineering workforce are dependent on the systems in which individuals are educated and trained. Other factors beyond NSF's control include appropriations, indirect cost rates, government-wide policies, inflation, budget and plans of other R&D agencies, uncertainty and risk inherent in research, availability of technology and the pace of technological innovation.

G. Assessing Agency Progress toward Strategic Outcomes

Implementing GPRA has been a challenge for NSF and other agencies with missions involving research and education activities because the substance and timing of outcomes from such activities are unpredictable. This poses a challenge in linking research and education outcomes to annual investments and an annual budget.

The true value of NSF is demonstrated in the long-term results of the research and education activities it supports. Many of these activities require years to develop and can only be judged retrospectively. As a result, NSF obtained Office of Management and Budget (OMB) approval for use of the "alternative form" in assessing agency progress toward meeting its Outcome Goals. Use of this alternative form enables NSF to use a retrospective approach and a qualitative scale in its annual assessments.

The Foundation has both qualitative and quantitative goals – its Outcome Goals are expressed in a qualitative form, while most Management Goals are quantitative. NSF's goals are also agency-wide goals – that is, the Foundation compiles results across the entire agency in reporting annual progress in meeting its GPRA goals.

Agency assessment of Outcome Goals is based largely on information included in reports prepared by committees of independent, external experts, such as Committees of Visitors and the Advisory Committee

for GPRA Performance Assessment (AC/GPA), who assess the quality of research and education program results based on their *collective experienced-based norms*. The focus of the portfolio assessment is the quality of past investments (the quality of outputs and outcomes) and the likelihood that the package of current awards will produce significant results in the future. NSF management reviews the assessments made by these committees, and the reports are used to determine agency success in achieving its Outcome Goals, in developing the annual GPRA Performance Report for the agency, and in program management, priority setting, and establishment of new areas of emphasis.

For the assessment of outcome goals NSF defines its goals using a qualitative standard that describes expected "successful" performance. For the FY 2003 outcome goals, NSF performance is deemed "successful" when, in the aggregate, results reported in the period demonstrate significant achievement for a majority of specified indicators[2]. These sets of indicators were developed for aggregated Foundation activities.

Assessment processes for the largely quantitative management goals are based on collection of relevant information with internal data systems, internal review by NSF staff, and auditing by third parties.

Performance assessment at NSF is supported with information obtained from the following activities:

- **Applicant and Grantee Information/Merit Review.** All applicants and grantees provide results from previous NSF support, information about existing facilities and equipment available to conduct the proposed research, biographical information on the Principal Investigators, other sources of support, federally required certifications and certifications specific to NSF. Such information is required at the time of application, at the time of an award, and in annual and final project reports. It is reviewed by NSF staff, and is utilized during merit review and is available to external committees conducting performance assessment. The merit review process mentioned above and described in the management section of this plan provides a rigorous, first phase of assessment of NSF's research and education portfolio.

- **Program Evaluation by Committees of Visitors (COVs).** To ensure the highest quality in processing and recommending proposals for awards, NSF convenes Committees of Visitors (COVs), composed of qualified external evaluators, to review each program every three years. This includes disciplinary programs in the various directorates and offices, and selected cross-disciplinary programs managed across directorates. The COVs are comprised of independent, external experts from academia, industry, government, and the public sector. These experts assess the integrity and efficiency of the processes for proposal review and provide a retrospective assessment of the quality of results of NSF's programmatic investments. COV reports are submitted to Directorate / Office Advisory Committees and ultimately to the NSF Director.

- **Directorate Assessment by Advisory Committees (ACs).** Directorate / Office Advisory Committees review COV reports, available external evaluations, and annual directorate performance reports. They judge program effectiveness, describe strengths and weaknesses, and provide advice on priorities. Their recommendations are reviewed by management and considered by NSF when evaluating existing programs and future directions for the Foundation. The ACs have full access to all available data sources to carry out their assessments. All advisory committees are subject to Federal Advisory Committee Act (FACA) rules.

[2] In FY 1999, NSF applied a two-level set of standards in the assessment process that allowed programs to be judged either "successful" or "minimally effective" in meeting NSF's goals. Based on feedback in FY 1999, NSF revised the two-level standard to one level for FY 2000 and beyond, which allowed programs to be judged "successful" or "not successful" in meeting NSF's goals.

- **Foundation Assessment by the Advisory Committee for GPRA Performance Assessment (AC/GPA).** The AC/GPA reviews NSF's People, Ideas and Tool portfolios and performs an assessment of results for indicators associated with these outcome goals. The Committee also comments on the quality/relevance/balance of award portfolios and on investment portfolios for their potential future impact.

II. SUMMARY TABLE

FY 2003 GPRA PERFORMANCE GOALS

NSF's annual performance goals for FY 2003 are organized in two categories:

- Strategic Outcomes (rationale, measurement approach, and baseline information provided in Section III); and
- Management (rationale, measurement approach, and baseline information provided in Section IV).

FY 2003 GPRA PERFORMANCE GOALS

Strategic Outcomes	No.	Annual Performance Goals for Strategic Outcomes[1]	FY 2003 Areas of Emphasis	
			For investment in emerging opportunities:	**For GPRA reporting, as relevant:**
PEOPLE **<u>Outcome Goal:</u>** **Developing "a diverse, internationally competitive and globally engaged workforce of scientists, engineers, and well-prepared citizens."**	**III-1a**	***NSF's performance for the People Strategic Outcome is successful when, in the aggregate, results reported in the period demonstrate significant achievement in the majority of the following indicators:*** • Development of well-prepared researchers, educators or students whose participation in NSF activities provides experiences that enable them to explore frontiers or challenges of the future; • Contributions to development of a diverse workforce through participation of underrepresented groups[2] in NSF activities; • Development or implementation of other notable approaches or new paradigms[3] that promote progress toward the PEOPLE outcome goal.	❑ Math and Science Partnership ❑ Centers for Learning & Teaching (CLT) ❑ Graduate Student Stipends: - Increasing stipends for GRF, IGERT and GK-12	❑ PreK-12 Education, e.g., - Systemic Reform ❑ Undergraduate Education, e.g., - REU ❑ Graduate and Professional Development, e.g., - IGERT, GK-12 - CAREER ❑ Centers for Learning & Teaching (CLT) ❑ Broadening Participation, e.g., - Partnerships for Innovation - Programs that serve underrepresented groups[3]
	III-1b	NSF will significantly enhance the quality of K-12 mathematics and science education available to all students in Math and Science Partnership schools. Performance Indicators: • Evidence in the award portfolio of the infrastructure to support high quality programs addressing issues related to teacher workforce capacity, including preservice education and inservice professional development of math and science teachers as well as alternative routes into the profession (e.g., scientists and engineers becoming teachers.) • Evidence within Partnership school systems of the infrastructure needed to improve math and science education and to measure improvement, i.e., the adoption of appropriate assessments of student achievement, as well as the initiation of the collection of achievement data that can be disaggregated by ethnicity, socioeconomic status, gender, etc.		

1 These performance goals are stated in the alternate form provided for in GPRA legislation.
2 For example, women, underrepresented minorities, or persons with disabilities.
3 For example, broad-based, program-wide results that demonstrate success related to improved math and science performance for preK-12 students, or professional development of the STEM instructional workforce, or enhancement of undergraduate curricular/laboratory/instructional infrastructure, or highly synergistic education and research activities, or international collaborations, or communication with the public regarding science and engineering.

FY 2003 GPRA PERFORMANCE GOALS (CONTINUED)

Strategic Outcomes	No.	Annual Performance Goals for Strategic Outcomes[1] (Continued)	FY 2003 Areas of Emphasis	
			For investment in emerging opportunities:	**For GPRA reporting, as relevant:**
IDEAS **<u>Outcome Goal:</u>** **Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."**	**III-2**	***NSF's performance[2] for the Ideas Strategic Outcome is successful when, in the aggregate, results reported in the period demonstrate significant achievement in the majority of the following indicators:*** • Discoveries that expand the frontiers of science, engineering, or technology; • Connections between discoveries and their use in service to society; • Partnerships that enable the flow of ideas among the academic, public or private sectors; • Leadership in fostering newly developing or emerging areas.	❑ Priority areas: - Biocomplexity in the Environment - Information Technology Research - Nanoscale Science and Engineering - - - Mathematical Sciences - Social, Behavioral, & Economic Sciences ❑ Core research and education activities ❑ Science of Learning Centers (SLC) ❑ Climate Change Research Initiative (CCRI)	❑ Balance of portfolio, including projects that are innovative, high-risk, or multidisciplinary ❑ Priority Areas: e.g., <u>Current</u> - Biocomplexity in the Environment - Information Technology Research - Nanoscale Science & Engineering <u>Former</u> - Life & Earth's Environment - Information Technology for the 21st Century - Knowledge & Distributed Intelligence ❑ Core research and education activities ❑ Centers, e.g., - STCs, ERCs, MRSECs. ❑ EPSCoR

1 These performance goals are stated in the alternate form provided for in GPRA legislation.

FY 2003 GPRA PERFORMANCE GOALS (CONTINUED)

Strategic Outcomes	No.	Annual Performance Goals for Strategic Outcomes[1] (Continued)	FY 2003 Areas of Emphasis	
			For investment in emerging opportunities:	For GPRA reporting, as relevant:
TOOLS **<u>Outcome Goal:</u> Providing "broadly accessible, state-of-the-art and shared research and education tools."**	***III-3***	***NSF's performance for the Tools Strategic Outcome is successful when, in the aggregate, results reported in the period demonstrate significant achievement in the majority of the following indicators:*** • Development or provision of tools[4] that enables discoveries or enhances productivity of NSF research or education communities; • Partnerships with local, state or federal agencies, national laboratories, industry or other nations to support and enable development of large facilities or other infrastructure; • Development or implementation of other notable approaches or new paradigms[5] that promote progress toward the TOOLS outcome goal.	❑ Major Research Equipment and Facilities Construction (new investments): NEON, EarthScope, ALMA II ❑ Science Resources Statistics (SRS) Survey Redesign ❑ National STEM Education digital library	❑ Major Research Equipment and Facilities Construction (current and former): e.g., ALMA I, LIGO, Gemini, LHC, NEES, SPSM, Terascale Computing ❑ Major Research Instrumentation (MRI) Program ❑ Science and Engineering policy analyses, information, reports and databases ❑ Scientific databases and tools for using them, including the National STEM Education digital library

1 These performance goals are stated in the alternate form provided for in GPRA legislation.

4 For example, includes research and education infrastructure such as large centralized facilities, or integrated systems of leading-edge instruments, or databases, or widely utilized, innovative computational models or algorithms, or information that provides the basis for a shared-use networked facility.

5 For example, broad-based, program-wide results that demonstrate success related to management/utilization of large data sets/information bases, or development of information and policy analyses, or use of the Internet to make STEM information available to NSF research or education communities, or exceptional examples of broadly accessible tools shared by NSF research and education communities.

FY 2003 GPRA PERFORMANCE GOALS (CONTINUED)

Performance Area	No.	Annual Performance Goals for Management
Proposal and Award Processes		
Use of Merit Review	IV-1	At least 85 percent of basic and applied research funds will be allocated to projects that undergo merit review.
Implementation of Merit Review Criteria – Reviewers	IV-2	At least 70 percent of reviews with written comments will address aspects of both generic review criteria.
Implementation of Merit Review Criteria – Program Officers	IV-3	For at least 80 percent of decisions to fund or decline proposals, program officers will comment on aspects of both generic review criteria.
Customer Service – Time to Prepare Proposals	IV-4	Ninety-five percent of program announcements will be publicly available at least three months prior to the proposal deadline or target date.
Customer Service – Time to Decision	IV-5	For 70 percent of proposals, be able to inform applicants whether their proposals have been declined or recommended for funding within six months of receipt.
Award Portfolio		
Award Size	IV-6	NSF will increase the average annualized award size for research grants to a level of $125,000, compared to a goal of $113,000 in FY 2002.
Award Duration	IV-7	NSF will maintain the FY 2002 goal of 3.0 years for the average duration of awards for research grants.
Award Oversight and Facilities Management		
Construction and Upgrade of Facilities	IV-8	For 90 percent of construction, acquisition and upgrade projects, keep any negative cost and schedule variances to less than 10 percent of the approved project plan.
Operations and Management of Facilities	IV-9	For 90 percent of operational facilities, keep scheduled operating time lost to less than 10 percent.

FY 2003 GPRA PERFORMANCE GOALS (CONTINUED)

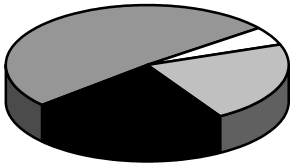
Performance Area	No.	Annual Performance Goals for Management (Continued)
Business Practices		
Electronic Business	IV-10	NSF will continue to advance "e-business" by receiving through FastLane and processing electronically 90 percent of Principal Investigator award transfers.
	IV-11	NSF will continue to advance "e-business" by implementing Phase III of the Electronic Jacket application. Performance Indicator: Implementation of the electronic capability for assigning proposal processing tasks, forwarding proposals to other programs as necessary, and delegating proposal action authority.
Information Technology Security	IV-12	NSF will maintain and enhance the agency-wide security program to ensure adequate protection of NSF's IT infrastructure and critical assets. Performance Indicators: - 95 percent of major systems will have approved security plans on file. - 95 percent of major systems will have documented certification and accreditation.
Human Resources and Workplace		
NSF Staff – Diversity	IV-13	NSF will ensure that diversity considerations are embedded in activities related to agency staffing of scientists and engineers (S&E). Performance indicator: Initiate development of a NSF S&E diversity plan.
	IV-14	NSF will show an increase over FY 2000 in the total number of appointments to NSF science and engineering staff and management from underrepresented groups.
Workforce	IV-15	NSF will align or develop competency-based curricula, through the NSF Academy, that provide cross-functional, work-based team learning opportunities. Performance Indicator: Initiate development of new courses or revision of existing courses to address program management, leadership development, and technology and business process training.
	IV-16	NSF will develop competency-based, occupation classification alternatives that support the agency's strategic business processes and capitalize on its technology enabled business systems. Performance Indicators: - Identification of workforce competencies for all current NSF job families. - Initiate identification of competency-based, classification alternatives.

III. GOALS FOR STRATEGIC OUTCOMES

NSF has developed performance goals with descriptive standards to evaluate the results of its investments in research and education, per the GPRA option to set performance goals in an alternative form. The descriptive standards characterize successful performance.

A. PEOPLE STRATEGIC OUTCOME

OUTCOME GOAL III-1: Developing "a diverse, internationally competitive and globally engaged workforce of scientists, engineers, and well-prepared citizens."



22%

PEOPLE = $1,087 M

NSF's investments in People enable the Foundation to meet its mission of promoting the progress of science, while facilitating the creation of a diverse, internationally competitive and globally engaged workforce of scientists, engineers and well-prepared citizens. In order to achieve the People strategic outcome, NSF supports formal and informal science, technology, engineering and mathematics (STEM) education at all levels – preK-12, undergraduate, graduate – in addition to professional development of faculty and teachers and public science literacy projects that engage people of all ages in life-long learning. The Foundation also supports programs specifically designed to promote the integration of research and education, such as the Integrative Graduate Education and Research Traineeship Program (IGERT), Research Experiences for Undergraduates (REU) and the Faculty Early Career Development Program (CAREER). In partnership with the research and education community, state and local education agencies, civic groups, industry, and parents, NSF fosters the continued development of research-informed standards-based STEM education at all levels.

FY 2003 Performance Goal III-1a: NSF's performance is successful when, *in the aggregate*, results reported in the period demonstrate significant achievement in the majority of the following indicators:

- Development of well-prepared researchers, educators or students whose participation in NSF activities provides experiences that enable them to explore frontiers or challenges of the future;
- Contributions to development of a diverse workforce through participation of underrepresented groups[3] in NSF activities;
- Development or implementation of other notable approaches or new paradigms[4] that promote progress toward the PEOPLE outcome goal.

Baseline: Goal III-1a was a new performance goal for FY 2001. NSF was successful in achieving this goal in FY 2001.

[3] For example, women, underrepresented minorities or persons with disabilities.

[4] For example, broad-based, program-wide results that demonstrate success related to improved math and science performance for preK-12 students, or professional development of the STEM instructional workforce, or enhancement of undergraduate curricular/laboratory/instructional infrastructure, or highly synergistic education and research activities, or international collaborations, or communication with the public regarding science and engineering.

Data/Sources Used in Assessment Processes (Goal III-1a): Examples of relevant information include 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; number and quality of teachers trained; and student outcomes including enrollments in mathematics and science courses, retention, achievement, and science and mathematics degrees received; press releases, scientific publications.

This information may be included in PI project reports (annual and final), program/division/directorate annual reports, agency internal collections, formal external evaluations or special studies, or internal/external information systems.

These sources of information provide the basis for reports prepared by external experts , which are utilized in management and GPRA reporting activities.

Data Sources for Determining Results (Goal III-1a): Independent assessments and third-party evaluations, such as the AC/GPA report using GPRA alternative form; external reports from awardees; internal and external information systems and external studies; and independently maintained databases.

Criteria for success are presented in the performance goal statement.

Data Limitations (Goal III-1a): Non-quantitative information requires judgment of experts; substance and timing of outcomes from research and education activities are unpredictable; some external databases not under agency control; long-term data needed to assess ultimate impact of outcomes; potential for self-reporting bias.

FY 2003 Performance Goal III-1b: NSF will significantly enhance the quality of K-12 mathematics and science education available to all students in Math and Science Partnership schools.

Performance Indicators:

- Evidence in the award portfolio of the infrastructure to support high quality programs addressing issues related to teacher workforce capacity, including preservice education and inservice professional development of math and science teachers as well as alternative routes into the profession (e.g., scientists and engineers becoming teachers.)
- Evidence within Partnership school systems of the infrastructure needed to improve math and science education and to measure improvement, i.e., the adoption of appropriate assessments of student achievement, as well as the initiation of the collection of achievement data that can be disaggregated by ethnicity, socioeconomic status, gender, etc.

Since the first awards under the Math and Science Partnership were made in September 2002, documentation of performance under the awards will begin late in the 2002-2003 academic year. During FY 2003, baselines for measuring progress will be established for the participating school systems, college and university efforts will be aligned to the aspirations of these schools, and curricular reform will begin in the schools and their partners in higher education. The work of Math and Science Partnerships will be designed to increase the number, quality and diversity of teachers through the close cooperation of school systems, colleges and universities, with strong involvement of math and science faculty.

Under these circumstances, the appropriate indicators are evidence of the infrastructure that Partnership projects have developed to lead and support implementation of proposed activities.

Baseline and Targets (Goal III-1b): This is a new goal for FY 2003. Annual performance targets for each Partnership project will be detailed in a Strategic Plan. In FY 2003, each partnership school system will document the current status of the K-12 science and mathematics curriculum, its teacher workforce, professional development needs, assessment and accountability systems, and policies. School systems will collect baseline student participation and achievement data with comparisons to state and/or national averages on achievement in math and science. Higher education partners will describe their history in educating mathematics and science teachers and prior involvement of math and science faculty in K-12 education. Funded proposals will provide details of plans for increasing numbers of math and science teachers participating in professional development and for increasing involvement of math and science faculty in teacher education.

Data/Sources Used in Assessment Process (Goal III-1b): For partnerships, description of partnership activities and efforts to strengthen infrastructure, including outreach efforts, identification of partners (higher education institutions and school districts), number and type of partnerships developed. For school systems, demographics of students and teachers, assessment of curriculum content and pedagogy, and student outcomes, including participation in challenging courses and achievement. For colleges and universities, quantity and demographics of mathematics and science teachers that are produced annually, where new teachers are placed for initial teaching appointments, description of pre- and in-service professional development activities, including degree of involvement of mathematics and science (Arts and Science) faculty.

Data Sources for Determining Results (Goal III-1b): Program reports; external reports from awardees, accompanied by student achievement and other data provided directly to databases that NSF will maintain; publications; internal and external information systems and external studies.

Criteria for success are presented in the performance goal statement.

Data Limitations (Goal III-1b): Non-quantitative information requires judgment of experts; basis for judgment not always evident; outcomes from educational activities in large systems may require significant lead times; some external databases not under agency control; long-term data needed to assess impact of outcomes; potential for self-reporting bias; processes to collect and aggregate data are not standardized; difficulty exists in attributing student outcomes to specific interventions.

External Factors that Affect Performance (Goal III-1b):
Although relatively small when compared with the total funds available to local school districts, NSF funds - if used strategically - can be an important catalyst for improving the teaching and learning of mathematics and science, grades K-12. Since higher education is NSF's natural constituency, it is especially important that NSF funding be used to induce developmental but sustained changes in the culture of higher education - in particular, (a) the greater engagement of mathematics and science faculty in the important work of K-12 teachers and students, (b) the concomitant institutional changes in academic policy required to support and reward faculty involvement (e.g., promotion and tenure), and (c) the restructuring of preservice education to forge more substantive collaborations between faculty in STEM disciplinary departments and faculty in education. In addition, documentation of sustained growth in K-12 student achievement, including the development of increasingly sophisticated levels of problem-solving and critical thinking / reasoning skills in mathematics and science, requires longitudinal measurement. Districts that are able to create a stable assessment environment where equivalent instruments and methodologies are used over a relatively long timeframe afford the best opportunities for assessing such sustained growth in K-12 mathematics and science student achievement.

Means and Strategies for Success (Goals III-1a,1b):

Related to process:

- Support, through merit-based grants and cooperative agreements, the most promising and capable individuals and groups throughout the U.S.;
- Pay particular attention to development of people beginning careers in science and engineering;
- Use all aspects of NSF activity to embed diversity in the science and engineering workforce;
- Explore partnerships with professional societies, industry, academe, or other federal agencies with activities that focus on broadening participation; make presentations at national and regional meetings involving minority-serving organizations and at formal campus meetings of NSF programs (i.e., EPSCoR and LSAMP) in order to expand participation of underrepresented groups in NSF activities;
- Focus on (a) preparation and professional development of teachers of math and science; and (b) alignment of standards, rigorous curricula and assessments;
- Ensure a sufficient variety of NSF activities (e.g., programs with industry; NSF centers) to afford interactive research and education opportunities for students, post-doctoral scientists and faculty at all career stages in order to produce well-trained researchers and educators;
- Support approaches that integrate research and learning activities and encourage partnering of K-12 and higher education communities;
- Encourage the use of educational, information and computer technologies in classrooms of teachers participating in NSF-funded projects in order to enhance development of the instructional workforce;
- Support attendance at international meetings, faculty/student exchange opportunities, and research utilizing international facilities and field/logistics centers in order to further the engagement of the NSF community in international activities; and
- Support increased linkages between formal programs and informal activities such as those involving museum and science center exhibits, public fora, or the Internet in order to communicate with the broader public.

Related to programs:

- Provide grants of sufficient size and duration to improve the efficiency of the research process.
- Provide financial support for activities specifically addressing the People strategic outcome. For FY 2003 the budget request is about $1,087 million, an increase of $74 million over FY 2002. Major components of the Foundation's investments in People focus on investments in programmatic activities related to (1) K-12 education, (2) undergraduate education, and (3) graduate and professional development. EHR provides a major focus for much of NSF's education and workforce investments; however, these efforts are integrated with complementary activities across the Foundation.
- Support programmatic themes for FY 2003 highlighted in the section labeled FY 2003 Areas of Emphasis for Investment in Emerging Opportunities (discussed in the NSF Budget Request, detailed below and listed in table in Section II.)

FY 2003 Areas of Emphasis for Investment / GPRA Reporting (Goal III-1a):

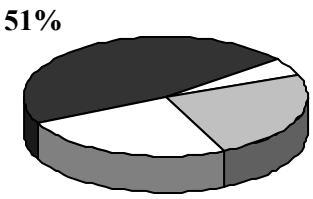
- *Math and Science Partnership (MSP):* The Math and Science Partnership, a program for which the first awards were made in FY 2002, is a national effort to unite the activities of higher education in support of K-12 students and teachers. MSP plays a central role in the Presidential education initiative, *No Child Left Behind*. It supports partnerships between local school districts and science, mathematics, engineering and education faculties of colleges and universities. The partnerships focus on improving the quality of science and mathematics instruction, encouraging student success and strengthening the recruitment, preparation, retention and professional development of highly

competent science and mathematics teachers. The program was funded at $160 million in FY 2002 and the proposed FY 2003 funding level is $200 million.

- Centers for Learning and Teaching (CLT) link K-12, higher education, and/or informal science education performers to provide a systemic approach for developing and enhancing the instructional workforce (Kindergarten through graduate school) where professionals are educated in an environment of research and practice. By the end of FY 2002 ten K-12 Centers and up to two higher education Centers focusing on faculty development will have been funded. Additional Center awards are anticipated over the next several years. (Request = $28 million.)
- Increasing Graduate Student Stipends is one strategy to attract more U.S. citizens, nationals, and permanent residents into graduate education in science and engineering. The stipend for NSF fellows and trainees for the 2001-2002 academic year is $21,500. In the 2002-2003 academic year, NSF will increase stipends for its GRF (Graduate Research Fellowships), GK-12 (NSF Graduate Teaching Fellows in K-12 Education), and IGERT (Integrative Graduate Education and Research Traineeships) fellows to $25,000.
- *Other*
  - > K-12 Education: This area of emphasis includes educational systemic reform initiatives such as Rural Systemic Initiatives (RSI), Statewide Systemic Initiatives (SSI), and the Urban Systemic Program (USP).
  - > Undergraduate Education: One example is the Research Experiences for Undergraduates (REU) Program. This program supports active research participation by undergraduate students in any of the research areas funded by NSF.
  - > Graduate and Professional Development: Examples include Integrative Graduate Education and Research Traineeships (IGERT) and Graduate Teaching Fellowships in K-12 Education (GK-12). IGERT meets the need for a cadre of broadly prepared Ph.D.s. It sponsors development of innovative, research-based graduate education and training programs in Ph.D. granting institutions. GK-12 places graduate and advanced undergraduate students in K-12 schools to serve as science and mathematics content resources for teachers and as role models for young students.
  - > The Faculty Early Career Development (CAREER) program supports junior faculty within the context of their overall career development. It combines in a single program research support and education of the highest quality. (Request = $123 million.)
  - > The Partnerships for Innovation (PFI) program focuses on connections between new knowledge created in the discovery process and learning and innovation. The goals of the program are: (1) to stimulate the transformation of knowledge created by the national research and education enterprise into innovations; (2) to broaden the participation of all types of academic institutions and all citizens in NSF activities to more fully meet the workforce needs of the national innovation enterprise; and (3) to create the enabling infrastructure. (Request = $5 million.)
  - > Programs that serve underrepresented groups: ADVANCE is an integral part of the Foundation's multifaceted strategy to help realize a diverse science and engineering workforce and advance the participation and advancement of women in all fields of science and engineering. Funding will total $17 million in FY 2003. The Tribal Colleges and Universities Program encourages Native Americans to pursue information technology and other science and technology fields of study and increases the capability of these colleges to offer relevant science and technology courses and enhance K-12 education in feeder school systems. The Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP) focuses on strengthening the research infrastructure and education in participating institutions and contributes to the goal of increasing the number of underrepresented minority students obtaining STEM baccalaureate degrees. (Request for the two programs = $24 million.)

B. IDEAS STRATEGIC OUTCOME

OUTCOME GOAL III-2: Enabling "discovery across the frontier of science and engineering, connected to learning, innovation, and service to society."



IDEAS = $2,559 M

Investments in ideas support cutting edge research that yields new and important discoveries and promotes the development of new knowledge and techniques within and across traditional boundaries. These investments enable the Foundation to meet its mission of promoting the progress of science – while at the same time helping to maintain the nation's capacity to excel in science and engineering, particularly in academic institutions. The results of NSF-funded research projects provide a rich foundation for broad and useful applications of knowledge and the development of new technologies. Support in this area also promotes the education and training of the next generation of scientists and engineers by providing them with an opportunity to participate in discovery-oriented projects. NSF-funded centers provide an enhanced environment for broad interdisciplinary education at all levels.

FY 2003 Performance Goal III-2: NSF's performance is successful when, *in the aggregate*, results reported in the period demonstrate significant achievement in the majority of the following indicators:

- Discoveries that expand the frontiers of science, engineering, or technology;
- Connections between discoveries and their use in service to society;
- Partnerships that enable the flow of ideas among the academic, public or private sectors;
- Leadership in fostering newly developing or emerging areas.

Baseline: Goal III-2 was a new performance goal for FY 2001. NSF was successful in achieving this goal in FY 2001.

Means and Strategies for Successful Implementation:

Related to Process:

- Support the most promising ideas through merit-based grants and cooperative agreements to individual researchers and groups, in partnership with colleges, universities, and other institutions – public, private, state, local, and federal – throughout the U.S.;
- Make awards focused on discoveries that create or have potential for connections with use in service to society;
- Encourage partnerships and cooperative research efforts – among disciplines, in different sectors, and across international boundaries;
- Take informed risks in emerging research areas where consensus on appropriate directions (e.g., theory, methodology, or knowledge) is just beginning to form;
- Partner with a diverse range of investigators (e.g., new, minority) and institutions (e.g., research universities, community colleges, EPSCoR states);
- Identify and support major cross-disciplinary priority areas where U.S. and NSF leadership are important;
- Identify and provide support for new and emerging opportunities; and

- Utilize the NSF core strategies of integrating research and education, promoting partnerships, and developing intellectual capital.

Related to Programs:

- Provide grants of sufficient size and duration to improve the efficiency of the research process.
- Provide financial support for programs specifically addressing NSF's strategic outcome related to Ideas. For FY 2003, this investment totals about $2,559 million, an increase of $128 million over FY 2002. Investments in research grants and centers are the principal components of NSF's investments in Ideas. The FY 2003 request continues to support core disciplinary research and education across the NSF.
- Support programmatic themes for FY 2003 highlighted in the section labeled FY 2003 Areas of Emphasis for Investment in Emerging Opportunities (discussed in the NSF Budget Request, detailed below and listed in the table in Section II). These themes focus on aspects of the entire NSF portfolio and on areas that hold exceptional promise to advance knowledge – such as Information Technology Research (ITR); Biocomplexity in the Environment (BE); Nanoscale Science and Engineering; Mathematical Sciences; Social, Behavioral and Economic Sciences; and Science of Learning Centers - SLC.
- Develop and support a high-quality balanced award portfolio that considers disciplines and fields, interdisciplinary research areas, and emerging opportunities.

FY 2003 Areas of Emphasis for Investment / GPRA Reporting:

- *Priority Areas:*
  - > *Biocomplexity in the Environment* (BE) became a priority area in FY 2000. The prospect of rapid environmental and climate change, the threat of biological warfare, and the complicated question of long-term environmental security are significant scientific and societal challenges. Fundamental study of complex environmental systems is therefore critical to the development of new scientific and technological capabilities that will significantly advance our ability to anticipate environmental conditions and thus improve environmental decision-making. Activities in this area for FY 2003 will emphasize dynamics of coupled natural and human systems, coupled biogeochemical cycles, genome-enabled environmental sciences and engineering, instrumentation development for environmental activities, materials use: science, engineering and society, microbial genome sequencing and ecology of infectious disease. Other multidisciplinary research and education activities include topics such as Tree of Life, Water Cycle research, molecular scale studies of environmental processes and technologies, educational activities, international partnerships and social and behavioral processes. (Request = $79 million).
  - > *Information Technology Research* (ITR) is an NSF priority area whose aim is to amplify the benefits of IT in all areas of science and engineering, and spur progress across the national economy and society. ITR is a collaboration across NSF's activities and is coordinated as part of NSF's participation in the multi-agency NITRD effort. Research in the program over the next two years will continue to target the following areas: large-scale networking; high-end computing; high-end computation and infrastructure; high confidence software and systems; human computer interaction and information management; software design and productivity; and social, economic, and workforce implications of IT plus IT workforce development. In FY 2003, ITR will exploit and deepen the research initiated to this point; it will support research to create and utilize cutting-edge cyberinfrastructure; and it will create new opportunities for novel research and technology development. (Request = $286 million).
  - > *Nanoscale Science and Engineering (NSE)*, a NSF priority area in its third year, is supported in conjunction with the multi-agency National Nanotechnology Initiative (NNI). NSF has been a pioneer among federal agencies in fostering the development of nanoscale science, engineering and technology. NSF is emphasizing long-term, fundamental research aimed at discovering novel

phenomena, processes, and tools; addressing NNI Grand Challenges; supporting new interdisciplinary centers and networks of excellence including shared user facilities; supporting research infrastructure; and addressing research and educational activities on the societal implications of advances in nanoscience and nanotechnology. This investment will be expanded in FY 2003 to develop and strengthen critical fields and to establish the science and engineering infrastructure and workforce needed to exploit the opportunities presented by these new capabilities. In addition to single investigator research, support will be focused on interdisciplinary research and education teams, national science and engineering centers, exploratory research and education projects, and education and training. (Request = $221 million.)

> *Mathematical Sciences.* For FY 2003 NSF is proposing a new mathematical sciences priority area to strengthen the mathematical foundations of scientists and engineers. The fundamental mathematical sciences – embracing mathematics and statistics – are essential not only for the progress of research across disciplines, they are also critical to training a mathematically literate workforce for the future. FY 2003 areas of emphasis for this new priority area include: fundamental mathematical and statistical sciences, advancing interdisciplinary science and engineering, mathematical and statistical challenges posed by large data sets, managing and modeling uncertainty, modeling complex nonlinear systems, and advancing mathematical sciences education. (Request = $60 million.)

> *Social, Behavioral and Economic Sciences.* For FY 2003 NSF is proposing a new priority area based in the social, behavioral, and economic sciences. The theme for this new priority area is to research how technology and society advance through continual interactions. The long-term goals are to generate knowledge from: (1) research on human factors in the design and development of technology, leading to technologies to enhance human capabilities, (2) research on social frameworks for scientific and technological innovation, suggesting changes in our social frameworks to further stimulate scientific discovery and the responsible development of technology; and (3) research on adaptation to technological change, enabling our society to take greater advantage of technology and anticipate and prepare for its consequences. (Request = $10 million.)

- *Core Research and Education Activities*: NSF will continue to invest in core research activities and education opportunities evolving from prior investments in disciplinary and interdisciplinary research. These ongoing activities build strength in the science and engineering (S&E) disciplines, enable the development of new and emerging fields, and provide leadership to improve the health and continued vitality of the nation's STEM education. Core activities prior to FY 2003 included cognitive neuroscience, functional genomics and plant genome research. Examples of specific core activities for FY 2003 include natural hazards research, sub-glacial lake exploration, quantum information sciences, and biological physics. FY 2003 plant genome research will emphasize functional genomics and training in plant genomics.
- *Science of Learning Centers (SLCs*) will be an area of emphasis in FY 2003. The SLC program creates multidisciplinary, multi-institutional Centers to expand our understanding of learning through research on the learning process, the context of learning and learning technologies leading to enhanced understanding of how people think and learn. SLCs will serve as national "learning" resources, and will play a critical role in the demonstration of effective workforce preparation strategies. The SLC investment will support a diverse portfolio of projects, providing leadership across a broad range of science and engineering approaches, including research that will speak to and learn from educational reform, workforce development, and the linkage of educational strategies to economic development, and add generally to the knowledge base in cognition. (Request = $20 million.)
- *Climate Change Research Initiative (CCRI).* NSF will participate in the new Climate Change Research Initiative focused on research on climate change risk management and the carbon cycle. (Request = $15 million.)

- *Other*
  - > Balance of portfolio: Focuses on development of a high-quality award portfolio that is balanced with respect to support for: emerging opportunities; integration of research and education; involvement of new investigators and members of underrepresented groups; and projects characterized as high-risk, multidisciplinary, or innovative. High-risk research is exploratory in nature – there is often a lack of experimental data or methodologies, little consensus on theory, information and/or approach, and a significant probability of failure associated with the research. If successful, such high-risk research could result in significant scientific or technological advances.
  - > Life and Earth's Environment (LEE) is a former area of emphasis that encompassed a wide range of activities designed to foster research on the complex interdependencies among living organisms and the environments which affect, sustain and are modified by them.
  - > The Information Technology for the 21st Century (IT^2) initiative addressed issues and concerns raised by the President's Information Technology Advisory Committee (PITAC) in its 1999 report. Past investments focused on software systems, high-end computing, the impacts of information technologies and terascale computing systems.
  - > Knowledge and Distributed Intelligence (KDI) is a former area of emphasis that aimed to improve our ability to discover, collect, represent, transmit and apply information. It included activities such as research on knowledge networking, learning and intelligent systems, new challenges to computation, and next generation Internet.
  - > Centers (e.g., STCs, ERCs, MRSECs). Science and Technology Centers (STCs) are university-based research efforts that foster a new collaborative culture among researchers and educators at all levels in academia, industry, government laboratories and other public and private organizations. The centers provide opportunities to explore challenging and complex research problems that often require interdisciplinary expertise and high-risk approaches, access to state-of-the-art instrumentation and facilities, and a commitment of high levels of support for sustained periods of time.
  - > Experimental Program to Stimulate Competitive Research (EPSCoR). Through its EPSCoR program NSF works with state governments, higher education institutions and businesses to improve the academic research infrastructure and national R&D competitiveness in states that have historically received lesser amounts of federal academic R&D funding.

Data/Sources used in Assessment Processes: Examples of relevant information include published and disseminated results, including journal publications, books, software, audio or video products created; 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.

This information may be included in PI project reports (annual and final), program/division/directorate annual reports, agency internal collections, formal external evaluations or special studies, press releases, scientific publications, or internal/external information systems.

These sources of information provide the basis for reports prepared by external experts, which are utilized in management and GPRA reporting activities.

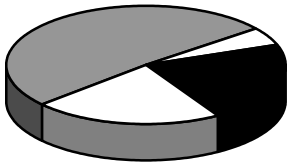
Data/Sources for Determining Results for Outcome Goals: Primary sources include formal external third-party evaluations, such as the AC/GPA report using the alternative form, external databases and reports from awardees, and independent assessments.

Criteria for success are presented in the performance goal statement.

Data Limitations: Non-quantitative information requires judgment of experts; substance and timing of outcomes from research and education activities are unpredictable; external databases not under agency control; long-term data needed to assess ultimate impact of outcomes; potential for self-reporting bias.

C. TOOLS STRATEGIC OUTCOME

OUTCOME GOAL III-3: Providing "broadly accessible, state-of-the-art and shared research and education tools."



22%

TOOLS = $ 1,122 M

As the research issues we face increasingly involve phenomena at or beyond the limits of our measurement capabilities, many of these research areas can only be studied and problems solved through the use of new generations of powerful tools. Examples of such tools include instrumentation and equipment needed by individual investigators in the conduct of their research, multi-user facilities, digital libraries, accelerators, telescopes, research vessels and aircraft and earthquake simulators. In addition, funding provides resources needed to support large surveys and databases as well as computational and computing infrastructures for all fields of science, engineering, and education.

NSF also provides support for large multi-user facilities that meet the need for state-of-the-art, world-class research platforms vital to new discoveries and the progress of research. NSF support may include construction, upgrades, operations, maintenance, and personnel needed to assist scientists and engineers in the conduct of research at such facilities. NSF consults with other agencies to avoid duplication and optimize capabilities for American researchers. It cooperates with other agencies and international partners in constructing facilities when this will facilitate use across broad communities of researchers.

All of these investments enable the Foundation to meet its mission of promoting the progress of science, while responding specifically to direction in the NSF Act of 1950 to foster and support the development and use of computer and other scientific and engineering methods and technologies, primarily for research and education in the sciences and engineering.

FY 2003 Performance Goal III-3: NSF's performance is successful when, *in the aggregate*, results reported in the period demonstrate significant achievement in the majority of the following indicators:

- Development or provision of tools[5] that enables discoveries or enhances productivity of NSF research or education communities;
- Partnerships with local, state or federal agencies, national laboratories, industry or other nations to support and enable development of large facilities or other infrastructure;
- Development or implementation of other notable approaches or new paradigms[6] that promote progress toward the TOOLS outcome goal.

Baseline: Goal III-3 was a new performance goal for FY 2001. NSF was successful in achieving this goal in FY 2001.

[5] For example, includes research and education infrastructure such as large centralized facilities, or integrated systems of leading-edge instruments, or databases, or widely utilized, innovative computational models or algorithms, or information that provides the basis for a shared-use networked facility.

[6] For example, broad-based, program-wide results that demonstrate success related to management/utilization of large data sets/information bases, or development of information and policy analyses, or use of the Internet to make STEM information available to NSF research or education communities, or exceptional examples of broadly accessible tools shared by NSF research and education communities.

Means and Strategies for Successful Implementation:

Related to process:

- Support, through merit-based grants and cooperative agreements of sufficient size and duration, the most promising projects proposed by individual researchers and groups throughout the U.S.;
- Partner with other federal agencies, states, private organizations, national laboratories, or other nations to develop infrastructure by capitalizing on and leveraging the human and financial resources of each group;
- Operate an internal NSF capital planning process that encourages the development of innovative capabilities and infrastructure needs of the U.S. community served by NSF;
- Continue to develop and implement improvements for selecting, managing and overseeing large facility projects (cf. NSF Large Facility Projects Management and Oversight Plan);
- Ensure that the breadth of infrastructure needs of the scientific community are examined regularly through workshops, panels, advisory groups, or other mechanisms;
- Continue broad support to the information technology community and others involved in innovative applications of cutting-edge IT tools for science and engineering;
- Upgrade computation and computing infrastructure for all fields of science and engineering;
- Provide information on the status of the domestic/foreign science and engineering enterprise to inform science policy and priority setting; and
- Utilize the NSF core strategies of integrating research and education, promoting partnerships, and developing intellectual capital.

Related to programs:

- Provide financial support for activities specifically addressing the Tools strategic outcome. For the FY 2003 budget request, this investment totals about $1,122 million, compared with $1,145 million for FY 2002. The principal components of this Tools portfolio are investments in research instrumentation and research facilities (capital and otherwise).
- Support programmatic themes for FY 2003 highlighted in the section labeled FY 2003 Areas of Emphasis for Investment in Emerging Opportunities (discussed in the NSF Budget Request, detailed below and in the table in Section II).
- Develop and support a high-quality balanced portfolio that invests in disciplines and fields, interdisciplinary research areas, and emerging opportunities.

FY 2003 Areas of Emphasis for Investment / GPRA Reporting:

- *Investments in Major Research Equipment and Facilities Construction*: This account provides funding for capital expenditures for the construction and acquisition of major research facilities that provide the U.S. scientific community with unique capabilities at the cutting edge of science and engineering. Projects supported by this account are intended to expand the boundaries of technology and offer significant new research opportunities. Funding for two new MREFC starts is included in the $126 million for FY 2003. MREFC support requested for FY 2002 was $139 million.
- *S&E Policy Analyses, Information, Reports, Databases and SRS Survey Redesign:* The work of NSF's Division of Science Resources Statistics (SRS) involves survey development, data collection, analysis, information compilation, dissemination, and customer service to meet the statistical demands of a diverse user community interested in the nation's science, engineering, and technology enterprise. In FY 2003, NSF will provide approximately $25.7 million (including ~ $2.3 million for A&M) for this program in order to support survey redesign, with a continuing emphasis on improving the relevance and quality of data. Every decade a redesign of the samples and surveys used to collect data on the scientific and engineering workforce is necessary to reflect the results of the Decennial Census. Extensive redesign activities were conducted in FYs 2000, 2001, and 2002. Implementation of the redesign began in FY 2002. During FY 2003, SRS will continue implementation of the

redesign, culminating in collection of data from the National Survey of College Graduates in calendar year 2003. This activity requires additional funding of $8.5 million in both FY 2003 and in FY 2004, so that the postcensal redesign and data collection can be implemented.

- *Other*
  - > The Major Research Instrumentation (MRI) Program was established to improve the condition of scientific and engineering equipment for research and research training in our nation's academic institutions. This program seeks to improve the quality and expand the scope of research and research training in science and engineering, and to foster the integration of research by providing instrumentation for research-intensive learning environments. In FY 2003, NSF will provide $54 million for this program.
  - > Scientific databases and tools for using them. This is a critical component of activity under Information Technology Research, one of NSF's priority areas since FY 2000. Also included in this group of Tools is continued investment in the K-16 National STEM Education Digital Library, which totals about $28 million in FY 2003.

Data/Sources used in Assessment Processes: Examples of relevant information include descriptions of new tools and technologies, shared-use of facilities, 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 shared-use facilities.

This information may be included in PI project reports (annual and final), program/division/directorate annual reports, agency internal collections, formal external evaluations or special studies, press releases, scientific publications, or internal/external information systems.

These sources of information provide the basis for reports by external experts, which are utilized in management and GPRA reporting activities.

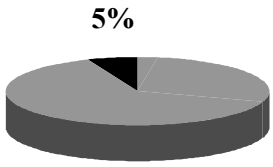
Data/Sources for Determining Results for Outcome Goals: Primary sources include formal external third-party evaluations, such as the AC/GPA report using the GPRA alternative form, and external databases and reports from awardees and independent assessments.

Criteria for success are presented in the performance goal statement.

Data Limitations: Non-quantitative information requires judgment of experts; substance and timing of outcomes from research and education activities are unpredictable; external databases not under agency control; long-term data needed to assess ultimate impact of outcomes; potential for self-reporting bias.

External Factors: In most cases, NSF does not directly operate the facilities that it supports. Typically, the Foundation makes awards to external entities to undertake construction, management and operation of facility projects. NSF's relationship with these organizations is often collaborative in nature and defined in cooperative agreements between NSF and those organizations.

IV. GOALS FOR MANAGEMENT



A&M = $268 M

Excellence in managing NSF's activities is an objective on par with the Foundation's mission-oriented outcome goals. It is critical to achievement of all NSF goals.

The development of management goals included in this FY 2003 Performance Plan was guided by the Strategic Plan, previous performance plans, internal deliberations, agency past performance, and reasonable projections for future levels of performance. In developing the FY 2003 portfolio of management goals, NSF limited the number of goals while focusing on those of fundamental importance to the Foundation. The FY 2003 goals emphasize Foundation-level activities central to managing NSF's proposal and award processes. In general, the plan does not include management goals that largely impact one organizational unit. Such management issues are addressed through internal controls and processes.

New to this year's section on Goals for Management are paragraphs entitled *Resources Required*. Where applicable, these paragraphs identify the additional human and financial resources necessary to achieve the annual performance target. Where the additional resources are unknown or cannot be determined at this time, acknowledgment is made that staff and/or financial resources will be needed. Once determined, this information will be incorporated into future Performance Plans. Successful progress toward goal achievement, as the goals are currently developed, may be contingent upon receipt of the additional resources as stipulated.

Embedded within the FY 2003 portfolio of goals is a set that relates to the President's Management Agenda and focuses on management challenges and reforms identified for NSF (and other federal agencies) by OMB, GAO, and the NSF OIG. NSF recognizes the importance of the issues identified and has addressed a significant number through the GPRA goals included in this document. The remainder is being addressed by other means. The actions the Foundation is taking to address each challenge or reform are discussed in Appendix B.

The FY 2003 management goals are organized into five performance areas – proposal and award processes, the award portfolio, award oversight and facilities management, business practices, and human resources and workplace – each of which is discussed below.

The performance goals included in this management section are largely accomplished through the A&M function. The FY 2003 budget request for A&M totals $268 million compared to $227 million for FY 2002 and $214 million for FY 2001.

A. PERFORMANCE AREA: PROPOSAL AND AWARD PROCESSES

This section on proposal and award processes focuses on merit review, customer service, and broadening participation. Success in achieving the included goals is dependent upon factors such as high quality external review, sufficient staff resources and operating expenses, constraints imposed by administrative requirements, and electronic information systems that support the various management processes.

MERIT REVIEW

NSF's merit review process is the keystone for award selection. NSF invests in the best ideas from the most capable people, as determined by competitive merit review. NSF evaluates proposals for research and education projects using two criteria – the intellectual merit of the proposed activity and the broader impacts of the proposed activity on society. The National Science Board established these two criteria in 1997. Both support NSF's mission, "To promote the progress of science; to advance the national health, prosperity, and welfare; and to secure the national defense."

NSF staff rely on expert evaluation by selected peers when evaluating proposals and making funding decisions. Each year, more than 250,000 merit reviews assist NSF program officers with the evaluation of proposals submitted for consideration. NSF's merit review process is critical to fostering the highest standards of excellence and accountability – standards for which NSF is globally recognized.

The NSF proposal process starts with electronic receipt of the proposals by the NSF Proposal Processing Unit. Based on information provided by the Principal Investigator, the proposals are forwarded electronically to the appropriate NSF program for review. All proposals are carefully reviewed by a scientist, engineer, or educator serving as an NSF program officer, and usually by three to ten experts from outside NSF in the particular fields represented by the proposal. Care is exercised to assure that the external reviewers have no conflicts of interest. Proposers are invited to suggest names of persons they believe are especially well qualified to review the proposal, along with persons who they believe should not review the proposal. These suggestions may serve as an additional source in the reviewer selection process, at the program officer's discretion. Program officers may obtain comments from assembled review panels or from site visits before recommending final action on proposals. Senior NSF staff further review recommendations for awards and declines. When a decision has been made, verbatim copies of reviews, excluding the names of the reviewers, and summaries of review panel deliberations, if any, are provided to the proposer.

NSF uses committees of external experts, such as Committees of Visitors, to monitor some aspects of the performance goals related to merit review (e.g., implementation of merit review criteria by reviewers and program officers).

Use of Merit Review

FY 2003 Performance Goal IV-1: At least 85 percent of basic and applied research funds will be allocated to projects that undergo merit review.

The target for this performance goal was revised from 90 percent in FY 1999 and FY 2000 in order to adjust for the revision to the government-wide definition of merit-reviewed scientific research as specified by OMB in FY 2000 (see below). Based on this revised definition, and OMB's recommended target level of 70% - 90%, NSF has established an 85 percent target.

DEFINITION:
"Merit-reviewed scientific research with competitive selection and external (peer) evaluation - Intramural and extramural research programs where funded activities are competitively awarded from a pool of qualified applicants following review by a set of external scientific or technical reviewers (often called peers) for merit. The review is conducted by appropriately qualified scientists, engineers, or other technically-qualified individuals who are apart from the people or groups making the award decisions, and serves to inform the program manager or other qualified individual who makes the award."

Indicator: Percent of basic and applied research funds allocated to projects that undergo merit review.							
	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
Baseline	85%						
Goal			N/A	80% *	85%	85%	85%
Result		86%	86%	87%	88%	&	&

* The 80% estimated goal, recalculated from NSF's original goal of 90%, is based on the OMB definition of merit reviewed scientific research disseminated in FY 2000.
& = Data not yet available.
N/A = Not applicable

Means and Strategies for Success:

> Utilize external merit review for the vast majority of proposals received by NSF.

> Make exceptions to the external merit review requirement in situations where objective external reviewers may be difficult to find, where timeliness is crucial (such as for studies of volcanic eruptions or earthquakes) or when researchers propose such new ideas that knowledgeable external reviewers may not exist.

Resources Required: No additional above FY 2002.

Data / Data Source: The information used to calculate the percentage of basic and applied research funds allocated to merit-reviewed scientific research with competitive selection and external (peer) evaluation is maintained in the NSF Proposal, PI and Reviewer System (PARS), Award System and Financial Accounting System (FAS). Data is reported in the Enterprise Information System.

Data Limitations: Possibility of funds not being properly assigned to basic/applied categories.

Comments:

> The Foundation exceeded the original goal (based on the earlier definition) of 90 percent for FY 1999 and FY 2000, achieving a result of 95 percent in both years.

> NSF has calculated a new baseline, target level, and results based on OMB's revised merit review definition issued in FY 2000. Using OMB's new definition, which measures merit reviewed scientific research with competitive selection and external evaluation as a percentage of basic and applied research funding, NSF exceeded the FY 2000 estimated 80 percent goal, reaching 87 percent for that year.

Implementation of Merit Review Criteria – Reviewers

FY 2003 Performance Goal IV-2: At least 70 percent of reviews with written comments will address aspects of both generic review criteria.

Baseline: NSF was judged not successful in achieving a similar goal in FY 2001. Reviewers did not consistently address the broader impacts criterion, as noted in COV reports evaluating FYs 1998 – 2000 activities.

Means and Strategies for Success:

> NSF's program announcements encourage proposers to provide information on all relevant aspects of the merit review criteria. The NSF Grant Proposal Guide contains guidance to

applicants and reviewers stressing the importance of using both criteria in the preparation and evaluation of proposals submitted to NSF.

> In FY 2001 separate screens were added in FastLane to enable reviewers to address each merit-review criterion separately.

> In FY 2001 NSF established an internal task force to examine strategies to improve both proposer and reviewer attention to the broader impacts criterion. The group assessed the characteristics and quality of reviewer responses to this criterion and found that, based on a sample of FY 2001 reviews, approximately 69 percent of reviews with written comments provided evaluative comments in response to the broader impacts criterion. The group also developed examples of broader impacts that may be useful to proposers in developing proposals and reviewers in evaluating proposals.

> In FY 2002, NSF will continue to develop and apply recommendations that focus on strategies that stress the importance of using both criteria. It will also make available examples of broader impacts.

> In FY 2002, NSF issued Important Notice 127, dated July 8, 2002, entitled *Implementation of new Grant Proposal Guide Requirements Related to the Broader Impacts Criterion*. This Important Notice reinforces the importance of addressing both criteria in the preparation and review of proposals submitted to NSF and specifies that, effective October 1, 2002, NSF will return without review proposals that do not separately address both merit review criteria within the Project Summary.

Resources Required: No additional above FY 2002.

Data / Data Source: FastLane. There are separate text boxes in FastLane for reviewers to provide assessments relative to each merit review criterion. Therefore, NSF will be able to determine the number of reviews that contain comments in both review text boxes.

Data Limitations: Proposals may not contain adequate information on the broader impacts of the proposed activity. FastLane statistics do not provide qualitative information on the content of reviewer responses to each criterion.

Comments:

> The "broader impacts" criterion addresses the extent to which proposed activities will: advance discovery and understanding while promoting teaching, training, and learning and vice versa; broaden participation of underrepresented groups; enhance the infrastructure for research and education; enhance scientific and technological understanding; and benefit society.

> The internal task group mentioned above focused on four specific tasks designed to increase proposer and reviewer attention to "the broader impacts of the proposed activity" criterion. They 1) developed a set of actions and recommendations to convey the importance of the broader impacts criterion to NSF staff and the science and engineering community; 2) identified revisions to the proposal preparation template in FastLane and the Grant Proposal Guide to emphasize the importance of addressing both criteria; 3) collected "examples" of broader impacts and developed a plan to disseminate them; and 4) identified policy impacts.

Implementation of Merit Review Criteria – Program Officers

FY 2003 Performance Goal IV-3: For at least 80 percent of decisions to fund or decline proposals, program officers will comment on aspects of both generic review criteria.

Baseline: In FY 2001 NSF was successful in achieving a similar goal.

Means and Strategies for Success:

> Encourage management to monitor the percent of review analyses that address both criteria.
> Consider implementation of an electronic review analysis form that contains separate text boxes for program officers to provide assessments relative to each merit review criterion.

Resources Required: Additional staff to develop enhanced electronic review analysis forms and automated approaches to provide information on program officer usage (on Form 7s) of both criteria. Successful progress on this goal, as currently developed, may be contingent upon receipt of the staffing and/or financial resources identified.

Data / Data Sources: Assessment of NSF performance is based on NSF staff assessment of a random sample of review analyses. In the future there is the possibility of developing an enhanced electronic Form 7 (the Review Record that contains the program officer's recommendation to fund or decline the proposal) with sections delineated for each review criterion. The implementation of an electronic review analysis form would allow information on the percent of review analyses that address both merit review criteria to be captured electronically.

Data Limitations: Proposals may not contain adequate information on the broader impacts of the proposed activity.

CUSTOMER SERVICE

Customer service has the potential to impact the number and quality of proposals received and thus NSF's ability to meet its strategic outcome goals. In 1995, NSF adopted a set of customer service standards, primarily related to the proposal submission and review processes, treating grantees and potential grantees (*applicants*) as the primary *customers* for NSF's administrative processes. In a survey, applicants valued three standards most highly: (1) clear guidelines for proposal content and preparation, (2) a minimum of three months between release of program announcements and proposal deadlines and (3) notification of proposal funding recommendations within six months of proposal submission. The survey measured baseline levels of customer satisfaction with reference to FY 1995 experiences. Subsequent surveys were conducted in FYs 1999 and 2000, with similar results.

The FY 2003 performance plan focuses on 1) the time between release of announcements and proposal deadlines and 2) notification of proposal funding recommendations within six months of proposal submission. The third factor – providing clear guidelines – is addressed in internal clearance processes.

Time to Prepare Proposals

FY 2003 Performance Goal IV-4: Ninety-five percent of program announcements will be publicly available at least three months prior to the proposal deadline or target date.

Indicator:	**Percent of program announcements publicly available at least three months prior to the proposal deadline or target date.**					
	FY 1998	**FY 1999**	**FY 2000**	**FY 2001**	**FY 2002**	**FY 2003**
Baseline	66%					
Goal		95%	95%	95%	95%	95%
Result		75%	89%	100%	&	&

& = Data not yet available.

Means and Strategies for Success:

> Each directorate has designated a clearance liaison to coordinate and plan funding activities. This has improved understanding and awareness of this goal throughout the Foundation.
> NSF will provide clearance for announcements and solicitations that do not meet this customer service standard only in unusual cases and if there is a clear need to have a deadline date less than three months from the date of release.

Resources Required: Resources to enhance tracking of this goal are included in cost for the Program Information Management System (PIMS), which is under development in FY 2002*.

Data / Data Source: A record of the date of release of each announcement is maintained in NSF's Online Document System (ODS). The deadline date and information on whether the announcement / solicitation is subject to this goal and whether it met the goal is maintained in the Program Information Management System (PIMS). It is expected that in FY 2003 data will be reported in the Enterprise Information System.

Data Limitations: None identified.

Comment:

> Foundation staff understand that researchers require sufficient time to prepare outstanding submissions. To solicit quality proposals and encourage new investigators, NSF has agreed to make program announcements and solicitations available at least 90 days prior to the deadline for submission.
> A number of continuing programs have standing or previously established deadline dates. Some of these programs reissue announcements within 90 days of a proposal due date. As long as that deadline date was previously announced, thereby providing the community with at least 90 days to prepare a proposal, the announcement is considered to be in compliance with this GPRA goal.

Time to Decision

FY 2003 Performance Goal IV-5: For 70 percent of proposals, be able to inform applicants whether their proposals have been declined or recommended for funding within six months of receipt.

Indicator:	Percent of proposals processed within 6 months of receipt.						
	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
Baseline	61%						
Goal			70%	70%	70%	70%	70%
Result		59%	58%	54%	62%	&	&

& = Data not yet available.

Means and Strategies for Success:

> During FY 2001, NSF initiated a series of staff brainstorming sessions on "time to decision" in order to identify effective practices related to timely processing of proposals. The results of these sessions have been widely disseminated throughout NSF.
> The Director and Deputy Director reiterated NSF's commitment to this customer service goal at an NSF Division Directors' retreat.

* PIMS development was completed in FY 2002 and the system is now being utilized by NSF staff when preparing program announcements and solicitations,

> "Real-time" management reports to help staff pinpoint pending proposals in danger of exceeding the six-month processing goal were developed. These reports are a useful tool to help improve processing time.
> Some divisions have added "performance on prompt handling of proposals" to their performance evaluation criteria for program officers.
> NSF staff continue to work towards shortening the award process time by making more effective use of electronic mechanisms in conducting the review, working cooperatively to eliminate overloads and bottlenecks, and carefully tracking the stage of processing and age of all proposals.

Resources Required: No additional above FY 2002.

Data / Data Source: The date of receipt and date of division director concurrence with a program officer's recommendation on a proposal are maintained in NSF's Proposal, PI and Reviewer System (PARS) and Award system. Data is reported in the Enterprise Information System.

Data Limitations: None identified.

Comments:
> Processing proposals within six months of receipt has been a challenging goal for NSF. In FY 2001, more than half of all proposals were processed within six months of receipt and 77 percent were processed within seven months. Over 90 percent of proposals were processed within 9 months of receipt. This performance exceeds the norm at comparable granting agencies.
> The length of time between the closing date of an announcement or the date of receipt of a proposal (whichever is later) and the date a Division Director concurs (electronically) with the program officer's recommendation on the proposal is considered the "time to decision".
> The Foundation continues to review factors that come into play in the decision-making process, including: the use of mail review versus panel review; the tendency to hold some highly rated proposals until the end of the fiscal year or even into the next fiscal year, in anticipation that more funds might become available; and the fact that processing of international and cross-directorate awards takes more time than regular awards.

BROADENING PARTICIPATION

NSF is strongly committed to increasing the participation in all NSF activities of science and engineering researchers, educators and students from groups currently underrepresented in the science and engineering enterprise. Congress has enacted legislation giving NSF explicit responsibility for addressing issues of equal opportunity in science and engineering. This assignment reflected the serious underrepresentation of women, minorities, and persons with disabilities in the science and engineering workforce.

Recognizing that progress toward all of its outcome goals requires maximum diversity of intellectual thought, over the next decade NSF seeks to:
– Increase the participation of scientists and engineers from underrepresented groups in NSF's merit review process (mail and panel review);
– Increase the participation of scientists and engineers from underrepresented groups in NSF's workshops and conferences;
– Increase the number of proposals submitted by and awards made to scientists and engineers from underrepresented groups; and

– Increase the number of scientists and engineers from underrepresented groups appointed by NSF to its staff.

In FY 2003 NSF will continue to focus on the first and the last of these efforts. The first is addressed in the following paragraphs. The latter is discussed in the section entitled NSF Staff-Diversity.

Diversity – Reviewer Pool

Development of future performance goals for reviewer pool diversity will be assessed once the FY 2002 goal of establishing a baseline for participation of members of underrepresented groups in the NSF reviewer pool is completed

A performance goal for reviewer pool diversity has not been added to the FY 2003 Revised Final Performance Plan. Collection of voluntarily-provided demographic data from reviewers began in FY 2001 and is ongoing. This data is still being assessed. The information obtained will allow NSF to consider the feasibility of developing future performance goals in this area.

Baseline: FY 2002 efforts focus on establishing a baseline. FY 2001 efforts focused on developing and implementing an electronic system to request voluntary demographic data from all reviewers.

Means and Strategies for Success:

> Continue efforts to identify additional reviewers from underrepresented groups through:
  - Expansion and enhancement of existing NSF Library resources (e.g., Finding People Weblinks)
  - Collection and sharing of potential reviewer data from associations and institutions serving groups that are underrepresented in science and engineering (including women, underrepresented minorities, persons with disabilities, and individuals in underserved universities).

> Encourage participation of members of underrepresented groups in activities such as NSF workshops or conferences so NSF is made aware of the review expertise of each.

B. PERFORMANCE AREA: AWARD PORTFOLIO

A high-quality balanced award portfolio assures NSF's success in attaining or making progress toward its strategic outcome goals. The diverse set of investments made across the Foundation provides the basis for new and important discoveries while promoting the development of a base of knowledge. A judicious mix of projects within and across traditional disciplinary boundaries, in the long run, has proven to be effective in attaining the Foundation's broad strategic outcomes. Fifty years of promoting the progress of science demonstrates it is not always possible to predict the next "hot" field, nor which institution or facility will foster the next breakthrough. Many years of knowledge-building, paradigm-confirming science may be necessary before a field is ready to leap forward.

External experts assess the majority of NSF's portfolio characteristics. These assessments address qualitative aspects such as the balance of high-risk, multi-(inter-) disciplinary and innovative projects. Two quantifiable aspects – award size and award duration – are examined in the goals that follow.

EFFICIENCY – AWARD SIZE AND DURATION

In FY 2003, NSF will continue to address Foundation-wide concerns about research grant size and duration. Adequate award size and duration are important factors in obtaining high quality proposals and ensuring that proposed work can be accomplished as planned. NSF has asserted that its current award size and duration might result in inefficiency at U.S. academic institutions if scientists and engineers devote a greater proportion of their time to preparing proposals rather than to conducting research.

This priority is highlighted in NSF's Strategic Plan and is one of OMB's management reform activities for NSF. OMB has asked the agency to develop metrics to measure the efficiency of the research process and determine the "right" grant size for the types of proposals that the Foundation funds. (See Appendix B)

In response to this request, NSF has contracted with Mathematica Policy Research, Inc. to assist in the development and administration of two surveys – one for Principal Investigators and one for institutions. An internal NSF Working Group on Award Size and Duration has been established. Deliberations from focus group meetings that included both temporary (rotators) and permanent NSF staff provided input to the wording of questions used in the survey instruments. The questionnaires were developed between August 2001 and January 2002. Both surveys will be administered from late January to mid-March 2002, with final results expected in May 2002*.

FY 2003 Performance Goal IV-6: NSF will increase the average annualized award size for research grants to a level of $125,000 compared to a goal of $113,000 in FY 2002.

Indicator:	Average annualized award size for research grants.					
	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
Baseline	$90,000					
Goal				$110,000	$113,000	$125,000
Result		$94,000	$105,800	$113,601	&	&

& = Data not yet available.

Given adequate funding, the Foundation's long-term goal is to increase the average annualized award size for research grants to $250,000.

FY 2003 Performance Goal IV-7: NSF will maintain the FY 2002 goal of 3.0 years for the average duration of awards for research grants.

Indicator:	Average duration of awards for research grants (in years).					
	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
Baseline	2.7					
Goal		2.8	N/A	3.0	3.0	3.0
Result		2.8	2.8	2.9	&	&

& = Data not yet available.
N/A = not applicable.

Given adequate funding, the Foundation's long-term goal is to increase award duration to 5 years.

* The analysis provided by Mathematica offered several alternative methods of determining the right grant size and has provided input relevant to the determination of the Foundation's long-term award size and duration targets.

Means and Strategies for Success:

> Carefully examine the resources and time needed to complete the research proposed, using the guidance of reviewers as needed.
> Utilize results of the award size and duration study, when available.
> Use electronic monitoring systems to keep track of average award size and duration and to modify funding strategies as needed.
> Increase award size for priority areas, focused competitions, and other programs.

Resources Required: Development of metrics, as mentioned above, will provide guidelines for the resources needed once the size and duration of a fully enabled grant is defined.

Data / Data Source: Data on award size and duration are maintained in NSF's Proposal, PI and Reviewer System (PARS) and Award system. Data is reported in the Enterprise Information System.

Data Limitations: Undefined.

External Factor: Because the increases are budget dependent, the award size and/or duration targets may fluctuate.

Comments:

> These two performance goals (IV-6 and IV-7) are applicable only to competitive research grants, a subset of awards that focuses on awards to individual investigators and small groups.

C. PERFORMANCE AREA: AWARD OVERSIGHT AND FACILITIES MANAGEMENT

As NSF continues to promote the progress of science, it increasingly initiates complex projects – many of which contain large infrastructure or facility components. The agency provides support for these large multi-user facilities in order to meet the need for state-of-the-art, world-class research platforms vital to new discoveries. Such facilities often test the limits of technological capability. NSF also provides funding for the construction and acquisition of major research facilities that provide unique capabilities at the cutting edge of science and engineering. In FY 2003, approximately 22 percent of the NSF Budget Request is allocated to the support of "Tools." Within Tools, the request for the Major Research Equipment and Facilities Construction (MREFC) Account is approximately $126 million.

NSF consults with other agencies and international partners to avoid duplication and optimize capabilities for American researchers. It cooperates with other agencies in constructing facilities when this will facilitate use across broad communities of researchers.

Although NSF has done well in the past in keeping large projects on schedule and within budget, OMB asked the Foundation to develop a plan that documents costing, approval, and oversight of major facility projects. In response, NSF has completed a Large Facility Projects Management & Oversight Plan and submitted it to OMB in September 2001.

This new facilities plan has four major foci:

- Enhance organizational and staff capabilities and improve coordination, collaboration, and shared learning among NSF staff and external partners;

- Implement comprehensive guidelines and procedures for all aspects of facilities planning, management and oversight;
- Improve the process for reviewing and approving Large Facility Projects; and
- Practice coordinated and proactive oversight of all facility projects to ensure success.

Further development and implementation of the plan is continuing.

After several years of GPRA reporting for facilities, NSF conducted a comprehensive internal review of its four facilities goals. The review led to revised goals for facilities construction and operations that more accurately capture NSF's performance in these areas and are in alignment with OMB guidance in Circular A-11 related to management of capital assets. For example, until FY 2002 NSF had three goals related to construction: one that measured annual cost, one that measured annual schedule, and one that measured total cost. In this Plan, NSF improves the construction goals by combining cost and schedule performance (on a project-to-date basis) into one goal. The revised goals are calculated using the Earned Value technique, a widely accepted project management tool for measuring progress. In addition, this year's guidance in OMB Circular A-11 adds a requirement for an earned value management system for capital asset projects.
NSF now has several years of experience reporting GPRA results for this performance area, and it has recently initiated discussions to develop improved reporting practices. The current goals and their associated reporting procedures are undergoing comprehensive internal review and may be revised in the future. Revisions will consider recommendations of PriceWaterhouseCoopers (January 2002 report), external facilities managers, and NSF Program Officers.

CONSTRUCTION AND UPGRADE OF FACILITIES

NSF puts a high premium on thorough and professional initial planning for construction and upgrade of facilities. Every year, in its Budget Justification to Congress, NSF sets out a cost plan and schedule for all construction and upgrade projects currently underway or planned for initiation in the Major Research Equipment and Facilities Construction Account. Cost plans and schedules are also developed for smaller construction and upgrade projects funded through the Research and Related Activities Account. NSF has established performance goals and measurements with respect to these plans and expects each construction and upgrade activity to meet them.

FY 2003 Performance Goal IV-8: For 90 percent of construction, acquisition and upgrade projects, keep any negative cost and schedule variances to less than 10 percent of the approved project plan.

The construction and upgrade goal applies to all ongoing projects and those that are completed within FY 2003 that are undergoing individual construction/upgrade activities of at least $5 million total.

OPERATIONS AND MANAGEMENT OF FACILITIES

FY 2003 Performance Goal IV-9: For 90 percent of operational facilities, keep scheduled operating time lost to less than 10 percent.

Indicator:	Comparison with scheduled operating time.				
	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003
Goal	Keep operating time lost due to unscheduled downtime to less than 10 percent of the total scheduled operating time.	Keep operating time lost due to unscheduled downtime to less than 10 percent of the total scheduled operating time.	For 90% of facilities, keep operating time lost due to unscheduled downtime to less than 10 percent of the total scheduled operating time.	For 90% of facilities, keep operating time lost due to unscheduled downtime to less than 10 percent of the total scheduled operating time.	For 90% of operational facilities, keep scheduled operating time lost to less than 10 percent.
Result	Majority of facilities successful.	22 of 26 (85%) facilities successful.	25 of 29 (86%) facilities successful.	&	&

& = Data not yet available.

The following sections apply to all of the facilities goals (IV-8 and IV-9).

Baseline: Due to the revision of the goals appearing in this Plan, FY 2003 will serve as the baseline for all facilities goals for FY 2003 and beyond.

Means and Strategies for Success:

> Ensure that construction and operating plans are realistic and contain needed contingency funds.
> Ensure that NSF program officers work closely with the external project managers so that performance goals can be met.
> Ensure that all possible appropriate actions are taken to:
  – Keep construction projects within cost and on schedule.
  – Maintain operating schedules to the extent possible.

Resources Required: Staff resources are needed in order to assure efficient and effective management and oversight of the construction and operation of facilities. Additional travel resources are needed to allow NSF personnel managing and overseeing NSF-supported facilities to interact more closely with facility project partners. NSF has developed a Large Facility Projects Management and Oversight Plan and is establishing a new position - Deputy, Large Facility Projects, to provide assistance to NSF's Program Managers on non-scientific/technical aspects of facility project planning, budgeting, implementation and management, to develop and implement policies, guidelines and procedures, and to ensure shared learning of best practices across all NSF facility projects[*]. Successful progress on these goals, as currently developed, may be contingent upon receipt of the staffing and/or financial resources identified.

Data / Data Source: In order to improve reporting on performance goals related to large facilities, NSF initiated development in FY 1999 of a new Facilities Reporting System. This system, which is linked to the Performance Reporting System, is a module of NSF's FastLane. It collects information on operations and construction from Facilities Managers external to NSF. It is being revised for FY 2003 in light of the revision of the goals. Data is reported in the Enterprise Information System.

Data Limitations: NSF expects the quality and consistency of the information provided to continue to improve as facility managers and NSF staff gain experience with gathering and reporting the required

[*] The Deputy position has been filled on an interim basis. The position is expected to be filled on a permanent basis in FY 2003.

data. NSF addresses the accuracy and completeness of the information through internal review and interactions between NSF staff and the managers of the facilities. Reporting procedures for data are being clarified and streamlined as a result of the internal review mentioned in the introduction to this section.

External Factors: External factors such as adverse weather or failure of partners to act as planned can have a significant impact on meeting deadlines for construction projects and operating plans.

D. PERFORMANCE AREA: BUSINESS PRACTICES

A state-of-the-art communications and technology infrastructure is essential to NSF's success in managing an increasing workload. The Foundation is aggressively moving towards an integrated paperless processing environment while providing customer-responsive, high-quality mission support. The following have been implemented or are in progress:

- Continuing experimentation with new means to do business electronically;
- Active leadership among federal agencies in doing business electronically;
- Active leadership in government/university forums for addressing business practices;
- Training for staff;
- Development of implementation plans involving all parts of NSF; and
- Issuance of Important Notices to institutions.

In FY 2001 the Foundation established a Business and Operations Advisory Committee to provide broad-based external support and guidance for the business and operations aspects of the agency. This new NSF Advisory Committee provides recommendations to the Office of Budget, Finance and Award Management and the Office of Information and Resource Management.

In FY 2001, the Foundation also initiated a contract with the State University of New York at Albany's Center for Technology in Government to help develop a vision for the grants-making organization of the future. The project includes coordination with NIH, extensive interviews with the public and private sector, and several workshops. The study will be completed in FY 2002*, and the results should include a vision of the grant making organization of the future, strategies to move towards that vision, and recommendations on a research agenda to support achieving that vision.

ELECTRONIC BUSINESS

On October 1, 2000 NSF became the first agency to perform all of its mission-critical interactions with its proposal applicants through the web. This represented a milestone, and was the first step in creating a completely electronic business process for proposal and award management. NSF's ultimate goal is to create an electronic environment capable of performing all internal and external functions from proposal submission through final project closeout. In the FY 2001 and FY 2002 Performance Plans, emphasis was placed on enhancing internal e-business capabilities, including demonstrating the capability to conduct the review process in a totally electronic environment and utilizing video-conferencing to facilitate panel reviews. By the end of FY 2002 NSF expects that these capabilities will be part of the

* The study was completed in FY 2002 and did include a vision of the ideal research enterprise and offered a supporting research and action agenda to help achieve that vision.

agency's normal operating procedures** and further efforts to promote internal e-business capabilities can be initiated in FY 2003.

The FastLane system makes use of the Internet to allow NSF customers to exchange information with the agency. FastLane functions permit users to prepare and submit proposals, proposal reviews and project reports, determine the status of proposal and funding actions, submit post-award requests and notifications, interactively cooperate in drafting panel evaluations of proposals, initiate cash requests, manage organization information, view reviews and award letters, and perform other basic interactions. Over 200,000 scientists, educators, technology experts and administrators use FastLane and over 99 percent of proposals are now submitted electronically. FastLane places NSF in the position to fulfill the vision of a fully integrated electronic proposal and award system.

The **first of NSF's e-business goals** for FY 2003 (below) focuses on award transfers between organizations. This process is initiated when a Principal Investigator moves from one institution or organization to another. The electronic processing of Principal Investigator transfers occurs about 300-400 times per year, and is a process that is not yet included in the capabilities of the FastLane system**. The grantee community and staff request it frequently. The transfer of an award involves the transmission of data from the original organization to the new organization. This would be the first time that research offices at different organizations will be communicating through FastLane. In addition, the transfer of an award from one organization to another is the most complex type of transaction undertaken in NSF's electronic business systems. It is a process that involves five of the twenty major NSF internal grants management information technology systems and, therefore, will provide a good measure of the integration and interoperability of the internal information technology systems at NSF.

FY 2003 Performance Goal IV-10: NSF will continue to advance "e-business" by receiving through FastLane and processing electronically 90 percent of Principal Investigator award transfers.

Baseline: This is a new goal for FY 2003. Organizations receiving NSF grants do not currently have the capability to initiate and implement electronic Principal Investigator award transfers. Initial development of this capability will begin in FY 2002, and by FY 2003 it is expected that FastLane will be the primary means of initiating these transfers***.

Means and Strategies:

> Work cooperatively with users to develop a requirements document;
> Develop software and program changes for the systems;
> Develop test and migration plans; and
> Implement FastLane-initiated PI award transfer capability.

Resources Required: Development of an electronic Principal Investigator transfer process will involve extensive user input, development of functional requirements, project planning, program specification, test planning, installation planning and implementation. In FY 2003, $80,000 is needed for implementation support. Successful progress on this goal, as currently developed, may be contingent upon receipt of the staffing and/or financial resources identified.

Data / Data Sources: The number of Principal Investigator award transfers initiated through FastLane will be maintained in the FastLane database. The total number of Principal Investigator award transfers,

* This expectation was met. NSF demonstrated the capability to conduct the review process in a totally electronic environment and utilized video-conferencing to facilitate panel reviews.

** The capability to initiate and process PI award transfers electronically was implemented in FY 2002.

*** Organizations receiving NSF grants now have the ability to initiate and implement electronic PI award transfers. Initial development of the capability began in FY 2001 and implementation was completed in FY 2002.

whether FastLane-initiated or not, is recorded in the Financial Accounting System (FAS). A comparison of the two will permit measurement of the percentage of FastLane-initiated transfers.

Data Limitations: None identified.

Comments:

> NSF is the only federal agency currently receiving proposals electronically as a standard operating procedure. Its web-based interface with grantee organizations was built through collaborations involving both NSF staff and the research and education communities.

> The PI award transfer process involves five major NSF systems (FastLane, PARS, Awards, FAS and Electronic Jacket). Many of the initial steps, including extensive planning with user involvement, were started in FY 2001 and development of the external web interface is expected early in FY 2002. The linkage with other systems will follow later in FY 2002.

External Factors: Cooperation is required between two research organizations before NSF can initiate any actions. Extensive user input will be needed to develop a successful process.

The **second of NSF's e-business goals** relates to development of an Electronic Jacket (eJacket). The Electronic Jacket is part of the Foundation's goal to create an integrated, paperless proposal and award-processing environment at NSF. Presently, paper "jackets" (folders) are used for retaining the official records associated with proposals and awards. As NSF moves toward processing through electronic systems, the Electronic Jacket will become the primary electronic environment for internal proposal and award processing.

The eJacket will extend NSF's paperless processing environment to internal systems and work seamlessly with FastLane. Using eJacket, NSF staff can process a proposal from submission through closure, and will eventually have the ability to archive all proposals electronically. Designed by a group of NSF employees representing a large cross-section of job functions throughout NSF, the system not only displays information electronically but also integrates with other corporate applications to create a total workflow system.

The eJacket project is multi-phased. Phase I replaced the client-server version of NSF's Electronic Jacket with a web-based system that provides secure anywhere, anytime access and adds the ability to transfer files, e-mails and diary notes into the eJacket. Phases II and III will be implemented in FY 2003. Phase II incorporates the functioning of various independent, internal FastLane systems into the eJacket and permits staff to take actions on reviews, proposals and post-award requests without leaving the eJacket system. Phase III will permit staff in program offices to process proposals electronically from submission through closure for declines, provide a fully functional, personalized "My Work" area to let staff know of proposals, reviews and reports submitted in their area and provide the ability to share information and responsibilities with other NSF organizations. Additional phases are planned for future years.

FY 2003 Performance Goal IV-11: NSF will continue to advance "e-business" by implementing Phase III of the Electronic Jacket application.

Indicator: Implementation of the electronic capability for assigning proposal processing tasks, forwarding proposals to other programs as necessary, and delegating proposal action authority.

Baseline: NSF implemented Phase I of the web-based Electronic Jacket application in FY 2002.

Means and Strategies for Success:

> Continue to meet with a core group of users to identify all integrated electronic processes related to a proposal or award;
> Establish a NSF proposal archival system that will eliminate the physical storage of all hardcopy non-awards thereby further reducing the use of paper at NSF.
> Establish requirements for converting NSF internal proposal processing into an integrated workflow application.

Resources Required: New development beginning in FY 2003 is expected to require at least $3 million over the next three years. Maintenance of the Electronic Jacket will require at least $1 million in FY 2003 for contractor support and software purchases. Successful progress on this goal, as currently developed, may be contingent upon receipt of the staffing and/or financial resources identified.

Data / Data Source:
Secure web-access by NSF staff to an Electronic Jacket (containing grantee-, reviewer- and panelist-submitted FastLane documents) will document success for this goal.

Data Limitations: None identified.

Comments:
> Phase I, implemented in July 2002, provides the following functionality.
  - Display of all electronic information available for a given proposal or award;
  - The ability to add notes, upload files, and copy e-mail relating to a proposal or award. (No information available in a paper jacket is excluded from an electronic jacket);
  - An "inbox" of proposals and awards requiring action is available for managing program officers;
  - Secure remote access using existing SecurID technology.
> Phase II functionality, implemented in early FY 2003, consists of:
  - Integration of Project Reports, Administration, Review and Panel summaries and Notifications;
  - Internal electronic signatures for E-funding
  - Integrated E-correspondence.
> Planned Phase III functionality consists of:
  - Electronic capability for assigning proposal processing tasks, forwarding proposals to other programs as necessary, and delegating proposal action authority.

INFORMATION TECHNOLOGY SECURITY (ITS)

The NSF Information Technology Security program is focused on assuring that NSF infrastructure and critical assets are appropriately protected while maintaining the open and collaborative environment that is critical to scientific research and discovery. The NSF approach is based on a fundamental philosophy of risk management where ITS risks are assessed, understood, and mitigated appropriately. This approach allows NSF to implement appropriate protective measures to ensure the privacy, integrity, and security of information and information technology resources needed by NSF and the broad research community. The NSF Chief Information Officer provides overall leadership of the ITS Program, and assures that policy, procedures, and activities are coordinated with NSF program management and research initiatives.

NSF places significant priority on ITS and initiatives to assure adequate protection of resources. In October 2002 NSF appointed a new Chief Information Officer (CIO). The CIO reports directly to the Director of the Foundation on all aspects of information systems management and IT security matters. NSF also appointed an Information Security Officer, who reports to the CIO and assists with coordination

of the Foundation's ITS Program plans and initiatives. This new, dedicated resource has agency-wide responsibility and senior management support to ensure that ITS policies and procedures are effectively managed and followed. The majority of NSF's significant assets are managed within the Division of Information Systems of the Office of Information and Resource Management. This organization is responsible for managing the NSF Computer Center and providing telecommunications, e-mail, and agency-wide applications and services. The components of the NSF ITS Program include policies and procedures; self-assessments, risk assessments, and security plans; incident prevention, detection and response; infrastructure security components audits and penetration tests; and training and education.

In FY 2002, NSF reviewed its 96 systems in accordance with the NIST framework and with the guidelines in OMB Circular A-130, and identified 20 major systems (i.e., general support systems and major applications). Agency self-assessments were conducted on all 20 of the major systems identified.

FY 2003 Performance Goal IV-12: NSF will maintain and enhance the agency-wide security program to ensure adequate protection of NSF's IT infrastructure and critical assets.

Indicators:
- 95 percent of major systems will have approved security plans on file.
- 95 percent of major systems will have documented certification and accreditation.

Baseline: A System Inventory was established as part of NSF's FY 2002 GISRA Review.

Means and Strategies for Success:
Following current guidance (including the Government Information Security Reform Act of 2000, OMB Circular A-130 and the Computer Security Act of 1987), NSF's IT security program will continue to:
> Focus on development of security plans and the accreditation process for major systems;
> Focus on appropriate security policies and procedures;
> Focus on training of NSF staff and on-site contractors, with primary emphasis on those with significant security responsibilities; and
> Focus on independent reviews of ITS program execution.

Resources Required: NSF will continue to use NSF staff and contractor resources to execute IT security program requirements. Additional investments in IT hardware and software will be required in the future as the breadth and complexity of IT security threats increase. Successful progress on this goal, as currently developed, may be contingent upon receipt of the staffing and/or financial resources identified.

Data / Data Source:
> Examples of major systems include the NSF Central Web Site, FastLane, the Proposal, PI, and Reviewer System (PARS), the Awards System, and the Financial Accounting System (FAS).
> The percentage of major systems with completed security plans and documented certification and accreditations will be based on results from the annual IT Security program review as presented by NSF in the GISRA report.

Data Limitations: None identified.

E. PERFORMANCE AREA: HUMAN RESOURCES AND WORKPLACE

The NSF Strategic Plan notes that "a diverse, capable, motivated staff that operates with efficiency and integrity" is a critical factor for NSF success. For more than 50 years, the agency has promoted the progress of science, drawing upon its talented, diverse workforce to catalyze science and engineering discovery, learning and innovation. NSF has a long history of being at the forefront in providing a work environment conducive to supporting and motivating its staff.

Throughout the federal government there is increasing recognition that human capital is a valuable asset that needs to be managed strategically. Within NSF, approximately 44 percent of the science and engineering excepted service employees, 63 percent of the executive service employees and 24 percent of the general schedule employees will be eligible to retire in 5 years. In addition, NSF experiences approximately a 25 percent turnover of science, education and engineering staff every two years because of its extensive use of visiting scientists and rotators. These factors – coupled with the increase in interdisciplinary proposals, the switch to electronic proposal processing and e-business practices, and new internal and external requirements for accountability, performance measurement and oversight – make succession planning, recruitment, retention, and adapting the skill mix of employees critical issues confronting the Foundation.

The nature of science and engineering research and education at an ever-changing frontier also demands unique knowledge agility in the NSF workforce. The agency maintains this characteristic by capitalizing upon current staffing flexibilities such as the Intergovernmental Personnel Act to complement its permanent workforce. By so doing, it develops a cohort of visiting scientists and engineers who typically spend 1-3 years with the agency. These individuals motivate innovation and stimulate science and engineering investments that may not occur otherwise. Following their NSF assignments, these researchers and educators return to their home organizations with an informed perspective on national science and engineering priorities and federal investments in science and engineering research and education. They also serve as a reserve workforce to call upon in the future as the need arises.

A major contribution that will guide NSF's future efforts is the agency's newly developed five year strategic A&M plan. The plan calls for examination of organizational alignment and workforce size, skill and deployment as part of its strategic business analysis.

NSF STAFF – DIVERSITY

The 2000 Biennial Report to Congress developed by the Committee on Equal Opportunities in Science and Engineering (CEOSE)[7] addresses issues internal to NSF and recommends that "NSF should become the model for a diversity-based workforce in order to demonstrate what can be accomplished when barriers are lifted." The report identifies a set of action steps, including:

- Seeking "equitable distribution of underrepresented minorities, women and persons with disabilities at all staff levels throughout NSF", and
- Continuing "the policy of embedding diversity at all levels and in all programs throughout NSF, and delineating strategies for implementing this policy and establishing measures of accountability."

[7] Enhancing the Diversity of the Science and Engineering Workforce to Sustain America's Leadership in the 21st Century, Committee on Equal Opportunities in Science and Engineering, 2000 Biennial Report to the United States Congress.

The NSF Strategic Plan also notes the importance of sustaining a recruitment and retention policy that enables the agency to focus on excellence and diversity and on improved participation of underrepresented groups in both career and temporary positions. NSF recognizes that a diverse workforce – e.g., one that includes members of underrepresented groups and reflects institutional and geographic differences – broadens the agency outlook and talent base and enables it to better serve both its research and education communities and ultimately all citizens. Science and engineering (S&E) staff are one of three employment categories for which NSF maintains demographic data (the other two are business and operations staff and program support staff). For the FY 2003 Performance Plan, NSF includes two goals related to the S&E staff that comprise its internal workforce. The first is a new goal related to development of a diversity plan. The second expands on an existing goal on S&E hires from underrepresented groups.

The S&E staff and management includes Assistant Directors, Division Directors, program officers, and others in program management and scientific positions. It also includes the majority of those assigned under the provisions of the Intergovernmental Personnel Act and those appointed as limited term Visiting Scientists. This is the group that is most intensively involved with the agency's external research and education communities. It is also involved internally in development of new programs, in merit review and review analysis, and in making recommendations to fund or decline proposals. It is thus particularly important that this group be diverse, with an ability "to identify best practices that are appropriate to a diverse [research and education] community." (CEOSE, 2000)

There is underrepresentation of women, certain minority groups, and persons with disabilities within the NSF S&E staff. Realistic goals for closing this representation gap vary across the different research and education areas; however, NSF intends to continue its efforts to develop effective strategies designed to attract and retain a diverse corps of science, engineering, and education professionals. Agency recruitment practices will continue to involve proactive searches for qualified candidates, in combination with earnestly practiced inclusivity and review by NSF management.

Performance Goal IV-13: NSF will ensure that diversity considerations are embedded in activities related to agency staffing of scientists and engineers.

Indicator: NSF will initiate development of a NSF S&E diversity plan guided by:

- Demographic profiles of NSF S&E staff (FY 1997 – FY 2001) that provide relevant data with respect to the makeup of NSF's current workforce (gender, race/national origin, persons with disabilities.)
- Relevant data, where available, on the geographic and institutional diversity of NSF IPAs and VSEEs (for FY 1997 – FY 2001);
- Issues requiring special attention during recruitment and retention of a diverse workforce (e.g., advertisement, outreach, encouraging new entrants into the workforce pool, workplace environment);
- Inventory of best practices at NSF and other federal agencies related to leadership development and succession planning that ensure diverse representation;
- Accountability practices that link performance to results; and
- Specific recommendations with respect to the NSF science and engineering staff, including implementation strategies.

Baseline: No baseline exists. This is a new goal for FY 2003.

Means and Strategies for Success:

> Establish an internal, ad hoc task force (one year duration) led by a senior member of the S&E staff to research, develop, and prepare the report;

> Assure task force membership is fully representative across all directorates / offices – inclusiveness is critical for successful development and implementation of a plan;

> Examine and consider the data and recommendations developed by organizations such as the Committee on Equal Opportunities in Science and Engineering (CEOSE) and included in reports such as that prepared by CAWMSET (the Congressional Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology Development); and
> Conduct inreach activities with key NSF staff (e.g., division director and working group meetings) to share accomplishments and best practices related to diversity issues.

Resources Required: Additional business/operations staff or contractors with IT expertise to develop and maintain information bases that capture institutional and geographic data for the NSF IPAs and Visiting Scientists, Engineers and Educators (VSEEs) within its workforce. A database or interface with the current HRM database must be created to capture and manage geographic and institutional data. At least $150,000 will be needed. Successful progress on this goal, as currently developed, may be contingent upon receipt of the staffing and/or financial resources identified.

Data / Data Sources: The NSF HRM database that contains demographic data on the number of hires and retention levels in S&E positions can be used to develop information contained within the report; OEOP databases may also be used.

Comments:
> For IPAs, other characteristics may include geographic diversity and variations in the Carnegie institutional typology.

Performance Goal IV-14: NSF will show an increase over FY 2000 in the total number of appointments to NSF science and engineering staff and management from underrepresented groups.

Baseline: In FY 2000, 46 females and 25 members of underrepresented minority groups were appointed to the NSF staff. In FY 2001, 59 females and 32 members of underrepresented minority groups were appointed to the NSF staff. In FY 2002, 63 females and 33 members of underrepresented minority groups were appointed to the NSF staff.

Means and Strategies for Success:
> Continue to encourage members of underrepresented groups to apply for NSF science and engineering positions through increased outreach efforts including targeted advertising, participation in targeted professional engineering, scientific and education conferences, invitations to members of underrepresented groups to participate as proposal reviewers, attendance at employment fairs, and site visits to minority institutions and organizations;
> Publicize and widely disseminate information regarding NSF employment opportunities and NSF sponsored activities in newspapers and magazines with broad and focused geographic coverage;
> Make presentations on the full breadth of NSF opportunities at regularly scheduled meetings (e.g., Experimental Program to Stimulate Competitive Research, Louis Stokes Alliances for Minority Participation, etc.); and
> Encourage science and engineering staff to develop and maintain personal contacts with individuals, professional societies, and other groups who focus on broadening participation of underrepresented groups and on eliminating barriers associated with their participation.

Resources Required: Staff resources trained in recruitment and outreach skills; financial resources to travel and conduct outreach activities; staff to develop and maintain internal databases. Successful progress on this goal, as currently developed, may be contingent upon receipt of the staffing and/or financial resources identified.

Data / Data Sources: Demographic data on the actual number of appointments to S&E staff and management in the NSF workforce is maintained in Division of Human Resources Management databases.

Data Limitations: Provision of diversity-related information is voluntary and therefore may be incomplete.

Comment:

> Prior to FY 2003, the agency has focused on program officers and equivalent in this goal, and has met the goal for the past three years. For FY 2003, the goal and associated baseline were expanded to include all staff normally categorized as "scientists and engineers". This group includes those staff counted in previous GPRA reports as well as senior executives and management staff with science and engineering backgrounds who are involved in program planning and agency management. The results from this expanded goal will serve to inform the agency in the development of future workforce and diversity plans.

External Factor:

> NSF can collect information only by categories agreed upon within the current federal data collection standards.

WORKFORCE

Driven by a constantly-expanding science and engineering frontier, fundamental changes in NSF business processes and practices, and by the potential retirement of an experienced generation of NSF staff, one of the agency's most critical undertakings in the near-term is a strategic business analysis. This analysis will be designed to provide information needed to identify future workforce competencies within the context of how the agency plans to perform its work in the future and to facilitate integration of NSF's human capital strategies with strategic and programmatic planning.

NSF believes that workforce challenges can be met with the continued professional development of current personnel. In FY 2001, NSF initiated discussions about the feasibility of creating the NSF Academy, a contemporary organizational and professional development program that creates and integrates innovative learning opportunities. These discussions acknowledged that the Academy would embody the Foundation's dedication to advanced technologies and continuous learning and that the Academy would be the linchpin for individual and workforce development. In FY 2001, a coordinator was selected to lead the Academy Initiative, staff were designated to support this effort, and a variety of planning activities were undertaken. In April 2001, plans were discussed with the Business and Operations (B&O) Advisory Committee.

In FY 2002, NSF initiated development of an Academy that will integrate existing workforce development programs and associated learning opportunities into a strategically aligned learning system. This system will support the agency's performance culture and capitalize upon its technology-enabled business environment. NSF will work in concert with learning partners in the public and private sectors to provide a comprehensive suite of organization and career-enhancing programs. Pedagogies will merge theory with practice, knowledge with experience, and will facilitate cross-functional and team-oriented learning experiences that focus on contemporary organizational challenges.

Leadership and succession planning will be built into the skill development curriculum providing all employees the opportunity to gain the skills and knowledge necessary to compete for leadership and management roles.

Through this activity, the agency will place a greater emphasis on providing opportunities for personnel to update and expand project management and business-related skills, as well as on ensuring that these skills are sought out and valued in the recruitment and hiring of additional permanent personnel. In addition, the Academy will address the impact of technology innovation on NSF's workforce. These changes demand new and increasing IT skills in almost all career fields, as well as the development of new IT staff positions.

The **first of NSF's workforce goals** for FY 2003 addresses these workforce needs.

FY 2003 Performance Goal IV-15: NSF will align or develop competency-based curricula, through the NSF Academy, that provide cross-functional, work-based team learning opportunities.

Indicator: Initiate development of new courses or revision of existing courses to address program management, leadership development, and technology and business process training.

Baseline: NSF currently offers a variety of course offerings. The Academy, once fully developed, will provide a more comprehensive suite of courses tied to competency requirements.

Means and Strategies for Success:

> Initiate a nationwide search for, and select, a Dean to lead the Academy.
> Establish an internal advisory group to obtain broad staff input on the direction and curriculum of the Academy and continue discussions with the B&O Advisory Committee;
> Establish regular seminars with industry and government leaders on visionary workforce, management and other relevant topics;
> Use multiple methods of learning, i.e., instructor-led classes, e-learning, distance learning, and other learning delivery methods available through technology;
> Obtain contractor support to develop curriculum and/or classes, as needed; and
> Acquire and customize a new learning management system that provides the capacity to measure the results of training.

Resources Required: Staff with technological, policy, oversight and contracting skills; funding (internal and contractor-based) for ongoing classes and development of new classes; a new learning management system capable of supporting e-learning; systems capability to produce reports on the dimensions of the workforce and learning activities; for FY 2003, an additional $2.3 million and additional staff are needed. Successful progress on this goal, as currently developed, may be contingent upon receipt of the staffing and/or financial resources identified

Data / Data Sources: Curriculum development activities will utilize employee input (gathered via focus groups or surveys), internal NSF course catalogues, financial and class data from the learning management system, and the course content for the Program Management Seminar.

The **second of NSF's workforce goals** for FY 2003 reflects and is an extension of the FY 2002 effort to initiate a strategic business analysis. While the FY 2003 goal retains an emphasis on assessing future workforce needs, it also represents a transition towards implementation of the preliminary findings / results of the strategic business analysis. The FY 2003 effort includes identifying human capital needs that will support NSF's critical business processes and emerging technology.

Foreseeing the workforce challenges before it, NSF has taken some preliminary steps to identify emerging workforce needs. For example, the agency has been exploring the potential of increasing the number of entry-level science and engineering positions, providing opportunities for science and

engineering internships, and funding academic advancement and career development programs. A strategic facet of this workforce investment is its impact on new entrants to the science and engineering workforce where there are a greater number of individuals from groups presently underrepresented in science and engineering.

FY 2003 Performance Goal IV-16: NSF will develop competency-based, occupation classification alternatives that support the agency's strategic business processes and capitalize on its technology-enabled business systems.

Indicators:
- Identification of workforce competencies for all current NSF job families.
- Initiate identification of competency-based, classification alternatives.

Baseline: The FY 2003 goal reflects and is an extension of the FY 2002 effort to initiate a strategic business analysis. NSF's preliminary analysis, based on OMB Bulletin No. 01-07, supports program development activities in the areas of recruitment, retention, workforce mix, diversity of the workforce, classification and compensation, identification of core competencies and work-life learning.

Means and Strategies:
> Identify current workforce skill mix and skill gaps;
> Analyze emerging and future workforce needs; and
> Work collaboratively with the NSF Academy to address training needs and skill development.

Resources Required: Current staff, supplemented by additional FTE and contractor staff, to manage results and provide needed functional expertise to conduct the activity; budget allocation to support analysis. It is estimated that an additional $2.1 million will be required in FY 2003 to fulfill this goal. Successful progress on this goal, as currently developed, may be contingent upon receipt of the staffing and/or financial resources identified.

Data / Data Source: Workforce competencies and competency-based, classification alternatives are deliverables to be provided by the contractor.

Data Limitations: Undefined.

WORK ENVIRONMENT

The foundation of a high performing organization is based on the talents, attributes, and competencies of the individuals who comprise the organization. Equally important is the climate and environment in which they work. Individual strengths and talents are maximized when employees are satisfied with their work and their workplace, and the corporate culture supports and values innovation, creativity, and risk-taking.

In FY 2002 an Organizational Assessment Survey will be disseminated to all NSF employees. The survey, which was conceived as part of the development of the FY 2001 Performance Plan, will assist NSF in improving organizational effectiveness. The survey will enable employees to provide feedback on their working conditions and on various employee issues including employee recognition, training opportunities, leadership, fairness, communication, teamwork, security, and diversity.

The results of this survey will guide the Foundation in developing future work environment goals.

V. VERIFICATION AND VALIDATION (V&V)

The Foundation has both qualitative and quantitative GPRA goals. Its qualitative goals include the three broad strategic outcome Goals related to People, Ideas, and Tools and portions of two management goals related to implementation of merit review criteria. The Outcome Goals are presented in a format that requires qualitative assessment of achievement. These assessments are based largely on information included in reports prepared by committees of independent, external experts (e.g. Committees of Visitors and the Advisory Committee for GPRA Performance Assessment) who assess the quality of program results based on their collective experience-based norms. The Foundation's quantitative goals focus on management activities, with the majority presented in a format that enables quantitative assessment of progress toward goal achievement. Assessment for these goals is based on data collected with NSF's central data systems.

A. QUALITY OF REPORTED PERFORMANCE INFORMATION

NSF acknowledges an ongoing need to improve data systems for collecting performance information and data, especially that related to facilities. NSF views the improvement of the quality of its data and data systems as an evolutionary process and intends to maintain it as a priority as budget and time allow. Implementing GPRA has enabled NSF to gather information in a structured way and to address issues in a more formal, focused manner than in the past.

In their January 2002 report PricewaterhouseCoopers LLP (PwC) addressed system aspects of NSF data quality for the Awards system, Enterprise Information System, Financial Accounting System, FastLane, Integrated Personnel System, and the Proposal, PI, and Reviewer System. PwC "reviewed NSF's information systems to ensure that adequate internal controls are in place to produce reliable data. The techniques presented are based on interviews with NSF managers and staff, rather than a full application review. Pursuant to GAO's assessment guide, we relied on previously conducted work and on departmental sources to determine whether there were any known problems with the data sources or the data itself that would cast doubt on the credibility of the information. One external report that we referenced was the House Subcommittee on Government Efficiency, Financial Management, and Intergovernmental Relations' *computer security report card*, which it released in October 2001. The report card rated NSF with the highest grade (B+) of 24 major federal agencies."

In FY 2002, NSF's data quality program has the following objectives:

- Complete the evaluation of data elements with primary focus on data supporting GPRA goals;
- Complete the population of validated data elements into the data dictionary for all GPRA data elements;
- Enhance the functionality of the data dictionary for all NSF-wide information systems to ensure that meta-data describing the data is identified and thoroughly documented;
- Continue to ascertain the causes of the data quality problems and develop systematic methods for correction; and
- Develop and promulgate data quality policies and procedures NSF-wide.

In FY 2003, objectives for the data quality program include the expansion and enhancement of the agency's data directory. NSF will also continue to ascertain the causes of data quality problems and develop systemic methods for correction.

Finally, a COV data project initiated in FY 2001 will substantially improve the quality, consistency and availability of data, reports and charts that are used by external NSF committees. These committees, in addition to providing advice to the NSF organization, provide assessments used in NSF's annual GPRA reporting. Currently, each NSF organization produces its own reports and charts for each of its committees. As a result of this new project, the reports will be generated centrally to reduce costs and improve quality and consistency across NSF. The initial planning for the project begins in FY 2001 with the majority of the implementation to be completed in FY 2002. The project will be completed in FY 2003.

B. DATA V&V ACTIVITIES

NSF used a process similar to the one used in FY 2000 to verify and validate selected FY 2001 GPRA performance information. In FY 2000 and FY 2001, NSF engaged an external third party, PricewaterhouseCoopers LLP, to verify and validate selected GPRA performance results as well as the process through which supporting data was compiled. PwC documented the processes NSF follows to collect, process, maintain, and report selected performance data. They identified relevant controls and commented on their effectiveness. Based on GAO guidance, they provided an assessment of the validity and verifiability of the data, policies, and procedures NSF used to report results for the FY 2001 goals. For the outcome goals, PwC confirmed the ratings and interpretations contained in the COV and AC reports. PwC also provided high-level review of NSF's information systems based on GAO standards for application controls. NSF expects to use a similar process in FY 2003.

In their report (January 2002), PwC concluded "From our review, we determined that NSF has reported on ten of the quantitative goals and all five qualitative goals in a manner such that any errors, should they exist, would not be significant enough to change the reader's interpretation of the Foundation's success in meeting the supporting performance goal. For these goals, NSF relies on sound business processes, system and application controls, and manual checks of system queries to report performance. We believe that these processes are valid and verifiable. For the four goals related to facilities management, we identified significant data limitations, which impaired our ability to verify the processes. However, we believe that NSF's reported outcomes are consistent with the data they collected."

For reporting on goal achievement, all of NSF's outcomes are compiled for programs and activities across the agency. To enable a uniform and systematic organization of reporting information for the strategic outcome goals, NSF has developed specially designed templates and reporting guidelines for use by committees of external experts (COVs and ACs). These templates and guidelines are reviewed and refined annually. Options for rating NSF are limited to either successful or not successful.

C. TYPES AND SOURCES OF PERFORMANCE DATA AND INFORMATION

Most of the data that underlie achievement assessments for strategic outcome goals originate outside the agency and are submitted to NSF through the Project Reporting System, which includes annual and final project reports for all awards. Through this system, performance information/data (compiled by NSF staff) such as the following are available to program staff, third party evaluators, and other external committees:

- Information on People – 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;

- Information on Ideas – published and disseminated results, including journal publications, books, software, audio or video products created; 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; and
- Information on Tools – 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 shared-use facilities.

Most of the data supporting management goals can be found in NSF central systems, as noted in the description accompanying each goal. These NSF central systems include the Enterprise Information System (EIS); FastLane, with its Performance Reporting System and its Facilities Reporting System; the Online Document System (ODS); the Proposal, PI, and Reviewer System (PARS); the Awards System; the Electronic Jacket; and the Financial Accounting System (FAS). These systems are subject to regular checks for accuracy and reliability.

The Division of Human Resources Management (HRM/OIRM) maintains information related to staff recruitment and staff training, under the guidance of the Chief Information Officer. OEOP databases are also available for reporting purposes.

The qualitative aspects associated with the goals on implementation of both merit review criteria are addressed in reports of external committees (COVs and ACs) and/or staff analyses.

D. DATA/INFORMATION LIMITATIONS

The description accompanying each goal provides detail on relevant data/information limitations.

For outcome goals, the collection of qualitative data during assessment may be influenced by factors such as a lack of long-term data/information to assess the impact of outcomes, the potential for self-reporting bias, the unpredictable nature of discoveries, and the timing of research and education activities. For the quantitative management goals, the assessment may be influenced by factors such as accuracy of data entry into central computer systems, lack of experience in using new reporting systems or modules, or individual non-responsiveness (e.g., self-reporting of diversity information; workplace surveys).

Finally, external expert assessments (presented in COV and AC reports) may lack sufficient justification for ratings or may provide incomplete information. To address this issue NSF is continuing to modify its reporting templates and improve guidance to committees and staff in order to improve the completeness and consistency of the reports. This will aid NSF in compiling qualitative information. Additionally, NSF has focused on clarifying language in goal and indicator statements.

APPENDICES

A. ACRONYM LIST

B. MANAGEMENT CHALLENGES AND REFORMS

C. CROSS-CUTTING ACTIVITIES AND PROGRAMS (ADDITIONAL EXAMPLES)

D. MODIFICATIONS TO NSF GOALS FROM FY 2003 FINAL PERFORMANCE PLAN TO FY 2003 REVISED FINAL PERFORMANCE PLAN

E. INTERIM ADJUSTMENTS TO NSF GPRA STRATEGIC PLAN FY 2001-2006

APPENDIX A: ACRONYM LIST

Acronym	Definition
A&M	Administration and Management
AC	Advisory Committee
ADP	Automated Data Processing
AHRQ	Agency for Healthcare Research and Quality
B&O	Business and Operations
BE	Biocomplexity in the Environment
BFA	Office of Budget, Finance and Award Management
BIO	Directorate for Biological Sciences
CAREER	Faculty Early Career Development Program
CAWMSET	Congressional Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology Development
CCRI	Climate Change Research Initiative
CEOSE	Committee on Equal Opportunities in Science and Engineering
CERN	European Organization for Nuclear Research
CIA	Central Intelligence Agency
CISE	Directorate for Computer and Information Science and Engineering
CLT	Center for Learning and Teaching
COV	Committee of Visitors
DARPA	Defense Advanced Research Projects Agency
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOE-SC	Department of Energy, Office of Science
DOI	Department of Interior
DOJ	Department of Justice
DOS	Department of State
DOT	Department of Transportation
DOTreas	Department of Treasury
ED	Department of Education
EHR	Directorate for Education and Human Resources
EIS	Enterprise Information System
ENG	Directorate for Engineering
EPA	Environmental Protection Agency
EPSCoR	Experimental Program to Stimulate Competitive Research
ERC	Engineering Research Center
FACA	Federal Advisory Committee Act
FAIR	Federal Activities Inventory Reform
FAS	Financial Accounting System
FEMA	Federal Emergency Management Agency
FFRDC	Federally Funded Research and Development Center
FTE	Full-Time Equivalent
FY	Fiscal Year
GAO	General Accounting Office
GEO	Directorate for Geosciences
GK-12	Graduate Teaching Fellowships in K-12 Education
GPRA	Government Performance and Results Act
GRF	Graduate Research Fellowship

Acronym	Definition
HBCU-UP	Historically Black Colleges and Universities-Undergraduate Program
HHS	Department of Health and Human Services
HRM	Division of Human Resource Management
IA	Integrative Activities
IERI	Interagency Education Research Initiative
IGERT	Integrative Graduate Education and Research Traineeship
IPA	Intergovernmental Personnel Act (appointee)
IPERS	Integrated Personnel System
IT	Information Technology
ITR	Information Technology Research
ITS	Information Technology Security
K-12	Kindergarten through twelfth grade
K-16	Kindergarten through college
KDI	Knowledge and Distributed Intelligence
LEE	Life and Earth's Environment
LHC	Large Hadron Collider
LSAMP	Louis Stokes Alliances for Minority Participation
MCC	Management Controls Committee
MPS	Directorate for Mathematical and Physical Sciences
MREFC	Major Research Equipment and Facilities Construction (Account)
MRI	Major Research Instrumentation
MRSEC	Materials Research Science and Engineering Center
MSP	Math and Science Partnership
NAS	National Academy of Sciences
NASA	National Aeronautics and Space Administration
NEES	Network for Earthquake Engineering Simulation
NEHRP	National Earthquake Hazards Reduction Program
NICHD	National Institute for Child Health and Development
NIH	National Institutes of Health
NIST	National Institute of Standards and Technology
NITRD	Networking and Information Technology Research and Development
NNI	National Nanotechnology Initiative
NNSA	National Nuclear Security Administration
NOAA	National Oceanic and Atmospheric Administration
NRC	Nuclear Regulatory Commission
NRC	National Research Council
NSA	National Security Agency
NSE	Nanoscale Science and Engineering
NSF	National Science Foundation
NSTC	National Science and Technology Council
ODS	Online Document System
OEOP	Office of Equal Opportunity Programs
OIG	Office of Inspector General
OIRM	Office of Information and Resource Management
OMB	Office of Management and Budget
ONR	Office of Naval Research
OPP	Office of Polar Programs
PACI	Partnerships for Advanced Computational Infrastructure
PARS	Proposal, PI and Reviewer System
PFI	Partnerships for Innovation

Acronym	Definition
PI	Principal Investigator
PMA	President's Management Agenda
PwC	PricewaterhouseCoopers LLP
R&D	Research and Development
R&RA	Research and Related Activities (Account)
REU	Research Experiences for Undergraduates
RSI	Rural Systemic Initiatives
S&E	Science and Engineering
S&E	Salaries and Expenses (Account)
SBE	Directorate for Social, Behavioral and Economic Sciences
SEARCH	Study of Environmental Arctic Change
SGER	Small Grant for Exploratory Research
SI	Smithsonian Institution
SLC	Science of Learning Center
SRS	Division of Science Resources Statistics
SSI	Statewide Systemic Initiatives
STC	Science and Technology Center
STEM	Science, Technology, Engineering and Math
UNOLS	University-National Oceanographic Laboratory System
USDA	United States Department of Agriculture
USGCRP	United States Global Change Research Program
USGS	United States Geological Survey
USP	Urban Systemic Program
V&V	Verification and Validation
VSEE	Visiting Scientists, Engineers and Educators

APPENDIX B: MANAGEMENT CHALLENGES AND REFORMS

This appendix contains a discussion of management issues presented in the President's Management Agenda or identified for NSF and other federal agencies by OMB, GAO, and the NSF OIG. The OIG issues addressed are those included in a November 2000 statement on NSF's management and performance challenges. An updated OIG statement was issued on the day this FY 2003 Final Performance Plan was completed; thus, the OIG recommendations included therein are not thoroughly addressed in this document. However, we expect to address each challenge in the FY 2001 Performance Report. Please note that the "Steps to Address Challenge" reflect the status as of submission of the FY 2003 Final Performance Plan. Additional progress made since that time is not reflected in this FY 2003 Revised Final Performance Plan.

Many of the issues discussed also fall within the purview of the internal NSF Management Controls Committee (MCC), chaired by the Chief Financial Officer. That committee provides continuing and long-term senior executive attention to NSF's management challenges and reforms.

The issues identified below are organized by NSF GPRA performance area – e.g., Proposal and Award Processes, Award Portfolio, Award Oversight and Facilities Management, Business Practices, and Human Resources & Workplace.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Proposal and Award Processes: Merit Review (OIG)	
NSF's OIG (November 2000*) noted "Because of its importance to the success of NSF's mission, the merit review system remains on our list of management challenges. … NSF must continue to ensure that: reviewers correctly apply NSF's review criteria; due consideration is given to ideas, individuals, and institutions that have not received past support; and that the process is fairly and evenly administered. … We believe that NSF should enhance its effort to expand the peer review community with regard to race, gender, geography, and type of school, providing the chance to participate to all who are qualified."	NSF considers its merit review process the keystone for award selection. The agency evaluates proposals using two criteria – intellectual merit of the proposed activity and broader impacts of the proposed activity on society. NSF staff rely on expert evaluation by selected peers when evaluating proposals and making funding decisions. Each year, more than 250,000 merit reviews are provided to assist NSF with the evaluation of proposals submitted for consideration. NSF focuses its management activities on a wide variety of issues related to merit review – including use of both merit review criteria by reviewers and program officers, broadening participation, and enhancing customer service. In FY 2001 NSF established an internal task force to examine strategies to improve both proposer and reviewer attention to the broader impacts criterion. The group assessed the characteristics and quality of reviewer responses to this criterion and found that, based on a sample of FY 2001 reviews, approximately 69 percent of reviews provided evaluative comments in response to the broader impacts criterion. The group also developed examples of broader impacts that may be useful to proposers in developing proposals and reviewers in evaluating proposals. In FY 2002, NSF will continue to develop and apply recommendations that focus on strategies that stress the importance of using both criteria. It will also make available examples of broader impacts. Summary: Issue addressed with FY 2003 GPRA Goals IV-1, 2, 3, and 5 and with internal management controls and processes.

*The November 2000 OIG reference that appears throughout this section refers to the NSF Inspector General's statement concerning NSF's Management and Performance Challenges. See the NSF FY 2000 Accountability Report (p. 98-101) to view a copy.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Award Portfolio: Efficiency of the Research Process (OMB)	
In discussions with OMB, NSF has asserted that the current size of its grants and their duration might result in inefficiency at U.S. academic institutions if scientists and engineers devote a greater proportion of their time to preparing proposals than to conducting research. OMB has asked the agency to develop metrics to measure the efficiency of the research process and determine the "right" grant size for the types of proposals that the Foundation funds.	The agency has contracted with Mathematica Policy Research, Inc. to assist in the development and administration of two surveys – one for Principal Investigators and one for institutions – to obtain the views of the research and education communities on award size and duration issues. The surveys have been cleared by the Office of Management and Budget. The surveys will be administered early in FY 2002, with final results expected in May 2002. Summary: Issue addressed with FY 2003 GPRA Goals IV-6 and IV-7; internal management controls and processes; activities external to NSF.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Award Portfolio: Federal Funding of Astronomy and Astrophysics (OMB)	
NSF and NASA provide more than 90 percent of Federal funds for academic astronomy research and facilities. Historically, NASA has funded space-based astronomy and NSF has funded ground-based astronomy as well as unsolicited astronomy research proposals. Recent changes (e.g., the share of grants funding and the need for more integration of ground and space-based facilities) suggest that the Federal government's management and organization of astronomical research should be assessed.	In response, a National Academy of Sciences committee was directed to assess the current disposition of management and operational responsibilities for Federal support of astronomical sciences. The NAS report was released the first week in September 2001. It recommended that "The National Science Foundation's astronomy and astrophysics responsibilities should not be transferred to NASA" and that an interagency planning board to coordinate scientific planning be established. Summary: Issue addressed with activities (NAS Panel) external to NSF.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Award Oversight & Facilities Management: Enhance NSF's Capability to Manage Large Facility Projects (OMB;OIG)	
OMB has noted that NSF has several multi-year, large facility projects awaiting approval for funding. Although the agency has done well in keeping past projects on schedule and within budget, OMB believes that NSF's capability to manage proposed projects needs to be enhanced given the magnitude and costs of future projects. NSF was asked to develop and submit a plan to OMB that documents its costing, approval, and oversight of major facility projects. Similarly, the NSF OIG (November 2000) has noted that "successful management of large infrastructure projects requires a more disciplined project management approach. Management of these projects is particularly challenging for NSF because of its limited number of staff."	In order to mitigate the risks attendant to large facilities management, and to comply with the President's mandate in *A Blueprint for New Beginnings: A Responsible Budget for America's Priorities* (February 2001), NSF developed a Large Facility Projects Management & Oversight Plan. The plan was submitted to OMB in September 2001. This new facilities plan has four major foci: • Enhance organizational and staff capabilities and improve coordination, collaboration, and shared learning among NSF staff and external partners; • Implement comprehensive guidelines and procedures for all aspects of facilities planning, management and oversight; • Improve the process for reviewing and approving Large Facility Projects; and • Practice coordinated and proactive oversight of all facility projects. Further development and implementation of the plan is continuing. Summary: Issue addressed with FY 2003 GPRA Goals IV-8, IV-9, and internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Award Oversight & Facilities Management: NSF's Ability to Administer and Manage a Growing Portfolio of Program Activities (OMB; OIG)	
OMB has noted that NSF has had robust increases in its program responsibilities and budgets in the past decade, but funding for administration and management has remained relatively flat. OMB and the NSF OIG have expressed concern about the adequacy of staffing at a time when the agency is facing succession planning, recruitment challenges and management of more complex programmatic activities. The agency has been able to keep pace with the increased workload by investing in information technology. However, this shift to complex systems requires more sophisticated skills from the Foundation workforce. A number of areas related to these needs – including systems and data management, program management and staffing and resource management – are also cited as management challenges by both the OIG and the internal NSF Management Controls Committee.	NSF has developed a 5-year Administration and Management Strategic Plan at the request of OMB. A revised version of this plan, which has IT and workforce components, was submitted to OMB in December 2001. Discussions with OMB about the plan are continuing, and in the interim, NSF continues to focus on systems enhancement, especially further development of FastLane. FY 2002 efforts focus on initiating this plan. FY 2003 efforts include initial development of human resource standards that link employee competencies with critical business processes and emerging technology. Summary: Issue addressed with GPRA Goals IV-10, IV-11, IV-15 and IV-16 and internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Award Oversight & Facilities Management: Award Administration (OIG)	
Award administration is a broad term used to describe the award and program monitoring directed toward scientific progress and the oversight exercised by BFA (Office of Budget, Finance, and Award Management) over grantees' financial management of NSF awards. The NSF OIG (November 2000) noted that "Assessing scientific progress and ensuring effective financial/administrative management are critical elements in managing NSF's Grants Programs. ... At any one point in time NSF is administering as many as 30,000 on-going awards. ... Given this sizeable workload, NSF is challenged to adequately monitor its awards for scientific accomplishments and compliance with the award agreement and federal regulations."	NSF program portfolios have become more diverse and more complex; however, there has not been a concomitant increase in the staffing complement to provide additional program and administrative oversight functions. The NSF A&M Strategic Plan (December 2001) presents a framework for Award Management and Oversight that focuses on a collaborative, multi-functional award management and oversight process that is informed by risk management strategies and verifies that projects are in compliance. On-site post-award monitoring is one of the most effective methods of ensuring awardee compliance with award agreements and federal regulations. However, it is least often employed because of staff resource constraints. In order to leverage NSF administrative oversight capability, NSF will develop and initiate in FY 2002 a risk assessment/risk management plan for awards. A GPRA management goal covering these activities has been added to the FY 2002 Revised Final Performance Plan for NSF. Summary: Issue addressed in the FY 2002 Revised Final Performance Plan (Goal IV-8) and with internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Award Oversight & Facilities Management: NSF Data Quality Assurance (OIG)	
The NSF OIG (November 2000) has expressed concern about verification and validation of NSF data used in GPRA processes. It notes that "if uncertainty persists about data validity, decision-makers will be reluctant to rely on the information, and its usefulness will be diminished."	For FY 2000 and FY 2001 GPRA reporting, NSF engaged an external party, Pricewaterhouse Coopers LLP (PwC), to provide an independent verification and validation (V&V) of selected GPRA goals. The V&V focused on reliability of data, on processes to collect, process, maintain, and report the data, and on program reports prepared by external experts. PwC mapped NSF procedures against GAO guidance for polices and procedures that underlie GPRA performance reporting. FY 2001 progress on NSF's data quality program includes completion of an extensive analysis of the existing data dictionary designed in Access and recommendations for improving the functionality of the data dictionary. Summary: Issue addressed with external V&V and internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Award Oversight & Facilities Management: Management of the U.S. Antarctic Program (OIG)	
The NSF OIG (November 2000) has stated that "While OPP operates like other NSF directorates in making awards for polar research, its responsibilities do not end there. In providing science, operations, and logistics support to the research projects it funds, it is significantly different than other NSF units. ... NSF's polar programs involve not only a large expenditure of money, but also the safety of scientists and workers, environmental concerns and the prestige of the U.S. government. The successful operation of the United States Antarctic Program requires certain management and administrative skills that are responsive to the special needs of Antarctic scientific research."	Staff provide special expertise in: • Coordinating Department of Defense, NASA, USGS and DOE activities; • Overseeing environmental, health, safety, and medical activities; • Overseeing construction and maintenance of all infrastructure at three U.S. stations in Antarctica (roads, fire stations, clinics, power stations, heating, communications, ground stations, air traffic control, ground vehicles, food services, sewage treatment, water supplies, etc.); • Coordinating support of scientists in Antarctica, construction of specialized science instrumentation, etc.; • Budgeting for the above activities; and • Selecting science projects for deployment on the basis of merit review and ability to meet logistics requirements. Summary: Issue addressed with internal controls and processes and external means such as international treaties.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Business Practices: Electronic Government (PMA, OMB; GAO)	
The President's Management Agenda (2002) states that "The Administration will advance E-government strategy by supporting projects that offer performance gains across agency boundaries, such as e-procurement, e-grants, e-regulation, and e-signatures. An expanded electronic-government is one of the government-wide initiatives presented in the *President's Management Agenda for 2002*. That document states that "the administration's goal is to champion citizen-centered electronic government." Note: Expanded application of on-line procurement is discussed below in a separate section.	The NSF Administration and Management Strategic Plan (December 2001) provides the framework for agency activities that address the President's Management Agenda eGovernment initiative. The results of NSF's eGovernment initiatives are significant. In FY 2001, NSF received and processed more than 32,000 electronic proposals, 130,000 electronic reviews, 7,000 electronic post-award actions, and distributed electronically $4 billion in funds. NSF's FastLane system exemplifies what can be achieved in eGovernment information system design, development, and implementation. Proposal submission, peer review, panel analysis, project reporting, individual and organization registration, cash requests, Federal Cash Transaction Reports, post-award requests, award letters, proposal status inquiries, and supplemental funding requests are performed through NSF's electronic systems. In June 2001, NSF implemented electronic signatures for all proposals and, since that time, has been implementing this approach, where appropriate, in other parts of the NSF proposal and award process. NSF has been, and continues to be, an active leader in interagency electronic grant efforts through the new government-wide eGrants initiative approved by the President's Management Council, the Federal Demonstration Partnership and other activities. In particular, the common interagency grant portal, known as the Federal Commons, directly benefits from NSF's trail-blazing efforts and the strong foundation provided by NSF's information systems and electronic grants processing. NSF's first phase of implementing next generation eGovernment capabilities will focus on two core business processes: Merit Review and Award Oversight and Management. New investments will improve internal NSF processing as a complement and extension to the common processes and products planned for the government-wide eGrants initiative and the Federal Commons. These investments will focus on integration and improvement of internal back-office NSF functions. As with FastLane, NSF will assure that internal business process improvements and IT capabilities are integrated with government-wide eGrants initiatives to streamline and simplify electronic grants management across the Government. Summary: Issue addressed with FY 2003 GPRA Goals IV-10 and IV-11 and internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Business Practices: FastLane (PMA, OIG)	
The NSF OIG (November 2000) stated "the development and implementation of FastLane, which began in 1994, has moved the agency closer to the goal of establishing a widely accessible paperless proposal and award process. In many respects the implementation has been successful and NSF serves as a leader within government in electronic innovation. ... However, problems remain, as reflected by the inability of the help desk to cope with the high volume of incoming questions and problems. ... Management must continue to monitor its progress and assure that the system is as user-friendly and reliable as possible. An expanded electronic-government is one of the government-wide initiatives presented in the *President's Management Agenda for 2002*. That document states that "the administration's goal is to champion citizen-centered electronic government."	NSF's FastLane system uses the Internet to allow its customers, the grantee community, to exchange information with NSF. It permits users to prepare and submit proposals, proposal reviews and project reports, determine the status of funding actions, submit post-award requests, interactively participate in panel evaluations of proposals, initiate cash requests, view reviews and award letters, and perform other basic interactions. Over 200,000 scientists, engineers, educators, technology experts and academic administrators use FastLane, with over 99 percent of proposals submitted electronically in FY 2001. In addition, the public can access titles, authors, funding amounts and abstracts of NSF awards. A past challenge for FastLane was to make the system more user-friendly and reliable. In January 2001, FastLane implemented a conversion process to allow Word, WordPerfect, TeX and other documents to be uploaded and converted in real-time to PDF files. This significant, and technically challenging, change to the system was greeted by FastLane's user community with more positive responses than any other user-oriented change in the system. In March 2001, FastLane included a detailed manual, available through the web, for electronic preparation and submission of proposals. The implementation in FY 2000 of a toll-free phone number to the FastLane Help Desk made it easier for NSF's user-community to obtain assistance – while at the same time increasing significantly the call volume. In June and July 2001, the FastLane Help Desk was able to handle peak loads without, for the first time, supplementing the Help Desk with staff from program offices. This improvement is attributed to better Help Desk practices, increase in the operating hours of the Fast Lane Help Desk and the number of trained Help Desk staff, improved on-line documentation, implementation of a word processor conversion tool, work on the web interface to make the system more user-friendly, and spreading out proposal deadlines. Summary: Issue addressed with FY 2003 GPRA Goals IV-10 and IV-11 and with internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Business Practices: On-Line Procurement (PMA, OMB)	
The President's Management Agenda and OMB guidance for FY 2002 addressed an expanded application of on-line procurement. Specifically, agencies are instructed to post on the government-wide point-of-entry website (www.FedBizOpps.gov) (a) all synopses for acquisitions valued at over $25,000 for which widespread notice is required and (b) all associated solicitations unless covered by an exemption in the Federal Acquisition Regulations.	Though NSF's contracting activity is relatively small, the agency embraces the use of on-line procurement. It currently posts all nonexempt synopses for acquisitions over $25,000 on the NSF website and at www.FedBizopps.gov. NSF has also posted the agency acquisition plan on its external website. Summary: Issue addressed with internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Business Practices: IT Security (GAO, OMB)	
The NSF OIG (November 2000) stated that "Electronic information and automated systems are essential to NSF's operations. Next year NSF will depend on its automated computer systems to manage over $4 billion in funds, receive and process over 35,000 grant proposals ... it is imperative that NSF's systems are developed and operated with appropriate security controls to reduce the ever increasing risk of unauthorized access." GAO (01-758) noted that recent audits continue to show that federal computer systems are riddled with weaknesses that make them highly vulnerable to computer-based attacks and place a broad range of critical operations and assets at risk of fraud, misuse and disruption.	The NSF Information Technology Security (ITS) Program is focused on assuring that NSF infrastructure and critical assets are appropriately protected while maintaining the open and collaborative environment for science and engineering research and education. NSF's approach is based on a fundamental philosophy of risk management where ITS risks are assessed, understood, and mitigated appropriately. An agency-wide ITS program had been implemented that encompasses all aspects of information security, including policy and procedures, risk assessments and security plans, managed intrusion detection services, vulnerability assessments, and technical and management security controls. The NSF Chief Information Officer provides overall leadership of the ITS Program, and assures that policies procedures, and activities are coordinated with NSF program management and research and education initiatives. In FY 2001, NSF placed significant priority on ITS and initiatives to assure adequate protection of resources. In December 2000, NSF appointed an ADP Security Officer to coordinate ITS program plans and initiatives with the NSF Chief Information Officer. The majority of NSF's significant assets are managed within the Division of Information Systems in the Office of Information and Resource Management. This organization is responsible for managing the NSF Computer Center and providing telecommunications, e-mail, and agency-wide applications and services. Summary: Issue addressed with FY 2003 GPRA Performance Goal IV-12 and internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Business Practices: Performance-Based Contracts (OMB)	
For FY 2002, the NSF is subject to a Performance-Based Contracting goal to award contracts over $25,000 using Performance-Based Service Contracting techniques for not less than 20 percent of total eligible service contracting dollars. This goal is based on the goals established under the Government-wide Acquisition Performance Measurement Program established by the Procurement Executives Council.	The National Science Foundation is fully committed to implementing performance based contracting. NSF has an award-fee contract with Raytheon Polar Services Company for science and logistics support of the United States Antarctic Program. This contract is valued at $134 million per year, which represents over 55% of NSF's contracting dollars. Three-fourths of the award fee is based on 222 performance metrics for Raytheon to achieve 139 goals; the remaining one-fourth is based on the Foundation's qualitative evaluation of Raytheon's performance. Even though the Raytheon contract far exceeds OMB's 20% goal, the Foundation reviews each requirement for services to determine whether it can be awarded as a performance based service contract. Summary: Issue addressed with internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Business Practices: Erroneous Payments to Recipients of Government Funds (PMA, OMB)	
OMB guidance The *President's Management Agenda for 2002* addresses improved financial performance for federal agencies, including erroneous payments. In addition, the General Accounting Office (GAO) recently issued an executive guidance, which outlines strategies for agencies to effectively manage improper payments.	NSF has always understood its fiduciary responsibility to ensure taxpayer funds entrusted to us are properly controlled and disbursed. Consequently, NSF has a culture of high operating efficiencies and sophisticated systems, which results in few improper payments. NSF has already adopted many of the strategies suggested by GAO in its internal controls as part of daily business functions. Since all NSF payment functions are centrally located, the agency has the ability to do pre-payment review of all payments, which keeps the amount of improper payments low. We estimate our improper payments in the last two years to be less than 20 with minimal dollars to commercial activities and zero to our grant recipients. NSF will provide a formal risk assessment and cost-benefit analysis to OMB in May 2002. NSF's goal is to reduce improper payments to zero. The agency believes that this attainable with its systems and communications. NSF will continue to monitor current internal controls to ensure improper payments remain a low-level risk to the performance objectives of the agency. Summary: Issue addressed with internal NSF management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Business Practices: Cost-Sharing (OIG)	
The NSF OIG (November 2000) noted that " ...NSF requires that each grantee share in the cost of NSF research projects resulting from unsolicited proposals. In addition to this statutory requirement, NSF can require additional cost sharing when it believes there is a tangible benefit to the award recipient. We have been finding significant problems with awardees who are failing to meet their cost sharing requirements."	In June 1999 an "Important Notice" was sent to Presidents of Universities and Colleges and Heads of National Science Foundation Grantee Organizations. This notice transmitted the "National Science Foundation Policy Statement on Cost Sharing" as approved by the National Science Board. In addition to providing a definition of cost sharing, the policy states that: (1) NSF-required cost sharing is considered an eligibility rather than review criterion; (2) NSF cost sharing requirements beyond the statutory requirement (1%) will be clearly stated in the program announcement, solicitation or other mechanism which generates proposals; (3) for unsolicited research and education projects, only statutory cost sharing will be required; and, (4) any negotiation regarding cost sharing will occur within NSF stated parameters. NSF has a long-standing policy requiring cost- sharing certification when cost-sharing exceeds $500,000. This "Important Notice" was also distributed to NSF staff. During the past year, NSF has held several training sessions on cost-sharing for NSF staff and has also conducted sessions on cost-sharing for NSF customers at regional conferences, seminars and workshops. The Foundation recently conducted an analysis of grantee audits that contain findings related to cost-sharing. It showed that while some grantees have often provided cost-sharing, they may not have had financial and accounting systems able to document their activities. NSF is now conducting more pre-award reviews of grantee financial and accounting systems to assess their capability to report on cost-sharing. Post-award reviews are also conducted to assure compliance with agreed upon cost-sharing requirements. In this analysis, over half of the audit activity (both in number of audit reports and dollar amount of findings cited) reported by the NSF OIG in its Semiannual Reports to Congress since 1997, when the NSF OIG first reported separate statistics on cost-sharing, was for grantee organizations that are "non-traditional" (e.g., public school systems). NSF is currently developing an appropriate strategy for reviewing cost-sharing by these types of grantee organizations and providing outreach and instruction as necessary. Summary: Issue addressed with internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Business Practices: A-76 Competitions and FAIR Act Inventories (PMA, OMB)	
The President has proposed to increase competition for activities performed by the government as listed on agency FAIR Act inventories. The FY 2002 guidance for agencies is to complete competitions on not less than 5% of the FTE listed on their FAIR Act inventories, and in FY 2003, increase to a total of 15%, or an additional 10%, of the listed FTE. The President's commitment is to open at least one-half of the Federal positions listed on the FAIR Act inventory of commercial functions to competition with the private sector. Agency plans should outline how the agency intends to meet these goals.	For many years NSF has leveraged the potential of competitive sourcing to achieve its mission. While the agency is comparatively small and has a federal workforce of only about 1,300, many times that number are involved each year in realizing the agency's goals. A significant example is how NSF has competitively sourced its commercial administrative functions, including its mailroom, copy center, health unit, travel center, and much of its software and systems development, which has brought the total number of NSF contractor personnel to approximately 1,400. A high level of competitively sourced commercial activities over the years has enabled NSF to focus its small workforce on its core business needs and mission-essential functions. Although NSF's budget has increased by more than 80 percent in the past ten years, the number of NSF federal employees has increased by only one percent, due in part to the agency's effective use of competitive sourcing. In FY 2000, NSF's Federal Activities Inventory Reform (FAIR) Act Inventory identified 533 FTE as subject to competitive sourcing. Since FY 2000 however, the nature of many of these positions has changed, due in large measure to NSF's rapidly evolving, technology-enabled business environment. Furthermore, as the agency begins a Strategic Business Analysis and migration toward a competency-based, occupation classification system that may redefine all NSF positions, NSF's FY 2000 FAIR Act inventory will become increasingly obsolete. Consequently, the agency plans to draw upon its Strategic Business Analysis to redefine its FAIR Act inventory. This will place the agency in a strong position to develop a strategic competitive sourcing plan that optimally supports its future business needs. Development of this plan will begin in FY 2003. Summary: Issue addressed with internal management controls and processes and through development of Strategic Business Analysis.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Human Resources and Workplace: Workforce/Human Capital (PMA, OMB; GAO; OIG)	
GAO *(GAO-01-236, April 2001)* has identified shortcomings of many agencies involving key elements of modern strategic human capital management, including (1) strategic planning and organizational alignment; (2) leadership continuity and succession planning; and (3) acquiring and developing staff whose size, skills, and deployment meet agency needs. The NSF OIG has expressed concerns about staffing and human resource management – especially "... whether NSF can successfully manage future growth without adding more staff" (November 2000). Additionally, the *President's Management Agenda (2002)* includes strategic management of human capital as a government-wide initiative. .	NSF's flexible and motivated workforce currently includes approximately 600 permanent and visiting scientists and engineers (about 65% of whom are permanent government employees), 450 administrative personnel (who provide business operations support), and approximately 350 program support personnel. NSF has a steadfast commitment to empower a workforce of teams and individuals who are continuously expanding their capabilities to shape the agency's future. To sustain its high-performing workforce, NSF is exploring ways to recruit and retain excellent employees. New initiatives include an updated telecommuting program, strategic recruiting techniques that also seek to increase representation of underrepresented groups in the NSF science and engineering workforce, a renewed focus on continuous learning and an increased emphasis on leadership and succession planning. NSF's Strategic Business Analysis (presented in the Draft NSF Administration and Management Plan; submitted to OMB in December 2001) will examine organizational alignment and the workforce size, skill mix, and deployment necessary to ensure mission accomplishment. Summary: Issue addressed with GPRA Goals IV-15 and IV-16 and internal management controls and processes.

MAJOR MANAGEMENT CHALLENGE	STEPS TO ADDRESS CHALLENGE
Human Resources and Workplace: Fostering a Diverse Scientific Workforce (OIG)	
The NSF OIG notes (November 2000) that "Because diversity programs are difficult to implement in a society challenged by economic, legal and cultural constraints, NSF faces numerous challenges and should clearly define its diversity strategies and develop concrete steps ... for attaining goals in this area."	NSF recognizes that a diverse workforce – one that includes members of underrepresented groups and reflects institutional and geographic differences – broadens the agency outlook and talent base and enables it to better serve its research and education communities and ultimately all citizens. The FY 2003 NSF Performance Plan includes two goals related to the agency's science and engineering (S&E) staff. This S&E group includes program officers, division directors, the majority of staff assigned under the provisions of the Intergovernmental Personnel Act, limited term Visiting Scientists appointments, and others in management and scientific positions. In aggregate, this group is the one most intensively involved with the agency's external customers, the award community. It is also the group involved within the Foundation in development of new programs, in merit review and review analysis, and in making recommendations to fund or decline proposals. It is thus particularly important that these staff be diverse, with an ability "to identify best practices that are appropriate to a diverse [research and education] community." (CEOSE, 2000[*]) Summary: Issue addressed with GPRA Goals IV-13 and IV-14 and internal management controls and processes.

[*] Enhancing the Diversity of the Science and Engineering Workforce to Sustain America's Leadership in the 21st Century, Committee on Equal Opportunities in Science and Engineering, 2000 Biennial Report to the United States Congress.

APPENDIX C: CROSS-CUTTING ACTIVITIES AND PROGRAMS (ADDITIONAL EXAMPLES)

The following appendix presents supplementary examples for the Section on Cross-Cutting Activities and Programs)

EXAMPLES OF CROSS-CUTTING ACTIVITIES - PEOPLE

- **Interagency Participation in Support of International Student Assessment Studies:** NSF and the Department of Education's National Center for Education Statistics and Office for Educational Research and Improvement jointly sponsored the development, collection, and publication of results of a repeat of the Third International Mathematics and Science Study in 27 states, districts, and consortia. The three agencies also participated in a successful joint public release of this study of the "benchmarking" districts in December 2000. These agencies continue to work together to assure that future studies in this series are effectively communicated to a wide audience in order to improve mathematics and science education.

- **Fellowship/Traineeship Activities for Graduate Education:** Many agencies support research and education activities, usually with a specific mission orientation, in academic institutions. Their activities contribute to developing the workforce in science and engineering, both directly and indirectly. Most work indirectly through support of research assistants. In addition to NSF, the following agencies, among others, have dedicated fellowship or traineeship activities for graduate education in science and engineering: National Institutes of Health, Department of Education, Department of Defense, Department of Agriculture, and Department of Energy.

EXAMPLES OF CROSS-CUTTING ACTIVITIES - IDEAS

- **Interagency Research in Biological Sciences:** NSF is involved with numerous agencies in support of research in the biological sciences, including:
  - > Interagency Arabidopsis Genome Project, which has a goal of understanding biological processes underlying plant growth and development (USDA/DOE/NIH/NSF as lead agency);
  - > International Cooperative Biodiversity Groups (NSF/NIH/USDA);
  - > NSF/NASA Neurolab which supports ground-based research leading to experiments flown on the NASA space shuttle (NSF/NASA/NIH/ONR/international partners);
  - > the Human Brain Project, a broad Federal research initiative to support research in the neurosciences and the new field of neuroinformatics (NIH/NSF/DOD/DOE/NASA);
  - > Ecology of Infectious Diseases (NSF/NIH).

- **Interagency Education Research Initiative (IERI):** This joint research activity was established in response to the recommendations of the President's Committee of Advisors on Science and Technology. The Committee recommended the development of a strong research base for education and learning, particularly investigation of the role of learning technologies. IERI supports an evolving, cumulative and integrated portfolio of effective instructional practices and research projects. Taken together the projects will provide a substantive body of knowledge that can be implemented in varied educational environments to enhance student learning (NSF/NIH/NICHD/ED).

- **Integrated Science Activities in the Antarctic:** NSF is charged with managing all U.S. activities in the Antarctic as a single, integrated program. The U.S. Antarctic Program implements national policy to maintain Antarctica as an area of international cooperation reserved for peaceful purposes, to preserve and pursue unique opportunities for scientific research to understand Antarctica and its role in global environmental systems, to protect the environment, and to assure the conservation and sustainable management of the living resources in the surrounding oceans.

EXAMPLES OF CROSS-CUTTING ACTIVITIES - TOOLS

- **Support of the U.S. Academic Research Fleet:** The U.S. Academic Research Fleet provides essential support to enable productive basic research in oceanography. NSF provides most of the support for operation, maintenance, and upgrade of the Academic Research Fleet. NSF, in partnership with the Office of Naval Research, supports and manages a ship inspection program to oversee safety practices, crew training, maintenance, operational procedures, and shipboard science laboratory facilities. Ship operations are coordinated through the University-National Oceanographic Laboratory System (UNOLS), a consortium of 61 institutions, 21 of which currently operate ships. Other federal agencies using these vessels coordinate through NSF and UNOLS.

- **Interagency Access to Leading-Edge Computing Capabilities:** The Terascale Computing Systems project, a part of the Information Technology Research priority area, will enable U.S. researchers to gain access to leading edge computing capabilities. The project is connected to NSF's existing Partnerships for Advanced Computational Infrastructure (PACI), and will be coordinated with the activities of other agencies, such as the Department of Energy, to leverage the software, tools, and technology investments.

- **Digital Libraries for Education:** The National Science, Technology, Engineering and Mathematics Education Digital Library (NSDL) Program is developing a national library to support STEM education at all levels in both formal and informal settings. Opportunities for leveraging the large resource holdings of various federal agencies and research laboratories are being explored through projects with the National Institute of Standards and Technology (NIST), DOE, Argonne National Laboratory, and the Institute of Museum and Library Services.

EXAMPLES OF CROSS-CUTTING ACTIVITIES – BUSINESS PRACTICES

- **Federal Demonstration Partnership:** NSF is an active participant in the Federal Demonstration Partnership, a joint effort of government and academe to address commonality of processes and reporting requirements that facilitate federally funded research and education activities in academe.

- **Federal Committee on Statistical Methodology:** NSF is one of many public and private agencies responsible for obtaining statistical information on areas of important national interest. NSF and other agencies share information on statistical, information technology, and other methods and resources through this committee and related groups.

APPENDIX D:
MODIFICATIONS TO NSF GOALS FROM FY 2003 FINAL PERFORMANCE PLAN TO THE FY 2003 REVISED FINAL PERFORMANCE PLAN

This section compares goals contained in the FY 2003 GPRA Performance Plan submitted on February 4, 2002 with those developed for this FY 2003 Revised Final GPRA Performance Plan.

ANNUAL PERFORMANCE GOALS FOR NSF STRATEGIC OUTCOMES

FY 2003 Original Performance Goal: NSF will significantly enhance the quality of preK-12 mathematics and science education available to all students in Math and Science Partnership schools.

FY 2003 Original Performance Indicators:

- Evidence of high quality programs addressing issues related to teacher workforce capacity, including preservice education and inservice professional development of math and science teachers as well as alternative routes into the profession (e.g., scientists and engineers becoming teachers.)

- Evidence within Partnership school systems of the infrastructure needed to improve math and science education and to measure improvement, i.e., the adoption of standards-based curricula and of appropriate assessments of student achievement, as well as the initiation of the collection of achievement data that can be disaggregated by ethnicity, socioeconomic status, gender, etc.

FY 2003 Revised Performance Goal: NSF will significantly enhance the quality of K-12 mathematics and science education available to all students in Math and Science Partnership schools.

FY 2003 Revised Performance Indicators:

- Evidence in the award portfolio of the infrastructure to support high quality programs addressing issues related to teacher workforce capacity, including preservice education and inservice professional development of math and science teachers as well as alternative routes into the profession (e.g., scientists and engineers becoming teachers.)

- Evidence within Partnership school systems of the infrastructure needed to improve math and science education and to measure improvement, i.e., the adoption of appropriate assessments of student achievement, as well as the initiation of the collection of achievement data that can be disaggregated by ethnicity, socioeconomic status, gender, etc.

Explanation of Change: The goal statement and wording of the indicators has been revised in light of actual FY 2002 performance. The goal statement was changed because the expected focus on pre-K has not materialized, i.e., few awards/proposals in the FY 2002 competition addressed pre-school, and as a result of this feedback from the community "pre" has been removed from the FY 2003 solicitation. The first indicator was revised because Awards for Comprehensive and Targeted Partnerships were made on September 30, 2002. Accumulation of evidence documenting project progress will not be feasible in FY 2003, although documentation of project plans and infrastructure development will be available in the strategic plans and other supporting evidence submitted by projects. The second indicator was revised because while many Math and Science Partnerships may give attention to the utilization of standards-based curriculum, it was not a specific requirement in the MSP solicitation.

ANNUAL PERFORMANCE GOALS FOR NSF MANAGEMENT

FY 2003 Original Performance Goal: At least 70 percent of reviews will address aspects of both generic review criteria.

FY 2003 Revised Performance Goal: At least 70 percent of reviews with written comments will address aspects of both generic review criteria.

Explanation of change: The goal statement was adjusted to accurately reflect current practice with respect to tracking the usage of the merit review criteria.

FY 2003 Original Performance Goals:
For ninety percent of projects, keep construction and upgrades within annual expenditure plan, not to exceed 110 percent of estimates.

Ninety percent of construction / upgrade projects will meet all major annual schedule milestones.

For all construction and upgrade projects initiated after 1996, when current planning processes were put in place, keep total cost within 110 percent of estimates made at the initiation of construction.

FY 2003 Revised Performance Goal: For ninety percent of construction, acquisition and upgrade projects, keep any negative cost and schedule variances to less than 10 percent of the approved project plan.

Explanation of change: NSF has improved the construction goals by combining cost and schedule performance into a single goal based on the Earned Value technique, a widely accepted project management tool for measuring progress. This change recognizes that cost or schedule data alone can lead to distorted perceptions of performance.

FY 2003 Original Performance Goal: For ninety percent of facilities, keep operating time lost due to unscheduled downtime to less than 10 percent of the total scheduled operating time.

FY 2003 Revised Performance Goal: For ninety percent of operational facilities, keep scheduled operating time lost to less than 10 percent.

Explanation of change: To achieve clarity, the wording of the goal has been slightly revised.

FY 2003 Original Performance Goal: NSF will continue to advance "e-business" by creating a functional, web-based Electronic Jacket for use by NSF staff by the end of FY 2003.

FY 2003 Revised Performance Goal: NSF will continue to advance "e-business" by implementing Phase III of the Electronic Jacket application.

> FY 2003 Revised Performance Indicator: Implementation of the electronic capability for assigning proposal processing tasks, forwarding proposals to other programs as necessary, and delegating proposal action authority.

Explanation of change: This goal statement was adjusted based on actual performance data from FY 2002. Phase I of the Electronic Jacket was implemented in July 2002. Phase II was implemented in early FY 2003.

FY 2003 Original Performance Goal: NSF will maintain and enhance the agency-wide security program to ensure adequate protection of NSF's infrastructure and critical assets.

FY 2003 Original Performance Indicators:

- 100 percent of mission-critical systems will have documented risk assessments.
- 100 percent of mission-critical systems will have approved security plans on file.

FY 2003 Revised Performance Indicators:

- 95 percent of major systems will have approved security plans on file.
- 95 percent of major systems will have documented certification and accreditation.

Explanation of change: This goal statement was adjusted based on actual performance data from FY 2002. In accordance with OMB Circular A-130, NSF has expanded its IT Security program requirements for all systems and assessed security controls for the 20 identified "major" systems. This more rigorous task expands the scope of the previously planned assessment of "mission-critical" systems. Risk assessments are a subset of the certification process. This significant program change was reported in NSF's FY 2002 GISRA report.

FY 2003 Original Performance Goal: NSF will show an increase over FY 2000 in the total number of appointments to NSF science and engineering positions from underrepresented groups.

FY 2003 Revised Performance Goal: NSF will show an increase over FY 2000 in the total number of appointments to NSF science and engineering staff and management from underrepresented groups.

Explanation of change: The goal statement has been adjusted based on actual performance data from FY 2002. Recognizing that we have achieved this goal in each of the 3 years we've monitored this effort, the Foundation has decided to expand the previous goal to include Assistant Directors, Division Directors and others in order to ensure the goal is continuously challenging.

FY 2003 Original Performance Goal: NSF will align or develop competency-based curricula, through the NSF Academy, that provide cross-functional, work-based team learning opportunities.

FY 2003 Original Performance Indicator: Initiation of curriculum development activities that address program management, leadership development, and technology and business process training.

FY 2003 Revised Performance Indicator: Initiate development of existing courses or revision of existing courses to address program management, leadership development, and technology and business process training.

Explanation of change: To achieve clarity, the wording of the goal has been slightly revised.

FY 2003 Original Performance Goal: NSF will develop competency-based, occupation classification alternatives that support the agency's strategic business processes and capitalize on its technology enabled business systems.

FY 2003 Original Performance Indicators:
- Identification of workforce competencies for two or more of NSF's strategic business processes.
- Initiate identification of competency-based, classification alternatives.

FY 2003 Revised Performance Indicators:
- Identification of workforce competencies for all current NSF job families.
- Initiate identification of competency-based, classification alternatives.

Explanation of change: The first indicator has been revised to reflect actual performance information from FY 2002. Workforce competencies will be identified for job families, rather than for business processes.

APPENDIX E:
INTERIM ADJUSTMENTS TO NSF GPRA STRATEGIC PLAN FY 2001 – FY 2006

Recent NSF planning efforts have focused on developing:

1) A 5-year Administration & Management Strategic Plan
2) A Large Facility Projects Management and Oversight Plan (submitted to OMB and Congress in September 2001).
3) Alternatives for changing NSF's GPRA reporting processes (establishment of the Advisory Committee for GPRA Performance Assessment utilized in FY 2002 reporting).
4) Means of addressing program and policy changes of the new Administration.

Results of the above-mentioned activities may provide guidance for Foundation activities over the next two years, until a revised NSF Strategic Plan is developed. NSF will submit an updated / revised draft of its GPRA Strategic Plan to OMB on March 1, 2003 and a final updated plan no later than September 30, 2003. NSF submitted its FY 2001 – 2006 Strategic Plan in September 2000.