

### III. ASSESSMENT AND EVALUATION PROCESS

Implementing the Government Performance and Results Act of 1993 (GPRA) has been a challenge for NSF and other agencies having missions that support basic research and education activities. Both the substance and timing of outcomes from research and education activities are unpredictable. This creates difficulty in linking outcomes to annual investments and the agency's annual budget. The true value of NSF is seen in the long-term results of research and education activities that may require many years to develop and can only be judged retrospectively.

Therefore, NSF developed and obtained Office of Management and Budget (OMB) approval for use of the "alternative form". The alternative form allows NSF to assess progress annually using a retrospective approach and a qualitative scale for its Outcome Goals. In using this approach, NSF depends on external experts to assess the quality of research and education results and to judge the annual progress NSF is making toward achieving its Outcome Goals.

In addition, NSF's goals are agency-wide goals. NSF aggregates results across the entire agency to report annual progress in meeting each goal. Aggregation is accomplished by compiling many reports provided by external experts for the Outcome Goals, and integrating those results with the results of the Management and Investment Process Goals.

Because the conduct of research and education activities in science and engineering supported by NSF takes place outside the agency, external factors have a significant impact on NSF's performance. The circumstances of our institutional partners in academia, the private sector, and the government determine how individuals are able to respond in both proposing and conducting research and education activities responsive to NSF's goals.

#### A. TYPES OF GOALS

NSF employs a mix of both qualitative and quantitative goals, and makes use of both qualitative information and quantitative data in determining annual progress made toward goal achievement. NSF's Outcome Goals are expressed in a qualitative form, and most Management Goals and Investment Process Goals are quantitative.

## B. TYPES OF ASSESSMENTS

NSF has traditionally made use of various types of assessments and evaluations to monitor quality and process. Programs and plans are assessed and evaluated throughout the year on a continuing basis by internal staff and senior management. Evaluations are carried out by externally-contracted groups to review the progress of programs in meeting specific program objectives. NSF engages committees of external experts or evaluators, called Committees of Visitors (COVs), and Advisory Committees (ACs), to review program practices, processes, and results for the Outcome Goals. The Management and Investment Process Goals are reviewed internally by NSF staff and audited by third parties.

To determine program performance toward meeting the Outcome Goals, NSF depends on assessments provided by the COVs and ACs. Each NSF program has traditionally been assessed by COVs on a three-year cycle for quality of science and integrity of process. Each year, COVs assess a one-third portion of NSF's portfolio, looking at the program performance over the previous three years. COVs review practices and processes, and, with the implementation of GPRA, include an assessment of results. The schedule for COVs has been impacted by GPRA. Programs may be clustered together and evaluated as a group by COVs, to facilitate the assessment process. This has led to rescheduling COVs for some programs to accommodate the GPRA schedule.

In FY 2000, about 37% of NSF's portfolio of 200 programs were evaluated by COVs for quality of process and progress made in achieving NSF's Outcome Goals. Last year, about 40% of NSF's portfolio that was evaluated by COVs. The remaining portions of NSF's portfolio will be evaluated by COVs in FY 2001 to complete the full three-year cycle of assessment of NSF's programs under GPRA.

Approximately 250 COV members and 150 advisory committee members participated in the performance assessment process in FY 2000. Together, for the Outcome Goal assessment process alone, COVs and ACs generated a total of 64 reports which covered 78 of NSF's approximately 200 programs (see Section XV. for a schedule of program evaluations)<sup>2</sup>. We anticipate that electronic copies of the COV and advisory committee reports will become available in December 2001.

NSF makes use of internal data systems to monitor and report progress in achieving the quantitative Management Goals and Investment Process Goals. With the exception of one Investment Process Goal (Investment Goal 2), these goals and results are assessed and reviewed by internal management and staff rather than by external committees.

Reviews by external groups provide useful information for identifying issues, establishing new goals, and redirecting efforts. Changes to programs and plans may be necessitated by difficulty in meeting a goal, lack of appropriateness of a goal, or an inability to measure a goal. Some FY 2001 and FY 2002 goal levels are being adjusted based on FY 1999 and FY 2000 results, and on

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<sup>2</sup> In several instances, a single COV report evaluates more than one program.

realistic expectations for future progress. Changes of this type are handled through performance plans and internal management. Major changes, when necessary, are handled through revisions to the Strategic Plan, and make use of input provided by external Advisory Committees.

### **C. ASSESSMENT PROCESSES**

Assessments and evaluations for gauging progress in achieving NSF's goals involve different steps for the different types of goals. In FY 1998, NSF developed and established new reporting systems and procedures, reporting guidelines, and templates to enable the collection, assessment, and analysis of the qualitative information and quantitative data necessary for reporting performance across the agency. The systems and templates are continually upgraded and revised for reporting using feedback from previous experiences. The reporting templates were developed to permit more uniform and consistent reporting of the qualitative goals across the agency.

For the quantitative Management and Investment Process Goals, the assessment process is straightforward. The agency collects relevant data using internal corporate data systems and compares the result with the performance level targeted for the fiscal year. Most quantitative goals are evaluated on a quarterly basis, with the information undergoing review by senior management. In FY 2000, an agency-wide GPRA module for data relevant to the quantitative goals was developed to enable staff to follow or track their progress throughout the year.

For the qualitative Outcome Goals, NSF programs are judged by groups of external evaluators. The following discussion focuses primarily on Outcome Goal assessment. NSF receives and maintains performance information in the form of reports from external COVs and ACs, whose meetings are subject to Federal Advisory Committee Act rules.

Assessment of goal achievement by external evaluators takes into account such factors as:

- identified performance indicators for each performance goal;
- the success to which NSF strategies and plans are implemented;
- the level of resources invested;
- external events beyond control of the agency; and
- the agency's capability to be flexible and respond rapidly to emerging opportunities.

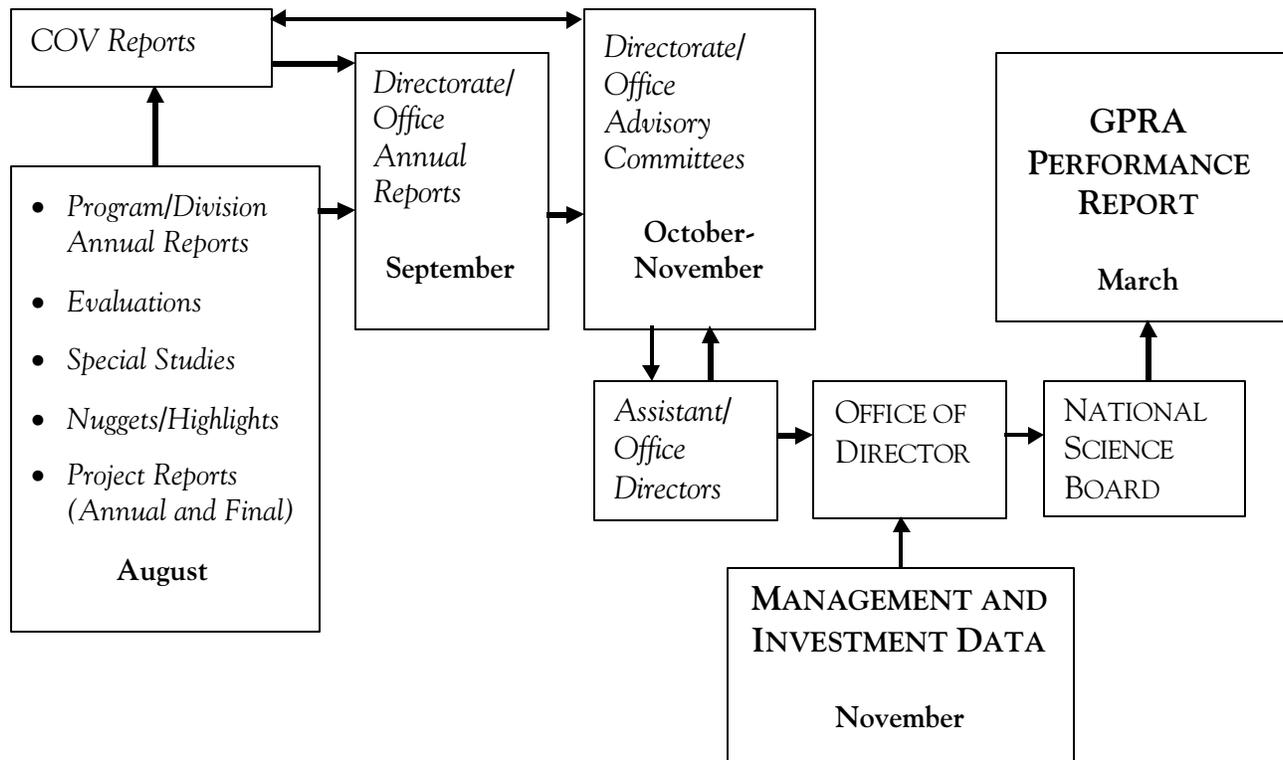
The focus of this portfolio assessment is the quality of past investments (the quality of outputs and outcomes) and the likelihood that the package of awards will produce strong results in the future.

Much of this performance assessment is retrospective, addressing investments made at some time in the past. NSF performance is *successful* if the outcomes of NSF investments reported during a fiscal year are judged to have achieved or to have made significant progress in achieving the specific performance goals. COVs use their collective experienced-based norms in determining the level of "significance" necessary for a rating of successful. COVs also address the quality of the sets of awards made and the integrity of the process for the period under review.

External COVs review approximately one-third of NSF's programs each year, so that all programs have been reviewed at the end of a three-year period. The judgements contained in COV reports and AC reports are combined with data from internal databases, and are integrated by NSF management to form the basis for NSF's performance report.

The flow-chart below represents the overall assessment process for the Outcome Goals and shows how data for the Management Goals and Investment Process Goals are submitted for integration in NSF's Performance Report. NSF staff prepare materials as input for the COVs (reports, evaluations, studies, highlights), for use by COVs in developing their reports and making their assessments. The COV reports are used by NSF staff in preparing directorate/office annual reports, and are also reviewed and approved by directorate/office ACs. Each directorate/office must prepare a subsequent response to the recommendations of the COVs, which is reviewed by the directorate/office AC. Directorates/offices also prepare an annual report for AC review (in October and November) which summarizes activities of the directorate/office for the fiscal year in addition to the activities examined in the COV process. The process culminates with the AC report, which caps the annual progress of the directorate toward achieving NSF's Outcome Goals.

**OUTCOME RESULTS DATA**



At the close of the fiscal year, each directorate submits all GPRA-related supporting materials (COV and AC reports, directorate annual reports, and responses to recommendations made by COVs) to the Office of the Director. Simultaneously, data relevant to the Management Goals and Investment Process Goals are finalized by NSF staff and submitted to the Office of the Director.

NSF makes use of several stages in the proposal and award process to assess performance. These include the following steps:

- **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 and education, location of proposed activities, biographical information on the primary investigators, other sources of support, and certifications specific to NSF. Information is required at the time of application, at the time of an award, and in annual and final project reports. Awards are made based on merit review by peers who are experts in the field using NSF's merit review criteria, and the availability of resources. Award decisions also take into account the quality of prior results. This type of information is part of the package of information made available to COVs when assessing program performance toward meeting Outcome Goals.

- **ANNUAL PROGRESS REVIEW BY PROGRAM OFFICERS**

Program officers review the annual progress of awards that have a duration longer than one year. This review typically takes place before the anniversary date of the award and prior to the release of any continuing funds. The Principal Investigator (PI) responsible for the award submits the annual progress report electronically via FastLane. The progress report includes information on significant accomplishments, progress achieved in the prior year, plans for the next year consistent with the proposed project, and points out issues that may impact progress or completion of the project on schedule and within budget. Once this report is approved, funds for the ensuing year are approved by the administering program officer and released. Annual progress reports are made available to COVs for during the assessment process.

- **PROGRAM EVALUATION BY COMMITTEES OF VISITORS (COVs)**

To ensure the highest quality in processing and recommending proposals for awards NSF convenes committees of qualified external evaluators (COVs) to review each program every three years. Strict guidelines are followed in selecting COV members to ensure independence, programmatic coverage, and balanced representation. COVs are committees composed of independent, external experts from academia, industry, government, and the public sector.

COVs have traditionally assessed the integrity and efficiency of the processes for proposal review. With the implementation of GPRA in FY 1999, NSF added a retrospective

assessment of the quality of results of NSF's programs in the form of outputs and outcomes. NSF asks COVs to report on the noteworthy achievements of each year, to identify ways in which projects have collectively affected progress, and expectations for future performance. The recommendations of COVs are reviewed by management and taken into consideration by NSF when evaluating existing programs and future directions for the Foundation.

In FY 2000, COVs were asked to judge whether NSF programs were successful or not in achieving Outcome Goals 1-4.a, and in implementing the merit review criteria (Investment Goal 2). To conduct their assessments, COVs use a standardized reporting template with a set of core questions addressing process, program management, and quality of outcomes. COVs are asked to justify their judgements and provide examples illustrating success. The results of their judgements are aggregated and collectively weighed to determine NSF's overall progress in achieving the Outcome Goals.

Each COV typically consists of between six and twelve members who review one or more programs over a two day period. In FY 2000 approximately 250 COV members participated in the performance assessment process. The Outcome Goal assessment process generated 55 COV reports covering 78 of NSF's approximately 200 programs (see Section XV for a schedule of program evaluations). Typically, there are fewer COV reports than programs as some reports evaluate clusters of programs. Electronic copies of COV reports will become available in December, 2001.

- **DIRECTORATE/OFFICE ASSESSMENT BY ADVISORY COMMITTEES (ACs)**

Eight Advisory Committees (ACs) advise the seven directorates and the Office of Polar Programs (OPP). Advisory Committees are composed of external experts who have broad experience in academia, industry, and government. Each AC typically has 18-25 members to work with the NSF in assessing annual progress.

Advisory committees annually review COV reports, available internal and external assessments, and directorate/OPP annual reports to judge program effectiveness and to report on strengths and weaknesses. In FY 2000 approximately 150 advisory committee members participated in the performance assessment process. Each AC reviews the portfolio of its respective directorate/office for progress in achieving NSF's Outcome Goals.

In their assessment capacity ACs respond to a set of standardized questions developed by NSF staff to indicate the success of the directorate/OPP in achieving each Outcome goal, and to provide a justification for their assessment. NSF management reviews the eight Advisory Committee reports and integrates the assessments into the NSF Annual Performance Report.

## AGGREGATION OF COMMITTEE REPORTS

All COVs and Advisory Committees are asked to complete a report template with questions addressing how well programs achieve NSF's goals. Committees are asked to address (A) the integrity and efficiency of the **processes** which involve proposal review; and (B) the quality of the **results** of NSF's investments. However, each goal may not apply to each program being evaluated, and therefore a goal may not be rated in every report. For example, in FY 2000 only 58% of all reports gave a rating for Goal 4.a. In many cases where the goals are not rated, committee reports provided comments indicating either full success, limited success, or indicated that the goal did not apply to the programs under review. In some cases the committee may not have had adequate information to provide a rating. Information may not have been available where programs were too new to have produced results for this report period.

Most committees provided a rating with sufficient information to justify how they arrived at the rating. Some committees provided comments that could be used to determine the success of a program. This year, to arrive at an aggregated result for the agency, comments provided in reports were used when ratings for a goal were not evident, provided that the comments were clearly relevant and sufficiently well justified. In cases where a high rating was assigned, but comments indicated performance was not fully successful, the comments were used to determine a rating. Committee reports were reviewed and results were tabulated for each goal. A tabulated summary was produced which combined results across the agency for each goal. In FY 2000, the tabulated summary was audited by PricewaterhouseCoopers LLP for Outcome Goals 1, 2, 3, and 4.a, and Investment Process Goal 2.

## D. HOW ASSESSMENTS AND EVALUATIONS ARE UTILIZED

NSF management reviews program annual reports, reports by COVs, reports by ACs, and reports by other external groups or organizations. NSF management writes a response to the performance issues raised in COV reports, and submits this response to the relevant AC for review, identifying steps that will be implemented to address specific issues raised in the COV reports. The NSF management review the recommendations and issues that are raised in the COV and AC reports in order to identify management concerns as well as areas of scientific opportunity. COV and AC reports address a broad range of issues ranging from staffing and quality of merit review to specifics of a scientific issue. They extend beyond the scope of the GPRA goals, and have traditionally been used by NSF management to improve program performance and set funding priorities.

### INTEGRATING NSF'S PERFORMANCE REPORT

NSF aggregates the performance results for Goals on Management, Investment Process, and Outcomes. This produces a report which is a combination of quantitative data collected and prepared by the agency for the Management Goals and Investment Process Goals, and qualitative judgements provided by external experts for the Outcome Goals.

COV reports and Advisory Committee reports form the basis for the Outcome Goal results. The judgements provided in reports are tabulated, analyzed, and aggregated across the agency for each Outcome Goal, to arrive at an assessment of the agency performance – the annual progress of the agency toward meeting the Outcome Goals. To support the outcome results, illustrative examples of outcomes are selected from COV and Advisory Committee reports, directorate/office annual reports, and other sources such as project reports, newspaper articles, or publications.

NSF staff integrate the results of the Investment Process Goals and Management Goals with the Outcome Goal results to produce this report. The resulting information is used in preparing the annual performance plans and internal management plans. The systems for FY 2000 data collections for the Management and some Investment Process Goal results, and the data tables for the Outcome Goals (1, 2, 3, and 4.a) and Investment Process Goal 2 were audited by PricewaterhouseCoopers LLP and reviewed by KMPG.