

---

# VERIFICATION AND VALIDATION – Collection, Reporting, and Validation of Performance Information and Results

## Types and Sources of Performance Data and Information

The data used in reporting NSF's goals are two types of data: (a) non-quantitative information in the form of outputs and outcomes, collected and reported using the alternative format, which are used for the Outcome Goals (Goals 1- 4) and the implementation of the new merit review criteria (Goal 7); and (b) numerical data collected through systems for the performance target levels of the Management and Investment Goals (Goals 6, and 8-20), and NSF's goal on relevant, timely information (Goal 5).

*NSF's outcome goals are  
expressed in the  
alternative format.*

## Issues Specific to NSF

Because it is difficult to predict or quantify research results, or to report them in a timely way, NSF's outcome goals are expressed in the alternative format. Research results cannot be predicted beforehand, and the time frame for reporting outcomes is typically long after the fiscal year in which an award was made. For example, a grant provided in one fiscal year might not produce a reportable outcome for five years or more, if at all. For FY 1999, the committees of external experts reviewed programs covering a period starting from before FY 1996, through FY 1999. Therefore, the outcomes reported here in FY 1999 include results from awards which were made prior to and including FY 1999.

To report the level of performance for these goals, we have included examples that illustrate achievements reported during the fiscal year. It should be noted that while NSF made use of the alternative format using the two standard approach required by

---

the Act (“successful” or “minimally effective”), it was found that there was little to be gained in defining the use of “minimally effective”, and that in many instances it was confusing to the evaluators. Therefore, for FY 2000, NSF will define one standard only: the “successful” standard. The programs will be evaluated on whether they are effective in achieving the target goals and on the effectiveness of their impact.

The Investment and Management goals are primarily target levels to be achieved, and lend themselves to quantitative analysis. The Outcome goals are non-quantitative, and make use of the alternative format, which is a qualitative standard. In all cases where the alternative format is used, groups of experts were asked to use their judgement and to provide examples to support their judgement of NSF’s performance in achieving a goal. In some reports, committees indicate that complete data necessary to evaluate a goal were not available. In most of these cases the evaluating committee did not provide a rating of performance. In some cases, the experts provided more substantial examples than in others, and in some cases the experts gave an opinion or rated a program without complete information, or without providing complete justification. In some cases, the experts gave a rating, then discussed how they arrived at their rating, which may not have been in agreement with the definitions of NSF’s qualitative scale. In a few cases, the experts did not give an opinion, either because they did not find the goal appropriate for the program being assessed, or because they did not have sufficient or appropriate information to give an opinion.

Collection of data is dependent on the type of data/information. Sources of data for each goal are indicated in the table(s) below. Collection of data for all goals takes place throughout the year, and is completed near the end of the fiscal year. Depending upon the specific type of data, data are collected into a report for a given goal by a group responsible for that goal, and then organized for reporting. The data obtained are reviewed on a continuing basis by senior NSF management throughout the year, to observe whether the results are as expected, or need to be improved, or whether to adjust the targets, or whether the information being obtained is useful to the agency. Data collection systems are also under constant observance and refinement, as in the case of the new FastLane reporting system.

A timing issue which NSF has faced in preparing this report may be an issue shared by other agencies. Specifically, the timing and phasing of the annual plan, collection of information and data for reporting, and the budget process have been difficult to coordinate. To optimize our goals for the new fiscal year, we must review our progress from the prior fiscal year, and make revisions to the annual plan for the upcoming year. In FY 1999, we found that the timing needed to collect and review the data for the first

year, and incorporate changes into the FY 2000 annual performance plan in a way which we believe benefits the process, was not available with the current schedule required by GPRA.

## Data Sources and Limitations

The sources of data used in the performance report are organized according to each goal relevant to Outcomes, Investment Process, and Management.

NSF sources of data include central databases such as the Electronic Project Reporting System, the Enterprise Information System, the FastLane system, the Proposal system, the Awards system, the Reviewer System, the Integrated Personnel System, the Finance System, and the Online Document System; distributed sources such as scientific publications, press releases, independent assessments including committee of visitor (COV) and advisory committee (AC) reports, program and division annual reports, directorate annual reports, and internally maintained local databases. In a few cases, NSF makes use of externally maintained contractor databases.

### Data for Outcome Goals

The results for Outcome Goals 1-4 are in the form of standardized reports collected across all areas of NSF from committees of external experts (COVs and ACs). The data used in reporting the results of achievement are tabulated from COV and AC reports, and reflect a rating given in the report by experts. Examples selected to illustrate achievement are chosen by COVs, ACs, and programs, and are associated with a grant number. These examples highlight in a tangible way, results that were achieved over a period of time. Outcome Goal 4 also includes two quantitative goals. The results for Outcome Goal 5 are quantitative.

This is the first year in which reports were collected and an assessment was completed. Several issues were identified, which will be addressed in future years. In FY 2000, NSF plans to establish parameters to define the acceptability and reliability of the qualitative information it uses. Initial plans call for the establishment of a Standard Deviation or Confidence Limit rule that the Foundation will use to define the quality of the information it uses to ensure uniform quality of information. NSF will use the confidence limit to identify non-substantive information, and information falling outside the confidence limit will be excluded from use.

**Data Sources and Limitations for Outcome Goals Using  
Alternative Format - Table 3**

OUTCOME GOAL	DATA SOURCE	LIMITATIONS
<p><b>1.a</b> <b>1.b</b> <b>2</b> <b>3</b> <b>4.a</b></p>	<p>Independent assessments including COV reports and AC reports using alternative format; program reports; press releases; scientific publications, internal data systems; independently maintained databases.</p>	<p>Non-quantitative information requires judgement of experts; basis for judgement by experts not always evident; substance and timing of outcomes from research and education activities are unpredictable; some local databases not under central quality control; long-term data needed to assess impact of outcomes; potential for self-reporting bias; process to collect and aggregate data needs improvement.</p>
<p><b>4.b</b> Over 80% of schools participating in a systemic initiative program will 1) implement a standards-based curriculum in science and mathematics; 2) further professional development of the instructional workforce; and 3) improve student achievement on a selected battery of tests, after three years of NSF support.</p>	<p>Internal and external data systems</p>	<p>Data is based on two academic years: 1998 and 1999 (Sept.-June). Respondents understand the definitions, concepts, and timeframes that have been established to govern responses to items concerning curriculum and professional development. Comment fields have been added to data collections systems. Working with districts to facilitate more effective data reporting and utilization. Third party evaluations and research studies being conducted to enhance assessment and interpretation of quantitative results and to address issues of attribution.</p>
<p><b>4.c</b> Through systemic initiatives and related teacher enhancement programs, NSF will provide intensive professional development experiences for at least 65,000 precollege teachers.</p>	<p>Internal and external data systems</p>	<p>See above.</p>
<p><b>5.a</b> Timely and relevant <b>5.b</b> information</p>	<p>Internal data base (timeliness data); External data base (relevance data)</p>	<p>There may be trade-offs between timeliness -- the speed with which data are released -- and data quality. Increases in timeliness should not be achieved at the expense of decreases in data quality.</p>

## Data for Investment Process Goals

These goals are relevant to the means and strategies used by NSF to support the outcome goals and the processes by which NSF shapes its portfolio of awards. In FY 2000, NSF plans to establish parameters to define the acceptability and reliability of the data it uses. Initial plans call for the establishment of a Standard Deviation or Confidence Limit rule that the Foundation will use to define the quality of the data it uses to ensure uniform quality of data. NSF will use the confidence limit to identify non-substantive data, and data falling outside a certain confidence limit will be excluded from use.

**Data Sources and Limitations for Investment Process Goals**  
**Table 4**

INVESTMENT GOALS	DATA SOURCE	DATA LIMITATIONS
6 Use of Merit Review	Internal data systems	None
7 Implementation of Merit Review Criteria	Program annual reports; COV reports; AC reports using alternative format	Information is subject to review for reliability and accuracy. Implementation more successful for some programs than others; adequate data not always available.
8 Customer Service - Time to prepare proposals	Internal data systems	None
9 Customer Service - Time to decision	Internal data systems	None
10 Award duration	Internal data systems	None
11 Maintaining Openness in the System	Internal data systems	Possible to incorrectly identify a PI as "new" - needs to be monitored
12 Identifying Emerging Opportunities	Internal systems	None
13 Encouraging Integration of Research and Education	Internal systems and public documents	None

Data Sources and Limitations for Investment Process Goals  
Table 4 (continued)

INVESTMENT GOALS	DATA SOURCE	DATA LIMITATIONS
<b>14</b> Encouraging attention to diversity in all aspects of NSF programming	Internal systems and public documents	None
<b>15.a</b> Construction and upgrade: within 110% of annual expenditure plan estimates	Internal data systems containing information collected from external sources	New reporting system developed and implemented in FY 1999; facilities managers still gaining experience in collecting and reporting this information.
<b>15.b</b> Construction and upgrade: annual schedule within 110% of estimates	Internal data systems containing information collected from external sources	New reporting system developed and implemented in FY 1999; facilities managers still gaining experience in collecting and reporting this information.
<b>15.c</b> Construction and upgrade: total cost within 110% of estimates	Internal data systems containing information collected from external sources	No construction and upgrade projects completed in FY 1999.
<b>15.d</b> Operations: keep operating time lost to less than 10% of total scheduled operating time	Internal data systems containing information collected from external sources	New reporting system developed and implemented in FY 1999; facilities managers still gaining experience in collecting and reporting this information.

## Data for Management Goals

Central data systems as well as internal databases are maintained to collect, verify and validate data pertaining to the management goals. These goals are relevant to the use of new and emerging technologies, training of NSF staff and implementation of management reforms to improve service to NSF's customers.

**Data Sources and Limitations for Management Goals**  
**Table 5**

MANAGEMENT GOAL	DATA SOURCE	LIMITATIONS
<b>16</b> New and emerging technologies-electronic proposal processing using FastLane	Central data systems	No serious issues identified
<b>17</b> Staff diversity	Internal data bases with input by staff applicants	Only 52% of applicatnts provided survey data
<b>18</b> Capability in use of information technology staff orientation to FastLane	Central data systems	Early issues regarding availability of training data were corrected
<b>19</b> Implementation of management reforms- Year 2000	Information provided by external contractor	No serious issues identified
<b>20</b> Implementation of management reforms -- Project Reporting System	Central data systems	Paper copies of reports not captured electronically are not counted

---

## Data Verification and Validation Activities

During FY 1999, NSF staff implemented a Data Quality Project for the quantitative Investment and Management goals. The objectives of the project are:

1. Evaluate the quality of the data in the central databases.
2. Ensure the paper documents and the NSF central databases are synchronized.
3. Identify inconsistencies so that methods for correcting the cause of the inconsistencies can be developed.
4. Ascertain the causes of the data quality problems and develop systematic methods for correction.
5. Develop a comprehensive data dictionary.
6. Promulgate data quality policies and procedures NSF-wide.

This project is currently underway with the first priority placed on the central data systems used to support the performance plan.

In addition, NSF staff implemented new standardized guidelines and reporting procedures for collecting data for the qualitative Outcome goals. The committee of visitor guidelines was revised in FY 1999 to incorporate the GPRA related reporting requirements. Standardized reporting templates were developed for the committee of visitors (COVs) to address the performance of programs in a systematic way to allow for aggregating information across NSF. COV's address a common set of questions for all programs reviewed in a fiscal year. Standardized reporting guidelines were also developed for advisory committees, to allow for a systematic aggregation of information. The results of using the new procedures have identified areas for improvement, which will be incorporated into the FY 2000 reporting guidelines. Many of the results learned while conducting these assessments have been used in revising the FY 2000 performance goals, and the revised strategic plan.