

1 Executive Summary

As a federal agency, the National Science Foundation (NSF or Foundation) is subject to performance reporting requirements established by the Government Performance and Results Act (GPRA) of 1993 and Office of Management and Budget (OMB).¹ With the passage of the American Recovery and Reinvestment Act (ARRA) of 2009, NSF and recipients of Foundation funds are subject to additional reporting requirements—as outlined in OMB guidance—to track and monitor all ARRA dollars in a manner that provides transparency and accountability to Congress and taxpayers.² NSF has developed a performance assessment and reporting framework to meet these reporting requirements and help the Foundation achieve its mission, goals, and objectives. Government Accountability Office (GAO) auditing standards indicate that federal agencies should provide confidence that the policies and procedures that undergird performance reporting are complete, accurate and consistent. As such, NSF tasked IBM Global Business Services with assessing the validity of the data and reported results of its performance goals and verifying the reliability of the methods used to compile and report data for these goals.

NSF reports its performance through four long-term Strategic Outcome Goals and 15 annual performance goals. The Advisory Committee for GPRA Performance Assessment (AC/GPA) evaluates three of the four Strategic Outcome Goals—Discovery, Learning, and Research Infrastructure. For these Strategic Outcome Goals, IBM reviewed the reliability of the assessment processes. NSF evaluates the remaining Strategic Outcome Goal—Stewardship—through eight performance areas. Based on our FY 2009 V&V review, IBM verified and validated the reliability of the assessment processes for the three Strategic Outcome Goals evaluated through the AC/GPA. We also verified the reliability of the processes and validated the accuracy of the results for the eight Stewardship performance areas.

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

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

1.1 Assessment Approach

NSF measures its performance as an agency using long-term Strategic Outcome Goals and annual performance goals. The four long-term Strategic Outcome Goals are Discovery, Learning, Research Infrastructure, and Stewardship. NSF assesses its achievement of the Discovery, Learning, and Research Infrastructure Strategic Outcome Goals through the annual AC/GPA meeting. NSF measures its achievement of the Stewardship Strategic Performance Outcome Goal through a set of eight qualitative and

¹ OMB is currently working with agencies to identify high-priority performance goals per Director Peter Orszag's June 11, 2009 memorandum: *Planning for the President's Fiscal Year 2011 Budget and Performance Plans.* Additional guidance on agency performance and strategic plans was also provided in OMB's Circular A-11. For details see http://www.whitehouse.gov/omb/circulars_a11_current_year_a11_toc/

² OMB, *Updated Implementing Guidance for the American Recovery and Reinvestment Act of 2009*, M-09-15, (Washington, D.C.: April 3, 2009): http://www.whitehouse.gov/omb/assets/memoranda_fy2009/m09-15.pdf

quantitative performance areas. The Foundation evaluates its achievement of these performance areas in a manner similar to that used for the 15 annual performance goals developed to measure the performance of the Kindergarten through 12th Grade (K-12) Math and Science Education program, and NSF's ARRA funded programs. As such, we group the eight Stewardship performance areas and 15 annual performance goals together in the remainder of this report. Sections 1.1.1 and 1.1.2 below provide greater detail regarding these two main components of our V&V assessment.

1.1.1 Review of Strategic Outcome goals and AC/GPA Process

The AC/GPA meeting reviewed the Strategic Outcome goals: Learning, Discovery, and Research Infrastructure. We based our assessment on a comprehensive review of the following actions:

Evaluation of background information: NSF Six-Year Strategic Plan, FY 2009 NSF Budget, FY 2009 AC/GPA guidance and agenda, and supplemental information located on the AC/GPA website

Attendance at the Advisory Committee for Business and Operations (AC/B&O) meeting: We observed the two-day AC/B&O meeting, May 19-20, 2009

Attendance at the AC/GPA meeting: We observed the two-day AC/GPA meeting, June 18-19, 2009, including committee and subgroup sessions

Documentation of changes to the AC/GPA process: Based on our review of background information, observations of the AC/GPA meeting, and discussion with staff and committee members, we identified changes to the AC/GPA process from FY 2008

Assessment of the AC/GPA process: We assessed the quality of the AC/GPA process, with particular focus on changes since FY 2008. Our assessment was based on a number of criteria, including the quality of the performance information, process documentation, transparency of the process, improvements made from last year, and the expertise and independence of the AC/GPA membership

Validation of the AC/GPA performance assessment: Based on the quality of the AC/GPA processes, we reached a conclusion on the validity of the AC/GPA's assessment process of NSF's performance against its Strategic Outcome Goals

1.1.2 Assessment of Stewardship Performance Areas and Annual Performance Goals

Our review of the processes and results consisted of the following actions:

Assessed the accuracy of NSF's performance data and reported outcomes for each performance goal

Described the reliability of the processes NSF uses to collect, process, maintain, and report data

Reviewed system controls to confirm that information collection and maintenance processes resulted in high-quality data for reporting results

Identified data limitations, if any, that we observed in the process

Provided observations from our review, recommendations for improvement as appropriate, and our conclusions

Drafted new, and updated previously composed, process maps (included in the Appendix) documenting all the current—"as is"—processes for FY 2009 performance goals

We applied GAO's *The Results Act: An Evaluator's Guide to Assessing Agency Annual Performance Plans* (GAO/GGD-10.1.20) to guide our review. We did not consider the appropriateness of NSF's performance goals or indicators in our assessment of the validity of NSF's reported results. Rather, our validation is based strictly on whether NSF achieved or did not achieve its performance goals based on the indicators established by NSF.

1.2 Results and Recommendations

IBM's review sought to verify the adequacy of the processes and data to yield valid and reliable results for 26 goals under review in FY 2009, including:

- Three Strategic Outcome Goals of Discovery, Learning, and Research Infrastructure,
- Eight performance areas associated with the Stewardship Strategic Outcome Goal,
- Three annual goals associated with the K-12 Mathematics and Science Education Program, which resulted from the Program Assessment Rating Tool (PART) evaluation in 2008, and
- 12 goals associated with NSF's 2009 ARRA programs.

Based on our FY 2009 V&V review, IBM verified and validated the reliability of the assessment processes for the three Strategic Outcome Goals evaluated through the AC/GPA. In Section 3 of this report, IBM outlines the processes NSF used to support the AC/GPA committee members' decision-making process. We were able to verify and validate the AC/GPA process for the three corresponding Strategic Outcome Goals through observation of NSF's preparation process for the FY 2009 AC/GPA meeting; attendance during the two-day AC/GPA meeting; follow-on discussions with NSF staff related to the AC/GPA report production process; and our review of the 2009 AC/GPA report.

We also verified the reliability of the processes and validated the accuracy of the results for the eight Stewardship performance areas. Further, IBM verified the reliability of the processes and validated the accuracy of the results for five of the 15 annual performance goals. For the remaining performance goals associated with the K-12 PART program and the ARRA programs, it became apparent during our review that some goals would have yielded only preliminary results, or no results at all, by the time that our report was due to NSF. In those cases, IBM reviewed the process to collect, process, maintain, and report future results. We were not, however, asked to verify and validate results as it is too early for NSF to report actual results at the time of this report. We were, however, able to verify that NSF is making progress toward achieving these long-term goals in FY 2009.

We were able to verify the processes and validate the FY 2009 results associated with the following NSF ARRA goals:

- Research and Related Activities: Number of Competitive Awards
- Research and Related Activities: Number of Investigators
- Research and Related Activities: Number of New Investigators
- The Robert Noyce Teacher Scholarship Program: Number of New Awards
- Math and Science Partnership: Number of New Awards

Although we were able to document the processes, we were unable to validate the FY 2009 results associated with NSF's K-12 PART program for the following reasons:

- K-12 Mathematics and Science Education: Minimum Number of Resources – no target for FY 2009
- K-12 Mathematics and Science Education: Development-Intensive Projects – only preliminary results available
- K-12 Mathematics and Science Education: MSP Adequate Yearly Progress – results not yet available

Likewise, although we were able to document the processes, we were unable to validate the FY 2009 results associated with NSF's ARRA programs for the following reasons:

- The Robert Noyce Teacher Scholarship Program: Number of New Pre-Service Teachers and Teacher Participants – no FY 2009 results were reported relative to the five-year target.
- The Robert Noyce Teacher Scholarship Program: Number of New Teachers in High-Need Districts – no FY 2009 results were reported relative to the five-year target
- Math and Science Partnership: Number of Teacher Leader/Master Teacher Participants – no FY 2009 results were reported relative to the five-year target
- Math and Science Partnership: Number of Post-Baccalaureate Credential or Master's Degree Recipients – no FY 2009 results were reported relative to the five-year target
- Advanced Technology Solar Telescope – construction not yet started
- Alaska Region Research Vessel – construction not yet started
- Ocean Observatories Initiative – construction not yet started

We summarize the results of our review for each performance goal in tables 1.1 and 1.2. In the "Process Verified" column, a "Yes" indicated that we were able to verify the reliability of NSF's processes to collect, process, maintain, and report data. In the "Results Validated" column, a "Yes" indicates we were able to validate the accuracy or reasonableness of NSF's reported results for the corresponding performance goal. In the "Comments" column, we summarize any significant issues concerning the goals that we feel NSF should address in FY 2010. The full results of our review are discussed in greater detail in the Results for Update Review of Strategic Goals and AC/GPA (Section 3) and Results for Review of FY 2009 Performance Goals (Section 4) sections of this report.