

**Survey of
Large Facility Projects
Management and Oversight Division**

**National Science Foundation
Office of Inspector General**

**December 29, 2004
OIG 05-6-002**



SURVEY OF LARGE FACILITY PROJECTS MANAGEMENT AND OVERSIGHT DIVISION

Background

NSF, in order to accomplish its purpose of advancing science and engineering in the United States across a broad and expanding frontier, primarily invests in single-investigator and small group awards that are small in scale and average approximately three years in duration. However, another portion of NSF's portfolio is dedicated to the "acquisition, construction, and commissioning of major research facilities and equipment that provide unique capabilities at the frontiers of science and technology."¹ These facilities – such as accelerators, telescopes, research vessels and aircraft, supercomputers, digital libraries, and earthquake simulators – are large in scope, may take many years to complete, and may be in operation or use for decades. The need for these facilities is generated within the user community itself and funding is approved only after a rigorous vetting process within the potential user community, the NSF, and finally, the National Science Board. According to NSF, projects that reach this stage are "transformative in nature, [and] have the potential to shift the paradigm in scientific understanding and/or infrastructure technology."²

Beginning with fiscal year 1995, NSF has funded these projects through a separate appropriation account now called the Major Research Equipment and Facilities Construction (MREFC) account. While, as a percentage of NSF's total budget, the annual dollars appropriated through this account have not changed significantly since the account's inception, the number of projects proposed by the science and engineering community for this funding has increased in recent years. NSF has a list of six projects that have passed through its vetting process but have not been funded.³

One of the challenges for NSF is that management of these awards is inherently different from the majority of awards that NSF makes. While oversight of the construction and management of these large facility projects and programs must always be sensitive to the scientific endeavor, oversight also requires a different management approach. It requires disciplined project management including paying close attention to meeting deadlines and monitoring budgets, and working hand-in-hand with scientists, engineers, project managers, and financial analysts. Although NSF does not directly operate or manage these facilities, it is NSF that is ultimately responsible and accountable for their success. Consequently, it is vital that NSF, through disciplined project management and oversight, exercise proper stewardship over the public funds invested in these large projects.

¹ NSF's Fiscal Year 2005 Budget Request to the Congress.

² Ibid.

³ Of the six large facilities projects on the unfunded list, two projects, the Scientific Ocean Drilling Vessel and the Rare Symmetry Violating Processes, will receive construction funding and another, the National Ecological Observatory Network, will receive planning and development funding in fiscal year 2005.

Survey Objectives, Scope, and Methodology

The objectives of this survey were to determine what progress the Large Facility Projects (LFP) Office has made in developing and implementing its project management guidelines and central cost-tracking system, whether the Deputy Director, Large Facility Projects (Deputy Director) has encountered any obstacles in implementing a viable large facility management and oversight program, and what future plans the Deputy Director has for the program.

To accomplish these objectives we conducted interviews of individuals involved in the management of large facility projects at NSF. We spoke with individuals involved at all levels including the new Deputy Director and LFP Office staff, program officers, and a principal investigator of one of these large projects. This survey was not intended to be an audit of the large facility program. As such, our work was limited in nature and based on observations and interviews only. Further, this survey did not include evaluating the financial or programmatic performance of any large facility project. We conducted this survey between September and December 2004, in accordance with generally accepted government auditing standards.

Results of Survey

The Large Facility Projects (LFP) Office continues to face a number of obstacles to successfully implementing a viable large facility management and oversight program because NSF has not yet established a management framework that adequately recognizes and supports the LFP Office's intended oversight responsibility. In addition, while NSF has made some progress during the four years since it first committed to instituting new project and financial management policies and procedures for the management and oversight of its large facility projects, NSF has yet to complete its project management guidelines or central cost-tracking system. NSF needs to demonstrate its commitment to effective large facility project management by formalizing the LFP Office's project management oversight role, and providing it with the appropriate institutional authority and staff resources to accomplish this very essential responsibility. Continued delay in addressing this issue puts NSF's investments, and taxpayer dollars, at risk of potential mismanagement and waste.

Management Framework Needed To Recognize Project Oversight Role of LFP Office

NSF, in response to Congressional and Office of Inspector General (OIG) interest, established the LFP Office with the intent that it would perform an oversight function. Between 2000 and 2002, the OIG issued three audit reports on large facilities with findings and recommendations aimed at improving NSF's oversight and management of and accounting for these large projects. Primarily, the recommendations were aimed at (1) increasing NSF's level of oversight of these projects with particular attention on updating and developing policies and procedures to assist NSF managers in project administration, and (2) ensuring that accurate and complete information on the total costs of major research equipment and facilities is available to NSF managers, as well as the National Science Board, which is responsible for not only approving the funding for these large projects, but also setting the relative priorities for their funding.

Likewise, the Congress has also been interested in NSF's oversight and management of large facility projects. In September 2001, the House Science Committee held a hearing specifically to address this important issue, with one member of the Committee expressing concern "about whether the lines of authority for facility project management are sufficiently clear."⁴ The member also stressed that, "It is important that the authority and responsibility for the management of large construction projects be unambiguous."⁵ Appropriation reports from both the House and the Senate have also discussed the need within NSF for increased management over this important portion of NSF's

⁴ U.S. House of Representatives, Committee on Science, Subcommittee on Research, Hearing on the National Science Foundation's Major Research Facilities: Planning and Management Issues, September 6, 2001. A member of the Subcommittee expressed concern that the arrangement where a Program Officer who reports to an Assistant Director maintains responsibility for project management, while the Deputy for Large Facility Projects reports to the Chief Financial Officer, "appears to create separate lines of authority to business oversight in technical management of a project."

⁵ Ibid.

portfolio. In 2003, the Senate Committee on Appropriations directed NSF to immediately develop internal guidelines and a central cost-tracking system of all research projects to ensure adequate oversight.⁶ More recently, the Senate Committee has expressed concern over the lack of staffing resources within NSF's new Large Facility Projects Office,⁷ to effectively carry out this oversight responsibility.

NSF responded to the OIG audits and Congressional interest by stating, through its corrective action plan, that it would both develop policies for managing large facility projects, including tracking the full-cost of these projects, and establish a new organizational unit charged with oversight of facility projects, headed by a Deputy, Large Facility Projects, reporting to NSF's Chief Financial Officer. In a March 26, 2002 briefing on its Large Facility Projects Management and Oversight Plan, given to NSF's Business and Operations Advisory Committee, NSF presented the purpose of this unit as twofold: assisting with non-scientific aspects of project management; and **conducting post-award oversight** of business operations, financial and internal control systems, and project management.⁸ After an extensive search, NSF created and filled this new position in June 2003 – the Deputy Director, Large Facility Projects (Deputy Director) within NSF's Office of Budget, Finance, and Award Administration.

The Committee on Setting Priorities for NSF-Sponsored Large Research Facility Projects of the National Academies⁹ envisioned a similar oversight role for NSF's LFP Office in its recent 2004 report, *Setting Priorities for Large Research Facility Projects Supported by the National Science Foundation*. In addition to recommending external periodic reviews of the implementation of large facility projects by independent panels of science, engineering, and project management experts, the Committee recommended **that the Deputy Director, Large Facility Projects, have “adequate and experienced project construction and management staff, access to qualified consultants and contractors, and the institutional authority to oversee the design engineering, construction, and operation phases adequately.** Each project or program will have dedicated leadership, **but it is this deputy who has principal responsibility to**

⁶ S. Report 108-143, Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Bill, 2004.

⁷ S. Report 108-353, Departments of Veterans Affairs and Housing and Urban Development, and Independent Agencies Appropriations Bill, 2005.

⁸ NSF's Advisory Committee for Business and Operations provides advice to the Director, Office of Budget, Finance, and Award Management, and to the Director, Office of Information and Resource Management concerning issues related to the oversight, integrity, development and enhancement for improved performance of NSF's business operations.

⁹ The National Academies is a corporation created by Congress for the purpose of advising the federal government on scientific and technical matters. In a letter dated June 12, 2002, Senators Barbara Mikulski, Christopher Bond, Ernest Hollings, John McCain, Edward Kennedy, and Judd Gregg requested the National Academies to review NSF's process for prioritizing large facility projects and recommend improvements. The Academies established the Committee on Setting Priorities for NSF-Sponsored Large Research Facility Projects to respond to this request.

support the undertakings and for oversight and management.”¹⁰ [Emphasis added.]

Thus, it was intended by NSF that the LFP Office would have sufficient institutional authority and resources in order to carry out its oversight role to independently gather and maintain information on and assess the scientific progress and financial performance of large facility projects. Also, in this oversight capacity, it was intended that the LFP Office would have the ability to report on its findings and recommendations at an organizational level capable of influencing management decisions affecting both the programmatic and financial aspects of the projects, from the early phases of planning for the project, through implementation and operations.

Having an independent project management oversight office can heighten the success of large facility research projects funded by NSF. Much like independent merit review and advisory committees are essential to ensuring that NSF is funding the best scientific projects that push the envelope of research, independent oversight of project management can ensure that NSF-funded projects are properly planned, have reasonable baselines and budgets, and that critical milestones are met, on-time and within budget. In addition, by providing a fresh perspective, the Deputy Director can help ensure that projects receive funding only when they are ready for the next phase of development. By focusing on the overall progress and management of the project, the LFP Office helps balance the business and financial performance with the scientific goals and interests.

However, NSF has not yet established the management framework and structure that recognizes the LFP Office’s project management *oversight* role. NSF has made progress in creating the LFP Office and developing the higher-level guidelines for managing large facility projects, and is beginning to develop the detailed guidance needed by program officers to adequately manage their large facility projects. Yet, the role of the LFP Office, at this point in time, is primarily advisory and collaborative in nature, and relies on relationships to influence project management decisions.

This is evidenced in NSF’s current policies and guidelines, which describe the LFP Office’s roles and responsibilities as advisory and collaborative, rather than authoritative, and do not describe an independent oversight function for the Deputy Director and the LFP Office, as originally intended. For example, according to NSF’s draft policy on roles and responsibilities, the Deputy Director has two primary responsibilities: (1) to serve as NSF’s primary resource for all policy or process issues related to the development, implementation, and oversight of MREFC projects; and (2) to update all policies and procedures for MREFC projects as reflected in the *Facilities Management and Oversight Guide* and its supporting documents.

¹⁰ “Setting Priorities for Large Research Facility Projects Supported by the National Science Foundation,” Committee on Setting Priorities for NSF-Sponsored Large Research Facility Projects, 2004, Washington DC: National Academies Press, p 31.

This draft policy also describes how the Deputy Director “works closely with the Program Officer and the Grants Officer, providing **expert assistance** on non-scientific and non-technical aspects of project planning, budgeting, implementation, and management to further strengthen the oversight capabilities of the Foundation.” The Deputy Director “also facilitates the use of best management practices by **fostering coordination and collaboration** throughout NSF to share application of lessons learned from prior projects...[and] **advises** the Program Officer directly on non-technical aspects of management and oversight.”¹¹ [Emphasis added.] While the Deputy Director chairs a facilities panel that has responsibility for approving a project’s Internal Management Plan, and receives periodic reports from the project’s program officer, he does not have actual authority to require responses to recommendations made on project management and execution.¹² Thus, these draft policies suggest that NSF views the LFP Office as primarily serving in a coordinating and advisory capacity to the scientific staff who are managing and making the day to day decisions affecting these large projects. The LFP Office does not appear to have the authority to substantively influence project management decisions.

The LFP Office recognizes that its role must evolve from that of an advisory office, to one that is more proactive, by providing oversight of large facility projects. However, to enable the LFP Office’s evolution to this more influential role envisioned by Congress and the National Academies Committee, the Deputy Director agrees that more formal authority and resources are necessary. NSF must clearly recognize and champion the LFP Office’s oversight responsibility, and provide it with the independent authority and resources to support its important work. Without this framework, the role of NSF’s LFP Office is likely to remain one that is primarily advisory and collaborative and relies on relationships to influence, rather than one with the formal charge to substantively and positively influence project management decisions.

LFP Office Organizational Placement Suggests Limited Oversight Role

The Deputy Director’s assistance and advisory function is reinforced by the LFP Office’s placement within NSF’s organizational structure. The Deputy Director reports to NSF’s Chief Financial Officer, within the Office of Budget, Finance, and Award Management (BFA), which may limit the office from being seen as the authority for large facility project management and oversight for both cost and performance issues. As a result, the Deputy Director does not appear to have the situational authority to meaningfully influence the actions of the program officers in NSF’s scientific directorates who ultimately manage these projects, and to be appropriately involved in key management decisions.

¹¹ Draft “Roles and Responsibilities of NSF Staff Involved in the Management and Oversight of Large Facilities,” pg. 30.

¹² While the Deputy Director and Chief Financial Officer have described to us a process for resolving conflicts among the Deputy Director and program officers managing large facility projects, this process is informal, not in writing, and still does not vest any decision-making authority with the Deputy Director.

For example, the Deputy Director may visit project sites and facilities, but he does not currently conduct independent reviews of large facility projects that could potentially identify any problems with ongoing projects and provide constructive solutions and recommendations to ensure that projects remain on schedule and within budget. In addition, NSF does not always include the Deputy Director in key discussions regarding large facility projects. For example, NSF did not initially include the Deputy Director in closed sessions of the MREFC Panel, chaired by NSF's Chief Operating Officer, where key decisions concerning ongoing and upcoming large facility projects are made. While the Deputy Director is now considered an *ex officio* member of the MREFC Panel and may attend both open and closed Panel sessions, his status within this group is unclear.

Similarly, because NSF has not clearly designated the Deputy Director as responsible for managing the implementation process and for bringing "all the various constituencies together so that the project happens on time, within budget, and with satisfactory performance,"¹³ his placement within BFA may be contributing to some confusion regarding the applicability of the new facility management policies. It is unclear whether these policies will be issued as internal BFA policy, or as formal NSF policy applicable to the scientific directorates as well.

BFA recently asked its Business and Operations Advisory Committee to establish a Facilities Subcommittee to help provide the LFP Office with direction and advice as to its policies, procedures, and practices as they relate to large facility projects. While this action helps to recognize the importance of the LFP Office within BFA, NSF senior management needs to send a clear message that project management oversight is an agency function that is important and necessary for the programmatic and financial success of both the project and NSF. Perhaps relocating the LFP Office to report to the Director's Office rather than the Chief Financial Officer would reinforce that message. However, at a minimum, NSF's Director should emphasize the importance of the LFP Office to both programmatic and financial operations and establish a clear line of authority for it by acting as its senior management champion.

Workload and Staffing Issues Constrain LFP Office Activities

Finally, the LFP Office lacks the staffing resources necessary to fulfill either its oversight or advisory responsibilities. The LFP Office currently consists of two permanent staff, the Deputy Director and a Facilities Management and Oversight Director. The current staffing level is down from fiscal year 2004 when the office also had a full-time staff person on loan from the Department of Energy. Another staff person on loan from within NSF recently joined the LFP Office to help with policy writing; however, this new staff member will be retaining program officer responsibilities and consequently, will only be available to the LFP Office roughly 50 percent of his time.

¹³ "Setting Priorities for Large Research Facility Projects Supported by the National Science Foundation," Committee on Setting Priorities for NSF-Sponsored Large Research Facility Projects, 2004, Washington DC: National Academies Press, p 31.

The LFP Office needs to develop a formal workforce-staffing plan for accomplishing its responsibilities. In expressing its concerns regarding the LFP Office's lack of staffing resources, Congress has requested that NSF detail its plans for staffing the office.¹⁴ The Deputy Director has general staffing ideas that include the possibility of adding another staff person later in fiscal year 2005, and possibly hiring temporary personnel from outside NSF on one-year details. However, to accomplish its many important tasks, the LFP Office currently relies on part-time staff on loan to support it; creating a "virtual office." The Deputy Director is also considering engaging the services of contractors or consultants to supplement the staff. But, at the time of our survey, these plans were not yet definite. According to NSF's Chief Financial Officer, to whom the Deputy Director reports, these needed additions to the staff are competing for resources with other priorities, and obtaining additional staff is dependent upon the LFP Office receiving a sufficient share of NSF's funding.

The Deputy Director and his staff are knowledgeable and conscientious, and are responsible for a wide range of activities, including writing the new policy and procedures for facilities project management, and overseeing the contract for an automated cost-tracking system. These very important tasks are in addition to providing advice in the day-to-day management of current large facility projects. The LFP Office's staff's many day-to-day activities include:

- Traveling to facility sites to see the progress of various projects;
- Providing formal support to NSF program officers through participation on Program Advisory Teams established for each project;
- Chairing and being involved with the Facilities Panel, which reviews and approves the Internal Management Plans for each project;
- Providing ad hoc advice to NSF program officers and others involved in large facility management;
- Receiving and reviewing monthly status reports for each project (the Deputy Director currently receives monthly reports on 13 separate projects);
- Helping to provide formal project management training to NSF staff through such outlets as the NSF Academy and the "Project Science" workshop on large project management; and
- Participating in NSF's Major Research Equipment and Facilities Construction (MREFC) Panel, which is part of the formal approval and prioritization process for large facilities.

With so many activities and few staff, the LFP Office, while conscientious and well-intentioned, has provided only minimal project management guidance to NSF staff, and has no apparent long-term strategy for putting in place basic management systems and processes to monitor and oversee large facility projects. For example, tasks such as writing formal policy are fit in around the growing day-to-day needs of advising on ongoing large facility projects. The policy-writing project expected to provide crucial

¹⁴ H.Rept. 108-792, Conference Report to Accompany H.R. 4818 - Consolidated Appropriations Act, 2005 (Nov. 2004).

project management guidance to NSF program officers and large facilities project managers, is as yet undefined with an unclear number of modules to the *Large Facilities Management and Oversight Guide* to be completed. Without a workforce staffing plan and adequate resources to implement that plan, it is difficult for the staff of the LFP Office to effectively perform even the many advisory activities and tasks required for adequately managing the various phases of all of the large facility projects, much less implement a successful long-term oversight program.

Progress Is Slow in Developing Procedures and the Central Cost-Tracking System

In addition to these obstacles to implementing a viable large facility management program, NSF has not yet completed the new project and financial management policies and procedures it committed to developing. During the past four years, NSF created a *Facilities Management and Oversight Guide*, which establishes a framework for project management. However, the *Guide* does not provide the detail necessary to give practical guidance to staff that perform the day-to-day oversight and management of large facility projects.¹⁵ NSF intends to provide that detail through supplementary modules to the *Guide* and the development of this guidance is one of the primary responsibilities of the LFP Office. The office intends as many as 24 modules, 4 of which have been completed in draft form but are not yet implemented. The OIG has been pleased to review these draft modules and provide comments back to the LFP Office.

Moreover, NSF has not yet implemented a centralized and automated system for tracking the actual full life-cycle costs of large facility projects. Recently, on September 30, 2004, NSF awarded a contract for the development of an automated cost-tracking system.¹⁶ Formal management of this contract, which the Deputy Director expects to be completed during fiscal year 2005, resides with NSF's Office of Information and Resource Management, and the LFP Office is involved in its oversight as the business-system owner.

Conclusions

While creating and filling the position of Deputy Director, Large Facility Projects is a good start towards addressing NSF's needs with respect to its management of large facility projects, much remains to be done before this new office can realize its intended oversight role. This office needs both resources and organizational authority. However, simply changing reporting lines and increasing the number of bodies may not be the answer. NSF needs to demonstrate its commitment to large facility project management and take a more structured management approach by recognizing and formalizing the oversight mission of the LFP Office. This mission statement should include both a vision for success along with specific goals and measures that reflect the

¹⁵ NSF is currently working to revise this Guide and expects the first draft of the new Guide to be complete by March 31, 2005.

¹⁶ NSF awarded the development of the cost-tracking system to Booz-Allen and Hamilton, Inc., as part of its \$4.3 million E-Business New Development Tasks.

Office's oversight activities and accomplishments. For example, outcomes for this office could include the number of large facility projects that are completed on time and within budget, as well as outputs such as the number of independent reviews of projects, and the number of program officers successfully completing project management training. Then, by developing a strategy for how this office will reach its oversight goals, NSF can develop a realistic staffing plan that provides the proper amount and type of resources.

In addition, in conjunction with the Chief Financial Officer, the LFP Office needs a high-level champion – possibly NSF's Director, in order to provide the LFP Office with the organizational authority it needs to be successful. Large facility project management has been an ongoing challenge at NSF. NSF will not be able to meet this challenge – thereby putting its investments, and taxpayer dollars, at risk of mismanagement and potential waste – without demonstrating a clear and strong commitment to the important oversight role to be played by the LFP Office.

As NSF developed the draft roles and responsibilities for this office, the OIG expressed its concern that the Deputy Director's responsibilities emphasized the advisory and collaborative aspects, but did not address the responsibilities necessary to fulfill his oversight charge. While providing advice and policy guidance are a part of successful project management, the Deputy Director's independent oversight role is equally critical to a viable and substantive large facility management program. The LFP Office recognizes the need to evolve beyond its advisory role and has embraced the recommendations made by the National Academies Committee that call for more independent oversight of large facility projects. However, its policies and guidance do not yet reflect that oversight role. Until NSF minimizes these obstacles and establishes a management framework for oversight, the LFP Office will continue to be hampered in its effectiveness, thereby putting NSF investments and taxpayer dollars at risk of mismanagement and potential waste.