

STATEMENT OF
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before the

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COMMITTEE ON SCIENCE

SUBCOMMITTEE ON RESEARCH

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Chairman Smith, Ranking Member Johnson, and distinguished members of the Subcommittee, I appreciate the opportunity to appear before you today. As you know, the National Science Foundation (NSF) is an innovative agency dedicated to maintaining American leadership in discovery and the development of new technologies across the frontiers of scientific and engineering research and education. As the scientific enterprise changes and research evolves, new challenges arise. Consequently, my office has worked closely with NSF management to identify and begin to address issues that are important to the success of NSF achieving its mission. One of these areas is the construction and management of large facility projects.

NSF is increasing its investments in large infrastructure projects such as accelerators, telescopes, research vessels, supercomputers, digital databases, and earthquake simulators. Currently, NSF spends approximately \$1 billion per year for such cutting-edge projects, some of which individually cost hundreds of millions of dollars. Many of these projects are large in scale, require complex instrumentation, and involve partnerships with other Federal agencies,

international science organizations, and foreign governments. Some, such as the new South Pole Station, present additional challenges because they are sited in harsh and remote environments.

Awards for large facilities (i.e. Tools) are inherently different than those that NSF makes to single investigators for individual research projects (i.e. Ideas).¹ In exploring Ideas, researchers need to be given the freedom and independence to allow their research to evolve and move in new directions. In large facility projects, or Tools, that same degree of freedom may sometimes be at odds with cost and schedule requirements. In one of our recent audits, we found evidence that the tension between research interests and cost and schedule requirements delayed the delivery of key scientific instrumentation. In her book *Einstein's Unfinished Symphony: Listening to the Sounds of Space-Time*, Marcia Bartusiak describes this tension as it relates to the NSF-funded Laser Interferometer Gravitational Wave Observatory (LIGO). Bartusiak states that

"[r]esearch scientists, long used to laboratory independence -- the freedom to change an experiment at will -- became upset over LIGO's rigorous schedules and their inability to make last-minute changes in the instrument. Scientific considerations suddenly had to bow to financial and engineering concerns. This meant that certain technologies had to be locked in early, even though advances may have developed later. Some adapted; others left."²

Overseeing the construction and management of these large facility projects and programs, while still being sensitive to the scientific endeavor, requires much more diligence than simply allowing for research independence and freedom. It requires a disciplined project management approach including meeting deadlines and budgets, and working hand-in-hand with scientists, engineers, project managers, and financial analysts. Furthermore, although NSF does

¹ NSF's strategic goals include investments in People, Ideas, and Tools. Investments in Tools "provide state-of-the-art infrastructure for research and education, such as instrumentation and equipment, multi-user facilities . . . Internet-based and distributed user facilities, advanced computing resources, [and databases]." Ideas are "discover[ies] across the frontier of science and engineering, connected to learning, innovation, and service to society." NATIONAL SCIENCE FOUNDATION, GOVERNMENT PERFORMANCE AND RESULTS ACT STRATEGIC PLAN FY 2001 - 2006 6-8 (Oct. 3, 2000) (<http://www.nsf.gov/pubs/2001/nsf0104/nsf0104.pdf>).

² MARCIA BARTUSIAK, *EINSTEIN'S UNFINISHED SYMPHONY: LISTENING TO THE SOUNDS OF SPACE-TIME* 141 (2000).

not directly operate or manage these facilities, it is NSF that is ultimately responsible and accountable for their success. Consequently, NSF must exercise proper stewardship over the public funds invested in these large projects.

NSF Needs Strong Management of Large Facility Projects

NSF's management of large facility projects has received increased attention recently. Last year, my office conducted an audit of one of these large projects and made several recommendations to NSF management. NSF has certain policies and procedures governing large projects, but we found that these were not comprehensive and did not cover all key aspects of managing such projects. We also found that important information about the status of projects did not always reach appropriate senior policy makers. We recommended that NSF develop strong policies and procedures for managing all aspects of large facility projects, including giving more extensive and higher level NSF management responsibility for oversight of Major Research Equipment (MRE) appropriation account projects, and training staff involved with these large projects on fund control and effective project management. In developing these recommendations, my staff interviewed NSF employees currently working on large facility projects and reviewed NSF's current written policies and procedures. We also researched other Federal guidance available, such as the General Accounting Office's *Executive Guide: Leading Practices in Capital Decisionmaking*,³ Office of Management and Budget Circular A-11 *Capital*

³ ACCOUNTING AND INFORMATION MANAGEMENT DIVISION, U.S. GENERAL ACCOUNTING OFFICE, EXECUTIVE GUIDE: LEADING PRACTICES IN CAPITAL DECISIONMAKING (1998).

*Programming Guide*⁴ and project management structures in place at other agencies such as the National Aeronautics and Space Administration⁵ and the Department of Energy.⁶

Shortly after the release of our report,⁷ the President mandated in *A Blueprint for New Beginnings: A Responsible Budget for America's Priorities* that NSF develop "a plan to enhance its capability to estimate costs and provide oversight of [large facility] project development and construction. This plan should help ensure that NSF is able to meet and stick to cost and schedule commitments for major facility projects."⁸

Because of the need for increased management and oversight of large facility projects, and because of the increasing level of funding being allocated to these projects, my office last year identified large facility project management as one of NSF's top ten management challenges.⁹

Facilities Management and Oversight Plan

In response to both the President's mandate and recommendations in my office's December 2000 report, *Audit of the Financial Management of the Gemini Project*, NSF has been

⁴ OFFICE OF MANAGEMENT AND BUDGET, CIRCULAR NO. A-11: CAPITAL PROGRAMMING GUIDE (Ver. 1.0 1997).

⁵ NATIONAL AERONAUTICS AND SPACE ADMINISTRATION PROGRAM AND PROJECT MANAGEMENT PROCESSES AND REQUIREMENTS, NPG 7120.5A (1998).

⁶ Members of my office attended a presentation given last year by the Department of Energy on their project management structure and techniques.

⁷ OFFICE OF INSPECTOR GENERAL, NATIONAL SCIENCE FOUNDATION, AUDIT OF THE FINANCIAL MANAGEMENT OF THE GEMINI PROJECT (Dec. 15, 2000); OFFICE OF INSPECTOR GENERAL, NATIONAL SCIENCE FOUNDATION, SEMI-ANNUAL REPORT TO THE CONGRESS 6-7 (Mar. 2001).

⁸ EXECUTIVE OFFICE OF THE PRESIDENT OF THE UNITED STATES, A BLUEPRINT FOR NEW BEGINNINGS: A RESPONSIBLE BUDGET FOR AMERICA'S PRIORITIES 161 (Feb. 2001).

⁹ Letter from Christine C. Boesz, Inspector General, National Science Foundation, to Senator Fred Thompson, Chairman, Senate Committee on Governmental Affairs (Nov. 30, 2000) (on file with the National Science Foundation Office of Inspector General).

developing a Facilities Management and Oversight Plan (Plan). This Plan, while still in draft form,¹⁰ is a good start on the road to addressing NSF's large facility project management needs. The Plan has four major goals: (1) to address organizational needs within NSF to effectively manage large facility projects; (2) to implement guidelines and procedures for all aspects of facilities planning, management, and oversight; (3) to improve the process for reviewing and approving large facility projects; and (4) to properly oversee facility projects to ensure their success.

First, the Plan primarily addresses organizational changes by creating a new position, Deputy CFO for Large Facility Projects, that will lead a Business Oversight Team. This Deputy is intended to be a point of accountability for the non-scientific aspects of large projects. The Business Oversight Team will consist of permanent NSF staff directly supporting the Deputy CFO for Large Facility Projects teamed with experts from other non-scientific NSF Divisions and Offices. NSF also plans to use Project Advisory Teams to give advice and assistance to the project managers responsible for individual large facility projects in the planning, review, management, and oversight of the project to assure cost, schedule, and technical performance. These Teams will be led by the NSF program officer, who is organizationally within an NSF scientific directorate or office, and will include members of the Business Oversight Team. In addition, the Business Oversight Team is expected to facilitate interactions and learning across all the Project Advisory Teams. Through the creation of these multi-disciplinary teams, NSF hopes to enhance oversight management practices.

Second, NSF intends to develop new and refine existing guidelines and procedures for oversight and management of large facility projects. These guidelines are intended to be

¹⁰ NATIONAL SCIENCE FOUNDATION, LARGE FACILITY PROJECTS MANAGEMENT & OVERSIGHT PLAN NSB-01-153 (Draft, Sept. 2001).

applicable to all large facility projects, cover the entire project life cycle, and give greater emphasis to post-award project oversight of construction and management. NSF also plans for these guidelines and operational procedures to be incorporated into a Large Facility Projects Manual for use by NSF staff working with these projects.

Third, NSF intends to strengthen its predecisional review process as it relates to large facility projects. To achieve this, NSF plans to require all large facility project proposals to undergo a predecisional review and approval process similar to that which is in place currently for MRE projects. NSF will develop criteria for making funding decisions for large facility projects and also plans to require that all proposals for large facility projects include a management plan. I believe that such a management plan is a keystone for successful project implementation and future monitoring of progress during the project implementation phase.

Fourth, NSF plans to develop a model template for post-award project review and oversight. This is intended to be an adaptable model of protocols for oversight reviews of large facility projects. Using these protocols, teams of NSF staff comprised of scientific, technical, management, business, and legal experts will conduct regular oversight reviews. Through these reviews, NSF hopes to identify and address potential performance and financial risks before they become problematic.

The Plan also includes milestones for its implementation. Currently, these milestones have NSF initiating its search for the Deputy CFO for Large Facility Projects in September 2001. By the end of January 2002, NSF plans to have developed the comprehensive guidelines and begin project oversight reviews. Finally, NSF plans to produce its Large Facility Projects Manual by the end of February 2002.

OIG Comments on the Plan.

NSF has sought my office's input as it has developed the Plan over the past several months, and we have provided comments to NSF throughout the process. We are pleased to see that NSF has found our audit recommendations helpful and we are looking forward to full implementation of the Plan. We also recognize and appreciate that NSF is undertaking a significant task. This process is an important investment. Although there are costs now in terms of time and resources, the returns are sure to be significant. NSF will complete this process with a greater understanding of the potential challenges involved with these projects and how best to avoid and/or overcome them. The research community, and the public at large, will be able to have confidence that the large facility projects NSF undertakes are managed to ensure the accomplishment of the intended research while maintaining accountability for public funds.

While the Plan covers both pre-award and implementation phases of large facility projects, my comments are generally focused on issues concerning the implementation phase. I believe that my office can be most useful in helping NSF put sound business and management practices in place that ensure that the intended scientific research is achieved with the funding NSF provides, not in evaluating the scientific merits of proposed projects. This Plan, as the blueprint for NSF's oversight of large facility project construction and management, lays the groundwork for all that is to come. In general, the Plan represents progress, particularly in terms of raising the profile and importance of project management within the agency. However, NSF will still need to address some key questions concerning implementation.

First, NSF should clarify who will have final oversight and accountability responsibility for each large facility project. The Plan envisions two organizational structures: one for scientific project management and the other for administrative oversight. For many issues that

arise during the life of these projects, one or the other of these organizational components should be able to be address them. However, as we have already seen, there are times when these two functional structures will tend to differ on how to proceed. Although the Plan does establish Project Advisory Teams to integrate these two viewpoints, these teams are advisory in nature and will be led by the cognizant program manager. It is important that NSF clearly identify the ultimate authority so that it can strike the appropriate balance between good science and good project management. The Plan should address this key issue and provide guidance for how conflicting views on science, construction, management, and funding will be resolved.

Second, although the Plan specifies that the awardee institutions will manage all aspects of project implementation and report to NSF, there is only a general indication of how NSF will ensure that awardees have the necessary project implementation capabilities (i.e. construction and management). In fact, project implementation capability is not currently listed in the Plan as a criterion for a funding decision. Although the Plan states that NSF will require every large facility proposal to contain a management plan that covers all phases of the project, it does not specify whether or how this plan will be evaluated or used. Further, it appears that the management plan will be approved after the award is made. Because NSF relies heavily on the project management skills of its awardees in conducting the projects, we recommend that NSF evaluate and consider the management plans as part of the selection process, prior to handing over Federal dollars.

Third, the Plan should include detailed information on a comprehensive training program. One of recommendations coming out of my office's audit of the Gemini Project focused on the need for project management training for NSF staff engaged in large facility projects. Training is mentioned briefly in the Plan but there are no details as to who will be trained, by whom, and

on what subjects. NSF should develop a comprehensive training program for its staff working on all aspects of large facility projects. This program should include training on basic project and financial management skills as well as specific training on NSF's new guidelines and procedures as they are developed and implemented.

Fourth, once NSF makes an award, it will need to ensure that the management plans are implemented and monitored as part of its ongoing oversight process. While a thorough planning process is critical, active and ongoing project oversight is equally important. The Plan includes, in an appendix, a graphic description of NSF's pre-award review and approval process currently in place for MRE projects, with a brief description of intended post-award activities. While the Plan indicates that oversight teams will conduct progress reviews, there is no detail on the scope of these reviews (e.g. content and frequency) and the role their results will play in taking the necessary actions to ensure the successful and timely completion of the projects. The Plan should clarify how these reviews could lead to changes in the management of the particular project being reviewed and how NSF will use the project management plans to monitor construction progress and assess ongoing management capability.

Finally, we note that NSF has set for itself ambitious and challenging milestones for implementation of the Plan. The Plan states that the Deputy CFO for Large Facility Projects will lead the effort to develop and implement the guidelines and begin the oversight reviews. These guidelines are expected to be developed and reviews started by the end of January 2002. However, the Deputy has not yet been recruited. Conducting a "nationwide search" for this position is an effort that could take a significant amount of time, and waiting for this person to develop the guidelines for reviewing projects may not allow NSF to meet its intended milestones. Because of the urgent nature of implementing this Plan, NSF should consider

gathering the necessary expertise now, on a temporary basis if necessary, to develop the guidelines, rather than awaiting the arrival of the Deputy. This may give NSF the opportunity to meet its “aggressive schedule.”

Continuing OIG Role

As NSF moves forward with implementation of its Plan and the corresponding guidelines and procedures for large facility project management, my office will continue to have a role in the process. First, because the Plan was partially developed in response to an audit recommendation, my office will conduct a follow-up review to ensure that the Plan has been fully implemented and is serving its intended purposes.

Second, my office will continue to monitor the agency’s management of large facility projects. I believe that it is NSF’s responsibility to manage and oversee its awards, including determining whether proposed project costs are realistic, ensuring that awardees are exercising proper project management, determining whether an entity has proper accounting systems in place to adequately account for Federal funds, and ensuring that the scientific goals of the project are achieved. NSF should conduct reviews of ongoing large facility projects to ensure that the awardees are following the management plans submitted to and approved by NSF. This should be a key component of NSF’s oversight process. My office will periodically revisit issues related to NSF’s award oversight process and, where necessary, make recommendations for improved efficiency and effectiveness. Because management of large infrastructure projects is one of the agency’s top ten management challenges, we will continue to prioritize these issues in formulating future audit work.

My office will continue to be available to NSF, upon request, to assist in specific areas for which we have particular expertise. For example, we have recently conducted, at NSF's request, a review of an awardee's proposed indirect cost rate to be applied to a large facility project. We have also in the past conducted proposal reviews and will continue to be available to NSF, resources permitting, for these types of consultations.

Finally, we will continue to carry out our statutory role of detecting and deterring fraud, waste, and abuse. We are confident that if significant and serious problems arise with large facilities or any other projects, NSF will continue to refer these matters to us. Our doors are always open and we have telephone and e-mail hotlines available for such reports.

Conclusion

In conclusion, the Large Facility Projects Management and Oversight Plan is an important first step in the process of ensuring that NSF's large facility projects provide their intended research benefits while also providing appropriate stewardship over public funds. We look forward to NSF addressing the fundamental issues of accountability, authority, and post-award project management. We also look forward to NSF meeting its timelines while producing a thorough and complete end-product. This Plan will lay the groundwork for all of NSF's efforts in this area and as such provide a blueprint for future actions. The NSF Plan represents progress toward that end.

Mister Chair, that concludes my statement. Thank you for the opportunity to share this information with you. I would be pleased to answer any questions that you may have.