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National Science Foundation

Committee on Science, Space, and Technology

Subcommittee on Research and Technology

United States House of Representatives

A Review of Recommendations for NSF Project Management Reform

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Mr. Chairman and Members of the Subcommittee, I appreciate this opportunity to discuss the National Science Foundation Office of Inspector General (OIG) views on the National Academy of Public Administration's report on NSF's use of cooperative agreements to support large scale investment in research.

The OIG is an independent entity and reports directly to Congress and the National Science Board. Our mission is to conduct independent audits and investigations of National Science Foundation programs and operations and to recommend policies and corrective actions to promote effectiveness and efficiency and prevent and detect waste, fraud, and abuse. Consistent with our statutory mandate, the OIG has an oversight role and does not determine policy or engage in management activities involving the Foundation or program operations. Thus, my office is not responsible for managing any NSF programs, nor do we attempt to assess the scientific merit of research funded by the Foundation.

Since 2010, my office has issued 28 reports containing more than 80 recommendations that relate to NSF's use and management of cooperative agreements for the construction and operation of high-dollar, high-risk research facilities. In that time frame I have also testified on this topic three times. The matter of NSF's oversight of such cooperative agreements is therefore an issue that we at NSF OIG take very seriously.

In light of our office's longstanding interest in this area, we were intrigued when the NSF Director and the Chair of the National Science Board's Audit and Oversight Committee proposed the idea of having the National Academy of Public Administration examine NSF's use of cooperative agreements and benchmark the agency's policies and practices against similarly situated federal scientific agencies. I want to commend Drs. Cordova and David for their vision in commissioning this report, as well as the NAPA panel and staff who conducted the review and prepared the final product. The report does an outstanding job of setting forth the historical context in which these issues arose, of articulating the audit history and the differing views on specific issues held by the agency and my office, and of identifying practices at other federal agencies that NSF should emulate. Most importantly, it sets forth practical recommendations

that, if implemented by the agency, will significantly improve NSF's ability to ensure accountability over these high-risk, high-dollar projects.

I have been asked to identify the recommendations NSF OIG supports, as well as those it does not, to note any recommendations our office has made that were not addressed in the report, and to comment on the extent to which implementation of NAPA's recommendations would address issues previously raised in my office's audits and reviews. Let me begin by saying that OIG supports all of the report's recommendations, each of which is the result of thoughtful analysis and reflects NAPA's in-depth understanding of the challenges NSF is facing. Implementation of these recommendations will significantly enhance NSF's ability to award and oversee large facility projects, and will thus go a long way toward addressing many of the issues my office has raised to date.

Based on our office's work in this area, there are six recommendations that I will discuss in more detail. I will address these recommendations in the order in which they appear in the report. I will also discuss three additional matters that were not the subject of a NAPA recommendation but are nonetheless critical to NSF's management and oversight of large facility projects.

OIG Responses to Specific NAPA Recommendations

Recommendation 3.1: NSF should require that exceptions to the recommendations from pre-award cost analyses conducted by Cost Analysis and Audit Resolution, be reviewed by the Large Facilities Office and forwarded to the Chief Financial Officer for a final determination. The results of the CFO's determination should be documented in writing and shared with the Major Research Equipment and Facilities Construction (MREFC) Panel prior to the release of award funds.

In its review, NAPA noted that NSF has a group of in-house accountants and analysts in the Cost Analysis and Audit Resolution (CAAR) branch of the Division of Institution and Award Support who conduct pre-award cost analyses of proposals pending before the agency, including those for large facilities. NAPA also noted that CAAR's reports and analyses, which identify areas of concern prior to award, are advisory only and do not have to be accepted by the grants and agreements officer (GA/O). NAPA made recommendation 3.1 in order to promote transparency and require higher level review of disagreements between CAAR and the GA/O. If followed, NAPA believes that the process it outlined in recommendation 3.1 would provide NSF with an additional tool for ensuring accountability, as well as a clear audit trail.

OIG agrees with NAPA that there is great value in the analyses CAAR performs. Our September 2014 alert memo on NSF's management of costs proposed for the Large Synoptic Survey Telescope (LSST) construction project,¹ discussed a June 2013 pre-award review performed by CAAR at the preliminary design review stage in great detail. Among other things, the CAAR reviewers found that they could not independently verify costs for any of the 136 proposed expenditures sampled, including approximately \$145 million in direct materials, nearly \$20 million for contingencies and more than \$6 million in direct labor costs. CAAR reported that,

¹ NSF OIG Alert Memo Report No. 14-3-002, *NSF's Management of Costs Proposed for the Large Synoptic Survey Telescope Construction Project*, September 30, 2014.

without further documentation, it was unable to determine if the methodology used to estimate the cost is appropriate, consistently applied, or reasonable.

CAAR also performs post-award assessments. Our December 2015 review of NSF's oversight of the LSST construction project² noted that CAAR had identified several areas of concern during its indirect cost rate negotiations for fiscal year 2014 with the Association of Universities for Research in Astronomy, Inc. (AURA), the entity that manages the LSST project. CAAR found that AURA's indirect cost rate structure was extremely complicated, which could make errors more likely and lead to overcharges to the government. Based on its review of general ledger details for costs incurred in 20 expense categories considered most likely to include potentially unallowable costs, CAAR also identified some costs that were questionable, as well as others that were not adequately supported.

Finally, CAAR expressed concern with the fact that the AURA corporate office did not appear to have a leading role in the oversight and approval of corporate expenses, noting that this could potentially constitute an internal control weakness in AURA's expenditure monitoring process. As a result of these and other concerns, the GA/O concluded that an incurred cost audit of the LSST project after the first year of the award was warranted. He indicated that he would evaluate performing an audit on an annual basis based on the results of the first incurred cost audit. Among other things, such audits would identify misallocations of indirect costs or inequitable indirect rates.

We share NAPA's belief that action is necessary to ensure that the important issues CAAR identifies are brought to the attention of the senior officials and panels charged with oversight of large facility construction projects. In the absence of such transparency, we have found instances in which CAAR's important concerns have not been addressed in a timely fashion. Using the CAAR review discussed in our first LSST memo as an example, we found that many of the significant issues CAAR had identified in June of 2013 had not been addressed before the project was funded during the summer of 2014. OIG therefore finds recommendation 3.1's focus on transparency and higher-level review of any disagreements between CAAR and the GA/O to be well-founded. We also believe that the recommendation should be extended to require the same review and analysis for post-award assessments conducted by CAAR.

Finally, we note that in addition to the work done by CAAR, other reviews available to NSF, such as grants officer reviews, business system reviews, panel reviews, and site visit reviews, contain similar pre- and post-award analysis and recommendations. NSF is also currently working to develop a procurement vehicle that will enable it to contract out for incurred cost audits and audits of cost estimates for its large facilities. NSF should ensure that the findings and recommendations from these reviews and audits are subject to the same review and analysis process outlined in recommendation 3.1 and are addressed in a timely manner. In particular, in the future any recommendations from audits of cost estimates should be resolved prior to award.

Recommendation 4.1: NSF should retain control of a portion of an award recipient's contingency funds and distribute them with other incremental funds as needed.

² *NSF's Oversight of the Large Synoptic Survey Telescope Construction Project*, Report No. 16-3-001, December 10, 2015.

In its report, NAPA noted that at NSF contingency is managed by MREFC award recipients and access to those funds is governed by a Change Control Board run by the recipient's senior managers. In contrast, at the two comparator agencies NAPA used (the Department of Energy (DoE) Office of Science and the National Aeronautics and Space Administration (NASA)), contingency (or its equivalent³) is held completely or primarily by the agency, and the decision to release such funds is made by the agency.

NAPA concluded that by holding a percentage of contingency funds, NSF would have an additional and significant accountability measure in place for managing such funds. It noted that the agency's current practice of releasing control of all contingency funds does not provide recipients with a compelling incentive to preserve contingency funding. By adopting a process similar to NASA's (where a percentage of contingency is held at the directorate, program and project levels), NSF would signal that these funds are intended to be spent judiciously. NAPA noted that NSF has systems in place to hold contingency funds, the capacity to release them in a timely fashion, and past experience holding contingency when warranted.

OIG wholeheartedly concurs with this recommendation. Our previous audit work has found that construction budgets for NSF's large facility projects included millions of dollars for contingencies which lacked adequate supporting documentation. The risk of misuse of these funds is heightened because of the control NSF allows recipients to exert over contingency funds, and the lack of clarity that exists over how amounts for contingencies are actually expended. If NSF maintains control over the majority of these funds and provides them to awardees only after they have demonstrated a *bona fide* need for contingency funds that is supported by verifiable cost data, this risk will be significantly mitigated. We sincerely hope that for construction projects valued in excess of \$100 million, NSF will retain control over the majority of contingency funds at the directorate and program level.

Even if NAPA had recommended that NSF retain control over all contingency funds, given the lack of supporting data for those costs at the proposal stage we would still be concerned about the fact that awardees are not required to track contingency expenditures in their accounting systems. Absent such a requirement, it is almost impossible to audit the use of contingency funds to determine if they were used consistently with the purpose for which they were provided. Although the NAPA report reflects OIG's concerns about this issue, the panel did not make a recommendation on this point, noting that neither NSF, the comparator agencies examined, nor the Office of Management and Budget (OMB) require such tracking. NAPA indicated that while NSF does not track contingency expenditures separately, its policy requires monthly reporting of a summary table of contingency allocations and a clear tie to the work breakdown structure (WBS) and realized risk. NAPA stated that NSF needs to ensure it is monitoring compliance with these requirements closely.

A recent letter of observations⁴ on the need for NSF to require the tracking of contingency expenditures on construction projects illustrates why tracking just to the budgetary WBS level is not sufficient and why tracking and comparing budget to actual contingency expenditures is

³ NAPA noted that at NASA contingency is referred to as unallocated future expenses.

⁴ *The Defense Contract Audit Agency's Letter of Observations on the Need for NSF to Require the Tracking of Contingency Expenditure on Construction Projects*, Report No. 15-6-004, September 30, 2015.

critical. In that letter, auditors for the Defense Contract Audit Agency (DCAA) indicated that on examining an awardee's budget system they found that \$19.6 million in actual budgeted contingency use differed significantly from what was requested and from what NSF approved in six of the seven cases they reviewed. As a result, based on the information it possessed NSF could not tell if the awardee was properly accounting for contingency or if contingency funds were used without approval for cost overruns, unapproved increases, or other unauthorized purposes. The DCAA auditors also concluded that the awardee's budgeted use of contingencies varied often and significantly, to such an extent that there was not a direct correlation between contingency requested and approved by NSF and actual budgeted contingency use.

These findings underscore why it is important to track how contingency funds are actually spent, and why NSF, as a steward of federal funds, should require visibility and accountability over those expenditures. Given the tens of millions of dollars in contingencies usually provided for large facility construction projects and the lack of support OIG has identified for such amounts at the proposal stage, it is especially important to have visibility into how those funds are expended to ensure that they are not used without approval for inappropriate purposes. For this reason, OIG agrees with DCAA that NSF should require its awardees to separately track the use of contingency in their accounting systems.

Recommendation 4.3: NSF should eliminate the practice of including management fee in cooperative agreements in future projects.

The NAPA report does an excellent job of explaining the historical context and current use of management fees within the federal government as a whole and at NSF in particular. It ultimately recommends that NSF end its use of such fees in cooperative agreements as a means of eliminating the additional management burdens associated with monitoring the award and use of such fees, and because of the potential that inappropriate expenses will be funded by such fees.

NSF has indicated that it is evaluating its current policy and investigating alternatives to management fee, such as those mentioned in the panel's report. If NSF decides to continue the use of management fee in cooperative agreements, it should consider and address the concerns raised in our September 2015 alert memorandum on NSF's management fee policy.⁵ In that document, which details the many positive steps NSF took to strengthen its draft fee policy, OIG notes several areas in which further improvement is warranted.

One area of particular concern is the fact that NSF's final policy omits any consideration of other sources of income available to an awardee in determining the amount of the fee award, thereby moving away from the principle that an awardee should only receive a fee based on its demonstrated need to maintain financial viability. In this regard, the final version of the policy differs from the draft version, which had stated that "the proposal must also include a schedule of all federal, non-federal, and other sources of income to justify that alternative sources are not available to address potential needs covered in the proposal."

⁵ *NSF's Management Fee Policy*, September 11, 2015.

Our November 2014 white paper on management fees⁶ noted that in fiscal year 2013, each of the seven awardees that received management fee from NSF had at least one other income source, indicating that an analysis of this type of data should provide information useful in determining if the awardee's sources of revenue are sufficiently limited to require the payment of management fee to maintain financial viability.

Recommendation 6.3: NSF should identify requirements for project management and financial management expertise related to large facilities projects and explicitly add the requirements to the criteria for selection of external reviewers.

Recommendation 6.7: NSF should identify project management skill requirements by role and develop/implement required corollary role-specific project management training/workshops.

Recommendation 6.8: NSF should require award recipient project managers be certified in project management. NSF should also specify the minimum project management experience thresholds for project positions in the programmatic terms and conditions of the cooperative agreement.

I have highlighted these recommendations as they reflect NAPA's determination that NSF needs to take swift, decisive action to improve its internal project and financial management capability, as well as the project management capability of its awardees. OIG concurs with the findings and recommendations that flow from this conclusion and recognizes that the actions required to implement these recommendations will require culture change within the agency and at its awardees. Such change is clearly warranted, because as the NEON project has recently illustrated, deficiencies in business processes have the potential to undermine scientific goals if a project must be de-scoped due to cost and/or schedule overruns resulting from inadequate project management.⁷

Additional Matters That Are Critical to NSF's Management and Oversight of Large Facility Projects

I would like to conclude by focusing on three areas in which NAPA did not make a recommendation. The first concerns earned value management (EVM) systems. According to the NAPA report, an EVM system provides an integrated approach for tracking and measuring project costs and schedule performance, as well as for identifying potential issues and project risks. As such, a robust EVM system provides critical information about a project's status to its stakeholders.

The NAPA report notes that NSF, DoE and NASA require that projects develop and implement EVM systems. It found that both DoE and NASA have well-developed EVM policies and processes in place:

At DOE, projects over \$20 million are required to start implementing EVM in the preliminary design phase. EVM must comply with federal standards and be certified by

⁶ *White Paper on Management Fees*, November 24, 2014.

⁷ *NSF's Management of Potential \$80 Million Cost Overrun for NEON*, Report No. 15-3-001, September 15, 2015.

the agency. An EVM surveillance review is performed biannually by the agency and annually by the awardee after the projects enters the construction phase. Similarly, NASA requires the use of EVM which must be in compliance with federal standards for projects valued at more than \$20 million and for all single-project programs, (NASA projects most analogous to NSF projects). The agency validates EVM compliance for contracts over \$50 million. Projects (and contractors) are required to submit their EVM data on a monthly basis, and the agency conducts annual surveillance reviews to monitor the use of EVM.⁸

NAPA found that NSF is in the process of developing policies and guidance to standardize the use of EVM across projects.

Our recent reviews of two of NSF's largest, riskiest construction projects noted issues with EVM. In our September 2015 review of NSF's management of the potential \$80 million cost overrun for the NEON project, we found that the EVM reports provided by NEON did not give accurate figures for the cost to complete the project until NEON was prompted by NSF based on declining scheduled variance.⁹ As a result, based on NEON's EVM and monthly progress reports, NSF was unable to identify the magnitude of the potential budget overrun or the precise reason for the schedule variance.

In our December 2015 review of NSF's oversight of the LSST construction project, we found that while NSF receives EVM reports for LSST, which it uses to measure project schedule and costs, NSF does not verify the data LSST provides in its reports.¹⁰ Compounding this concern, we learned that NSF did not certify the EVM system for LSST. Certification of an EVM system, including supporting data, is conducted by the Defense Contract Management Agency to ensure that an awardee maintains an acceptable EVM system, which includes data to support scheduling of work and interim progress measures, among other things.

In addition to the thresholds the NAPA report noted for DoE and NASA, our examination of the thresholds other federal agencies use when determining whether an awardee's EVM system should be certified found that the Health and Human Services requires such certification for projects over \$10 million, while the General Services Administration requires certification for projects over \$20 million. The \$473 million LSST award--and the other NSF large facility construction projects--substantially exceed the thresholds other federal agencies use in determining when to require certification of the EVM system.

In light of the importance of accurate EVM data, we recommended that NSF obtain certification of the LSST EVM system and that it validate that data. In its response to our draft report, NSF indicated that it will validate the EVM data for LSST as part of the 2016 annual review process. The agency also indicated that it has begun evaluating the benefits of EVM system certification as a requirement for large scale facilities and mid-scale infrastructure projects and that it is investigating establishing thresholds for EVMS certification on all facilities projects. In light of the critical insights robust EVM data can provide those managing and overseeing projects, NSF

⁸ *National Science Foundation: Use of Cooperative Agreements to Support Large Scale Investment in Research*, National Academy of Public Administration (December 2015), pp. 59-60.

⁹ *NSF's Management of Potential \$80 Million Cost Overrun for NEON*, Report No. 15-3-001, *op cit*.

¹⁰ *NSF's Oversight of the Large Synoptic Survey Telescope Construction Project*, Report No. 16-3-001, *op. cit*.

should conclude its evaluation as swiftly as possible and take decisive action to ensure the quality of EVM data on all its large construction projects.

The last topics I would like to address are incurred cost submissions and incurred cost audits. The NAPA report notes that OIG has repeatedly recommended that NSF require annual incurred cost submissions and incurred cost audits for cooperative agreements totaling a minimum of \$50 million.¹¹ In response to these recommendations, the report states that NSF has, among other things, indicated that it will now conduct, at a minimum, a cost incurred audit at project completion for large facility construction projects valued in excess of \$100 million. It will also complete an annual review of awards valued over \$100 million to determine if an incurred cost audit may be necessary during performance based on risk. The NAPA report also noted that NSF is developing a draft award provision specifying the format and detail of incurred cost information to be maintained by award recipients, and is in the process of seeking OMB clearance for these new reporting requirements.¹² Finally, NSF is currently working to develop a contractual vehicle that will enable it to have incurred cost audits performed by independent accounting firms.

Although the NAPA report did not include recommendations focused on these aspects of OIG's work, I note OIG's recommendations here because of their extreme importance in the effort to ensure accountability over large facility projects. Incurred cost submissions, which include certified schedules of direct costs by award (identified by cost element) and applied indirect expenses, provide information that is critical for NSF to properly discharge its administrative and fiduciary responsibilities as a steward of federal funds. They are also essential tools for the conduct of an incurred cost audit. In some cases, the absence of properly prepared incurred cost submissions has added months and even years to the time required for audits being conducted by my office.

The continued relevance of our incurred cost submission recommendations was underscored by two very recent reviews conducted by the Defense Contract Audit Agency.¹³ In those cases, DCAA auditors performed adequacy reviews of two large facility awardees' incurred cost submissions to determine if they included all of the information necessary to facilitate timely completion of an audit. In both cases the auditors found the submissions were inadequate, identifying a number of problems requiring corrective action before an audit could be initiated. These reports illustrate the importance of the actions NSF is taking in this area and the need to finalize those actions as quickly as possible.

Finally, incurred cost audits of large facility recipients provide NSF and its stakeholders with the best evidence of how awardees are expending the federal funds entrusted to them. While not required by law or regulation, such audits are essential tools for ensuring accountability in high-risk, high-dollar projects. In their absence, unallowable costs charged to these awards may go undetected because NSF lacks sufficient visibility over incurred costs. While we commend NSF for deciding to require incurred cost audits at project completion, by waiting until the end of a

¹¹ OIG has made clear that it is willing to consider a higher dollar threshold.

¹² NAPA report, p. 25.

¹³ *Inadequate Incurred Cost Submissions for Fiscal Years 2010 and 2011, National Ecological Observatory Network, Inc., (NEON)*, Report No. 16-6-003, January 29, 2016; *Inadequate Incurred Cost Submissions for Fiscal Years 2011-2013, Associated Universities, Inc. (AUI)*, Report No. 16-6-004, January 29, 2016.

project to obtain real insights on how funds are being expended NSF will miss opportunities to identify and correct problematic expenditures in the early days of the project. Given the level of risk we have identified with NSF's current large facility construction projects, we believe that annual or at least bi-annual audits are clearly warranted for all such projects.

Conclusion

At the very start of its report, the NAPA panel articulates the fundamental challenge that NSF is currently grappling with:

It is clear that, in the past, NSF has prioritized the innovative scientific aspects of large facility construction projects; the agency now needs to apply equal emphasis on increased internal management of the business practices critical to enhanced oversight and project success. In doing so, the Panel believes that NSF and NSB will enhance the agency's ability to fulfill its mission of supporting groundbreaking science.¹⁴

OIG concurs with this conclusion. Through our extensive body of audit work in this area, we have identified ways for NSF to strengthen the management and oversight of its costliest and riskiest large facility projects. The NAPA report reinforced many of our recommendations and, in some instances, endorsed more stringent measures. NSF's swift and decisive implementation of the report's recommendations will have a significant, positive impact on the Foundation's ability to manage and oversee these high-risk, high-dollar projects.

Our work reflects my office's sustained commitment to helping NSF be an effective steward of taxpayer dollars, and we look forward to our continued partnership with NSF and the Congress to this end.

¹⁴ *National Science Foundation: Use of Cooperative Agreements to Support Large Scale Investment in Research*, National Academy of Public Administration (December 2015), pp. 6-7.