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4.4.3 The IPT's purview and lifespan should be extended to the operational phase of the project with a mandate to regularly review operational performance of NSF large facilities; and the membership of the IPT should include members who have experience operating large facilities.

4.4.4 At least once every five years after the initial ten years of operations, the annual review should evaluate whether divestment should be considered for the facility. Any resulting plan developed by a Directorate or Division that proposes significantly repurposing and redirecting a facility or its decommissioning, disassembly, and disposal – any of which can involve significant expenditures of resources – to go through the MREFC Panel for review and recommendation to the Director

4.5 NSF should work with the research communities, including consultation with the Directorate advisory committee, to explore and document approaches and best practices for managing facility end of life and divestment from large research facilities. NSF should develop policy and guidance for programs to support divestment consideration and decision making.

5.1 The Subcommittee believes that there should be a clearly-designated senior official in the Office of the Director with direct visibility into and accountability for the Foundation's facilities and research infrastructure – which would encompass significant projects in the directorates as well as in the MREFC account. This official would serve a role analogous to the Acquisition Executive role in DOE and NASA

6.1 Instead of creating a new Large Facilities FACA, NSF should utilize BOAC subcommittees as needed to periodically review the rigor of NSF's large facilities oversight processes in a manner analogous to the role a Committee of Visitors has in providing external expert assessment of the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions. BOAC, like other FACA committees, has a mechanism for creating subcommittees as necessary.

6.2 To ensure that the NSF Director has full awareness of all such BOAC subcommittee assessments, NSF should recharter BOAC so that the NSF Director, through the BFA and OIRM Heads, becomes the official to whom the committee reports as recommended by the General Services Administration's Committee Management Secretariat guidance.

In addition to the formal charges addressed above, the Subcommittee makes three additional obervations with respect to MREFC review packages, MREFC ranking criteria, and the chartering of high level FACA committees. The Subcommittee recommends that LFM §2.3.2.6 be revised to make more explicit the responsibility of the Director's Review Board to prepare cover memos for packages advancing to the Director and NSB that focus executive attention on cost, scope and schedule risks, mitigation options analyzed, and remediation actions taken to manage those risks. The Subcommittee recommends that the international leadership question be considered as one criterion for approval to enter the Conceptual Design Phase. And, consistent with recommendation 6.2 that NSF recharter BOAC so that the NSF Director be the official to whom the committee reports in compliance with the General Services Administration's Committee Management Secretariat guidance to address the NAPA Panel's concern that the NSF Director does not have direct access to advice on important issues, the Subcommittee recommends that NSF consider rechartering the advisory committees reporting to the Associate Directors as well as the two joint NSF/DOE FACAs.

I. Introduction

In early 2015, the NSF Director and the National Science Board (NSB) asked the National Academy of Public Administration (NAPA) to review issues raised by the NSF Office of the Inspector General (OIG) about the agency's use of cooperative agreements for funding the construction and operation of large-scale, multi-user research facilities as well as the adequacy of the management, oversight and accountability practices for monitoring those investments. Additional charges for the NAPA study derived from congressional hearings and language in the America COMPETES Act of 2015 (H.R. 1806) and the NSF Major Research Facility Reform Act of 2016 (H.R. 5049) that would have codified a number of the OIG's previous recommendations. As the NAPA Panel notes, "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."[1]

The NAPA report, issued in December 2015, made thirteen recommendations that fall into three general categories: business practices; planning, oversight and accountability; and project management. NSF has completed actions on recommendations related to improving business practices by requiring NSF officials to review and approve any proposed exceptions to the recommendations of pre-award cost analyses (NAPA rec. 3.1), retaining a portion of contingency budgets at NSF (rec. 4.1), and requiring award recipients to follow the guidance in the Government Accountability Office's Cost Estimating & Assessment Guide and Schedule Assessment Guide (rec. 4.2). NSF has hired two additional staff in the Large Facilities Office (LFO), and the Head of that office is now a voting member of the NSF Major Research Equipment and Facilities Construction (MREFC) Panel (rec. 6.5).[2]

Two NAPA report recommendations have been assigned to this Subcommittee for study. They are calls for the Foundation to add more rigor to the process of reviewing major facilities projects at the MREFC Panel level of oversight for readiness and performance (rec. 6.2) and to provide the NSF Director direct access to independent project and cost estimating expertise for reviewing large research projects (rec. 6.4).

Two reforms included in the House-passed bills mentioned above were assigned to this Subcommittee for study. They are evaluating the extension of the scope of the MREFC Panel to include oversight for the full life-cycle of operating facilities, including divestment, and evaluating the need for creating a new internal agency "senior official" specifically responsible for large facilities (both facilities in development and those that are operating) within the Office of the Director.

Action on the remaining seven NAPA recommendations are underway at NSF in parallel with this Subcommittee's study. Since this study began, Congress has taken action, and the American Innovation and Competitiveness Act (AICA, P.L. 114-329) was signed into law on January 6, 2017. The AICA requires full life-cycle oversight for all major multi-user research facilities regardless of whether the facility is funded out of the MREFC account or whether it is funded out of the Research & Related Activities account and it exceeds one of two statutorily-defined thresholds. The AICA also requires appointment of a "senior official" in the Office of the Director to be specifically responsible for large facilities.

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[1] National Academy of Public Administration, *National Science Foundation: Use of Cooperative Agreements to Support Large Scale Investment in Research* (December 2015) p 6.

[2] That status will be correctly reflected in Section 2.1.6.4 of the next release of the NSF Large Facilities Manual.

II. Explanation of Process Used for Subcommittee's Work

The Subcommittee composition and charter were finalized in June 2016, and the group began its work with a kick-off meeting at NSF in August 2016. The morning session focused on NSF's views of the challenges the agency faces with respect to its oversight of research infrastructure,[3] including an overview by Dr. Fae Korsmo, Senior Advisor in the Office of the Director, of the Foundation's interpretation of and actions to date in response to the NAPA report. Matt Hawkins, Head of the Large Facilities Office, provided a detailed briefing about the current NSF business processes for each stage of the research infrastructure life cycle from the support of earliest development and design stages through construction and operations to the ultimate decommissioning of a facility (Figure 1). He noted some of the differences in process between largest projects funded out of the MREFC account and the mid-scale projects funded out of R&RA. That was followed by a frank and detailed discussion with staff from the Office of the Director and the Office of Budget, Finance and Award Management about known challenges the agency has faced in its handling of facilities projects and lessons learned. The morning session concluded with a brief tutorial by Jeff Lupis, Director of the Division of Acquisitions & Cooperative Agreements, on the cooperative agreement mechanism.

The afternoon session was anchored by a panel discussion with the leadership of the NSF directorates responsible for research infrastructure, namely Dr. Fleming Crim, Assistant Director for Mathematics and Physical Sciences; Dr. James Kurose, Assistant Director for Computer & Information Science & Engineering; Dr. James Olds, Assistant Director for Biological Sciences; Dr. Roger Wakimoto, Assistant Director for Geosciences; and Dr. Grace Wang, Deputy Assistant Director for Engineering. Given the increasing internationalization of many of the largest research infrastructure investments within NSF and across the federal portfolio, Dr. Rebecca Keiser, Head of the Office of International Science and Engineering, also participated in the discussion. NSF Chief Operating Officer (COO), Dr. Richard Buckius, joined the discussion as an observer.

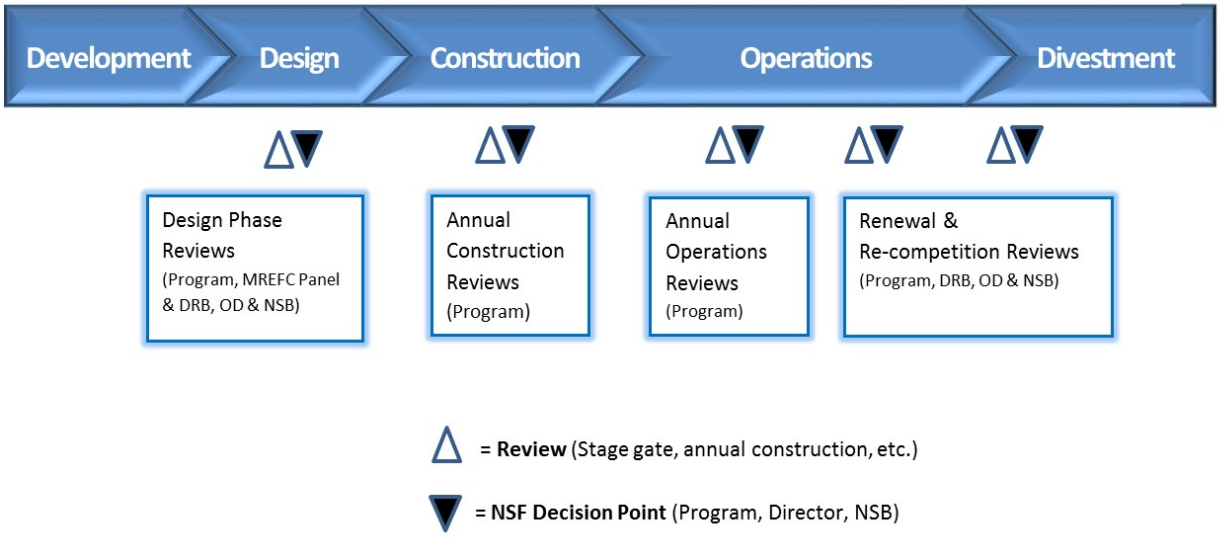

Figure 1. Life Cycle for Research Infrastructure Development

[3] In carrying out this study, the Subcommittee encountered the terms "large facility," "large research project," "major research facility," and "MREFC project" used almost interchangeably. To avoid confusion, the Subcommittee will use the term "**research infrastructure**" to refer to multi-user research facilities. Our usage of the term is not tied to a specific NSF budget account, since funding for major multi-user research facilities (MMURF) is supported by both the Research & Related Activities (R&RA) account and the MREFC account. "**Large-scale infrastructure**" will be used to differentiate projects eligible for MREFC funding from "mid-scale infrastructure," which fall below the $70 million MREFC threshold and above the $4 million limit of the Major Research Instrumentation (MRI) program. Thresholds for mid-scale infrastructure, which is funded out of the R&RA account, are defined by each of the Directorates.

The NAPA report notes that a 2012 internal study commissioned by the NSF Director recommended the designation of a senior official for large facilities in the Office of the Director to coordinate facilities planning and oversee development of the then Project Assessment Office (now LFO). The House-passed version of the America COMPETES Act of 2015 would have required the NSF Director to appoint a senior official within the Office of the Director responsible for oversight of major multi-user research facilities. Despite that, the NAPA Panel did not recommend the designation of a senior official in the Office of the Director, noting that where the LFO organizationally resides is not as important as clear project management roles, responsibilities, and authorities—together with leadership support.

Since the Subcommittee began its work, Congress has taken legislative action. Paragraph 110(a)(2)(H) of the American Innovation and Competitiveness Act of 2017 requires NSF to "appoint a senior agency official whose responsibility is oversight of the development, construction, and operations of major multi-user research facilities across the Foundation." NSF's interpretation is that this statute is not prescriptive with respect to line reporting or positioning within NSF, so the Subcommittee's initial charge remains relevant.[12]

Analysis. The charge for this Subcommittee is to evaluate the potential value in creating an internal agency "senior official" position in the Office of the Director charged with reporting to the Director and Deputy Director/COO on large facilities.

As described elsewhere in this report, the Subcommittee believes the current NSF process for stage gate approvals confounds these approvals (i.e., readiness to proceed to the next stage) with oversight of performance within a stage (i.e., cost and schedule performance during preliminary design). Exacerbating this issue is a lack of clarity regarding who holds the final approval authority for such decisions. Together, these issues create a level of opacity that hinders management and oversight at the executive level.

The Subcommittee believes that there should be a senior NSF executive who serves as the final gatekeeper on approvals prior to presentation to the National Science Board and as the "owner" of the agency-wide oversight processes for projects underway. The Subcommittee sees this as the proper role of the Senior Official posed in this charge question. The role is analogous to the Acquisition Executive function at the Department of Energy and at the National Aeronautics and Space Administration. It is the Acquisition Executive that considers project performance, recommendations from various review committees, and feedback from stakeholders, and then ultimately decides whether to proceed or not. Locating the large facilities senior official in the Director's office would solidify that position's role in establishing cross-agency standards and policies as relate to large facilities and other major research infrastructure. It would also provide for improved consistency regarding technical and administrative review and approval processes.

> *Finding*: *The issue of a Senior Official and the NAPA Panel's call for a Large Facilities FACA are tightly linked. The Subcommittee sees value in the Office of the Director having a clearly articulated responsibility with respect to facilities and research infrastructure, which may include more than the MREFC budget account.*

Recommendation 5.1: The Subcommittee believes that there should be a clearly-designated senior official in the Office of the Director with direct visibility into and accountability for the Foundation's facilities and research infrastructure – which would encompass significant projects in the directorates as well as in the MREFC account. This official would serve a role analogous to the Acquisition Executive role in DOE and NASA.

[12] The Subcommittee notes the passage of P.L. 116-264, the Program Management Improvement Accountability Act, which calls on each agency to designate a senior executive of the agency as the Program Management Improvement Officer, whose role is to support continuous improvement in program and project management.

The Subcommittee also believes that it is important to avoid the creation of a separate position to serve in this role, as the Subcommittee believes that would dilute the authority and accountability of the Director and Deputy Director, as well as create ambiguity between the senior official role and the LFO head. The Subcommittee therefore recommends that the Deputy Director/COO serve as this senior accountable official. The Deputy Director/COO would then have discretion to staff the role as needed – whether that be placing direct staff in the OD or leveraging the LFO head to serve that function.

VI. A New Large Facilities FACA

Background. The NAPA Panel states that a FACA committee for large research projects and other high visibility initiatives could provide the NSF Director with direct access to project and cost estimating expertise, affording an independent perspective that can help inform oversight actions. The NAPA Panel notes that the BOAC advises BFA and OIRM on issues related to oversight, integrity, and enhancement of NSF's business operations with the goal of improving agency performance. But because BOAC is chartered jointly to the Heads of BFA and OIRM, NAPA believes the committee is not able to fulfil the envisioned role of providing the Director direct access to independent project and cost estimating expertise for reviewing research infrastructure projects.

BOAC has a history of establishing facilities-focused subcommittees. In addition to the current subcommittee, the 2011 *ad hoc* Subcommittee on Funding and Governance of Future Major Multi-user Facilities and the 2012 Subcommittee on Recompetition of Major Research Facilities carried out studies that have informed oversight actions.[13]

The 2015 NSB Policy Statement on Recompetition of Major Facilities[14] acknowledges that the Board was strongly influenced by the January 2012 BOAC Subcommittee on Recompetition of Major Research Facilities. In that policy statement, the Board "affirms that merit-reviewed competition must remain the foundation for the NSF's grant/award making process, but is concerned that imposing a recompetition for the management of a major facility at every renewal, typically at five-year intervals, could be damaging to the best interests of U.S. science and technology." The Recompetition Subcommittee's recommendations that NSF adopt a statement of goals and principles guiding the recompetition of major research facilities and that the NSF adopt uniform definitions for the terms "recompetition" and "renewal" across NSF programs are reflected in §2.5.2 and §3.5.2 of the 2015 LFM.

Analysis. For individual large-scale infrastructure projects, an appropriately empowered LFO will provide as called for in recommendation 3.5 the Director with direct access to independent project and cost estimating expertise. Section 5.4 of the November 2016 draft LFM, which states that guidelines for planning and executing external reviews of NSF's large facilities are under development, signals that NSF is moving in this direction. Language was added indicating that [1] the reports and recommendations from external reviews are made directly to NSF and [2] NSF evaluates the review panel input, determines the appropriate response, and issues written guidance to award recipients for any subsequent response and action.

The Subcommittee does concur with the NAPA Panel's view that the NSF Director requires an independent perspective as to whether the LFO and program officers are identifying and tasking the required independent project and cost estimating expertise with sufficient rigor. Here, NSF's Committee of Visitors process is an appropriate existing model. NSF uses Committees of Visitors to periodically assess the quality of its program management activities related to the reviewing and awarding of research- or education-related grants, cooperative agreements, and contracts. A primary focus of the COVs it to examine the quality and integrity of matters pertaining to proposal decisions. In a similar fashion, BOAC

[13] Available at https://www.nsf.gov/oirm/bocomm/meetings/may_2011/Report_of_the_FGFMMF_Subcommittee_Mar_17_2011.pdf and https://www.nsf.gov/oirm/bocomm/meetings/spring_2012/Recompetition_report.pdf

[14] The National Science Board approved NSB Statement NSB-2015-45 on November 19, 2015.

subcommittees can be periodically charged to assess the quality and integrity of the LFO and Directorates risk assessment, program management and cost estimating activities as related to research infrastructure investments.

> *Finding: The Subcommittee does not believe an additional external review of individual projects by a Large Facilities FACA would improve performance. Independent project management and cost estimating reviews of individual research infrastructure projects must be designed into processes codified in the LFM.*
>
> *Finding: The Subcommittee notes that the charter of the BOAC is not in compliance with the General Services Administration's Committee Management Secretariat guidance document, Preparing Federal Advisory Committee Charters, that states the agency "identify the agency or official (by title or position) to whom the advisory committee provides its advice. Normally, this is the agency head."*[15]

Recommendation 6.1: Instead of creating a new Large Facilities FACA, NSF should utilize BOAC subcommittees as needed to periodically review the rigor of NSF's large facilities oversight processes in a manner analogous to the role a Committee of Visitors has in providing external expert assessment of the quality and integrity of program operations and program-level technical and managerial matters pertaining to proposal decisions. BOAC, like other FACA committees, has a mechanism for creating subcommittees as necessary.

Recommendation 6.2: To ensure that the NSF Director has full awareness of all such BOAC subcommittee assessments, NSF should recharter BOAC so that the NSF Director, through the BFA and OIRM Heads, becomes the official to whom the committee reports as recommended by the General Services Administration's Committee Management Secretariat guidance.

VII. Additional Considerations/Observations

In the course of its work, three issues arose where the Subcommittee identified additional opportunities for NSF to improve its internal processes for reviewing, approving and overseeing its research infrastructure investments.

MREFC Review Packages. In the Subcommittee's conversations with NSF and NSB executives and staff, the issue was raised about the staffing culture at NSF. When documentation is required for agency-wide reviews by the MREFC Panel, the NSF Director, or the NSB, the default posture is conveyance of complete documentation packages. While these levels of disclosure of detail is laudable, executives and oversight staff do not have the intimate familiarity with projects nor their documentation to catch every relevant detail. ***The Subcommittee recommends that LFM §2.3.2.6 be revised to make more explicit the responsibility of the Director's Review Board to prepare cover memos for packages advancing to the Director and NSB that focus executive attention on cost, scope and schedule risks, mitigation options analyzed, and remediation actions taken to manage those risks.***

MREFC Ranking Criteria. The United States remains atop the list of the world's R&D-performing nations, but our share of total global R&D has declined from 42% to 33% over the 1996-2013 period as research capacity has grown globally.[16] With the arrival of an era where the U.S. finds itself approaching parity with other nations in many fields of research, NSF needs to be strategic about identifying research areas where US leadership is essential, and the facilities which help to ensure that leadership. To that end, the ranking criteria included in Appendix A of the LFM correctly include the requirement for the MREFC Panel to review projects for their potential for maintaining US leadership in key science and engineering

[15] GSA Committee Management Secretariat, "Preparing Federal Advisory Committee Charters," at http://www.gsa.gov/portal/mediaId/165487/fileName/Preparing_FAC_Charters_%28F%29-110211.action.

[16] Science and Engineering Indicators 2016 (NSB-2016-1), Figure 4-8: Gross domestic expenditures on R&D, by the United States, the EU, and selected other countries: 1981–2013.

fields. However, the Subcommittee believes that NSF should be more explicit in the assessment of that particular criteria earlier in the MREFC process than it is currently. The international leadership question is a component of the LFM's Third Ranking Criteria, which does not formally enter the analysis until the NSF Director's Recommendation for Advancement to Final Design (§2.3.2.5, footnote 1, p. 2.3.2.5-1). ***The Subcommittee recommends that the international leadership question be considered as one criterion for approval to enter the Conceptual Design Phase***. Some research communities (e.g. Astronomy, High Energy Physics) conduct rigorous community-based planning efforts (e.g. the Decadal Survey for Astronomy and Astrophysics) and this could be one source for this analysis/assurance.

FACA Committees. The revised LFM requires that the originating directorate obtain an endorsement from the appropriate advisory committee prior to requesting NSB approval for inclusion of the project in a future NSF budget request to Congress.[17] Many of these high level advisory committees with a role in prioritizing discipline-wide investments and in the oversight of the performance of large facilities are not chartered comparably to those of the other agencies that build and operate large scientific facilities. According to the GSA Committee Management Secretariat, the NSF has 50 registered FACA committees.[18] Excluding the 34 grant review panels, the nine FACA committees that advise the Directorates (BIO, CISE[19], EHR, ENG, GEO, MPS and SBE) or the Office of International Science & Engineering are chartered at the Associate Director or Office Head level. Comparable FACA committees in DOE's Office of Science or at NASA are chartered to an official appointed by the President needing Senate confirmation (PAS).[20]

There are three additional advisory committees that are jointly chartered by NSF, DOE and NASA or by NSF and DOE. The Astronomy and Astrophysics Advisory Committee is chartered to the NSF Director, the NASA Administrator, and the Secretary of Energy. Two additional FACA committees that have significant roles in the prioritization of large scientific facility investments, the High Energy Physics Advisory Panel and Nuclear Sciences Advisory Committee, are jointly chartered to the Director of DOE's Office of Science and the AD for MPS. The Director of Office of Science, however, is a PAS appointment, so the chartering officials are not of a comparable level of authority and accountability in the two agencies.

Consistent with recommendation 6.2 that NSF recharter BOAC so that the NSF Director be the official to whom the committee reports in compliance with the General Services Administration's Committee Management Secretariat guidance, the Subcommittee recommends that NSF consider rechartering the advisory committees reporting to the Associate Directors as well as the two joint NSF/DOE FACAs. This will help ensure greater visibility of the NSF Director and Deputy Director, the agency's two PAS officials, into the operations of these FACA committees that are assigned critical roles in the evaluation and endorsement of research infrastructure projects by the LFM.

VIII. Conclusion

In response the NAPA report, NSF has focused much of its attention on improving business practices and oversight for research infrastructure investments in the design and construction stages. Given the large financial investment in the construction of facilities and the associated risks, as well as the high visibility of research infrastructure projects in the scientific community, the Executive Branch, and Congress, improving risk management for research infrastructure investments in these stages of the facility life cycle

[17] LFM, §2.1.6.2, duties assigned to the AD (or Office Head) of the Originating Organization.

[18] GSA Committee Management Secretariat, FACA Database Downloadable Datasets, "FACA Data collected and verified for FYs 1997-2015," at http://www.facadatabase.gov/datasets/.

[19] Both the Advisory Committee for Computer and Information Science and Engineering and the Advisory Committee for Cyberinfrastructure report to the AD for CISE.

[20] In DOE's Office of Science, these are the Advanced Scientific Computing, Basic Energy Sciences, Biological & Environmental Research, and Fusion Energy Science Advisory Committees. At NASA, this is the NASA Advisory Council.

has been the first-priority. NSF has strengthened its methodology for contingency estimating and analysis, as well as the management of project contingency funds. Further, the NSF has been actively clarifying the roles and responsibilities of NSF staff and offices, as well as the NSB, to improve management oversight. The recently updated LFM reflects this maturation and is a significant step forward, providing a strong policy and framework for the management and oversight of large research infrastructure construction projects, and if followed carefully and fully implemented, will significantly reduce NSF exposure to risks associated with these investments. The NSF efforts in strengthening oversight of large-scale infrastructure construction projects are laudatory.

The recommendations of this Subcommittee are motivated by an understanding that large-scale research infrastructure projects require routine oversight throughout their full life cycle, and that a stable, transparently applied, enterprise-wide framework for risk monitoring, independent of the budget account funding any given project, is necessary from conception to de-commissioning and divestment. The Subcommittee believes that a key component of this enterprise risk management involves not only monitoring facilities in construction, but also monitoring the health of operating facilities, as well as carefully analyzing the risks inherent in new, one of a kind research facilities *at the earliest stages of conception*.

Appendix A

Charge from the Business and Operations Advisory Committee to the Subcommittee on NAPA Implementation

Dated August 3, 2016

The National Science Foundation (NSF) hereby initiates the formation and operation of an ad hoc Subcommittee of the NSF Business and Operations and Advisory Committee (the Committee) on NAPA Implementation (the Subcommittee). The purpose of the Subcommittee is to issue a report to the Committee with recommended ideas for NSF for implementing a subset of National Academy of Public Administration (the Academy) recommendations related to NSF-wide oversight of large-scale research facilities in the report *National Science Foundation: Use of Cooperative Agreements to Support Large Scale Investment in Research.*

Context

The NSF Director and the National Science Board (NSB) requested that the National Academy of Public Administration review NSF's use of cooperative agreements (CAs) to support the development, construction, commissioning, and future operations of state-of-the-art, large-scale research facilities. Specifically, the Academy was asked to:

- Address how CAs are currently used at NSF, examining the effectiveness of NSF's current CA policy;
- Compare the CA mechanism with other federal funding mechanisms;
- Ascertain how comparator scientific agencies manage similarly large, complex research facilities projects; and
- Identify potential improvements to the NSF's processes that support large-scale research facilities.

NSF seeks to ensure effective implementation of a subset of the NAPA recommendations in a manner that provides the greatest benefit to the scientific community served by the NSF while ensuring exemplary stewardship of taxpayer resources. In order to ensure this effective implementation, NSF must be fully informed of the best oversight practices of other agencies and organizations that sponsor, oversee, or manage large-scale research facilities.

Charge to the Subcommittee

Because of the topical nature of the subject matter of the advice requested, the Committee hereby charges the Subcommittee to prepare a report for the Committee to advise NSF on the following areas, and to identify and advise the Committee, and ultimately NSF, on other important topics that the Subcommittee deems relevant. The Committee will then be prepared to provide advice to NSF to support the Foundation's goal to be comprehensively informed and equipped to implement the NAPA recommendations in an expert fashion. **Specifically, the Subcommittee should provide options for appropriate agency-wide oversight** for the NSF Office of the Director (OD). In developing options, the Subcommittee should consider the following:

- Re-scope of the role, duties, and membership of the Major Research Equipment and Facilities Construction (MREFC) Panel to include status update reviews of projects in the development and construction phases focusing on cost, schedule, and performance. [Recommendation 6.2].
- Evaluate the potential value in extending the MREFC Panel's role to operating facilities, including divestment (i.e. full life-cycle).
- Evaluate the potential value in creating an internal agency "senior official" position in OD charged with reporting to the Director and Deputy Director/Chief Operating Officer (COO) on large facilities;

- Evaluate the potential value in creating a new Federal Advisory Committee Act (FACA) committee to provide the NSF Director with a sounding board for objective insight on large research projects. [Recommendation 6.4]

To carry out this charge, the Committee requests the Subcommittee meet with:

- NSF OD, Directorate, and Office leadership and staff;
- NSB Members, Office leadership and staff;
- NSF's Inspector General
- Representatives from other agencies with analogous facilities, to benefit from experience at those agencies.

The Subcommittee may collaborate with the Committee if the Subcommittee deems it necessary to do so.

Subcommittee Membership: The Committee's Designated Federal Officials (the Heads of the NSF Office of Information and Resource Management and Budget, Finance and Award Management) shall initiate a list of approximately 8 individuals for Subcommittee membership, including at least one Committee member who shall serve as the liaison to the Committee. Final membership shall be approved by NSF with collaboration and advice from the Committee.

Additional Background: *Attach material such as the NAPA implementation chart, any draft guidance, proposed options, detailed questions to the Subcommittee, etc*.

Activities of the Subcommittee: The Subcommittee is requested to provide a written report to the Committee recommending NSF actions on a priority basis established by NSF so that implementation can take place incrementally, if possible. The Committee requests an update on Subcommittee activities at 3 month intervals and a final report by April 1, 2017.

NSF will organize and convene at least one in-person meeting at NSF, comprised of the Subcommittee, NSF staff cognizant of the projects and issues concerning the Subcommittee, and with the individuals mentioned above necessary to carry out this charge. Additional in-person meetings will be considered depending on need and budgetary resources.

NSF will provide logistical and travel support for invited non-local participants. Participants will be invited to submit written materials to the Subcommittee for reference in their report preparation.

The Subcommittee may organize additional meetings by conference call or other virtual technology as it deems necessary to do so.

The Subcommittee chair will submit its written report to the Committee and provide a verbal presentation at a duly organized Committee meeting subsequent to submittal to NSF. The Subcommittee liaison to the Committee will facilitate this presentation, and will ensure that the report is discussed and deliberated at the meeting. The Committee will accept the report and make it publicly available. The Committee may also provide feedback to NSF and any additional comments it has to offer on the report by way of a cover letter to NSF.

On or before the meeting where the Subcommittee's written report is discussed, the Committee's Designated Federal Officials may extend the Subcommittee's charge and activities as deemed necessary by NSF; otherwise, the Subcommittee will terminate upon completion of the activities set forth in the charge.

Appendix B
Membership of the Subcommittee on NAPA Implementation

Dr. Michael J. Holland (Subcommittee Chair, BOAC member) – Executive Director, Center for Urban Science & Progress, New York University, Brooklyn NY.

Dr. J. Patrick Looney – Chair, Sustainable Energy Technologies Department, Brookhaven National Laboratory, Upton NY.

Dr. Kevin B. Marvel – Executive Officer, American Astronomical Society, Washington DC.

Ms. Kathryn S. Schmoll (former BOAC member) – Independent Consultant

Dr. Richard P. Seligman (former BOAC Co-Chair) – Associate Vice President for Research Administration, California Institute of Technology, Pasadena CA.

Ms. Stephanie A. Short (BOAC member) – Associate Deputy Director for Field Operations, Office of Science, U.S. Department of Energy, Washington DC.

Dr. Dan C. Stanzione, Jr. – Executive Director, Texas Advanced Computing Center, The University of Texas at Austin, Austin TX.

Dr. John C. Tao (BOAC member) – President, O-Innovation Advisors LLC, Allentown PA.

Dr. David Trinkle (former BOAC member) – Director, Berkeley Research Development Office, University of California, Berkeley CA.

Dr. Joseph A. Whittaker – Dean, School of Computer, Mathematical & Natural Sciences, Morgan State University, Baltimore MD.