

Division of Engineering Education and Centers (EEC) Response to the 2020 Committee of Visitors (COV) Report

Introduction

The Committee of Visitors (COV) met September 22-23, 2020 to review programs in the Division of Engineering Education and Centers (EEC) in the Directorate for Engineering (ENG). The COV covered EEC operations for fiscal years (FYs) 2016, 2017, 2018, and 2019. The Committee was co-chaired by Drs. Darryll Pines and Lance Perez.

EEC wishes to thank the members of the 2020 EEC COV for their time and effort in carefully reviewing the activities of the Division. EEC is especially grateful to Co-Chairs Darryll Pines and Lance Perez for their leadership during the COV process. The final report consists of a thorough review with many clear and actionable recommendations.

The COV evaluated 175 randomly selected proposal actions spanning the fiscal years mentioned above. The COV report addressed five topic areas: I. Merit Review Process; II. Selection of Reviewers; III. Management of the Program; IV. Portfolio of Awards; and V. Other Topics. Our response to each of these areas is listed below.

I. Merit Review Process

1. *Recommendation/Observation: Provide more training/tools/guidance for reviewers. Reviewers may not be familiar with division or directorate specifics or the merit review criteria in general. Defining terms such as intellectual merit and broader impacts will help focus reviewers on the key aspects of the merit review criteria. [I.2, I.3]*

Response: Program Directors provide reviewers with training tools prior to the start of their panel so that they are appropriately prepared to complete their individual reviews. These training tools include information regarding confidentiality, an overview of the program and its goals, the standard NSF review criteria (including definitions of intellectual merit and broader impacts), and any program specific review criteria. Intellectual merit and broader impacts are terms defined in our solicitations (located under section VI. NSF Proposal Processing and Review Procedures, A. Merit Review Principles and Criteria, 2. Merit Review Criteria). The solicitation states that "...reviewers will be asked to evaluate all proposals against two criteria:

- Intellectual Merit: The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- Broader Impacts: The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

- 2. Recommendation/Observation: Currently, there is considerable variation in the format of the Program Officer review analyses. This often leaves the rationale for proposal award/decline decisions to be vague. Providing this information to PIs, especially for declines, in a more standardized and explicit manner will increase future success for these PIs. [I.4, I.5, I.6]*

Response: The EEC Division will continue to work to provide as much insight as possible to the PIs. Program Officers utilize RoboRA as a templating tool in order to construct their review analyses.

The EEC Division will continue to provide worthy insight in the form of PO comments that supplement reviewers' comments with Program Officer's perspectives.

- 3. Recommendation/Observation: Collaborative proposals should have information documented in all jackets involved. [I.6]*

Response: EEC will work to ensure that all of the jackets associated with a collaborative submission have the full set of documentation.

II. Selection of Reviewers

- 1. Recommendation/Observation: The division should continue to increase diversity of reviewers and gather additional information to ensure the population is diverse. [II.1]*

Response: Some PDs collect info using surveymonkey, PRIM, etc. – currently NSF is in the process of switching from PRIM to myNSF to collect reviewer information which will be shared with future COVs.

- 2. Recommendation/Observation: Collect and provide more data on disciplinary expertise of reviewers. [II.1]*

Response: Currently, NSF uses various methods to collect these data and it is dependent on the preferences of the Program Officer. One way is through surveys sent out to reviewers in which they return self-reported data back to the Program Officer. Another way is through the use of PRIM. This system allows prospective reviewers to select multiple areas of expertise after which the Program Officer can refine the areas aligning with the the specific program or division. PRIM however is only used for determining which reviewers may be best suited for a given panel. Since the information received from PRIM is not linked to the NSF reviewer data, we cannot use this system to determine which reviewers actually served on a panel. The PRIM system is in the process of being replaced by a reviewer availability tool in MyNSF. The MyNSF system is not completed, so it cannot be used to the full capacity that it is

intended for currently. Below is a screenshot of the information that we are able to get from the system once we are able to transition to that tool completely.

Suggested Reviewer Name	Suggested Reviewer ID	Suggested Reviewer Email	Suggested Reviewer Institution	Project Role	Race	Ethnicity	Gender	COI	COI Details	Upcoming Panel	Assigned Panelist	Last Panel Served Date	Last Review Submitted Date	Similar Proposal Reviewed Count	
				PI/Co-PI	White	Hispanic or Latino	Male	Y	Project Description Project Summary Proposal PI/Co-PI Institution Proposal PI/Co-PI Name		N			3	
				PI/Co-PI	Unknown	Do not wish to provide	Male	Y	Project Description Project Summary Proposal PI/Co-PI Institution Proposal PI/Co-PI Name		N				3
				Reviewer	White	Not Hispanic or Latino	Female	N			N	10/07/2019	09/13/2019	3	

3. *Recommendation/Observation: Consistently identify COIs and how these were handled during panels. [II.2]*

Response: During the reviewer selection process Program Officers will collect institution data to help determine if potential reviewers will be conflicted with the proposals to be reviewed. Program Officers then determine which potential reviewers are best suited based on their expertise as well as who are the least conflicted for the panel. Prior to the panel, COI forms are collected from each reviewer to ensure that they are not conflicted with the award they are reviewing for. Program Officers will also ask the reviewers to provide any individual conflicts that they may have so that they can appropriately assign non-conflicted proposals to the reviewers. During the panel, if a reviewer is conflicted with a proposal, they will be asked to step out of the room into the hallway for the duration of the discussion. In the current virtual setting, reviewers are assigned to a breakout room where they will stay for the duration of the discussion of the conflicted proposal. During the ranking of the proposals in the “Fund” category, reviewers with a conflict will be asked to leave for the discussion of where the conflicted proposal should be ranked and return to continue with rankings of all other proposals they are not conflicted with.

4. *Recommendation/Observation: Diversity across the reviewer population could be improved. Reviewer data should include other genders. Virtual meetings would assist in expanding the geographic distribution of reviewers. Additionally, more reviewers from industry should be sought out. [II.3]*

Response: Reviewer demographic data are collected as self-reported data. We encourage reviewers to give as much information as possible, however if they do not

wish to provide the information, we cannot obtain it any other way. We will continue to look for ways to improve our ability to acquire this self-reported data.

III. Management of the Program

1. *Recommendation/Observation: NSF should look at workload across programs and program directors. [III.1]*

Response: This is done consistently throughout the year. EEC recognizes that workload differences result from increased proposal pressure and new initiatives. Due to an increase in a combination of ERC activities and EEC's overall effort to better understand and develop future portfolio strategies for each of the division's clusters, we have hired three additional team members since the COV (an ERC PD, a Program Specialist and a Science Analyst) and are currently recruiting another ERC PD (expected to be completed by May 2021). We have also regularly engaged EEC team members across the division to help support review panels and help the PDs in preparing and organizing jacket documentation.

2. *Recommendation/Observation: There is little to no documentation of the higher level (DD/DDD and higher) decisions toward a proposal or cluster. There is also no documentation for what happens after the decision has been made for the proposal. [III.1]*

Response: After panels are conducted, Program Directors will meet with the DD and DDD to discuss the likely awards that they can support. In this discussion, proposal ideas, portfolio balance, demographics, etc. are taken into account.

3. *Recommendation/Observation: The COV felt it would have been helpful to be provided with NSF's strategic plan for new programs, re-evaluating current programs, and/or investigating emerging areas. They also would have appreciated the process for how changes are made and instituted. [III.2]*

Response: Unfortunately, strategic plans that consist of future information are considered sensitive and we are limited in our ability to share them with the COV. In order to evaluate current programs, we will fund external evaluators. One example of such an evaluation was when we funded the National Academy of Engineering (NAE) to complete a study to evaluate the effectiveness of engineering research centers. This study helped to guide the division to the key changes that developed the new generation of engineering research centers (Gen-4). Similar activities were conducted for the Revolutionizing Engineering Departments (RED) program and will be conducted for the Broadening Participation (BP) program.

IV. Resulting Portfolio of Awards

1. *Recommendation/Observation: There seems to be an imbalance in the funding for each of the clusters. Centers and Networks appear to have substantially more funding than the rest of the clusters. [IV.1]*

Response: The budgets for each of the four programs in the Engineering Education and Centers Division are determined based on the amount it will need to support each of the program's awards. For example, the Engineering Research Centers (ERC) program allocation is based on the budget required to support an ERC. Since the budget varies in this way, the budget for the programs varies proportionately (for example an ERC versus an REU site).

2. *Recommendation/Observation: There is concern about the decreasing award size and duration in Broadening Participation and Workforce Development clusters. [IV.2]*

Response: The two main programs within the Workforce Development cluster are the REU and RET programs. These programs received significant co-funding from the DoD, which made up most of the award budget. This co-funding would have resulted in the illusion that funding decreased for these programs, when in reality funding increased due to the help of the co-funding from the DoD.

3. *Recommendation/Observation: Increased CAREER proposal development workshops will develop more competitive CAREER proposals and increase funding amounts of those awards. [IV.2]*

Response: Funding over the years has decreased, but this is largely due to the decrease in the amount of proposals that we receive for this solicitation. EEC has looked at the number of awards versus the number of submissions for each of the fiscal years in the COV period. We noticed that submissions dropped dramatically in 2017, however the success rate of this program still increased.

4. *Recommendation/Observation: Define what is potentially transformative. Projects do not have to be novel or innovative to be potentially transformative. [IV.3]*

Response: NSF defines transformative research as follows: "Transformative research involves ideas, discoveries, or tools that radically change our understanding of an important existing scientific or engineering concept or educational practice or leads to the creation of a new paradigm or field of science, engineering, or education. Such research challenges our current understanding or provides pathways to new frontiers." This definition, which is available to the public on www.nsf.gov, has been developed from the National Science Board's 2007 report "Enhancing Support of

Transformative Research at the National Science Foundation” and is the definition that NSF has adopted for transformative research.

5. *Recommendation/Observation: Increase outreach to encourage more diverse institutions to collaborate with PhD granting institutions to increase their representation within the program portfolio. [IV.6]*

Response: We conduct outreach in a variety of ways and continue to seek opportunities to improve. Some examples of our efforts include outreach with the Innovation Engineering Consortium (IEC) which consists of 15 HBCUs, and asking them to help stimulate activity with NSF. Program Officers have worked on outreach at conferences they have attended such as SHPE, NSBE, AISES, SWE, etc. They also collaborate with EHR to do outreach related to the HBCU-EiR program, consisting of webinars and other similar events. QEM (Quality Education for Minorities) has been awarded funding from EEC which has resulted in dozens of faculty and their institutions (HBCUs, MSIs, HSIs, tribal colleges, etc.) to learn more about NSF and the proposal process with Program Officers from across ENG. Recently, QEM has also provided a virtual workshop in an effort to increase EEC’s connection and outreach to MSIs.

6. *Recommendation/Observation: The COV was disappointed in the decreased underrepresented racial minority and women involvement during the COV period. [IV.9]*

Response: The observed decrease in underrepresented racial minority (URM) and women involvement during the COV period has been attributed to the overall decrease in proposal submission that EEC has seen due to the start of no-deadline solicitations in 2018. Although this event has caused an initial decrease in proposal submissions, we have seen an increase in the success rate of proposals with underrepresented racial minority and women involvement.

7. *Recommendation/Observation: Consider REU and RET PI involvement. Allowing multiple investigators will help with disparities in the senior personnel that are often underrepresented groups and women. [IV.9]*

Response: The role of the PI/Co-PI is a major directorial/managerial role. For REU, it is difficult to justify needing more than 2 people (PI and Co-PI) in order to oversee and manage the site. For RET, the limit is 3 Co-PIs along with the PI. The senior personnel are often individuals involved as research mentors for the students. This role is not limited and varies by site. These individuals can oversee the research that students are working on, but they do not participate in the activities for managing the

site itself. These individuals, that are serving as mentors to the diverse students participating in the REU site, typically represent a more diverse and underrepresented population in order to serve as role models to the participants. Additionally, NSF overall limits the number of Co-PIs to four individuals, so sites with more than 4 mentors/senior personnel (which is very common) would have to make difficult decisions around who would be considered Co-PI versus senior personnel.

8. *Recommendation/Observation: NSF should collect data to determine the impacts of studies funded with versus without minority involvement. [IV.9]*

Response: Most of the demographic data that we collect is self-reported. We try our best to encourage participation in providing this information so that we can make the assessments suggested. The ERC program does a great job in providing data regarding this comment. The end of year (EOY) data that are collected by ERCs and reported to NSF (e.g., the 2019 EOY data which was provided to the ERC COV subcommittee) include student successes (where they end up after graduation), minority involvement, women involvement, and involvement of persons with disabilities over the course of the ERC. They also provide similar information for the personnel within the ERC.

V. Other Topics

1. *Recommendation/Observation: The ERC proposal process could benefit from being condensed. Additionally, thematic priority area for planning grants may be helpful. [V.1]*

Response: We will take this recommendation under advisement. Unfortunately, the competition has multiple steps to the review process and we need to conduct these activities in concert with the fiscal year and the academic calendars.

2. *Recommendation/Observation: Implement RETs more broadly within NSF. [V.1]*

Response: Although not part of the period that was under review for this COV, we are happy to report that all 5 engineering divisions are now participating in this program.

3. *Recommendation/Observation: Carefully review the REU and RET programs. [V.1]*

Response: We plan on conducting a program assessment for these programs before the next COV.

4. *Recommendation/Observation: Increase cross over research between other directorates and engineering education. [V.1]*

Response: SBE has been helping to inform work in Team Science and was engaged in

the planning grant development workshops for the ERC program. Additionally, RED is co-funded by EHR and ENG. Many other programs receive co-funding from other directorates. EEC also receives co-funding from other government agencies which would not appear in the co-funding data that we provided to the COV. As an example, the REU program received significant funding from the DoD in 2018 and 2019.

5. *Recommendation/Observation: Encourage proposals involved in curricular changes in engineering, especially at the graduate level. [V.1]*

Response: We will take this recommendation under advisement. We plan on exploring the potential for conducting workshops in this topic area.