CORE QUESTIONS and REPORT TEMPLATE
for
FY 2016 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to NSF Staff: This document includes the FY 2016 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2016. Specific guidance for NSF staff describing the COV review process is described in the "COV Reviews" section of NSF's Administrative Policies and Procedures which can be obtained at https://inside.nsf.gov/aboutnsf/hownsfworks/rolesresponsibilities/Pages/Committee-of-Visitors.aspx [1]
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NSF relies on the judgment of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. Committee of Visitor (COV) reviews provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations; and (2) program-level technical and managerial matters pertaining to proposal decisions.

The program(s) under review may include several sub-activities as well as NSF-wide activities. The directorate or division may instruct the COV to provide answers addressing a cluster or group of programs – a portfolio of activities integrated as a whole – or to provide answers specific to the sub-activities of the program, with the latter requiring more time but providing more detailed information.

The Division or Directorate may choose to add questions relevant to the activities under review. Copies of the report template and the charge to the COV should be provided to OIA prior to forwarding to the COV. NSF staff should work with the COV members in advance of the meeting to provide them with the report template, organized background materials, and to identify questions/goals that apply to the program(s) under review.

Suggested sources of information for COVs to consider are provided for each item. As indicated, a resource for NSF staff preparing data for COVs is the Enterprise Information System (EIS) –Web COV module, which can be accessed by NSF staff only at http://budg-eis-01/eisportal/default.aspx. In addition, NSF staff preparing for the COV should consider other sources of information, as appropriate for the programs under review.

For programs using section IV (addressing portfolio balance), the program should provide the COV with a statement of the program's portfolio goals and ask specific questions about the program under review. Some suggestions regarding portfolio dimensions are given on the template. These suggestions will not be appropriate for all programs.

Guidance to the COV: The COV report should provide a balanced assessment of NSF's performance in the integrity and efficiency of the ***processes*** related to proposal review. Discussions leading to answers of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. ***COV reports should not contain confidential material or specific information about declined proposals.*** The reports generated by COVs are made available to the public.

We encourage COV members to provide comments to NSF on how to improve in all areas, as well as suggestions for the COV process, format, and questions. For past COV reports, please see http://www.nsf.gov/od/oia/activities/cov/.

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[1] This document has three parts: (1) Policy, (2) Procedures, and (3) Roles & Responsibilities.

FY 2016 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

The table below should be completed by program staff.

Date of COV: July 19-20, 2016
Program/Cluster/Section: All
Division: Engineering Education and Centers (EEC)
Directorate: Engineering
Number of actions reviewed: 175 **Awards:**   79 awards (AWD) **Declinations:**   73 full proposal declines (DECL) **Other:**   15 Return Without Review (RTNR) proposals, 3 invited pre-proposals (INVT), and 5 not invited pre-proposals (NIVT)
Total number of actions within Program/Cluster/Division during period under review: 2136   **Awards:**   593 AWDs   **Declinations:**   1324 DECLs **Other:**   36 RTNR, 15 INVT, 162 NIVT, and 6 withdrawn proposals (WTH)
Manner in which reviewed actions were selected: Stratified Random Sample Jackets were randomly selected to include the desired distribution of awards, declinations, and returned without review proposals within each program within each cluster across the three fiscal years under review. The Centers subcommittee also received invited (INVT) and not invited (NIVT) pre-proposals. Each COV member in the Workforce Development/Broadening Participation in Engineering (WD/BPE) and Engineering Education subcommittees received 15 jackets and each COV member in the Centers subcommittee received 5 jackets due to the size and nature of Centers proposals versus other proposals. The total number of jackets reviewed was 175, 8.2%, of 2136 actions in FY 2013-FY 2015. The number of proposals for each program was chosen to best reflect the overall portfolio while ensuring that the COV received proposals from across all programs. The tables below show the number of proposals assigned to COV members for each of the programs in each cluster.

WD/BPE			
Program	AWD	DECL	RTNR
BP	2	2	1*
BRIGE	1	1	
RET	1	1	
REU	3	3	

Eng Ed			
Program	AWD	DECL	RTNR
CAREER	1	1	
General Eng Ed	1	1	
NUE	1	1	1*
RIEF	1	1	
RED	1	1	
RFE	2	2	

*Due to the small overall number of RTNRs, the RTNRs from all programs within a subcommittee were combined and each COV member received 1, resulting in a variety of programs represented across a subcommittees sample of RTNRs.

Centers	
AWD ERC or ERC-related full proposal	2
DECL ERC or ERC-related full proposal or INVT ERC pre-proposal (not AWD)	1
NIVT ERC pre-proposal	1
RTNR ERC or ERC-related full proposal	1

COV Membership

	Name	Affiliation
COV Co-Chairs:	Deba Dutta Galip Ulsoy	Purdue University and NSF ENG Advisory Committee Representative University of Michigan, Ann Arbor
COV Members:	Oscar Barton	George Mason University
	Julie Chen	University of Massachusetts, Lowell
	Santosh Devasia	University of Washington
	Bonnie H Ferri	Georgia Institute of Technology
	Gary Gabriele	Villanova University
	Olivia Graeve	University of California, San Diego
	Clas Jacobson	United Technologies
	Javier A Kypuros	University of Texas - Pan American
	Dimitris C Lagoudas	Texas A&M University
	David McLaughlin	University of Massachusetts, Amherst
	Devdas Pai	North Carolina A&T
	Lance C. Pérez	University of Nebraska - Lincoln
	Mary L Realff	Georgia Institute of Technology
	Karen Thole	Penn State University
	Gregory Washington	University of California, Irvine

**INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES
AND MANAGEMENT**

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, and withdrawals) that were *completed within the past three fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? **Comments:** The consensus of the committee is that the vast majority of proposals were reviewed by appropriate methods. For the Engineering Education and WD/BPE proposals, most proposals were reviewed by a panel. The supplements, workshops, and EAGER proposals were reviewed using an ad-hoc process involving one or more program directors or external reviewers. Proposals found to be non-compliant to the solicitation were appropriately Returned without Review. The majority of proposals were in response to specific program announcements and were reviewed by panels. For other awards, such as supplements and workshops, the proposals were either reviewed by program managers, or in some cases, one or more outside reviews were solicited. It appears that in the very few cases where proposals were not given a panel review or review by program managers, appropriate circumstances, e.g. non-conformance with proposal guidelines, were noted in the jacket by the program manager. It is important to note that the issues with the review of BPE proposals noted in the 2013 COV report appear to have been corrected and no issues were noted by this COV. As part of the ERC competition, an ad hoc review and panel review are conducted for pre-proposals. The invited full proposals were then subject to ad hoc review, site visit recommendation panel review; a pre-award site visit, Blue Ribbon Panel review, and NSF PD review. The reviewers represented the	YES

National Academies, national laboratories, foundations, academic institutions, industry and state and federal agencies. SECO (Small business ERC Collaboration Opportunity) proposals also received panel reviews.	

2. Are both merit review criteria addressed
 	
    a) **In individual reviews?**
    b) **In panel summaries?**
    c) **In Program Officer review analyses?**
 	
Comments:
With regards to Engineering Education proposal reviews, the two criteria are consistently addressed in the panel summaries and review analysis. While most individual reviews address each criteria separately, a few present the review in a consolidated manner without explicitly separating the Intellectual Merit from the Broader Impact.
 	
There is considerable variability in the quality of the individual written reviews both in terms of the assessment and in the understanding of the merit review criteria (i.e., Intellectual Merit and Broader Impact). Broader Impact is sometimes narrowly interpreted as only meaning broadening participation.
 	
The panel summaries were, in general, strong, comprehensive and more consistent in substantively addressing both merit review criteria. This is not surprising and is in fact a natural outcome and strength of the panel review process.
 	
With regards to Workforce Development and Broadening Participation in Engineering proposal reviews, in general, the intellectual merit of the proposal seemed to receive more attention by the individual reviewers participating in panel reviews than did the broader impacts merit criteria. It is noted, however, that the panel summaries provided more specificity for both criteria, perhaps reflecting a richer discussion of these criteria than that addressed by each individual review. In general, panel summaries provided a more complete assessment and evaluation for both criteria.
 	
Overall, the committee was impressed with the Program Officer review analyses. These provided excellent reviews of the program demographics, the panel results, specifics on how well the proposal addressed the two merit criteria, and excellent rationales for awards or declinations.
 	
Regarding Engineering Research Centers proposal reviews, the reviews consistently addressed both merit criteria. In many cases, the reviews were very thorough for both Intellectual Merit and Broader Impact. This is especially true of the Program Officer's review analysis.
	YES

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?	YES

Comments:

In general, the reviewer comments are comprehensive and substantive providing a summary of the strengths and weaknesses of the proposals. In some panel reviews, five review elements were addressed within the individual reviews, which were addressed by the individual reviewers with only a few exceptions. In many cases, intellectual merit tends to receive more attention from the reviewer than broader impacts, but both criteria were always addressed in the panel summary (not all individual reviewers provided summary statements).

The reviews of projects that were recommended for funding did not contain extensive feedback. Also, there is a tendency to provide more feedback to the proposals in the "fund if possible" category than those in the "do not fund" category. It is appropriate that proposals not recommended should receive additional constructive feedback, but some reviews were very terse and did not provide substantive feedback. Particularly, for proposals on the fence (i.e., recommended but not highly recommended) an effort must be made to include substantive comments. Even those highly recommended may benefit from substantive feedback. While most individual reviews were found to be sufficiently thorough, some could provide more detail.

For the ERC proposal reviews, save for a minority of the proposals which had very brief reviewer comments, the majority received thorough reviews, typically from seven reviewers. Comments were very clear and substantive in terms of strengths and weaknesses, including specific technical questions and overarching questions. The level of detail did vary somewhat depending on the type of proposal. For example, the comments were not extensive but the key points were clear for a pre-proposal that was not invited for full proposal submission.

4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?	YES

Comments:
Most panel summaries were well done and sufficiently comprehensive to provide both the PI and the program officer with a narrative that documents the main strengths and weaknesses of the proposal as identified by the panel. They reflected the panel's discussion of the proposal and the majority of the panel summaries documented the fact that all panel members had endorsed the strengths and shortcomings of the proposal in light of the review criteria. The panel summaries tended to provide a more comprehensive and more complete summary of the panel's assessment than did the individual reviews. While most panel-reviewed proposals were seen by a single panel, ERC proposals were reviewed by a succession of three panels, including a pre-proposal panel, a site visit recommendation panel, and a Blue Ribbon award recommendation panel.

5. Does the documentation in the jacket provide the rationale for the award/decline decision? [Note: Documentation in the jacket usually includes a context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.] **Comments:** Engineering Education and Workforce Development/Broadening Participation in Eng (WD/BPE): The consensus of the committee is that the documentation found in the vast majority of the proposal eJackets was complete and helpful in determining the justification for the award/decline decision. In particular, the review analysis and the context statement provided by the program officer provided the most complete data on the decision rationale. Additional information, such as diary notes and correspondence with the PI were also available in many cases and provided additional insights and evidence for the decision to the COV. The COV review identified a few cases where individual reviews were lacking detail, however, the other reviewers did provide adequate comments to compensate. Since there were more reviews than required, this was not seen as a situation needing to be addressed. For supplements, the review analysis provided the rationale for the funding decision. Centers: For Center proposals, the review process included decisions to invite proposers to submit a full proposal. The documentation provided and reviewed by the COV supported the rationale for the "invite" decision for full proposals. The documents included the review analysis and the context statements. The context statement provided information about how many letters of intent, pre-proposal and full proposals were received. For the full proposal decisions, the review analysis documents provided the rationale for the funding decisions. For supplements, the review analysis provided the rationale for the funding decision.	YES

6. Does the documentation to the PI provide the rationale for the award/decline decision? [Note: Documentation to PI usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), and, if not otherwise provided in the panel summary, an explanation from the program officer (written in the PO Comments field or emailed with a copy in the jacket, or telephoned with a diary note in the jacket) of the basis for a declination.] **Comments:** WD/BPE: The panel summary, individual panelist reviews and panel summaries were shared with the PI to provide the rationale for the award/decline decision. Additionally, some eJackets also contained diary notes (not shared with the PI) that the COV found helpful understanding further explained the rationale for the decision. Engineering Education: Much more detail is provided for those who are declined, which is both expected and reasonable. In general, PIs are given sufficient feedback about the rationale for the decision to award or decline their proposal. For funded proposals, less feedback is given in the review analysis, however, the document is sufficient for supporting the decision. In some cases, it was not clear what documentation was provided to the PI. This was the case for some supplements and EAGER proposals. Centers: Individual reviews, panel summaries and site-visit reports provide the rationale for funding decisions. The COV also had access to the context statements and PD's Review Analyses, which are not shared with the PI except maybe in direct correspondence between the PD and PI and/or any debrief over the phone or in person. This is appropriate, given the size and scope of the program.	YES
7. Additional comments on the quality and effectiveness of the program's use of merit review process: For the Engineering Education proposals, the Committee found that the criteria are applied consistently, but the reviews are seemingly more rigorous for RFE than for RIEF. This may be due to the nature of the program, and does not appear to be a consequence of factors such as the makeup of the review panel or application of the merit review criteria. For the WD/BPE programs, the Committee felt that the quality of the review process is very good and effective use is being made of the process to make appropriate awards. As noted above, individual reviews tend to provide less feedback on the broader impacts criteria but this is usually sufficiently covered in the panel summary. In general, strengths and weaknesses are provided back to the PI that should guide those that were declined with a starting point to discuss their proposal with the PO for a future submission.	

The Committee felt that the ERC review process was consistent and conformed to the solicitation guidelines. Panel reviews for the pre-proposal stage were effective in that they provided a fairly consistent message on the strengths and weaknesses so that the PIs could strengthen their full proposal submission. The Context Summary and Review Analysis provide very extensive discussion of the review process and demonstrate a careful and thoughtful approach to determining which proposals would be recommended for funding.

The COV noted that in one particular proposal, a recommendation for a site visit was made by NSF PDs, the ERC Working Group, and approved by EEC management, all described in the Context Statement. Although recommended by the Blue Ribbon Panel, the proposal was ultimately declined. All this information is noted in the summary box at the top of the Review Analysis. The PD's Review Analysis provides a very comprehensive and reasonable justification for the declination recommendation for this proposal. What remains is a question about how much of this decision process is conveyed to the PI.

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question.

SELECTION OF REVIEWERS	YES , NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? **Comments:** Judging only by their titles and affiliations, panelists appeared to have some level of diversity and qualifications. Panels included early and later career faculty and administrators. It was noted that industry and national laboratory representatives were active in the center proposals but rarely in the engineering education and broadening participation proposals. It was more difficult to determine the specific backgrounds of the industry representatives from their titles. In general, the panelists and reviewers spanned the appropriate disciplines, and came from a range of universities (large, small, private and public). However, it was documented in 2007, 2010, and 2013 COV reports that "insufficient information was contained to ascertain reviewers' backgrounds and to determine each reviewer's qualifications for proposal review." The same concern was identified in the current 2016 review. NSF has attempted to address this particular concern, as indicated in the response to the 2013 COV report through the use of PRIM in 2016. However, no evidence of this response was detected by the current 2016 review. During the COV meeting, upon request, EEC provided additional information on how reviewers were selected. Based on that information the COV felt that the PO's were taking appropriate measures to ensure a panel of qualified reviewers. However, the fact that this is a recurring problem raises a real concern for the 2016 COV.	YES
2. Did the program recognize and resolve conflicts of interest when appropriate? **Comments:** In general, the conflicts of interest were properly managed. In one case the Division Director was conflicted and the Deputy Division Director served as the individual who concurred with the action decision on the submission, and the ERC Program Director assigned to the panel recommended the action.	YES

Reviewer summaries documented whether or not a conflict of interest was identified. Several eJackets (of 75 reviewed by the COV) identified a COI and in those cases, the COI was indicated on the Review Record/Form 7 and in the Review Analysis. The Review Analysis indicated how the COI was handled. In each case, the panelist left the room during the discussion of the proposal with which they had a conflict of interest.

3. Additional comments on reviewer selection:

Based on the information given in the COV Data Book, Section II, the following comments can be made:

1) The percentages of the reviewers from specific disciplines approximately match the corresponding percentages of the PIs with the exception of the "other" category in which other disciplines are brought in to review engineering proposals, which is viewed favorably by the COV.
2) The report shows the demographic distribution of EEC Reviewers for all reviewers who self-identify. It would be informative to know the percentage of reviewers who did not self-identify.
3) Geographic diversity of reviewers shows a strong bias towards the northeast. For example, the number of reviewers in Maryland exceeds the number of reviewers in Texas and yet Texas has the second highest engineering enrollments in the U.S. As other examples, consider Colorado and Illinois who both have disproportionately numbers of reviewers relative to others states with similar populations.
4) Very few reviewers from industry or national laboratories were used with the exception of center proposal panels and reviews.

III. Questions concerning the management of the program under review. Please comment on the following:

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MANAGEMENT OF THE PROGRAM UNDER REVIEW

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1. Management of the program.

Comments:
Goals and metrics should be identified for evaluating the management of the submission, review, and assessment processes. These were not available to the COV. However, there are regular meetings with program directors and the division director; centers and networks team and also the workforce development team. The centers & networks cluster currently consists of 4 PDs. There is a good mix of dedicated PDs with PDs from other divisions contributing as needed, e.g., 14 in the case of centers. The PDs from the other divisions provide specific technical and community expertise plus potential leveraging and integration of investments made by those divisions. Program directors from other divisions are intimately involved and help balance the awards portfolio of the division.

1) Submissions: The percent funding rate has risen between 2013 and 2015, which can be primarily attributed to a reduction in the number of competitive proposals, the numbers having dropped between 2013 and 2015. However, the number of new PI proposals decreased from 2013 to 2015. It is unclear what processes were used to promote a healthy level of new PI proposals.

2) Reviews: Overall, the management of the review process seems appropriate, however it would be good for EEC to ensure that the review time for proposals submitted by junior faculty is kept low due to their short pre-tenure timelines. Although the number of competitive proposals in 2014 and 2015 were similar, the number of individual reviews in 2014 was significantly higher than in 2015. EEC stated that this was because the government shutdown pushed the ERC proposal cycle into 2014 (with higher reviews/proposal for the ERC).

3) Assessment: The COV should be provided with metrics and data about program assessment and how it is integrated into the management of the EEC. Without this, it is difficult to determine whether and how programmatic goals are being met, and the program's impact.

2. Responsiveness of the program to emerging research and education opportunities.

Comments:
The POs are consistently developing new initiatives and areas for funding. New programs are being created that are timely and relevant, for example the RED program was developed in response to needs associated with making significant improvements in engineering education. The EEC programs are partnering successfully with other programs and directorates to leverage funding and increase impact, and it continues to attract very high quality people for both permanent and temporary program officer positions. Also, the establishment of BPE was in response to the urgent needs identified to address STEM pipeline opportunities. The COV feels that EEC should continue to create new initiatives that make substantive systematic and not just programmatic (or individual),

contributions to engineering education and broadening participation in engineering.

Workshops: Workshops are a good way to identify emerging opportunities. Program directors are very active disseminating information about the program through various means including workshops on topics relevant to the division. They have funded 8 workshops over the period 2013 – 2015 to engage with the internal and external community to identify emerging areas, identify future directions and topics, and participants for the workshops.

Reports: Use of NAE studies and workshops for strategic planning is commendable. If the NSF ERCs seek to advance various grand challenges proposed by the National Academy of Engineering, using "Gap Analysis" would be helpful to assess what is being done now and what areas could use additional focus.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments:
The Gap Analysis developed and used in 2014, for engineering education, was an important step in taking a more strategic view for program planning and prioritization. This could be expanded to other program areas within EEC.

EEC management began a program portfolio review process in FY2015. The Context Statement of the ERC program review provides additional information about the selection of new ERC's. The meeting between program director and division director to discuss the outcomes of the merit review process serves to facilitate the program planning and prioritization. The COV believes this interaction between the PDs and DD is necessary and is appropriately supported by the division.

4. Responsiveness of program to previous COV comments and recommendations.

Comments:
EEC response to previous COV has been appropriate with the exception of establishing a documented process to ensure the quality and expertise of reviewers. Overall, the strategies of (i) integrating education and research in the Gen-3 ERC and (ii) collaborating with other Directorates allow the EEC to take a leadership role in Engineering Education while leveraging other resources in NSF and ongoing investments in the ERCs.

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity? **Comments:** The program does have an appropriate balance in terms of percentages of budgets and number of awards. Centers are the largest part of the budget comprising a small number of the awards but the majority of the division funding, owing to the scope and size of the ERCs and other projects funded by the centers cluster. Broadening participation is an important area and the division is currently growing its funding (having taken foundation-wide responsibility for INCLUDES). The engineering education and workforce development programs appear to have the right mix and proportion of awards across disciplines.	YES
2. Are awards appropriate in size and duration for the scope of the projects? **Comments:** For the Broadening Participation Awards, the average award size has increased by a factor of five from 2013 to 2015 while the average duration has remained flat. It seems that the current level and duration is now stabilized, and given that it is in its first full year of implementation at the time of this review, this issue should be assessed at the next COV. The Workforce Development average award size and duration appears to be appropriate for the scope of the RET and REU. The awards for Centers (approximately $3M/year ramping up to $4M/year) are appropriate for the mission, scope and size of the projects. The duration of initial 3 years with renewals up to 10 years is appropriate.	YES
3. Does the program portfolio include awards for projects that are innovative or potentially transformative? **Comments:** The Revolutionizing Engineering and Computer Science Departments (RED) program funds proposals that are "revolutionary" and "transformative". The reviewers were diligent in looking for these features in the proposals and	YES

rating them appropriately. So, indeed, the RED awards are innovative and potentially transformative.

Innovation is key for the development of an ERC. All projects focus on generation of IP with emphasis on commercialization and establishment of spinoff companies. The support of engineering education programs within ERCs is transformative for the engineering education system. In general, the systems level goals and translational aspects of ERCs make them unique investments for NSF.

A review of the WD awards shows participation of undergraduate students and teachers in innovative research projects reflective of the broader research portfolio of the ENG directorate (e.g. robotics, MEMS, polymer manufacturing, computational nanotechnology, parallel and advanced computing). | |
| 4. Does the program portfolio include inter- and multi-disciplinary projects?

Comments:
All EEC programs are interdisciplinary by the nature of their establishment and are designed to deliver interdisciplinary outcomes. There are also a large number of EEC awards co-funded with other divisions.

The portfolio includes inter- and multi-disciplinary projects. Evidence of this includes the various funding sources from other directorates including BIO, CISE, EHR, MPS, O/D, and SBE and other federal agencies that support funding of EEC programs. Typically, as per program solicitations for RED, RFE, and RIEF, successfully awarded proposals employ interdisciplinary research teams that include an engineering educator, social scientist, and external evaluator. In reviewing WD awards over the past three years, the program is addressing topics across many disciplines. In a typical model for an REU/RET, the participants work in various research laboratories which are engaged in inter- and multi-disciplinary projects. | YES |
| 5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?

Comments:
The data provided about the number of competitive proposals submitted per state shows that the number of proposals received is roughly proportional to the population of the state from which they are received. This suggests a reasonable geographic distribution of proposals received.

Proposal submissions are from all states, and exhibit varying funding rates. This is encouraging and reflects well on the efforts by NSF to support worthy efforts from all corners of the US. | YES |

6. Does the program portfolio have an appropriate balance of awards to different types of institutions? **Comments:** There is appropriate balance among research focused institutions. Doctoral institutions receive most of the awards. This percentage is likely to increase as the field of engineering education research gains more prominence at research intensive institutions. The COV did not have information on sub-awards that often include community colleges and 4-yr colleges. Based on the information give, community colleges, which educate a large number of students who matriculate into engineering and engineering technology programs, submitted and received very few awards. The 4-yr colleges and Master's institutions, which also educate a significant number of engineering students, fared marginally better. Note, the number of proposals received by EEC from community colleges and 4-yr institutions was a very small percentage of overall submissions and a likely reason for so few awards to these institutions.	YES
7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award. **Comments:** The percent of proposals submitted by new PIs went down from 2013 to 2015. This declining trend is due to the BRIGE (Broadening Participation Research Initiation Grants in Engineering) being discontinued. However, during the same period, the success rate of new-PI grants increased significantly. Therefore, it appears that the discontinuation of the BRIGE program has not impacted the overall number of awards given to new PIs. The 2015 success rates for new PIs is relatively good compared to prior PI success rates, indicating that EEC has been giving attention to new PIs. The one targeted program remaining for early career faculty members is the CAREER award, for which 4-5 are awarded in EEC each year. The ERC awards by their nature go to established PIs.	YES

8. Does the program portfolio include projects that integrate research and education?

Comments:
This is a hallmark of NSF programs and has served the nation very well. All ERC, REU and RET programs integrate research and education both at the discovery level through the ERC, and also directly involving students and teachers through REU and RET, respectively. | YES |
| 9. Does the program portfolio have appropriate participation of underrepresented groups[2]?

Comments:
Proposals with minority involvement and women participation have consistently higher success rates in all four clusters of the division. The percentages of proposals involving underrepresented minorities during the period of review were appropriate. The evidence provided indicates that the success rates of projects that involved self-identified underrepresented PIs or Co-PIs increased over the period of review as compared to proposals without underrepresented PIs. The data indicates positive trends with increasing participation of minority PIs/Co-PIs and increasing funding of proposals with minority PI/Co-PI participants.

All ERCs operate with their own plan for inclusion and diversity. The program directors should ensure that the underrepresented participants are also in leadership roles (Directors, Associate Directors, Thrust Area Leaders, etc.) and not unduly burdened with primary responsibilities for the diversity and inclusion aspects of the ERCs. | YES |
| 10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports.

Comments:
In the absence of a formal strategic plan that guides the division and aligns its programs with broader national needs the COV is unable to comment on this in relation to national priorities and agency mission. However, the division is responsible for supporting innovative projects important to national priorities and collaborations in four key areas for the advancement of engineering: center-based transformational research through the engineering research centers; research and implementation programs to educate the future engineers; workforce development through the REU and RET programs; and inclusion of underrepresented groups in engineering through | LIKELY |

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[2] NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

the broadening participation programs. These areas of investment are relevant to national priorities, agency mission, and relevant fields within Engineering. While EEC broadly addresses key priorities of broadening participation and systems-level translational R&D, a gap analysis, connection to other federal agencies, and relation to the NAE grand challenges is s suggested. EEC should also develop a strategic plan links its programs with the ENG Directorates goals and priorities.	
11. Additional comments on the quality of the projects or the balance of the portfolio: The COV commends the EEC division for funding high quality projects in a well balanced portfolio.	

SECTION V: OTHER TOPICS

1. **Please comment on any program areas in need of improvement or gaps (if any) within program areas.**

There should be a strategic planning process for selection of ERC topics and for leveraging funding from other agencies.

ERCs should maintain a hybrid process of selecting PI-identified and directed topics. For example, EEC could use the NAE grand challenges as a directed set of topics. Given the emphasis on innovation, is there a strong link between the ERCs and the I-Corps program? For example, the number of spinoffs is a quantifiable measure of the impact. It would be helpful to analyze this further and develop a list of lessons learned and guidelines for future ERCs.

We recommend workshops emphasizing the educational aspects of ERCs for pre-proposals invited for full proposal submissions. Is there an opportunity to modify the ERC process to incorporate more of a planning workshop between the pre-proposal (or earlier) and full proposal stages to introduce more best practices and deeper knowledge for the education, diversity, and innovation aspects (as well as others) of the ERC proposals (and facilitate teaming)? The addition of the Education PDs to the review and the site visits provide positive input, but only the winning ERCs benefit from this experience. It would be great to encourage best practices and deeper understanding for a wider set of proposers (not just the institutions who have figured it out already and created ERC proposal "machines")

The ERC competition context statement notes, "All Gen-3 ERCs prepare a Culture of Inclusion and Diversity strategic plan in collaboration with their associated deans and department chairs. They are required to benchmark achievements in the involvement of women, underrepresented racial and ethnic minorities, and persons with disabilities against university engineering-wide averages."

First, the addition of "Culture of Inclusion" is new and is to be commended. Gen 2 and early Gen 3 ERC's prepared a diversity strategic plan, but culture of inclusion wasn't part of it.

Second, the language mirrors language of NSF and addresses "groups that traditionally have been underserved and/or underrepresented in the STEM enterprise" and includes specifically "women, blacks, Hispanics, and people with disabilities". It is time to include the LGBTQ community in this vision and definition of inclusion. Research is emerging that shows LGBTQ individuals have unequal access to opportunities in STEM fields, and engineering in particular, owing to the hetero-normative, male-dominated demographic and culture of these fields. And LGBTQ identified individuals are now being counted on forms such as the "Common App" that graduating high school students use when applying to college. The COV suggests including LGBTQ in the language.

The COV believes it is important for the engineering education research programs to continue to encourage the translation of research to practice. EEC should explore ways to catalyze this phase. The committee suggests that the impact of the engineering education research, directly on students and practices, be assessed. Elements of NSF Advance Programs should be considered as a potential model for institutional transformation in the integration and practice of engineering education. RED is potentially a good catalyst and efforts should be made to assess its impact on the specific institution and, more broadly, the discipline.

2. **Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.**

EEC should develop a process to identify more industry participants, with the appropriate technical expertise, in the ERC review process as well as engineering education proposals. Perspectives from industry on how to better train engineers can be very useful.

3. **Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.**

The committee believes that the main objective of NSF programs that seek to partner with industry and other practitioners is to strengthen and enhance the nation's innovation capacity. NSF should develop a process to assess the actual need and inject additional funds or leverage (as appropriate) industrial funds (or other agency and foundation funds) for ERCs.

4. **Please provide comments on any other issues the COV feels are relevant.**

None.

5. **NSF would appreciate your comments on how to improve the COV review process, format and report template.**

1) The issue of geographic diversity of reviewers is a significant challenge agency-wide and perhaps EEC could be a model for how to diversify the proposal review process. The committee feels strongly that augmentation of the current review mechanism is needed. The items below are being proposed for consideration by the NSF/EEC for future review processes. Additionally, NSF is moving to smaller facilities in the future, space for panel reviews at the NSF will be a premium.
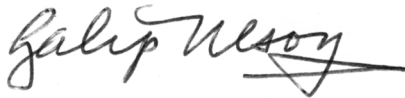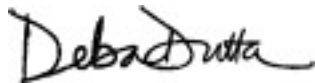
   a) **Establish Midwest and/or Western proposal review sites.** To avoid renting a facility, or creating conflicts with academic institutions, one can attempt to identify neutral sites.

For example, the west coast facility of the National Academies (Beckman Center) is an option that is well suited for panels as the staff and the infrastructure is already in place.

b) **Panels can be held at the site of National Conferences (either before or after the major conference).** The National Effective Teaching Institute is held for two full days before the ASEE National Conference. It is extraordinarily well attended. Most hotel venues where a conference is held have conferencing facilities and access. This can also increase the acceptance rate as many serious scholars will attend the national conference in their research area. Many NSF PDs attend these meetings as well.

c) **Society Managed Panels.** Why can't Societies manage panels for the NSF? For example, ASEE, ASME, AiCHE, SPIE, IEEE, NSBE, SHPE, etc. Many already have the infrastructure for managing these proposals.

d) **Virtual Panels:** This is the least preferred option.

2) The COV should also review the post-award processes, metrics, and management of the impact of the ERCs.

3) The COV process should contain information used to ensure that the sample of proposals is a representative sample and unbiased, i.e., more information on the stratified random sampling.

4) The Data Books were very helpful! However, some of the charts provided could have broken out the Centers data (in some cases this happened, but not all), since these awards are very different in size and timing.

5) All sub-contracts should be included in the reporting, as shown on Tables 8 and 9 to more accurately represent who is benefiting from the NSF resources. By including the sub-contracts, it allows the COV to understand where the money is being used.

The Committee of Visitors is part of a Federal advisory committee. The function of Federal advisory committees is advisory only. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the Advisory Committee, and do not necessarily reflect the views of the National Science Foundation.

SIGNATURE BLOCK:

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For the Engineering Education and Centers COV
Deba Dutta and Galip Ulsoy
Co-Chairs