

**FY 2019 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)**

Date of COV: June 3-4, 2019
Program/Cluster/Section:
Division: Division of Chemical, Bioengineering, Environmental, and Transport Systems (CBET)
Directorate: Directorate for Engineering (ENG)
Number of actions reviewed: 439 Awards: 216 Declinations: 202 Other: 21
Total number of actions within Program/Cluster/Division during period under review: Awards: 3,682 Declinations: 12,064 Returned without Review: 931 Preproposals: 44 Grand Total: 16,721
Manner in which reviewed actions were selected: <p>The 2019 CBET COV focused on fiscal years 2015 through 2018. CBET's four clusters – Chemical Process Systems (CPS), Engineering Biology & Health (EBH), Environmental Engineering & Sustainability (EES), and Transport Phenomena (TP) – were reviewed in addition to major CBET-led solicitation or DCL activities across the fiscal years under review.</p> <p>Jackets were selected for the COV committee by way of a random sampling of proposals, awards, and returns without review (RWR) within the CBET division. A master spreadsheet was created of the 16,721 competitive actions ascribed by the NSF database to the CBET Division in fiscal years 2015 through 2018. Fiscal year attribution is based on the date action was completed, rather than on the submission date. In most instances, the two are the same; exceptions are proposals submitted to a program with a deadline or close of window before the beginning of the Federal fiscal year on October 1 (for example, CAREER proposals, which are received in July of a given fiscal year and then completed processing during the next fiscal year).</p> <p>Data retrieved for each proposal included the fiscal year, the proposal ID number, PI name, institution,</p>

managing program, and program officer, targeted program announcement (or not), collaborative status (lead, non-lead, or not a collaborative), and outcome (award, declination, returned without review). A random number generator was then used to place the proposals in a completely random order.

A selection grid was created for each of the reviewed programs, containing as columns the four fiscal years being reviewed and as rows the types of actions (for example, unsolicited award or CAREER declination). The master spreadsheet was filtered according to the column and row identifiers of the selection grid, and a proposal(s) was drawn from the top of the randomized list to fill the corresponding slot in the grid. If a COV member assigned to review proposals in that program had an institutional or individual conflict of interest with the selected proposal, then the proposal was skipped and the next entry in the filtered spreadsheet was chosen. For linked collaborative proposals, if one of the substituent proposal submissions was selected, then the remaining substituent proposals were selected along with it.

This process resulted in selection of 439 proposals total, or roughly 23 proposals per COV member. A few additional proposals were added (after screening for conflicts of interest) in response to specific information requests during the COV meeting. Access was blocked for proposals in which a COV member had a COI identified either before or during the onsite COV meeting.

COV Membership

	Name	Affiliation
COV Chair or Co-Chairs:	Jennifer Sinclair Curtis Chris Roberts	University of California Davis Auburn University
COV Members:	Diana Bauer	Department of Energy
	David Berkowitz	University of Nebraska - Lincoln
	Bert Chandler	Trinity University
	Michael Harold	University of Houston
	Julianne Holloway	Arizona State University
	Barbara Karn	Sustainable Nanotechnology Organization
	Stella Korre	ExxonMobil
	Jennifer Ladd-Lively	Oak Ridge National Laboratory
	Rose McCallen	Lawrence Livermore National Laboratory
	Andre Palmer	Ohio State University
	Michael Plesniak	George Washington University
	John Schmisser	University of Tennessee Space Institute
	Levi Thompson	University of Delaware
	Jean VanderGheynst	University of Massachusetts, Dartmouth
	Lynn Walker	Carnegie-Mellon University
	Krista Walton	Georgia Institute of Technology
	Rebecca Whelan	University of Notre Dame
	Phillip Westmoreland	North Carolina State University
	Yannis Yortsos (ENG Advisory Committee Member)	University of Southern California

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, returns without review, and withdrawals) that were *completed within the past four 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
<p>1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?</p> <p>Comments:</p> <p>Overall, the review methods are appropriate. Primarily, reviews were performed via panels. In some cases, panels covering broad research areas were supplemented with ad hoc reviews with specific expertise. In general, each externally reviewed proposal received at least three reviews and there was good transparency in the review and decision process, although more details about internal reviews could be provided.</p> <p>There are some inconsistencies with regard to internal review methods, e.g. those used to review EAGER, RAPID and workshop proposals. In some cases, proposals were submitted to another program, received reviews indicating the work was too high risk, and the proposal was routed to EAGER – hence, it had undergone prior review. However, in other cases, proposals were submitted directly as an EAGER proposal, did not receive prior review(s), and the decision to award/decline was not informed by a review other than the PO. For larger awards, additional reviews are warranted – perhaps a lower cap in award amount should be set on awards with no external review. This issue was exacerbated by the introduction of new initiatives that were launched as DCLs (e.g. SitS, DESYN-C3) and exclusively invited as EAGER submissions.</p> <p>Some COV members expressed concern that the panel process misses out on specific reviewer expertise and might bias against more risky or non-traditional research within a given area. These members also expressed concern over the efficiency of the panel process given the funding rate.</p>	<p>YES</p>

<p>2. Are both merit review criteria addressed</p> <p>a) In individual reviews?</p> <p>In general, individual reviews do a good job of addressing intellectual merit, but broader impact comments were more uneven and often treated less rigorously. In some cases, comments regarding the two criteria were intermingled and embedded within overall comments rather than separately addressed. In some cases, there was a limited articulation of weaknesses concerning the broader impacts, and in other cases, the broader impact comments were superficial and conflicting.</p> <p>b) In panel summaries?</p> <p>In general, the panel summaries are of good quality and convey panel consensus. The panel summaries do a better job, in general, of addressing the strengths and weaknesses for both of the review criteria compared to individual reviews. Nevertheless, comments regarding broader impacts were still handled less rigorously in the panel summary than in the Program Officer review analysis. In some cases, the panel summary was vague while the individual reviews were more detailed. Some panel summaries for funded proposals provided large numbers of weaknesses that were found to be inconsistent with the positive funding decision.</p> <p>c) In Program Officer review analyses?</p> <p>In general, the Program Officers appropriately address both merit review criteria, although some COV members noted that there were exceptions among some of the POs. For proposals that were declined, some of the PO review analyses were more generic and short on detail, especially for the broader impacts.</p> <p>Comments:</p> <p>It was found that some confusion remains on what constitutes intellectual merit and broader impact; there is still variability amongst reviewers, panels and some POs. The COV encourages CBET to explore other methods of reviewer oversight and preparation with an assessment of learning outcomes to ensure reviewers understand both review criteria.</p> <p>Care should be taken to ensure reviewers address the scientific and/or societal impact as part of their broader impacts consideration along with outreach and educational efforts. Specifically, some of the COV members highlight that technological impact is not sufficient to constitute intellectual merit and is more of a scientific broader impact.</p> <p>In some cases, mixed messages were being sent to the PIs in terms of broader impacts. For example, one reviewer would indicate that the broader impacts of a particular proposal were standard but fine while another reviewer would rate that as a weakness.</p>	<p>YES</p>
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<p>Reviewers should be reminded that novelty is not a requirement for broader impacts, nor is it necessary to include all student stakeholder groups (middle school, high school, college URM, prospective graduate students, etc.). Broader impacts contributions, rather, should be evaluated on their effectiveness.</p>	
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<p>3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?</p> <p>Comments:</p> <p>In general, individual reviews are detailed and provide good context for the proposal rating. However, some of the reviewers provided only superficial assessments or simply restated the objectives of the proposal without a detailed appraisal.</p> <p>In the case of Special Initiatives, there is considerable variation in the depth of comments from reviewers among solicitations. Alignment between ratings and reviews are inconsistent for some special programs, and occasionally reviews were shallow.</p> <p>It was observed that reviewers tend to not use the entire range of rankings – less use of the ‘fair’ and ‘poor’ ratings - thereby resulting in overall rating compression. This makes a differentiation between proposals for funding decisions all the more difficult.</p>	<p>YES</p>
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<p>4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)?</p> <p>Comments:</p> <p>In general, panel summaries were of good quality and do a nice job of conveying the panel consensus. This is especially important when a proposal is ranked relatively high but does not receive funding. In those cases, the panel summaries emphasized some of the critical weakness and explained the overall tone of the panel discussion, even though a few of the individual reviews may have been extremely positive. In some cases, the panel summaries were taken directly from the individual reviews rather than from the panel discussion. Instructions to the panel summary scribes should emphasize that they need to capture the panel discussion. The rationale for funding recommendations was sometimes inferred rather than conveyed in an explicit fashion. Proposals that had low ratings and were declined tended to have less constructive feedback than proposals with higher ratings.</p>	<p>YES</p>
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<p>5. Does the documentation in the jacket provide the rationale for the award/decline decision?</p> <p>Comments:</p> <p>Detailed documentation was found to be generally available in the jacket. The program officer reviews analyses were detailed in cases where the proposal was funded or when program officer decisions went against the panel recommendation (some exceptions were noted, however). Most of the declined proposals did not have a detailed review analysis.</p> <p>The panel observed that a subset of PIs in the top of the “competitive” rating category was asked to respond to panel-identified weaknesses in their proposals. Clarity on how this process impacts the award/decline decision is needed.</p>	<p>YES</p>
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<p>6. Does the documentation to the PI provide the rationale for the award/decline decision?</p> <p>Comments:</p> <p>Overall, documentation on the rationale for the award decision is appropriate.</p> <p>Many of the declined proposals reviewed by the COV were rated as “Competitive.” The COV would like to encourage POs to provide the PIs that are on the borderline of funding with detailed feedback for improving their subsequent submissions.</p> <p>More consistency in the provision of documentation to the PIs of both awarded and declined proposals is recommended. Some proposals that were very low ranked were not discussed in the panel and there was no panel summary. However, individual reviews in this case usually provided enough detail to the PI.</p> <p>The PO comment tool appears to be underutilized in the jackets and is a valuable tool for providing the PI with constructive feedback from the PO.</p>	<p>YES</p>
<p>7. Additional comments on the quality and effectiveness of the program’s use of merit review process:</p> <p>Overall, the merit review process appears to be working well, but improvements are certainly possible. Additional thought regarding reviewer preparation may make the review process more efficient and ultimately provide more useful information to the Program Officers and PIs. The COV encourages CBET to explore other methods of reviewer preparation to ensure reviewers understand the review of both criteria. One possible suggestion is that a detailed review template could be provided to reviewers to address the five elements that they are asked to evaluate.</p> <p>Panels often must choose from among worthy proposals to recommend for funding; this inevitably leads to an extended discussion of smaller deficiencies once the panel agrees that the proposals are, overall, of very high quality. Additionally, requesting that scribes include explanations for why a major concern jeopardizes the proposal would benefit the PIs.</p> <p>The average dwell time appears to be consistently increasing, particularly for funded proposals. The new “no-deadline” system may impact this with even longer dwell times for all proposals.</p> <p>The COV noted that the average number of reviews for declined proposals was higher than those for awarded proposals, but the reason for this was unclear. This is troubling as it suggests that the proposals which receive fewer reviews are the ones that are more likely to be awarded.</p>	

The COV observed that a subset of PIs at the top of the competitive category was asked to respond to panel identified weaknesses in their proposals. It is not clear how this process informs the recommendation process.

While the quality and effectiveness of the COV review process do not seem to be affected, to date, by the change in the 'no deadline' policy, it will be important for future COV panels to evaluate the effect of this deadline change.

In the Special Initiatives, the documentation reveals the variability in the quality of awarded proposals selected in different solicitations.

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
<p>1. Did the program make use of reviewers having appropriate expertise and/or qualifications?</p> <p>Comments:</p> <p>Overall, based on the quality of the reviews, the program makes use of appropriate reviewers in terms of expertise and qualifications. Additional use of ad hoc reviewers is recommended when panel topics are very diverse. The need for ad hoc reviewers could increase as programs move away from deadlines and panels must cover broader topics. For a small number of proposals, expert perspective in specialized science, e.g. biology, would have been valuable.</p> <p>CBET should be mindful that the disciplinary representation of reviewers aligns more closely with that of the PIs on the proposal submissions.</p> <p>Reliance on panels staffed by reviewers with broad ranges of backgrounds necessitates that program officers give more detailed instructions for the reviewers.</p>	YES
<p>2. Did the program recognize and resolve conflicts of interest when appropriate?</p> <p>Comments:</p> <p>It is clear that the NSF takes COIs very seriously There was no evidence that COIs were not handled appropriately. The POs consistently provided actions on COI conflicts. The program has a commendable, well-defined process to resolve COIs.</p>	YES
<p>3. Additional comments on reviewer selection:</p> <p>The COV understands that finding reviewers willing to serve on panels is very difficult. The COV encourages an increase in participation of reviewers from</p>	

industry and national laboratories although these reviewers may need additional training.

CBET should be careful about how the proposal deadline impacts the selection of reviewers.

While geographic diversity was generally achieved across CBET, this was not necessarily true in a given cluster.

Self-reported percentages of reviewers who are women or persons with disabilities should be contextualized. No data on the percentage of URM reviewers were provided. A description is needed on the efforts made to ensure diversity and inclusion in the review process.

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

MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program.

Overall management of CBET is strong and the COV commented on three areas of management; review process, program management, and division-specific comments.

Review Process

Execution of the review process is functional and well-orchestrated given the volume of proposals handled. Jackets and other records provide a sustained archive of programmatic decisions. Diary notes were generally good and there is a nice balance among the various programs within CBET. Proposals are reviewed in a timely manner. Document tracking is well managed.

As mentioned in the merit review process section of this report, more training of reviewers on the meaning of broader impacts and intellectual merit is warranted.

The COV supports the program change away from deadlines for proposal submissions. We understand that this change is new, and more data are needed to fully evaluate.

Program Management

The portfolio analyses and rebalancing have strengthened the program.

Extensive feedback on the annual reports and final reports is not typically given to the PI.

There is a concern that program coherency is lost through cyclic program officer (rotator) turnover. It would be helpful to know how program officer are transitioned into the role and extent of overlap between incoming and outgoing program officer.

Given the high proposal volume, additional staff may be needed.

Division-Specific Comments

The Division is to be commended for working so effectively with PDs from other divisions and directorates.

There is one instance of the PO managing two programs which may be challenging for the PO to manage effectively.

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

CBET is effective at responding to emerging research opportunities. Response to emerging research and educational opportunities is generally through special programs and division or directorate wide initiatives and not through a change of focus of individual clusters.

The EAGER program is used effectively to respond to emerging research opportunities. Special Initiatives are additional examples of responding to emerging opportunities. Workshops are also helpful in this regard. Recent examples of new programs (e.g., EFRI distributed manufacturing and end-of-life plastics, biomanufacturing, DESYN-C3 initiative related to the rules of life) show responsiveness to emerging areas.

Reorganization of the clusters was effective in clarifying the different program goals.

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

From the nature and distribution of funded proposals, the portfolio appears to be well balanced and represents cutting-edge science.

Overall, CBET has a well-defined process for planning and prioritization that includes revisions of program descriptions, an annual retreat and workshops, as well as communication with the engineering research community. However, it is not clear how this planning, prioritization, and engagement with the community is done at the program or cluster level. It would be useful to have a mechanism for formally engaging with stakeholders, academic and industry, to determine areas of opportunity and impact of prior investments. The increase in proposal pressure in any given research theme or topic should not entirely inform the funding or direction for CBET.

It is unclear how CBET shifts its budget between and within clusters over the long term.

The bulk of the research investments of CBET are made through unsolicited proposals submitted to the core programs and respond to community direction and interests. Special programs (e.g., EAGER, RAPID) provide a smaller, but critically important, investment mechanism for the program to support emerging, high risk/high reward and innovative ideas that have yet to reach consensus in the community. The COV suggests division level decisions on the balance of these programs and values the autonomy of the program officers in decision-making.

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

CBET engaged in appropriate activities to address previous COV comments. The COV appreciates the detailed data and documentation provided by CBET leadership.

Several observations from the previous COV report are also noted in this report.

- Variation in review quality and consistency continues. Minimal documentation is more pervasive in declined proposals. Contradictory statements in some panel summaries continue to exist.

- Inconsistency in the type of reviews for EAGER proposals continues.
- Confusion and inconsistencies remain in how broader impacts are judged by panels. The broader impact criterion may benefit from more explanation and description, and clearer guidance as to how it should be assessed. There is evidence of a wide range of interpretation among both PIs and reviewers about what constitutes broader impact and how it should be weighted in the proposal ratings.
- A more transparent process for portfolio planning across CBET was identified in the previous COV report. Similar efforts in portfolio planning at the Cluster level was not apparent.

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

<p align="center">RESULTING PORTFOLIO OF AWARDS</p>	<p align="center">APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE</p>
<p>1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity?</p> <p>Comments:</p> <p>If the objective is that the funding is consistent across all four clusters, the answer is yes as the portfolio of awards and budget are balanced between clusters.</p> <p>The provided data only report on funding distribution over the clusters, not across disciplines and sub-disciplines. Therefore, it would be helpful if the COV were provided more data to deliver a more informed assessment.</p>	<p align="center">APPROPRIATE</p>
<p>2. Are awards appropriate in size and duration for the scope of the projects?</p> <p>Comments:</p> <p>The average standard 3-year grant continues to hover around the \$100-110K/year mark. As noted in the 2015 COV report, the typical award size has not kept pace with the rising costs of academic research due to increases in stipends, tuition, overhead, materials, and supplies. Regarding duration, Ph.D. students often require up to five years to graduate while the typical NSF grant duration is approximately three years. It is also difficult to conduct multi-investigator research given the typical award size. We recommend that grants be of a larger annual amount and longer duration.</p> <p>While the average award amount increased slightly during this COV review period, it was observed that the average award duration decreased. This apparent decrease is likely due to the inclusion of short-term (e.g., EAGER) grants. The data would be easier to interpret if regular grants were displayed separately from grants of longer or shorter duration.</p>	<p align="center">NOT APPROPRIATE</p>

<p>3. Does the program portfolio include awards for projects that are innovative or potentially transformative?</p> <p>Comments:</p> <p>The portfolio includes projects that are innovative and potentially transformative. This is particularly true for the EAGER awards and for projects within the Special Initiatives which seem to do a good job identifying and supporting high-risk/high-reward projects. Panel summaries and reviews commented on the transformative nature of some proposals, especially those given the 'highly competitive' rating.</p> <p>It is unclear why there is such a large variation in the EAGER funding rate among clusters.</p> <p>COV members noted a few innovative unsolicited proposals that were not funded. Innovative ideas can be polarizing, and panels tend to be consensus-driven and conservative. This outcome puts extra pressure on the Program Officers to emphasize to panelists the need to include potentially transformative but risky projects in their final recommendations.</p>	<p>APPROPRIATE</p>
<p>4. Does the program portfolio include inter- and multi-disciplinary projects?</p> <p>Comments:</p> <p>The portfolio includes many projects that are inter- and multi-disciplinary. There were also numerous collaborative ventures with BIO, CISE, GEO, and MPS.</p>	<p>APPROPRIATE</p>
<p>5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators?</p> <p>Comments:</p> <p>The geographic distribution of awards appears reasonable. Perhaps the data could be better evaluated if they were normalized by number of institutions and/or number of PIs.</p>	<p>APPROPRIATE</p>
<p>6. Does the program portfolio have an appropriate balance of awards to different types of institutions?</p> <p>Comments:</p> <p>The balance of awards to different types of institutions looks to be reasonable although the awards to smaller, less well-known institutions are low. COV</p>	<p>APPROPRIATE</p>

<p>recommends to evaluate this and set some goals. For example, Research in Undergraduate Institutions (RUI) funded research programs constitute 0-1% of total funded proposals and is a missed opportunity for increasing the pipeline of scientists and engineers. Another missed opportunity is the community (2-year) colleges.</p> <p>HBCUs present an opportunity for diversity if competitive grants are submitted from PIs at these institutions. CBET is encouraged to include award data for HBCUs for future COVs.</p>	
<p>7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators?</p> <p>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.</p> <p>Comments: On average, the balance of awards to new and early-career investigators is appropriate although the success rate for new PIs is lower than prior PIs. Hence, there is concern about junior faculty success and career advancement. CBET is encouraged to pursue ways to develop early-stage and new investigators to help them be more successful in securing CAREER and other awards.</p>	APPROPRIATE
<p>8. Does the program portfolio include projects that integrate research and education?</p> <p>Comments: CBET includes projects that integrate research and teaching (e.g. CAREER awards) but not all projects do this well. For other types of awards, nearly all will include mentoring and training of graduate students. Additional educational aspects (such as course development) appear in the Broader Impacts of most proposals.</p>	APPROPRIATE
<p>9. Does the program portfolio have appropriate participation of underrepresented groups¹?</p>	APPROPRIATE

¹ 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.

<p>Comments:</p> <p>There is appropriate participation of underrepresented groups.</p> <p>The Committee notes with concern that, in a particular cluster, the funding rate for three out of four programs is lower for proposals with the involvement of women and minorities than for proposals overall.</p> <p>CBET is encouraged to include proposal data for HBCUs.</p>	
<p>10. Is the program relevant to national priorities, agency mission, relevant fields, and other constituent needs? Include citations of relevant external reports.</p> <p>Comments:</p> <p>CBET is well-aligned with national priorities and agency mission. There are numerous examples of this alignment (catalysis, separations, environmental sustainability, food-energy-water nexus initiative, etc.). In addition, global engagements through the US-China program and EPSRC program are commendable. The information provided to the COV did not, however, include relevant external reports (NAE Grand Challenges, OSTP letter, National Academy reports, etc.) that could be used to form a strategic vision to guide prioritization.</p>	<p>APPROPRIATE</p>
<p>11. Additional comments on the quality of the projects or the balance of the portfolio:</p> <p>No additional comments.</p>	

OTHER TOPICS

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

COV members recommend that NSF continually work on integrating the environmental questions with the process sciences. The EES cluster looks at the consequences of past and present issues (Environmental Engineering) and at present and future issues (Environmental Sustainability). Effective integration with the process and fundamentals clusters is important to the vitality of them all.

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.

There was a considerable discussion among COV members on the relative merits of initiating a peer-reviewed, pre-proposal process. Such a system may decrease the reviewing load on the community and the proposal evaluation load on the POs.

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

Data that provide information on CBET in the context of the Engineering Directorate and NSF would be helpful to better assess performance.

CBET contributes to a number of cross-disciplinary NSF big ideas. Given the disproportionately high proposal pressure for CBET, additional resources, in the form of staff and funding, should be provided.

The COV team noted CBET's participation in funding international collaborative research in special INFEWS initiatives with both China (NSF-C), focused on water-FEWS issues, and with the UK (EPSRC). The team advises the leadership team at CBET to assess the effectiveness of these collaborative international endeavors. The lessons learned here are likely to be valuable in deciding whether to expand such activities and involve other partners in the future.

Determining proposal merit on how "potentially transformative" an idea may lead to the systematic dismissal of high-quality proposals that would advance the field. If overemphasized, this may undermine the scientific process, as both "potentially transformative ideas" and solid foundational studies designed to improve depth of understanding are required to advance science and engineering. CBET and the NSF as a whole would do well to ensure that they maintain a long-term commitment to depth of understanding through rigorous investigation of new and existing fields.

CBET should evaluate the optimal duration of PO rotators and the optimal mix between IPA and permanent staff. COV members appreciated the recent example of having a new DD come in as an Expert to transition with the departing DD.

Some COV members hold the strong belief that NSF should change its name to the National Science and Engineering Foundation.

FastLane and eJacket's inability to handle quotation marks and em dashes and display of other non-printing characters has been a long-standing problem. The Fastlane problem creates unnecessary confusion and lengthens the time that it takes for panelists to complete their work. It should be fixed.

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

Overall funding levels and success rates make NSF less attractive for proposal submission compared to other funding agencies (e.g., NIH). NSF could be missing out on good ideas that are being sent to other agencies.

For productive PIs, it is worth considering mechanisms such as (i) allowing for or inviting a renewal, (ii) granting a 4-year award, or (iii) granting a Special Creativity Extension (SCE) for 1-2 years. Program Officers should be made more aware of the SCE opportunity (PAPPG Part II.VI.D.3d).

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

The team thanks the CBET leadership for the detailed data and documentation provided in support of this COV. Including additional composite statistical data for each cluster, and broader comparisons to the Directorate would be valuable in the future.

More information on the outcomes and plans emerging from division-wide retreats, for example, would be helpful in assessing priorities and planning. Evaluating the appropriateness of funding priorities and portfolio balance would be more effective if the COV had a better understanding of what those priorities are and how they were determined.

A 50/50 reviewing balance in funded/declined proposal jackets may not be the most representative sample for gaining insight into the evaluation process. Some COV members suggested choosing a balance that is closer to (not equal to) the funding rates in each program (perhaps 2 declined: 1 funded proposal).

Some COV members suggest that rather than simply using a random number generator to pull jackets, members might benefit from seeing clear awards, clear declines, and cases on the bubble for various funding mechanisms.

SharePoint, FastLane, and eJacket all with different usernames and passwords and difficulty in resetting these presented problems. Some COV members spent way too much time troubleshooting these login issues with NSF IT personnel prior to the COV meeting.

The coordination between the Data Book and the report template was very much appreciated. However, providing more information and detail about the process of the COV earlier would be helpful for members. Additional guidance on how to access and read eJackets, how to prepare for the meeting, and what to bring to the meeting would be valuable. Perhaps two webinars, the first covering COI issues and the second focused on more practical issues once members had access to the various databases (e.g. information on the SharePoint, report template, eJackets, etc.) could improve the process.

First-time COV members would benefit from information on how much time should be allotted for pre-meeting work.

It would be helpful to have a process or procedure checklist for COV members.

The report template is helpful in structuring feedback, but it is sometimes repetitive.

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SIGNATURE BLOCK:

For the 2019 CBET COV



Jennifer Curtis, Chair



Chris Roberts, Co-Chair