FY 2012 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

Date of COV: August 8-9, 2012

Program/Cluster/Section:
All

Division:
Civil, Mechanical, and Manufacturing Innovation (CMMI)

Directorate:
Engineering

Number of actions reviewed:

Awards: 96

Declinations: 99

Other: 18

Total number of actions within Program/Cluster/Division during period under review:

Awards: 2,800

Declinations: 8061

Other: 399

Manner in which reviewed actions were selected:

CMMI staff queried the NSF proposal database to obtain a list of proposals for each program element received between 06/30/2008 and 06/30/2011. The staff then randomly selected the jackets for each of the four clusters (Advanced Manufacturing; Mechanics and Engineering Materials; Resilient and Sustainable Infrastructure; and Systems Engineering and Design).

The sample, which contains awards, declines, and proposals returned without review because of non-compliance with NSF policies, was constructed using the following guidelines. Proposals in each subgroup were identified using a random number generator. Each proposal in the group was assigned a random rational number and then sorted smallest to greatest. The proposals were then selected to form the sample in the following manner:

1. Proposals were grouped by year, and decision type. (This was done before the randomization).
2. Equal numbers of proposals were selected from each of the three fiscal years under COV.
3. From these year groupings an equal number of awards and declines were selected. For each program, this represents approximately seven awards, and seven declines per year in the sample. Additionally, approximately two proposals, per program were provided to the COV that were Returned without Review (RWOR).
4. At least 10% of the proposals selected were Early Faculty Career Development Proposals (CAREER) and approximately 1% were EAGERs, RAPIDs, and/or Workshop proposals

based on the proposals in each cluster.

5. Proposals from special initiatives such as CDI or Scalable Nanomanufacturing were also added to the sample (selected at random from the overall CMMI pool of proposals) and the relevant cluster subsamples for review.
6. Balance among programs was considered and the sample was adjusted with actions added/removed to reflect the representation of proposals in a cluster per program.
7. Geographic and demographic balance was considered and the sample was adjusted as needed to reflect an accurate representation of the CMMI research community.[1] Within each cluster, proposals from COV member institutions were removed to avoid conflicts of interest.
8. At the request of the COV chair, CMMI added additional jackets that included social science-related research.

The results of this strategy can be found in Table 1:

Table 1: COV Sample of CMMI Proposals by Cluster

Clusters/Proposal Divisions	2009	2010	2011	Total
Advanced Manufacturing	15	15	16	46
Materials & Engineering Mechanics	19	19	22	60
Resilient & Sustainable Infrastructure	18	18	18	54
Special Programs		1	2	3
Systems Engineering & Design	17	16	17	50
Grand Total	69	69	75	213

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 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 review methods for all proposals were found to be appropriate for each type, which is to say: 1) Proposals such as CAREER, GOALI, and unsolicited were appropriately reviewed by panels; and 2) RAPID, EAGER, and Workshop proposals, which require review only by program staff, were promptly reviewed by staff. This was clearly documented in the Context Statements. 3) Nonconforming proposals were also appropriately returned without review. In general, review methods were appropriate with panelists selected according to their areas of expertise relevant to each proposal. The research proposals received thorough, thoughtful, and conscientious reviews from qualified reviewers. Occasional examples were found of individual reviews that seemed cursory, but the resulting panel reviews were fair, informed, and accurately reflected both the proposal content, and the reviewers' comments. While panel reviews are expensive to NSF, they are found to be very effective. Active discussion among reviewers with differing backgrounds and opinions is a valuable component of a fair review process. While it is understood that budget concerns are driving the agency toward considering telephone conferences and WebEx conferencing methods, there is no substitute for face to face meetings and continuation of that process is preferred, given that the selection process is so critical to the NSF method of program management.	Yes

2. Are both merit review criteria addressed a) In individual reviews? b) In panel summaries? c) In Program Officer review analyses? Comments: For the most part, individual reviews, panel summaries, and NSF program director review analysis each considered both the Intellectual Merit and Broader Impact. While the proposals were all fairly reviewed with respect to both criteria, the reviews for the Broader Impact were often cursory, often just repeating the proposal rather than making an assessment. It seemed that the reviewers were less comfortable with the Broader Impacts criteria and how to evaluate and weight it as part of their overall review. In some cases, individual reviewers focused on only one aspect – e.g., societal impacts of the science or technology – and only superficially addressed the educational, outreach, or diversity components. The committee also recognizes that CMMI is not alone in this varying interpretation of the Broader Impacts criteria. The December 2011 National Science Board report on Merit Review Criteria: Review and Revisions specifically stated that "the criterion is not well defined or clearly understood by the community". Efforts are underway to improve on this consistency, but time is needed for the understanding to propagate through the reviewer (and proposer) community. This item again points to the value of the panel reviews. In most cases, there are sufficient comments from the panel as a whole to allow for full and fair reviews with respect to both criteria, and with guidance from the Program Directors, panel summaries can provide much more substantive assessment.	YES for a, b, and c

3. Do the individual reviewers provide substantive comments to explain their assessment of the proposals? Comments: The vast majority of reviewers seem to take the proposal review responsibility seriously, providing helpful feedback to the PIs, and documenting their ratings with substantive comments. Occasionally, some reviewers only mention the strengths of the proposal and fail to provide specific feedback on the weaknesses of a proposal. This information can be critical to help PIs improve their proposals for future submissions. Some reviewers should be more direct on their comments as to why they think that the proposal does not merit a recommendation for funding. Regardless of their recommendation, most individual reviewers provided substantive comments to support their rating of proposals, particularly with regard to the technical merit. If any aspect received less attention, it usually involved the potential broader impacts of the proposed research. Most reviewers provide an overview of the proposal, giving the proposer an indication of whether they have made their points clearly. Many reviewers provide substantial comments regarding the details of the work plan, anticipated outcomes and other noteworthy areas. A small fraction of reviewers only summarized the proposal without providing any substantive analysis. It is possible that these reviewers participated in a meaningful way in the panel discussions, but they should be strongly encouraged to document their input and clearly provide information on their assessment of the content in their individual reviews. Another occasional but not prevalent issue was some lack of consistency in the individual grades compared with the comments. No cases were found where the panel review was superficial.	YES
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: In general, the panel summaries conveyed the consensus opinion and provided the justification for the panel ratings. The panel summaries do indeed reflect the individual summaries – combining both the strengths and weaknesses. In general, the final summary grade seemed to match the summary text – perhaps more so than the individual reviews. In addition to the rationale for the panel consensus, the panel summaries often include aspects of the panel discussion, which is not represented in the individual written reviews. This is good feedback to the PI. The panel summaries accurately reflect the input of the	YES

individual reviewers, and the quality of the panel summaries is generally quite high. While a large fraction of the panel summaries did not include a strong assessment (versus just listing the activities) of the educational, outreach and diversity programs, the Intellectual Merit summaries were more evaluative and were well-supported by proposal content. Panel consensus was achieved for all of the reviewed proposals. Overall, the documentation does provide the rationale for panel consensus, although the individual scoring is sometimes inconsistent with the consensus. This is likely due to the panel discussion, a healthy component of the review process, where the panel discussion moved reviewers from their initial, conflicting rating, but their individual reviews were not updated to reflect this. In a few cases panel summaries were rather brief with a tendency toward a briefer panel summary for highly recommended proposals in comparison to those for recommended or not recommended proposals. This provides good feedback to PIs who would be looking to resubmit, but providing suggestions to a PI that is likely to be funded should not be overlooked in its potential contribution to the success of the project. Administratively, there was inconsistency in whether panels were asked to identify a proposal as Recommend/Do Not Recommend on the panel summary. The committee felt that this was unnecessary and should simply be eliminated from the panel summary. The contents of the panel summary should be clear about the panel's assessment, and the PD's review analysis can provide sufficient detail about the ranking of the proposal in the panel.	
5. Does the documentation in the jacket provide the rationale for the award/decline decision? (Note: Documentation in jacket usually includes context statement, individual reviews, panel summary (if applicable), site visit reports (if applicable), program officer review analysis, and staff diary notes.) Comments: The Program Directors (PD) demonstrated a detailed understanding of the proposal content and provided much more in-depth analyses of proposal merit (for both criteria). In cases where a panel review was performed, the Program Director thoughtfully considered and incorporated the individual reviews of the panelists and the panel summaries, in many cases providing additional valuable clarity.	YES

The PD analyses typically followed the recommendations of the review panel, but whether in agreement or not, the PDs provided strong rationale to award or decline a proposal. However, in a few cases, there was a serious disconnect between the Summary of the Panel and the Review of the Program Director (PD). A strong panel review did not always lead to a recommendation, nor should it be expected. There was some question about the consistency of the process of comparing across different panels given that one panel may "grade easier" than another. Clearly, this must rely for the most part on the PD to make the comparisons. In summary, the rationales for making funding decisions were very clear and very well laid out. The review analyses of the program directors were strong, putting the decisions into context and linking the individual and panel evaluations with their own viewpoints. They captured the essence of the proposals, panel assessments, their own insight, and relevance and importance of the proposed work. Their analyses were found to be most valuable, showing that the systematic approach of individual reviewers, panel discussion, and program director synthesis is working as intended.	

6. Does the documentation to 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 or telephoned with diary note in jacket) of the basis for a declination.) Comments: The feedback to the PI is a crucial part of the review process. It provides transparency, and contributes to a sense that the process was fair and reasonable. It is also a powerful mechanism by which the quality of future proposals can be improved. The documentation provided to the PIs was thorough, fairly reflected the review process, and provided the rationale for the decision. Because the decision to fund proposals was based on ranking of proposals both within and outside of the specific panels, the summaries and individual reviews are not able to reflect the strength of that particular set of proposals compared to another panel's set. This can set up an unfortunate dynamic where the panel summary is very positive, but the top proposal in a panel is weaker than the 3rd ranked proposal in another panel. Again, this is where the responsibility then falls to the PD to help explain the rationale to the PI. On balance, the documentation to PIs provided a clear rationale for the decision to either award or decline a proposal. In a few cases, panel summaries were somewhat short. However, in such instances program directors compensated with very substantive review analyses. In the case of declinations, the Review Analysis generally provided a well-organized synthesis of the separate review components, giving the PI clear feedback should they contact the PI for a discussion (since the PD's review analysis is not sent out). One question that was raised is to what extent PIs know to contact the PD's for feedback, and given the increasing number of proposals, how practical is it for PDs to encourage all PIs to contact them by phone or in person? Overall, the feedback provided to the PI was appropriate and beneficial for lessons learned for the next proposal.	YES

7. Additional comments on the quality and effectiveness of the program's use of merit review process:

The use of panels is expensive, but is a good mechanism for assuring fair and informed reviews. It is particularly useful for multidisciplinary proposals. Guided by the program directors, the merit review process was of high quality. It was apparent, though, that a continuing challenge for them is to lay the ground work for obtaining substantive observations from individual reviewers and panels about both the technical merit and broader impacts of disciplinary and multidisciplinary proposals submitted to the programs for consideration.

Encouraging the PD's to continue to emphasize some of the questions within each review criteria – e.g., "to what extent do the proposed activities suggest and explore creative and transformative concepts" – to enrich the review, but not provide a rigid structure where each item must be addressed in order and given a point rating that gets added up.

Some RAPID proposals were submitted where the PIs did not communicate with the program directors prior to submitting the proposals. If there is any way to reduce the hesitation for PIs to communicate their ideas prior to submitting a proposal, it should be explored. In general, while NSF is better than most agencies in approachability, there are still many PIs (especially new PIs) that are not aware of the benefit of communicating with the PDs.

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: In general, program officers are recruiting reviewers with expertise that closely matches those of the proposed topics. The reviewers were excellent choices and reflected the appropriate range of expertise needed to evaluate the proposals, even in challenging multi-disciplinary panels. Full, associate and assistant professors were represented. EPSCoR state representation was included in the majority of the proposals. There was almost always sufficient overlap based on the Star metrics. That is not to say that the reviews always reflected a matching expertise, but simply that it is not clear how NSF could do a better job matching the reviewers given the variety and breadth of the proposals. The panels were generally diverse in terms of expertise, geography, background, and experience. However, a substantial fraction did not have a woman panelist or participants from underrepresented groups. This is an ongoing problem in some fields that have low numbers of potential reviewers from underrepresented groups and don't want to continuously tax the ones that do exist. Additionally, it would be useful to recruit more reviewers with industrial career experiences. In a few cases, GOALI proposals lacked representation of panelists from industry. Most of the reviewers were either current or former PIs or co-PIs, or had submitted a proposal at some point. Most of the reviewers were senior academics from doctoral granting research universities, but younger academics and those from master's granting institutions were also selected as reviewers. The reviewers included academicians/practitioners, male/female, and junior/senior faculty members. It is important to include panelists who have not yet received any NSF funding as they can bring a fresh perspective while also benefitting from the experience. NSF's method for tracking reviewer expertise and details is impressive. This system (Star Metrics) allows for a quick yet thorough check for expertise in	YES

common research topics. The system summarizes the qualifications, geographical location, and diversity of the panel. The committee felt that in addition to continuing the strong cumulative record in multiple aspects of a diverse reviewer pool, the Star Metrics system can enable the division to identify if specific programs are much less reflective of the community in their reviewer selection. For example, it appeared that one program had panels with reviewers only from tier-one institutions. In all cases, the expertise was within the scope of the proposal being reviewed.	
2. Did the program recognize and resolve conflicts of interest when appropriate? Comments: PD's and NSF staff do an excellent job in identifying and preventing conflicts of interest. Several conflicts were noted by NSF staff and that reviewer was removed from consideration. Panelists that are found to be in conflict of interest always recuse themselves from discussions of related proposals. Potential conflicts of interest for particular proposals were duly noted in the jackets. When a jacket had a conflict, an indication was included that those panelists left the room when those proposals were discussed so that those panelists did not participate in discussions and had no access to reviews.	YES
Additional comments on reviewer selection: The reviewer selection was generally excellent. Because diversity in all forms is important to fair discussion, NSF should continue strong efforts to recruit panelists from underrepresented groups, broad geographic distribution, and varying institution types (e.g., from undergraduate institutions to Tier 1 research universities). In terms of inclusiveness, many panels had female members, which is encouraging and should continue. It was difficult to determine the extent of participation by the two most underrepresented groups in science and engineering activities, Hispanics and African Americans. Given the importance of innovation and commercialization, panelists from national laboratories and from industry should also be encouraged. Information on reviewer selection was well documented with logical supporting statements. For example, when two reviewers from the same institution were on the same review panel, documentation was provided to explain the rationale behind the decision.	

The committee felt that CMMI (and NSF) should more widely communicate the information about reviewer expertise and diversity, since this will help to maintain and strengthen confidence in the fairness of the CMMI/NSF 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. Comments: The vast majority of the e-jackets are complete, with the required documentation. The management of the proposal review and selections process is clear, fair, transparent, and rational. Overall, programs were managed very professionally, placing a strong emphasis on identifying and supporting high-impact proposals that can help advance the frontiers of science through cutting-edge research. Panelists appeared to be selected according to the areas of expertise that best fit those of the proposals, thus providing an objective evaluation. Proposals were then evaluated on a timely fashion and results were typically communicated back to PIs within six months. The concept of rotating managers balanced with permanent program managers allows for fresh ideas while maintaining stability of the program. The programs in clusters connected well among themselves and with related programs elsewhere in the division. There has been leveraging through co-funding from other NSF programs such as GOALI and OD/OISE. CMMI has even managed to leverage resources with other agencies, including USDA and NOAA, thereby strengthening its impact both nationally and internationally. The program provided the lead in furthering NSF's efforts to make RAPID grants available for research, often collaborative in nature, on recent major earthquakes in Haiti, Chile, New Zealand, and Japan. The RAPID grants process was found to be extremely well-used and well-handled throughout the Resilient and Sustainable Infrastructures Cluster.
2. Responsiveness of the program to emerging research and education opportunities. Comments: Several different mechanisms for responding to emerging opportunities were identified – e.g., workshops, RAPID, EAGER. The committee felt that the combination of these mechanisms was appropriate and valuable, and stressed that communication to the broader community is a key factor for success and impact. In addition, the committee felt that many emerging opportunities really find their way from the technical community through the unsolicited proposals, and that this mechanism should remain the focal point of CMMI's funding. Workshops are held to identify new research areas, solicited by a PI or program director. This includes both workshops at the CMMI Grantees conference and stand-alone workshops. Workshops are also held with other divisions, directorates and agencies. Examples of new areas that were identified include Nano and Bio Mechanics. Some of the cluster reviewers feel that this process is

responsive to emerging opportunities. However, some cluster reviewers expressed a concern about the balance between programs focused on emerging opportunities and opportunities for unsolicited proposals. Data provided by CMMI did indicate that the ratio of unsolicited to solicited proposals funded was still heavily weighted towards the former. The committee recognized that participation in these workshops is necessarily limited due to cost and effective discussion numbers, but recommended that broader input be encouraged via the web prior to the workshop, and that results of the workshops be more actively disseminated.

Another example of an effective mechanism is the awarding of RAPID grants following recent disasters. For example, the IMEE program has successfully utilized such grants to open up new areas of investigation for engineering, social science, and physical science experts while also providing an unusual opportunity for training the emerging generation of hazard and disaster researchers. IMEE's model education activity, Enabling the Next Generation of Hazard Researchers, which links junior faculty hazard researchers with senior faculty mentors across the U.S., is now being adopted by others in the cluster.

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

Comments:

Priorities are based on administration initiatives, National Research Council studies and workshops. The prioritization appears to be responsive, and to be particularly effective in generating proposals in new areas. The division places strong priority on identifying and supporting potentially transformative research proposals that serve to advance science and the needs of the country. CMMI also is cognizant of their role in the national funding environment, recognizing when their funding represents the primary source within a given research area (e.g., Geomechanics). Some program officers use the CMMI Grantees Conference as an opportunity to brainstorm with PIs for identifying new areas of research that might be worth of support. The use of the National Research Council (NRC) to support program selection and development for some cluster areas within CMII is commended.

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

Comments:

The CMMI has responded to the 2009 COV report by forming teams and committees to address concerns. However, many of the problems identified in the previous report (e.g., diversity of review panels, industrial participation, some superficial reviews) are difficult to resolve, and they persist as concerns during this review period. Assessment of broader impacts seems to be on the right trajectory, but still has some distance to go – i.e., there are still proposals that were recommended

for funding with weak broader impacts, and the community is still inconsistent in their understanding and evaluation of the criteria. Size and duration of awards continues to vary widely under a rationale which is little understood outside the agency. In its report, the 2009 COV noted the absence of social science representation in its membership, indicating that this was an important omission because of the many disciplinary social science and multidisciplinary projects with social science components supported by CMMI, especially through the Resilient and Sustainability Infrastructure cluster. This omission was corrected with the inclusion of a social scientist on the 2012 COV, and it is important that future COVs also include a minimum of one person from the social science research field.

CMMI has been extremely responsive to our requests for additional information and clarification during this COV process.

IV. Portfolio Review.

Please comment on the division's portfolio in terms of:

- Support for potentially transformative research
- Areas of emphasis within the portfolio
- The role of crosscutting topics (e.g. materials, nanotechnology, and modeling and simulation) in division activities
- Areas of emerging opportunity where CMMI could play a leadership role
- Strategies for enhanced translation of knowledge/technology transfer to spur innovation
- Collaborations and platforms that could enhance CMMI's role in catalyzing frontier research and advancing the CMMI community
- Participation by the engineering community (new investigators, demographics, different institution types)

- Support for potentially transformative research

  The committee agreed that there needs to be further consideration of how CMMI/NSF handles support for potentially transformative (e.g., high risk/high impact) research. Several relatively new mechanisms (e.g., EAGER, CREATIV) are being tried, but it is unclear as to whether there is a clear assessment of how well CMMI/NSF is executing the process. This is a difficult challenge, as by definition, "High Risk/High Impact" typically means that a high rate of failures is expected and the true impact may not be known for decades. NSF needs to own that process and be proud of the successes. There needs to be documentation of what is learned, whether failure or success in achieving the anticipated result is the outcome.

- Portfolio (Areas of Emphasis, Emerging Opportunities, Cross-cutting topics)

  Overall, the PD's have done a very good job of identifying emerging areas and gaps where CMMI can have a significant impact (e.g., computational – new materials design, chemical/mechanical interface for biological and battery applications). Participation in cross- cutting topics (and leadership in some of these topics) is important to ensure that the expertise of CMMI researchers is contributed to these major programs and for effective leveraging of targeted funds. CMMI is well-suited to lead many of these interdisciplinary programs because of its engineering background coupled with social sciences. CMMI should continue to make its researchers aware of the targeted solicitations at an early stage, to encourage strong proposals.

- Strategies for enhanced translation of knowledge/technology transfer to spur innovation

  Graduating students are often the most effective vehicle to transfer knowledge from the research lab to industrial innovation. GOALI, PFI, SBIR, etc. are all programs that require industry collaboration. To expand such collaborations to a greater number of projects, supplements and internships to enable students to spend time in industry and national labs, and efforts to

encourage PIs to identify representatives from industry and national labs to serve as advisors on projects could be considered.

- Collaborations and platforms that could enhance CMMI's role in catalyzing frontier research and advancing the CMMI community

  CMMI already collaborates with several other funding agencies – e.g., DOD, NIH. These collaborations should be further encouraged as they lead to better leveraging of the funding, while reducing undesired overlaps in funding across agencies. For example, fundamental research sponsored by CMMI can lead to new model creation, while the application of these new models to specific materials of interest to the DOD can be an effective approach for validation and greater impact. By communicating, the agencies can facilitate the identification of technical challenges, and advance the understanding more quickly.

  CMMI can also play a leadership role in helping researchers to cross boundaries – whether they be technical field or geographic in nature. CMMI should continue to expand its efforts with other divisions, directorates, and agencies to bring researchers from multiple fields together – e.g., medical and mechanical (e.g., the biomechanics and mechanobiology collaboration with NIH), chemistry and manufacturing, social sciences and civil. This includes not only solicitations that encourage multi-disciplinary research, but activities (e.g., regional) that help researchers from disparate fields meet each other. The CMMI grantees conference has led to many new collaborations, but these are limited to researchers who are already CMMI PIs. CMMI can play a similar role in helping to introduce their PIs to PIs from other divisions, directorates, and agencies. Similarly, CMMI currently participates in PIRE and sponsors international workshops. Such international partnerships and continued understanding of the global efforts in various research areas should be encouraged.

- Participation by the engineering community (new investigators, demographics, different institution types)

  Perhaps the most effective way to introduce new investigators to NSF is through their inclusion as reviewers on panels. In one meeting, these new investigators see firsthand how the review process works, meet the program directors, and meet other new investigators and seasoned PIs in the field. CMMI does a good job of having a percentage of its panel reviewers from the new investigator ranks.

  Mentoring programs (e.g., in earthquake engineering) or explicit mentoring activities within a broader workshop or conference, can help to bring junior and senior researchers together. This is especially important for the less extroverted, but no less talented faculty. A junior faculty with a senior faculty who helps to open doors, make introductions, and elucidate the proposal process has a significant advantage. CMMI should not assign mentors, but it could create an environment where more mentees may find appropriate mentors.

  To foster new generations of researchers, the Division's outreach to young faculty through proposal writing workshops, targeted funding for the REU supplement program and the Graduate Research Diversity Fellowship program are worthwhile. It appears that at the Division level, 25%

of researchers are taking advantage of the REU program. However, it is not clear how many researchers have been able to access the Graduate Research Diversity Program. A supplemental program, similar to REU, but for graduate students, should be explored at the Division level.

In addition to the comments provided in the report template, the following are additional comments from the group which the Chairs believe represent consensus opinions:

1. **Importance of face-to-face panels (can be blended with some virtual participation, but face to face should be the core of the review process)**: The "magic" of NSF's well known success in frontier research with outstanding "results" over time could be in large measure the result of its proposal solicitation processes and peer review driven award processes. Face to Face Panel Reviews are believed by the COV to be key and have served NSF well for many years. Limited travel budgets now pressure PDs to carry out reviews using "web-TV" rather than "face to face" discussion. The Committee believes strongly that reliance on "virtual reviews" would be a big mistake and that CMMI must continue panel reviews, much as in the past, to perpetuate its successful track record. Face to face panels provide strong discussion necessary for both quality reviews and for community building. While Web-X conferencing may be a great idea for a Committee member who cannot attend the panel review due to emergencies or last minute scheduling conflicts, it is no substitute for "face to face" panel reviews where not only words, but facial expressions and vibrant face-to-face discussion aids good communication and thus good decision making. The COV believes changing to "virtual panels" could threaten NSF/CMMI's proposal selection processes, and harm NSF's performance as a result. To save trivial amounts of travel funds using procedures that could destroy "best practices" for decision making regarding awards of much greater value is "penny wise and pound foolish" and is to be resisted strongly. This was perhaps the strongest recommendation of our Committee. Recognizing that the budget climate, particularly restrictions on travel, may make some form of virtual review a cost-effective tool, the committee recommends *pilot programs* to avoid unintended consequences, while seeking to identify the most effective structure for limited use of virtual meetings. (Those who attended the May 18, 2012 Kickoff Meeting by Web-X conference were painfully aware of the challenges this method of communication can present, especially for larger and less narrowly-focused panels.)

2. **Importance of Travel:** The subject of travel budgets is a seemingly endless concern about which much is said, but little seems to be accomplished -- even though these issues have been raised repeatedly. It is unlikely the CMMI or even the Engineering Directorate can affect the present travel policies, but we would be remiss if we did not emphatically represent our COV's objections to how travel expenses are handled at NSF. There are several issues around the subject of travel that are disconcerting and frustrate "best management practices" within CMMI:

- ***Travel is Necessary for Program Director Project Management, Leading-Edge Performance & Job Satisfaction (enabling recruitment of the strongest candidates)***: As part of their management role, PDs must travel to manage and oversee critical or problem ridden programs. Further, if PDs are to make good proposal selections and focus on solicitations in areas of greatest impact, they must understand the field and know where the

opportunities lie. This cannot happen in a vacuum. It cannot happen by reading the literature, because when you are working at the forefront of discovery, by the time you can read about it, the opportunities have passed you by. When you are asked to do a job but not given the resources to do it to a high standard of excellence, job satisfaction falls, resignations occur, and recruitment of new hires becomes difficult for quality candidates who will face similar challenges and frustrations in the job.

- ***Travel is Necessary to Enhance Collaboration, Oversee Critical Projects and for Global Cooperation and Participation*:** Much of the true creative process happens through face to face contact between NSF's greatest resource, its People, and with others outside NSF. PDs play an important role in the research enterprise not only in the selection process, but also in facilitating the discussions within the technical community. The COV did not ask what fraction of CMMI's overall budget was allocated for travel, but we do know the current levels are insufficient. To do their job they must be informed on the latest theories, models and research ideas. And they must be engaged in the research arena with the best and the brightest -- not only in the U.S., but abroad as well. The necessary conceptualization and idea generation happens in conferences and in collaborative group meetings where experts in the field are assembled. It happens in cross disciplinary meetings held not only domestically, but in international settings with global players. It happens at national laboratories, universities, businesses, and at other governmental agencies. Often times, in fact most times, such discussions are not held at NSF, but rather at off-site locations. It is essential for PD's to travel in order to be a part of those discussions if they are to do their jobs effectively. Pursuit of research and engineering at the fringes of knowledge and understanding requires adequate travel budgets. Limiting travel budgets to the degree they are limited today for permanent PDs does not allow them to fully stay abreast of their field and uphold the intellectual and creative challenges of their job. The current restrictions on travel prevent that very necessary interaction with other experts and can lower the level of performance by not only impeding but outright preventing implementation of best management and operational practices.

SIGNATURE BLOCK:


For the CMMI COV

Julie Chen	David Spencer
Chair	co-Chair