Report of the Committee of Visitors

for the Basic Energy Sciences

Materials Sciences and Engineering Division

to the

Basic Energy Sciences Advisory Committee

Review of Fiscal Years 2015, 2016, 2017

Rockville, Maryland
April 18-20, 2018

Deliberately blank page

Executive Summary

A Committee of Visitors (COV), under the guidance of the Basic Energy Sciences Advisory Committee (BESAC), reviewed the programs of the Materials Sciences and Engineering (MSE) Division within the Department of Energy (DOE), Office of Basic Energy Sciences (BES) for the fiscal years (FYs) 2015, 2016 and 2017. The COV was chaired by Prof. Esther Takeuchi. All seventeen members of the committee met at the Rockville Hilton to review the management process of BES on April 18 – 20, 2018.

The charge to the COV was from Prof. Persis Drell, the chair of BESAC. The charge was: (i) For both DOE laboratory projects (Field Work Proposals) and grant program, assess the efficacy and quality of the process used to solicit, review, recommend, and document proposal actions and to monitor active projects and programs. (ii) Within the boundaries defined by the DOE missions and available funding, comment on how the award process has affected the breadth and depth of portfolio elements, and the national and international standing of the portfolio elements.

The format of the review was similar to that used in the prior COVs. The COV Panels reviewed the 3 programmatic teams within the MSE Division plus the DOE Established Program to Stimulate Competitive Research (EPSCoR) program that is managed by BES. This was the first BES COV to consider applications to the Early Career Research Program.

The COV would like to thank MSE management and all of the Division staff and program managers for their engagement with the COV including the advance preparation and assistance during the COV. They all provided timely answers to numerous questions including those related to the use of Portfolio Analysis and Management System (PAMS). This level of participation allowed the COV process to be conducted in an efficient and productive manner.

The COV commends the MSE management and program managers for their dedication and skill. The COV found that the processes by which MSE operates are fair, efficient, and professionally implemented. As a result, the MSE research portfolio is outstanding on a national and international scale.

The COV makes the following specific major recommendations:

- It is highly recommended that the program managers are provided expanded travel funds to attend national and international meetings/conferences to stay informed about the field and conduct site visits. This should include participation in smaller, focused workshops which are often highly informative. The lack of travel funds inhibits direct access by the program managers to rapidly evolving domestic and international research.
- The COV recommends addition of staff to MSE. First, replacement of personnel that have left is needed. Second, current staffing levels provide little to no opportunity to train personnel in anticipation of retirements or departures. The program managers play critical roles in the stewardship of the research portfolio and the need for additional talented staff is emphasized.

- Consider implementing the flexibility to hold COVs less frequently than every 3 years. The decisions regarding timing would be made in conjunction with the relevant constituencies such as the division, DOE leadership and BESAC.
- The COV recommends implementing the option to extend the term of awards. Consider ideas such as 4-5 years for large multi-PI awards or 3+2 awards based on the program needs, success, and program manager discretion.
- The Early Career Research Program has clearly been a big success in attracting top new talent and should definitely be continued. Based on the low acceptance rate, it is perceived that the early career program may be accepting too many full proposal submissions. Consider methods to reduce the number of full proposals submitted.
- Continue and expand communication pathways of programmatic emphasis areas and those deemphasized. This is particularly important for EPSCoR, academic early career and first time PIs.
- The COV recognizes that metrics for research are needed and it is understood that multiple considerations are currently employed. The COV expresses caution about the perception of using publication in 'high impact factor' journals as a metric of program success.

Table of Contents

1. Introduction

This report documents the findings from a Committee of Visitors (COV) that was assembled under the auspices of the Basic Energy Sciences Advisory Committee (BESAC) to evaluate the processes and programs of the Materials Sciences and Engineering (MSE) Division in the Office of Basic Energy Sciences (BES). The COV met at a hotel in Rockville, Maryland for two and one-half days from April 18-20, 2018. This was the sixth in the series of COV reviews of the MSE Division; the first held in March 2003, with subsequent reviews in 2006, 2009, 2012, and 2015.

2. The Charge to the Committee of Visitors

The charge to the COV was established in a letter from the Chair of BESAC, Prof. Persis Drell, to Prof. Esther Takeuchi, who had agreed to chair the COV. The letter is attached as Appendix I. The charge was to address the operations of the MSE Division and the impact of the program during the fiscal years 2015, 2016, 2017. The components of the Division that the COV was asked to review were:

1. Scattering and Instrumentation Sciences Team (Electron and Scanning Probe Microscopy, Neutron Scattering, X-ray Scattering),
2. Condensed Matter and Materials Physics Team (Experimental Condensed Matter Physics, Theoretical Condensed Matter Physics, Mechanical Behavior and Radiation Effects, Physical Behavior of Materials),
3. Materials Discovery, Design, and Synthesis Team (Materials Chemistry, Biomolecular Materials, Synthesis and Processing Science), and
4. DOE EPSCoR Program.

The COV was asked to focus on the following major elements: (i) For both Department of Energy (DOE) laboratory projects (Field Work Proposals, FWPs) and grants program, assess the efficacy and quality of the process used to solicit, review, recommend, and document proposal actions and to monitor active projects and programs. (ii) Within the boundaries defined by the DOE missions and available funding, comment on how the award process has affected the breadth and depth of portfolio elements, and the national and international standing of the portfolio elements.

3. The Committee Membership

The COV membership was selected by the COV chair, Prof. Esther Takeuchi, in consultation with the chair of BESAC and the Division leadership. The members were chosen to represent a cross-section of experts in scientific fields relevant to the activities supported by the MSE Division. A balance was achieved between researchers who currently receive funding from BES and those that do not (14 and 3, respectively), between academic (16) and national laboratory (4), between those that have previously served on a COV and those that have not (4 and 13, respectively), and also including representatives from EPSCoR states (3). Also, the panel representation had 6 women and 11 men.

Given the size of the Division and the breadth of programmatic areas, a sizable committee was assembled. The COV consisted of a total of 16 members, plus the chair and were divided between 3 panels for the first reading of the grant/FWP folders, and 4 panels for the second

reading of the folders (which included the read for the EPSCoR program).

The following COV members served as the leaders for the Panels: Prof. Susanne Stemmer (Scattering and Instrumentation Sciences), Prof. Harold Hwang (Condensed Matter and Materials Physics), Prof. Monica Olvera de la Cruz (Materials Discovery, Design and Synthesis), and Dr. Jeff Nelson (EPSCoR).

A full listing of the COV members and their panel assignments for both the first and second reading of the folders is given in Appendix II and Appendix III, respectively.

4. The Review Process

The COV assembled at the Rockville Hilton at 8:30 AM on Wednesday, April 18, and adjourned at 11:00 AM on Friday, April 20. The agenda for the COV is attached as Appendix IV.

Prior to convening in Rockville, each COV member was supplied with the link to access the MSE Division COV in the Portfolio Analysis and Management System (PAMs) that included a comprehensive set of information pertaining to: the COV process, the report template, the core research activities of the Division, and a copy of the 2012 and 2015 MSE Division COV reports together with the response from BES. The advance briefing for the Chair of the committee and providing the documents in advance to the panel leads were important in ensuring an effective and efficient review process. The templates for the panel reports and the prior COV report were particularly useful. Additional information was also supplied to each member during the meeting of COV, including copies of the plenary presentations, a more detailed overview of each of the Division's programs, and summary of the EPSCoR program.

The COV began with a presentation by Dr. Harriet Kung, the Director of BES, with an overview of BES and discussion of the COV charge, followed by an overview of the MSE Division by Dr. Linda Horton. A tutorial on how to use PAMS for the COV was also provided. The panel members were then presented with details of the overall review process by the COV Chair, Prof. Esther Takeuchi, before adjourning to their panel break-out rooms.

The first reading of the folders was preceded by an overview of the team programs by the MSE Division Team Leads and the respective program managers. Each panel was given access through PAMS to an electronic set of proposal folders to evaluate the MSE Division award/decline/monitoring process.

For grants, these proposals were distributed among four types of programmatic decisions: easy awards, easy declines, difficult awards, and difficult declines, with approximately 25 proposals per panel, except for EPSCoR (more than 12). In general, the number of proposals reviewed reflected the budget and numbers of applications for the subprograms. The panels were free to request any additional materials (including folders for other projects) and information that they felt would help them in their evaluation process.

For laboratory-based FWPs, the panels reviewed laboratory triennial reviews for renewals of projects plus mail reviews for new projects. Approximately 20% of the actions were from

laboratory based FWPs, except for EPSCoR that funds only university research.

The first reading of folders occupied the remainder of the first day with the panels preparing preliminary conclusions that were discussed with the COV chair and shared with the BES MSE management. Informal discussion and documentation continued well into the evening. The template used by the panels for their reports is presented in Appendix V.

On the morning of the second day, the majority of the panel members were assigned to different panels for the second read. The panel leads, however, remained with their original assignment to add continuity and context for the COV members assigned to do the second reading of the folders. The second reading allowed refinement and review of the preliminary findings. Also on the second day, a fourth panel met, led by Dr. Jeff Nelson, to conduct the first and only reading of the EPSCoR program folders.

During the afternoon of the second day, the original members of each panel reconvened (with the exception of the EPSCoR panel which continued their deliberations) with the panel lead to merge and finalize the findings from the first and second reads, and to prepare materials for the final report. The entire COV then met in executive session to discuss and reach consensus on the major findings and recommendations.

On the morning of the third day the COV Chair and panel leads met and presented the major findings and recommendations to BES management, MSE Division management, and the MSE Division program managers.

The written reports from the panels (Appendix VI - Appendix IX) and the conclusions and recommendations drawn from the executive session provided the basis for this report.

5. Major Findings of the COV

- The program managers are doing an outstanding job of managing their portfolios as they are knowledgeable, using high quality reviewers and are making highly informed decisions. They should be commended on their high quality work. Further, many PIs comment on the importance of having a sustained contact person. This can contribute to continuity of programs.
- The use of white papers is a very valuable and effective process. The program managers devote significant time to this process where they inform prospective Principal Investigators (PIs) on the areas of emphasis for their program. The success of proposals is strongly influenced by the PI engagement with the program managers during the white paper phase. While the process is informal using email and phone calls, the COV sees no need to formalize the process.
- The COV observes that there is an appropriate turn-over rate for the program portfolios. This ensures the ability to maintain strong continuity as well as the ability to bring in fresh ideas and new PIs.
- The Basic Research Needs (BRN) reports are highly influential, both in terms of shaping/ focusing the portfolio and defining fields as a whole. These reports are outstanding resources for those in the field and provide a view of needed research directions.

- DOE BES is unique in providing strong and sustained support in the fields of characterization and technique development. This support bears fruit in enabling science that otherwise may not be possible.
- PAMS was overall an effective tool to provide detailed information to the members of the COV. The panel members also comment that PAMS is also a useful proposal submission tool. Specific additional information that could be made more readily accessible is highlighted in the panel reports that may be useful for future COVs.
- PI meetings are outstanding venues to gain insight into program content, initiate collaborations and provide crucial interactions for EPSCoR and Early Career PIs. These meetings are regarded as some of the best, if not the best in the field. Additional site visits by program managers would be useful, particularly for the academic PIs.
- Several members of the COV find 3 years to be too short for funding cycles, in particular for larger multi-PI efforts including those at DOE national laboratories.

6. Major Recommendations of the COV

- It is highly recommended that the program managers are provided expanded travel funds to attend national and international meetings/conferences to stay informed about the field and conduct site visits. This should include participation in smaller, focused workshops which are often highly informative. The lack of travel funds inhibits direct access by the program managers to rapidly evolving domestic and international research.
- The COV recommends addition of staff to the MSE Division. First, replacement of personnel that have left is needed. Second, current staffing levels provide little to no opportunity to train personnel in anticipation of retirements or departures. The program managers play critical roles in the stewardship of the research portfolio and the need for additional talented staff is emphasized.
- Consider implementing the flexibility to make COVs less frequent than every 3 years. The decisions regarding timing would be made in conjunction with the relevant constituencies such as the division, DOE leadership and BESAC.
- The COV recommends implementing the option to extend the term of awards. Consider ideas such as 4-5 years for large multi-PI awards or 3+2 awards based on the program needs, success, and program manager's discretion.
- The Early Career Research Program has clearly been a big success in attracting top new talent and should definitely be continued. Based on the low acceptance rate, it is perceived that the early career program may be accepting too many full proposal submissions. Consider methods to reduce the number of full proposals submitted.
- Continue and expand communication pathways of programmatic emphasis areas and those deemphasized. This is particularly important for EPSCoR, academic early career or first time PIs.
- The COV recognizes that metrics for research are needed and it is understood that multiple considerations are currently employed. The COV expresses caution about the perception of using publication in 'high impact factor' journals as a metric of program success.

Appendix I: Charge from the Chair of BESAC, Prof. Persis Drell to the Chair of the COV, Prof. Esther Takeuchi

Stanford University

Persis S. Drell
Provost

October 31, 2017

Professor Esther Takeuchi
Materials Science & Chemical Engineering Department
Stony Brook University
314 Engineering Bldg.
Stony Brook, New York 11794-2275

Dear Professor Takeuchi:

The Basic Energy Sciences Advisory Committee (BESAC) has been charged by the Department of Energy Office of Science to assemble a Committee of Visitors (COV) to review the management processes for the Materials Sciences and Engineering Division of the Basic Energy Sciences (BES) program. Thank you for agreeing to chair this BESAC COV panel. Under your leadership, the panel should provide an assessment of the processes used to solicit, review, recommend, and document proposal actions and monitor active projects and programs.

The panel should assess the operations of the Division's programs during the fiscal years 2015, 2016, and 2017. The panel may examine any files from this period for both DOE laboratory projects and university projects. The components of the Division that you are being asked to review are:

(1) Materials Discovery, Design and Synthesis
(2) Condensed Matter and Materials Physics
(3) Scattering and Instrumentation Sciences
(4) Experimental Program to Stimulate Competitive Research

You will be provided with background material on these program elements prior to the meeting. The COV is scheduled to take place April 18-20, 2018 at the Rockville Hilton in Maryland. A presentation to BESAC is requested at its Summer 2018 meeting (exact dates tbd). Following acceptance of the report by the full BESAC committee, the COV report with findings and recommendations will be presented to the Director of the Office of Science.

I would like the panel to consider and provide evaluation of the following four major elements:

1. For both the DOE laboratory projects and the university projects, assess the efficacy and quality of the processes used to:
   (a) solicit, review, recommend, and document proposal actions and
   (b) monitor active projects and programs.
2. Within the boundaries defined by DOE missions and available funding, comment on how the award process has affected:
   (a) the breadth and depth of portfolio elements, and
   (b) the national and international standing of the portfolio elements.

Office of the Provost
Building 10, Main Quadrangle Stanford, CA 94305-2061 T (650) 724-4075

If you have any questions regarding BESAC or its legalities, please contact Katie Runkles, Office of Basic Energy Sciences at 301-903-6529 or by e-mail at katie.runkles@science.doe.gov. Teresa Crockett, the Program Analyst for the Materials Sciences and Engineering Division, will provide logistical support for the COV meeting. She may be contacted by phone at 301-903-5804 or by e-mail at teresa.crockett@science.doe.gov . For questions related to the Materials Sciences and Engineering Division, please contact Linda Horton, 301-903-7506, or by e-mail at linda.horton@science.doe.gov.

Sincerely,

Persis S. Drell

Persis S. Drell, Chair
Basic Energy Sciences Advisory Committee

cc: T. Crockett
L. Horton
H. Kung
K. Runkles

Appendix II: COV Members and Affiliation

BES Materials Sciences and Engineering Division
2018 Committee of Visitors Panel Membership Roster

Last Name	First Name	Affiliation
Allison	John	University of Michigan
Bobev	Svilen	University of Delaware
Bonnell	Dawn	University of Pennsylvania
DeYoreo	Jim	PNNL/University of Washington
Gedik	Nuh	Massachusetts Institute of Technology
Headrick	Randall	University of Vermont
Huang	Yu	University of California, Los Angeles
**Hwang	Harold	SLAC/Stanford University
Lau	Jeanie	Ohio State University
Millis	Andy	Columbia University
**Nelson	Jeff	Sandia National Laboratories
**Olvera de la Cruz	Monica	Northwestern University
Ong	Phuan	Princeton University
Sinha	Sunil (Sunny)	University of California, San Diego
**Stemmer	Susanne	University of California, Santa Barbara
*Takeuchi	Esther	Stony Brook University/ BNL
Yakobson	Boris	Rice University

* COV Chair ** Panel Leads

Appendix III: COV Panel Assignments

First Read

Panel 1	Scattering and Instrumentation Sciences Electron and Scanning Probe Microscopies, Neutron Scattering, X-Ray Scattering			
Chair: Susanne Stemmer	Panel Members			
	Dawn Bonnell	Nuh Gedik	Randy Headrick	Sunil (Sunny) Sinha
Panel 2	**Condensed Matter and Materials Physics** Experimental Condensed Matter Physics, Mechanical Behavior and Radiation Effects, Physical Behavior, Theory Condensed Matter Physics			
Chair: Harold Hwang	Panel Members			
	John Allison	Jeff Nelson	Jeanie Lau	Phuan Ong
	Andy Millis			
Panel 3	**Materials Discovery, Design and Synthesis** Biomolecular Materials, Materials Chemistry, Synthesis and Processing			
Chair: Monica Olvera de la Cruz	Panel Members			
	Svilen Bobev	Jim DeYoreo	Yu Huang	Boris Yakobson

Second Read

Panel 1A	Scattering and Instrumentation Sciences Electron and Scanning Probe Microscopies, Neutron Scattering, X-Ray Scattering		
Chair: Susanne Stemmer	Panel Members		
	Jim DeYoreo	Jeanie Lau	Phuan Ong
Panel 2A	**Condensed Matter and Materials Physics** Experimental Condensed Matter Physics, Mechanical Behavior and Radiation Effects, Physical Behavior, Theory Condensed Matter Physics		
Chair: Harold Hwang	Panel Members		
	John Allison	Nuh Gedik	Yu Huang
	Boris Yakobson		
Panel 3A	**Materials Discovery, Design and Synthesis** Biomolecular Materials, Materials Chemistry, Synthesis and Processing		
Chair: Monica Olvera de la Cruz	Panel Members		
	Dawn Bonnell	Andy Millis	Sunil (Sunny) Sinha

EPSCoR Panel 4
Chair: Jeff Nelson
Svilen Bobev
Randy Headrick

Appendix IV: COV Agenda

Agenda
Committee of Visitors
Review of the Materials Sciences and Engineering Division
April 18-20, 2018, Rockville Hilton

Wednesday, April 18 2018

Time	Activity	Participants/Lead	Location
7:30 AM - 8:30am	Continental Breakfast		Outside Eisenhower
8:30am - 9:00am	Welcome, Charge to the Committee and SC-BES Overview	Harriet Kung, BES Associate Director	Eisenhower
9:00am - 10:15am	MSE Overview, Statistics & PAMS Demo	Linda Horton, MSE Division Director	Eisenhower
10:15am - 10:45am	Instructions, procedures, and schedule	Esther Takeuchi, COV Chair	Eisenhower
10:45am - 11:00am	Break and disperse to panel rooms		
11:00am - 12:00pm	**Team Overviews:** • BES presentations (10 mins maximum per program) • Q&A with MSE Rep • Preliminary Review of Folders		
Panel Breakouts	**First Read Panel 1** Scattering & Instrumentation Sciences Team	**Panel 1** - Susanne Stemmer, Lead MSE Rep: Helen Kerch MSE Staff: P. Thiyagarajan, Lane Wilson, Jane Zhu	Jackson
	First Read Panel 2 Condensed Matter & Materials Physics Team	**Panel 2** - Harold Hwang, Lead MSE Rep: Jim Horwitz MSE Staff: Jim Davenport, Matthias Graf, Refik Kortan, Mick Pechan, John Vetrano	Lincoln
	First Read Panel 3 Materials Discovery, Design , and Synthesis Team	**Panel 3** – Monica Olvera de la Cruz, Lead MSE Rep: Mike Markowitz for Helen Kerch MSE Staff: Bonnie Gersten, Craig Henderson, Mike Markowitz, Michael Sennett	Monroe
12:00pm - 1:00pm	Working Lunch		Food Outside Eisenhower
1:00pm - 4:30pm **Panel Breakouts**	**Same Breakout Panels and Meeting Locations as Listed Above** **First Read:** Review Folders and Formulate Panel Comments ***Afternoon refreshments will be available outside Panel Rooms***		
4:30pm - 5:00pm	COV Executive Session	COV Panel Leads and Chair	Truman
5:00pm - 5:30pm	COV and BES General Discussion	COV Panel Leads & Chair and BES Management	Truman
5:30pm - 6:00pm	Break		
6:00pm - 7:30pm	Dinner	MSE/COV members	Wilson

Agenda
Committee of Visitors
Review of the Materials Sciences and Engineering Division
April 18-20, 2018, Rockville Hilton

Thursday, April 19, 2018

Time	Activity	Participants/Lead	Location
7:30 AM - 8:30am	Continental Breakfast		Outside Eisenhower
8:30am - 11:30am	**Second Read Panel 1A** Scattering & Instrumentation Sciences Team	**Panel 1A** - Susanne Stemmer, Lead MSE Rep: Helen Kerch MSE Staff: P. Thiyagarajan, Lane Wilson, Jane Zhu	Jackson
	Second **Read Panel 2A** Condensed Matter & Materials Physics Team	**Panel 2A** - Harold Hwang, Lead MSE Rep: Jim Horwitz MSE Staff: Jim Davenport, Matthias Graf, Refik Kortan, Mick Pechan, John Vetrano	Lincoln
Panel Breakouts	**Second Read Panel 3A** Materials Discovery, Design , and Synthesis Team	**Panel 3A** – Monica Olvera de la Cruz, Lead MSE Rep: Mike Markowitz for Helen Kerch MSE Staff: Bonnie Gersten, Craig Henderson, Mike Markowitz, Michael Sennett	Monroe
	Second Read Panel 4 EPSCoR	**Panel 4** - Jeff Nelson, Lead MSE Rep: Linda Horton MSE Staff: Tim Fitzsimmons	Truman
	Second Read: •Review of Folders •Formulate Panel Comments •Review 1st Read Comments *****Refreshments will be available outside Panel Rooms*****		
11:30am - 1:00pm	**Lunch**		Outside Eisenhower
12:30pm - 1:30pm	COV Executive Session Preliminary Panel Findings	COV Panel Leads and Chair	Eisenhower
1:30pm - 5:00pm	**Report Preparation and Panel Breakouts**	Panel 1 - Susanne Stemmer, Lead (First day reviewers)	Jackson
		Panel 2 - Harold Hwang, Lead (First day reviewers)	Monroe
		Panel 3 - Monica Olvera de la Cruz, Lead (First day reviewers)	Lincoln
		Panel 4 -Jeff Nelson, Lead	Truman
	Report Preparation: • **Merge 1st and 2nd Read Comments** • **Formulate Panel Final Comments** • **Outline Summary for Briefing** • **Prepare Draft Panel Report**		
5:00pm - 5:30pm	COV Executive Session Preliminary Panel Findings	COV Panel Leads and Chair	Jackson
5:00pm - 5:30pm	COV and BES General Discussion	COV Panel Leads & Chair and BES Management	Jackson
6:00pm - 7:30pm	Dinner		On your own

Friday, April 20, 2018

Time	Activity	Participants/Lead	Location
7:30 AM - 8:30am	Continental Breakfast		Outside Eisenhower
8:30am - 9:15am	Breakout Panels - Final Wrap-Up	COV Chair & Panel Leads	Jackson
9:15am - 10:00am	COV Executive Session	COV Chair & Panel Leads / BES Management	Eisenhower
10:00am - 11:00am	Closeout Session	COV Chair & Panel Leads / BES Staff	Eisenhower
11:00am	Adjourn - Thank You!		

Appendix V: First Read/Second Read COV Report Input Template and Progress Towards the Long-term Goals of the Office of BES

REPORT INPUT TEMPLATE

BES COMMITTEE OF VISITORS (COV) Reviewing the
Materials Sciences and Engineering Division Fiscal Years
2015, 2016, and 2017

First or Second Read Subpanel
Program: _____

Charge to the COV:

I. For both the DOE laboratory projects and the university projects, assess the efficacy and quality of the processes used to:

(a) solicit, review, recommend, and document proposal actions and
(b) monitor active projects and programs.

II. Within the boundaries defined by DOE missions and available funding, comment on how the award process has affected:

(a) the breadth and depth of portfolio elements, and
(b) the national and international standing of the portfolio elements.

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

Based on the COV's study of proposal actions completed within the past three fiscal years, please provide brief findings, recommendations, and comments on the following aspects of the program's processes and management used to:

(a) Solicit, review, recommend, and document proposal actions
Consider, for example:

- consistency with priorities and criteria stated in the program's solicitations, announcements, and guidelines
- adequate number of reviewers for balanced review; use of reviewers having appropriate expertise/qualifications; use of a sufficiently broad pool of reviewers; avoidance of conflicts of interest
- efficiency/time to decision
- completeness of documentation making recommendations

Findings:

Comments:

Recommendations:

(b) Monitor active project and programs

Consider, for example

- written progress reports
- principal investigators' meetings
- site visits
- interactions at topical, national and other meetings;

Findings:

Comments:

Recommendations:

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

Taking into account the DOE, BES, and Division missions, the available funding, and information presented about the portfolio of funded science, comment on how the award process has affected:

(a) the breadth and depth of portfolio elements

Consider, for example:

- the overall quality of the science
- the balance of projects with respect to innovation, risk, and interdisciplinary research
- the evolution of the portfolio with respect to new investigators and new science thrusts
- the relationship of the portfolio to other parts of the Division
- the appropriateness of award scope, size, and duration

Findings:

Comments:

Recommendations:

(b) the national and international standing of the portfolio elements

Consider, for example:

- the uniqueness, significance, and scientific impact of the portfolio
- the stature of the portfolio principal investigators in their fields
- the leadership position of the portfolio in the nation and the world

Findings:

Comments:

Recommendations:

Appendix VI: Summary Reports from Panel 1

COV PANEL REPORT
Panel 1: Scattering & Instrumentation Sciences

BES COMMITTEE OF VISITORS (COV)
Reviewing the Materials Sciences and Engineering Division
Fiscal Years 2015, 2016, and 2017

Charge to the COV:

I. For both the DOE laboratory projects and the university projects, assess the efficacy and quality of the processes used to:

(a) Solicit, review, recommend, and document proposal actions
(b) Monitor active project and programs.

II. Within the boundaries defined by DOE missions and available funding, comment on how the award process has affected:

(a) The breadth and depth of portfolio elements
(b) The national and international standing of the portfolio elements.

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

Based on the COV's study of proposal actions completed within the past three fiscal years, please provide brief findings, recommendations, and comments on the following aspects of the program's processes and management used to:

(a) Solicit, review, recommend, and document proposal actions

Consider, for example:

- consistency with priorities and criteria stated in the program's solicitations, announcements, and guidelines
- adequate number of reviewers for balanced review; use of reviewers having appropriate expertise/qualifications; use of a sufficiently broad pool of reviewers; avoidance of conflicts of interest
- efficiency/time to decision
- completeness of documentation making recommendations

Findings:

- The program managers are doing an outstanding job of getting high quality reviewers.

- The program managers are highly knowledgeable about their fields and are making very informed decisions.
- The proposal reviews are typically highly detailed and insightful.
- The time to decision varied with the longest times around 7-8 months. This is acceptable, but it should not increase.
- The number of reviewers (3 – 5) solicited for each proposal is sufficient to make an informed decision.
- The program staff's internal memos reflect the nuances of what is being said in the reviews.
- The system is fair.
- Proposers often get a chance to respond to negative comments by the reviewers, which helps with making an informed decision.
- The program managers encourage the submission of white papers. This reduces the burden on the reviewers and the white paper feedback helps the PIs in identifying topics that fit within the portfolio. This is a very valuable process.
- The information about the portfolio and covered research topics provided to the scientific community through websites and direct communication is excellent.
- Program managers are very responsive to inquiries by the scientific community.
- Communications among the program managers to find a good match between proposed projects and different programmatic areas are excellent.

Comments:

- A numerical scoring system is not used for most proposals, which was seen as positive.

Recommendations:

- Keep up the good work.
- Document/make a memo (for future COVs) if feedback was provided to the PIs whose proposals were declined, such as if the decision was (at least partially) programmatic or due to other reasons that are not obvious from the reviews.

(b) Monitor active project and programs

Consider, for example

- written progress reports
- principal investigators' meetings
- site visits
- effective interactions between program managers and PIs

Findings:

- The program managers are highly informed about the research in their portfolios.
- The program managers are doing an excellent job in monitoring projects despite the hiring freeze, increased number of proposals, and several staff overseeing more than one portfolio.
- PI meetings and written progress reports are the main mechanism of monitoring active projects at universities.
- Site visits are only used for the labs.
- Productivity (i.e., publications) is closely monitored.
- Expectation is on portfolio managers at labs to conduct multiple meetings a year to update program managers.
- Excellent support and continued encouragement of PIs to pursue their best ideas and a long-term vision
- Excellent communication between program managers on active projects across different portfolios
- Excellent continuity in staff and institutional memory

Comments:

Recommendations:

- More travel funds for the program managers are needed for site visits to universities and interactions with PIs.
- Using the number of publications in "high-profile/high impact factor" journals as a metric to judge success of a project should be strongly discouraged.

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

Taking into account the DOE, BES, and Division missions, the available funding, and information presented about the portfolio of funded science, comment on how the award process has affected:

(a) The breadth and depth of portfolio elements

Consider, for example:

- the overall quality of the science
- the balance of projects with respect to innovation, risk, and interdisciplinary research
- the evolution of the portfolio with respect to new investigators and new science thrusts
- the relationship of the portfolio to other parts of the Division and BES
- the relevance of the portfolio with respect to the missions of the program, division, BES, and DOE
- the appropriateness of award scope, size, and duration

Findings:

- Appropriate turn-over rate ensures bringing in fresh ideas and new PIs.
- Positive impact on the community due to stable funding
- Overall quality of the science is excellent.
- Ambitious, high-risk/high-impact projects are getting funded.
- Innovative projects are being actively solicited and funded.
- Good match with priority research directions and funded projects
- Mature areas are getting discouraged/terminated.
- New technique development is being valued.
- Breadth of topics covered is excellent across the priority research directions, which were clearly identified.
- The program managers are very informed about junior researchers in the field.
- Junior researchers are encouraged to submit proposals.

Comments:

Recommendations:

- The X-ray scattering portfolio includes optical and other advanced spectroscopic techniques. Consider renaming the portfolio to better reflect the breadth of topics covered and make it easier for future PIs to identify the correct program to apply to.
- Provide information to future COVs about senior vs. junior PIs in the program portfolio (i.e., use time since degree as a measure).
- Consider making 5 year or at least 3+2 year awards (at program manager's discretion) for long term stability. A 3+2 award might involve an informal review by the program manager after 3 years to get the 2 year option.

(b) The national and international standing of the portfolio elements

Consider, for example:

- the uniqueness, significance, and scientific impact of the portfolio
- the stature of the portfolio principal investigators in their fields

- the leadership position of the portfolio in the nation and the world

Findings:

- The outstanding scientific quality of the portfolios is due to the highly qualified and committed program managers and their hard work.
- DOE BES is unique in providing strong and sustained support in the fields of characterization and technique development.
- The BRN reports are highly influential, both in terms of shaping/focusing the portfolio and defining fields as a whole.
- Many of the forefront developments in neutron, x-ray, electron, and optical spectroscopies and imaging have resulted from the research supported by the portfolios.
- As a specific example, DOE is at the forefront of supporting new research in driven, ultrafast, and non-equilibrium states.
- World class researchers are across the various portfolios.
- Researchers supported by the programs have won many prestigious awards.
- Highlights provide very good snapshots of the success and high standing of the programs.

Comments:

- It would be helpful if some aggregated measures (i.e., invited talks and seminars, citations for the publications in the project, …) would be provided to judge the impact of the projects. PIs' honors are a measure of the long-term visibility of the PI but not necessarily due to a specific DOE supported project.

Recommendations:

- It is highly recommended that the program managers are provided travel funds to attend national and international meetings/conferences to stay informed about the field and new developments. This should include participation in smaller, focused workshops which are often more informative.

Appendix VII: Summary Report from Panel 2

COV PANEL REPORT
Panel 2: Condensed Matter and Materials Physics

BES COMMITTEE OF VISITORS (COV)
Reviewing the Materials Sciences and Engineering Division
Fiscal Years 2015, 2016, and 2017

Charge to the COV:

I. For both the DOE laboratory projects and the university projects, assess the efficacy and quality of the processes used to:
(a) Solicit, review, recommend, and document proposal actions
(b) Monitor active project and programs.

II. Within the boundaries defined by DOE missions and available funding, comment on how the award process has affected:
(a) The breadth and depth of portfolio elements
(b) The national and international standing of the portfolio elements.

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

Based on the COV's study of proposal actions completed within the past three fiscal years, please provide brief findings, recommendations, and comments on the following aspects of the program's processes and management used to:

(a) Solicit, review, recommend, and document proposal actions

Consider, for example:

- consistency with priorities and criteria stated in the program's solicitations, announcements, and guidelines
- adequate number of reviewers for balanced review; use of reviewers having appropriate expertise/qualifications; use of a sufficiently broad pool of reviewers; avoidance of conflicts of interest
- efficiency/time to decision
- completeness of documentation making recommendations

Findings:

- The Condensed Matter and Materials Physics (CMMP) team is a large and dynamic program, supporting first-rate scientific activities across a wide range of vital research areas. The Committee was uniformly impressed by the effort and thoughtfulness of the staff in constructing a mission-critical program, and exercising the highest levels of judgement on the proposal actions.
- The CMMP is run in a very effective and efficient manner – the typical time of proposal review and decision-making was ~ 4 months.
- We observe a uniformity of process and standards across national lab, university, and early career proposals. In all cases, sufficient reviewers (minimum 3, typically 4-5, sometimes more) with appropriate expertise were consulted, and they provided serious, technical reviews, keeping a notably high standard. It is clear that the reviews are carefully read and analyzed. The award decisions were quite well aligned with the reviewer evaluations.
- Early career reviews were generally thoughtful and carefully written to provide useful feedback, regardless of outcome, to the applicant.
- The CMMP program follows guidelines and priorities set in the solicitations, which are based on numerous inputs such as the BRNs. This reflects the fact that this is an actively managed portfolio of research activities.
- Significant efforts have been made to communicate priorities to the proposer community, and the DOE guidance is reasonably clear to PIs already "in the system" (members of national labs, or currently funded university PIs). The program managers are to be commended for their efforts in this direction. However, it appears to the Committee that there remains a gap in understanding with new applicants, who often perceive CMMP to span all research activities under this title and therefore submit proposals that are not well matched to the DOE programs.

Comments:

- While they may have been statistical outliers, some proposals were reviewed only by non-US reviewers. The choice of reviewers may be driven by factors including the technical needs of the review and avoidance of conflicts of interest, and is highly appropriate on these terms, but careful reading of the reports is required because non-US referees may have different expectations in format/content of proposals, and may be less familiar with the relevant Funding Opportunity Announcements (FOAs) and DOE priorities.

Recommendations:

- We recommend continued efforts to communicate the importance of the priorities emphasized in the FOAs to a wider audience including potential new investigators. This could include activities such as an annual

communication to university sponsored research offices emphasizing this point.

- The Early Career Research Program has clearly been a big success in attracting top new talent and proposals into the CMMP program – it should certainly be continued. The early career award holds in dynamic tension the desire to broadly attract leading young scientists to the problems of the DOE BES via a highly prestigious award, and the workload of overseeing many applications. Based on the headline acceptance rate, it is perceived that the early career program may be accepting too many full proposal submissions. One possibility is to incorporate explicit scientific feedback by the relevant program manager in the pre-application stage, in addition to the current feedback purely on responsiveness to the solicitation.

(b) Monitor active project and programs

Consider, for example

- written progress reports
- principal investigators' meetings
- site visits
- effective interactions between program managers and PIs

Findings:

- The biannual contractors' meeting is fairly unique among federally funded research programs – they are noted to be very high quality scientific meetings in themselves, as well as providing good networking opportunities among the PIs to develop collaborations, identify postdocs, etc. They further help program managers to communicate new developments and priorities with their PIs. However, the lack of travel funding for program managers means that other desirable means of communication and information gathering, including attendance at conferences and visits to locations where CMMP sponsored work was occurring, are not employed.
- The Computational Materials Science Centers are noted to have an active and serious interim management review process incorporated into their project activities. This is appropriate given the size of these multi-PI Centers.

Comments:

- Monitoring (in real time) the impact of a research project is intrinsically difficult. Rather than a reliance on publication numbers and journal impact factors, research impact may be more accurately assessed by considering additional factors: the short-term (1/2 year) impact is often reflected via invited talks, while citations might gauge impact on the 3-year timescale and beyond.

Recommendations:

- The lack of travel funds clearly limits the ability of program managers to sufficiently monitor and interact with their PIs. While relevant program managers usually attend on-site triennial reviews at the national labs, university PIs often never receive a site visit. Travel funding for this category should be increased with the goal of program managers having at least one on-site visit per 3 years for each of their lead PIs. These on-site visits can be made in conjunction with attendance of domestic conferences and workshops. A much better understanding of the effectiveness of a project can be seen in the context of a meeting (Is this work featured by an invited talk? Is it exciting the community, cited and motivating related work?).

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

Taking into account the DOE, BES, and Division missions, the available funding, and information presented about the portfolio of funded science, comment on how the award process has affected:

(a) The breadth and depth of portfolio elements

Consider, for example:

- the overall quality of the science
- the balance of projects with respect to innovation, risk, and interdisciplinary research
- the evolution of the portfolio with respect to new investigators and new science thrusts
- the relationship of the portfolio to other parts of the Division and BES
- the relevance of the portfolio with respect to the missions of the program, division, BES, and DOE
- the appropriateness of award scope, size, and duration

Findings:

- Overall the quality of the science is excellent, at a leading international level.
- Within the priority areas identified by the DOE, the CMMP research portfolio plays an essential role in the US scientific effort. The CMMP's stewardship of these areas of science is crucial in maintaining US leadership.
- Unlike the National Science Foundation (NSF), the DOE research directions are not meant to be comprehensive, but a targeted subset of the CMMP field – this gives the program managers a fair degree of discretion and responsibility. We find a very good balance between sustaining long-term

engagement of promising areas, with effective decision-making to close projects and launch new ones.

- This is currently a timeframe where significant efforts have been made towards BRNs to help identify and develop new priorities, and several new initiatives have been launched. It is clear that CMMP is actively and rapidly evolving, providing key guidance for the frontier missions at all levels across the DOE and the broader scientific community.
- Strong coordination and synergies were apparent between the program managers in the CMMP team, effectively managing the interdisciplinary/related research components. Overall this was apparent across the MSE programs in general.
- The timescale of (typically) 3-year funded projects, with opportunity to renew, is appropriate. The funding scales seem flexible, both for individual and multi-PI projects – this is appropriate and encouraged.

Comments:

- Within CMMP, we note that 3 sub-programs (Experimental Condensed Matter Physics (ECMP), Theoretical Condensed Matter Physics (TCMP), and Physical Behavior of Materials) had significant synergy around quantum materials and quantum phenomena, while Mechanical Behavior and Radiation Effects had a different emphasis – they are all evolving consistent with their mission and scientific disciplines.

Recommendations:

- Possibilities to increase interactions between PIs between different sub-programs could be considered. This is of course challenging; one possibility could be to arrange adjacent (in time) contractors' meetings for related areas. This might be relevant to ECMP and TCMP, given the intellectual overlap, bridging the partial separation between theory and experiment in the CMP area.
- We are concerned that limitations of travel funding have reduced the full participation of program managers at national lab triennial reviews in some cases. This diminishes their ability to coordinate relationships between their project portfolios and the broader context – this should be addressed.

(b) The national and international standing of the portfolio elements

Consider, for example:

- the uniqueness, significance, and scientific impact of the portfolio
- the stature of the portfolio principal investigators in their fields
- the leadership position of the portfolio in the nation and the world

Findings:

- This program plays the essential role for the US CMMP community. The portfolio PIs consist of internationally recognized leaders in the field, as well as up-and-coming young researchers. It provides crucial leadership in discovering advanced materials and quantum phenomena that have profound scientific and technological implications relevant to the DOE. In these areas of emphasis, this program contains the leading PIs in the field and plays a key role in advancing relevant areas of science.

Comments:

- Given an extended period of relatively flat funding, we support the decisions of the program managers to carefully identify and support priority areas. However, we note that this has increasingly required the termination of projects that are also highly important and productive, and leaves the program in significant danger of losing core expertise that might emerge to be essential in future.

Recommendations:

- We again emphasize the critical need for the program managers to have the resources to travel to scientific meetings and institutions, both in the US and abroad. Attendance at multiple conferences is essential if program officers are to be able to optimally carry out their mandate of identifying and supporting the best scientists and the highest priority research. Over the past decade, their presence at domestic conferences has been visibly lost. Upon our query, we were informed that across all of the MSE management, 4 international trips were taken over the past 9 years (one was to Canada). This leaves the management woefully unable to make key evaluation and planning decisions based on direct information. CMMP is increasingly in a multipolar landscape, both domestically (with industrial pursuit of quantum technologies, private foundation interest, etc.) and internationally (with strong competition from Europe and Asia). In this context, it is even more essential for this program to provide long-term stewardship for US activities in this vital area.

Additional Comments from CMMP Panel

As apparent in this report, the Committee found the CMMP program to be operating at a very high level. Important recommendations from previous COV reviews have been incorporated, such as increased utilization of PAMS and white paper reviews, while the underfunded travel budget for program managers remains to be substantially addressed. In this context, we suggest to BESAC that under the current charge, the COV review can be held less frequently while maintain appropriate oversight. Alternatively, the current triennial COV review schedule could be maintained with added scope, potentially including the following representative areas:

- Further consideration of the relationship of CMMP (and MSE more broadly) with other Divisions and relevant programs, such as the Energy Frontier Research Centers and the Materials Genome Initiative.
- Consideration of long-range planning efforts and broad programmatic/structural decisions, such as fraction of multi-PI versus single-PI projects.
- Efforts to increase the diversity of the program PIs.
- Budget implications of the rapid shift to publicly accessible publishing.

Appendix VIII: Summary Report from Panel 3

COV PANEL REPORT

Panel 3: Materials Discovery, Design and Synthesis

BES COMMITTEE OF VISITORS (COV)
Reviewing the Materials Sciences and Engineering Division
Fiscal Years 2015, 2016, and 2017

Charge to the COV:

I. For both the DOE laboratory projects and the university projects, assess the efficacy and quality of the processes used to:

(a) Solicit, review, recommend, and document proposal actions
(b) Monitor active project and programs.

II. Within the boundaries defined by DOE missions and available funding, comment on how the award process has affected:

(a) The breadth and depth of portfolio elements
(b) The national and international standing of the portfolio elements.

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

Based on the COV's study of proposal actions completed within the past three fiscal years, please provide brief findings, recommendations, and comments on the following aspects of the program's processes and management used to:

(a) Solicit, review, recommend, and document proposal actions

Consider, for example:

- consistency with priorities and criteria stated in the program's solicitations, announcements, and guidelines
- adequate number of reviewers for balanced review; use of reviewers having appropriate expertise/qualifications; use of a sufficiently broad pool of reviewers; avoidance of conflicts of interest
- efficiency/time to decision
- completeness of documentation making recommendations

Findings:

- We read a broad range of proposals in each program Materials Chemistry, Synthesis and Processing Science, and Biomolecular Materials. Those included from national lab teams, single PIs and early career applicants and

covered awarded, declined and terminal awards. In all three cases, it is clear that a good effort is in place, through selecting a sufficient number of reviewers, the templated structure of their comments, and sufficient length of the comments - all serve well to increase the quality of BES research and its international standing. In all three cases the reviewers were mostly or all domestic, with expertise in or closely related fields, and with good crossover of academia and national labs pools (that is academics evaluating labs and vice versa).

- The program manger's evaluation process is robust. With 5 to 6 reviews form experts in proposal field, the program managers are able to discern their value. That is, the ability of the program managers to make intelligent decisions when positive reviews did not account for deficiencies was impressive. And when negative reviews failed to recommend opportunities for high risk, high reward research, the program managers were able to document the importance of funding such proposals. Decisions were very well documented.
- The white papers are extremely valuable to the PIs.

Comments:

- Early career awards have a low success rate and generate a lot of work for the applicants, the program managers and the reviewers.

Recommendations:

- We propose that the division re-evaluate the success rate that is optimal for the early career applicants and put in place a mechanism that will reduce the number of reviewed proposals to achieve the targeted success rate.
- Consider additional pathways to communicate the process of proposal submission and the changes in strategic directions for PIs in universities to decrease the number of proposals that do not respond to the goals of the programs.

(b) Monitor active project and programs

Consider, for example

- written progress reports
- principal investigators' meetings
- site visits
- effective interactions between program managers and PIs

Findings:

- The PI meetings, besides providing a mechanism to evaluate the PIs' research, give a great opportunity for the funded PIs to hear the success

stories from their peers. The quality of the research presented makes these meetings some of the top workshops in the field.
- The feedback given to the national lab team leaders on the progress reports is very useful. This formal feedback is generally not given to university PIs.

Comments:
- The value of the PI meetings is also to facilitate collaborations among PIs and identify challenges and new directions in the research area.

Recommendations:
- That feedback be given to the PIs on their progress reports when there is danger of moving away from the goals of the proposed work or if new directions do not align with the goals of the program.
- The program managers should attend more national and international meetings to discuss research opportunities and new directions. In national meetings, the program managers can meet with PIs from universities to provide feedback on their research.

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

Taking into account the DOE, BES, and Division missions, the available funding, and information presented about the portfolio of funded science, comment on how the award process has affected:

(a) The breadth and depth of portfolio elements

Consider, for example:
- the overall quality of the science
- the balance of projects with respect to innovation, risk, and interdisciplinary research
- the evolution of the portfolio with respect to new investigators and new science thrusts
- the relationship of the portfolio to other parts of the Division and BES
- the relevance of the portfolio with respect to the missions of the program, division, BES, and DOE
- the appropriateness of award scope, size, and duration

Findings:
- The overall quality of the science funded is high and cutting edge. The projects funded are highly innovative.
- The programs address the full range of priority research directions and grand challenges called out by BES.
- There is a reasonable balance on the number of PIs and topics moving in and out of the portfolio with good alignment with program and BES goals.

- The program managers have made an effort over last years to be actively aware of the relation between different programs through, for example, attending the PI meetings of other programs. Increasing coordination is a very positive direction.
- The relevance of portfolio to the BES mission is well documented.
- A lot of attention is paid to the funding level relative to the goals of the proposal.

Comments:

- The panel believes three years duration for the awards is too short.

Recommendations:

- We encourage BES to find ways to advance collaborations between programs and between divisions in areas that span boundaries.
- We recommend that the grant duration is increased to 4 years, especially to teams in national labs.

(b) The national and international standing of the portfolio elements

Consider, for example:

- the uniqueness, significance, and scientific impact of the portfolio
- the stature of the portfolio principal investigators in their fields
- the leadership position of the portfolio in the nation and the world

Findings:

- The stature of the portfolio is tremendous and unique. The funded projects in all three programs emphasize mechanistic understanding of materials design and synthesis. In addition, the focus is on the BES mission, to understand, predict, and ultimately, control matter and energy at the molecular level.
- The program managers are doing a great job recognizing innovative proposals and long-term impact of the funded research.

Comments:

- The community believes there is too much emphasis on publishing in boutique journals, and on the number of publications. The quality of a publication is not always reflected by the quality of the journal, and in many cases solid work does not belong into high impact factor boutique journals. This is particularly true for technical work.

Recommendations:

- The panel supports the evaluation of successful research other than by the name of the journal and the number of publications.

Appendix IX: Summary Reports from Panel 4

COV PANEL REPORT

Panel 4: EPSCoR

BES COMMITTEE OF VISITORS (COV)
Reviewing the Materials Sciences and Engineering Division
Fiscal Years 2015, 2016, and 2017

Charge to the COV:

I. For both the DOE laboratory projects and the university projects, assess the efficacy and quality of the processes used to:

(a) Solicit, review, recommend, and document proposal actions
(b) Monitor active project and programs.

II. Within the boundaries defined by DOE missions and available funding, comment on how the award process has affected:

(a) The breadth and depth of portfolio elements
(b) The national and international standing of the portfolio elements.

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

Based on the COV's study of proposal actions completed within the past three fiscal years, please provide brief findings, recommendations, and comments on the following aspects of the program's processes and management used to:

(a) Solicit, review, recommend, and document proposal actions

Consider, for example:

- consistency with priorities and criteria stated in the program's solicitations, announcements, and guidelines
- adequate number of reviewers for balanced review; use of reviewers having appropriate expertise/qualifications; use of a sufficiently broad pool of reviewers; avoidance of conflicts of interest
- efficiency/time to decision
- completeness of documentation making recommendations

Findings:

- The management and use of resources of the EPSCoR program is excellent.

- The program manager executes program solicitations, peer reviews, and funding actions in an efficient timeframe (4-6 months).
- The program manager does an excellent job identifying appropriate peer reviewers in collaboration with other energy offices.
- The peer reviewers were uniform in their assessment of proposals, consistent with funding decisions.
- The evaluation criteria are well documented in the peer review process, including technical strengths, education of postdocs and students, and developing enduring state-based scientific depth and impact.
- The program manager actively works with other program offices to improve opportunities and success of EPSCoR PIs.
- Decision letters are comprehensive and clearly document the EPSCoR funding decision.

Comments:

- The program manager is following excellent practices in engaging colleagues in other program offices, leveraging co-funding opportunities.
- The Implementation grant had specific criteria the reviewers were asked to assess, including EPSCoR program goals and likelihood of success. This was viewed as good practice.

Recommendations:

- The COV recommends including up-to-date areas of emphasis and de-emphasis in the EPSCoR FOAs. The Sustainable Ammonia Synthesis FOA did clearly identify topics of emphasis and de-emphasis, as well as the Early Career FOA.

(b) Monitor active project and programs

Consider, for example

- written progress reports
- principal investigators' meetings
- site visits
- effective interactions between program managers and PIs

Findings:

- The site visit for the larger Implementation project (Clemson led) was comprehensive and also provided additional peer review input to the PI and team, increasing the opportunity for a successful outcome.
- The program manager actively engages in helping the EPSCoR PIs build ties with appropriate energy offices in DOE.
- The PIs are encouraged to attend the PI contractor meetings of the relevant program offices.
- It was notable that the project productivity is captured in PAMS.

Comments:

- COV reviewers on previous panels were impressed with the progress of PAMS development.
- Public abstract search in PAMS for proposers could be expanded to include solicitations and program areas.
- The open policy for in-person visits by university researchers to DOE BES-MSE program management offices is a commendable practice.

Recommendations:

- Increased travel budgets for onsite visits by the program manager would be valuable for the current and future success of the PIs.

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

Taking into account the DOE, BES, and Division missions, the available funding, and information presented about the portfolio of funded science, comment on how the award process has affected:

(a) The breadth and depth of portfolio elements

Consider, for example:

- the overall quality of the science
- the balance of projects with respect to innovation, risk, and interdisciplinary research
- the evolution of the portfolio with respect to new investigators and new science thrusts
- the relationship of the portfolio to other parts of the Division and BES
- the relevance of the portfolio with respect to the missions of the program, division, BES, and DOE
- the appropriateness of award scope, size, and duration

Findings:

- The balance of individual, implementation, and early career awards is appropriate- the number of State-Lab Partnership and early career awards increased since the 2015 COV review.
- The reviewed Implementation award clearly aligned with the state of South Carolina S&T and educational priorities.
- The breath of awards is consistent with the goals of the EPSCoR program.
- The role of the State in determining implementation grant proposals is consistent with their individual S&T plans.

Comments:

- The EPSCoR program covers a large, complex number of scientific disciplines and program mission priorities. Recognizing that a transition will eventually take place, developing a succession plan for the current program manager would be prudent. The success of EPSCoR and other MSE programs depends on deep technical knowledge and programmatic experience.

Recommendations:

- Develop a cost-effective methodology and support for the program manager to increase outreach to potential proposer communities, and communicate areas of programmatic needs, including emphasis and de-emphasis. For example, timely webinars and targeted presentations to university clusters.

(b) The national and international standing of the portfolio elements

Consider, for example:

- the uniqueness, significance, and scientific impact of the portfolio
- the stature of the portfolio principal investigators in their fields
- the leadership position of the portfolio in the nation and the world

Findings:

- With a balanced portfolio of individual, implementation, and early career awards, the EPSCoR program is achieving national standing within the eligible states. It is noted that several states have recently "graduated" from EPSCoR eligibility based on their percentage of NSF funding.
- The COV was pleased to see a large percentage of eligible states with active EPSCoR projects.
- The COV recognized the large number of fellows in professional societies participating in the EPSCoR program.

Comments:

Recommendations:

- We encourage the EPSCoR program manager to continue developing outreach efforts to university researchers in states with low EPSCoR representation.