REPORT OF THE COMMITTEE OF VISITORS (COV)

Climate and Environmental Sciences Division
Office of Biological and Environmental Research
Office of Science
US Department of Energy

Findings and Recommendations from
Review of Fiscal Years 2010-2012

2013

Submission to the
Biological and Environmental Research Advisory Committee
(BERAC)

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Date Approved by the BERAC_____

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Table of Contents

Acknowledgements…… ……..... ii
Table of Contents ……..…….. iii
Acronyms and Abbreviations…… …….. v

I. Executive Summary……..……..……. 1

II. Introduction……. 4
A. COV Operation…….…… 4
B. COV Charge…….…… 6
C. CESD Program Administration…….……... 6

III. CESD Overviews and Recommendations…….…….. 7

A. Atmospheric System Research…….……. 7
1. Program summary…… 7
2. Efficacy and quality of funding processes……..... 7
2(a). Solicit, review, recommend, and document application and proposal actions…….…… 7
2(b). Processes to monitor active awards, projects and programs…..…. 10
3. Effect of the award process on portfolios……...… 11
3(a). Breadth and depth of portfolio elements .……..…… 11
3(b). National and international standing of portfolios elements……. .. 11
4. Other review criteria……... 12

B. Earth System Modeling ….…….…. 12
1. Program summary…… 12
2. Efficacy and quality of funding processes……..... 13
2(a). Solicit, review, recommend, and document application and proposal actions…….…… 13
2(b). Processes to monitor active awards, projects and programs…..…. 14
3. Effect of the award process on portfolios……...… 15
3(a). Breadth and depth of portfolio elements ……..…… 16
3(b). National and international standing of portfolios elements……. .. 16
4. Other review criteria……... 17

C. Regional and Global Climate Modeling …… …….. …… . 17
1. Program summary…… 18
2. Efficacy and quality of funding processes……..... 18
2(a). Solicit, review, recommend, and document application and proposal actions…….…… 18
2(b). Processes to monitor active awards, projects and programs…..…. 19
3. Effect of the award process on portfolios……...… 19
3(a). Breadth and depth of portfolio elements ……..…… 19
3(b). National and international standing of portfolios elements……. .. 20

4. Other review criteria……... 21

D. Integrated Assessment Research …… …….. …… ……. 22
1. Program summary…… 22
2. Efficacy and quality of funding processes……..... 22
2(a). Solicit, review, recommend, and document application and proposal actions…….…… ……. 22
2(b). Processes to monitor active awards, projects and programs…..…. 23
3. Effect of the award process on portfolios……...… 24
3(a). Breadth and depth of portfolio elements ……..…… 24
3(b). National and international standing of portfolios elements.…… .. 25
4. Other review criteria……... 26

E. Terrestrial Ecosystem Science…….……. 27
1. Program summary…… 27
2. Efficacy and quality of funding processes……..... 27
2(a). Solicit, review, recommend, and document application and proposal actions…….…… 28
2(b). Processes to monitor active awards, projects and programs…..…. 28
3. Effect of the award process on portfolios……...… 29
3(a). Breadth and depth of portfolio elements ……..…… 29
3(b). National and international standing of portfolios elements.…… .. 31
4. Other review criteria……... 32

F. Subsurface Biogeochemical Research……. 33
1. Program summary…… 34
2. Efficacy and quality of funding processes……..... 34
2(a). Solicit, review, recommend, and document application and proposal actions…….…… 34
2(b). Processes to monitor active awards, projects and programs…..…. 36
3. Effect of the award process on portfolios……...… 37
3(a). Breadth and depth of portfolio elements ……..…… 37
3(b). National and international standing of portfolios elements.…… .. 39
4. Other review criteria……... 39

G. Atmospheric Radiation Measurement (ARM) Climate Research Facility.. 40
1. Program summary…… 40
2. Efficacy and quality of funding processes……..... 41
2(a). Solicit, review, recommend, and document application and proposal actions…….…… 41
2(b). Processes to monitor active awards, projects and programs…..…. 42
3. Effect of the award process on portfolios……...… 43
3(a). Breadth and depth of portfolio elements ……..…… 43
3(b). National and international standing of portfolios elements.…… .. 44
4. Other review criteria……... 45

H. Environmental Molecular Science Laboratory…….. 45
1. Program summary…… 45
2. Efficacy and quality of funding processes……..... 46
2(a). Solicit, review, recommend, and document application and proposal actions…….…… 46
2(b). Processes to monitor active awards, projects and programs…..…. 48
3. Effect of the award process on portfolios……...… 49
3(a). Breadth and depth of portfolio elements ……..…… 49
3(b). National and international standing of portfolios elements.…… .. 50
4. Other review criteria……... 51

IV. Cross-Cutting Themes……..... 52
A. Facilities…….…… 52
B. Interagency coordination……... 53
C. Workshops and initiatives……. 54
D. SFA management and CESD strategic plan…….. 55

V. Responses to Previous COV 2010……... 56

Appendix A – Charge Letter ……. 58

Appendix B – Committee of Visitors Members……. 60

Appendix C – Agenda……. 63

Appendix D – Table of CESD Program Funding Opportunities and Outcomes 2010-2012…… 65

Acronyms and Abbreviations

ACRF	ARM Climate Research Facility
AMS	American Meteorological Society
AGU	American Geophysical Union
ARM	Atmospheric Radiation Measurement
ARRA	American Recovery and Reinvestment Act
ASCR	Office of Advanced Scientific Computing Research
ASR	Atmospheric System Research
BER	Office of Biological and Environmental Research
BERAC	Biological and Environmental Research Advisory Committee
BID	Biological Interactions and Dynamics
CCSM	Community Climate System Model
CENRS	Committee on Environment, Natural Resources, and Sustainability
CESD	Climate and Environmental Science Division
CESM	Community Earth System Model
CLM	Community Land Model
CMBE	Climate Modeling Best Estimate
CMIP	Coupled Model Intercomparison Project
COV	Committee of Visitors
DOE	U.S. Department of Energy
EMSL	Environmental Molecular Sciences Laboratory
ERSD	Environmental Remediation Sciences Division
ESM	Earth System Modeling
FOA	Funding Opportunity Announcement
ESM	Earth System Modeling
FWP	Field Work Proposal
FY	Fiscal Year
GCAM	Global Change Assessment Model
IFRC	Integrated Field Research Center
HPC	High Performance Computing

IA	Integrated Assessment
IAM	Integrated Assessment Model
IAR	Integrated Assessment Research
IARPC	Interagency Arctic Research Policy Committee
IMB	Infrastructure Management Board
IOP	Intensive Operational Period
IPCC	Intergovernmental Panel on Climate Change
JGI	Joint Genome Institute
MIT	Massachusetts Institute of Technology
MOU	Memorandum of Understanding
NCAR	National Center for Atmospheric Research
NGEE	Next Generation Ecosystem Experiment
PAMS	Portfolio Analysis and Management System
PCMDI	Program for Climate Model Diagnosis and Intercomparison
PI	Principal Investigator
PM	Program Manager
PNNL	Pacific Northwest National Laboratory
RGCM	Regional and Global Climate Modeling
SBR	Subsurface Biogeochemical Research
SC	Office of Science
SciDAC	Science Discovery through Advanced Computing
SFA	Scientific Focus Area
SIP	Science of Interfacial Phenomena
SISC	Science Infrastructure Steering Committee
TES	Terrestrial Ecosystem Science
USGCRP	U.S. Global Change Research Program

I. Executive Summary

On August 20, 2012, Dr. W.F. Brinkman, then Director of the Office of Science (SC), charged the Biological and Environmental Research Advisory Committee (BERAC) to assemble a Committee of Visitors (COV) to evaluate the efficacy and quality of the processes used to solicit, review, recommend, monitor and document funding actions and to assess the quality of the resulting portfolio of CESD within BER. The Charge letter issued by Dr. Brinkman is in Appendix A. The CESD portfolio of scientific programs and facilities to be reviewed in the 2010 to 2012 period included:

(A) Atmospheric System Research
(B) Earth System Modeling
(C) Regional and Global Climate Modeling
(D) Integrated Assessment
(E) Terrestrial Ecosystem Science/Carbon Dioxide Information Analysis Center
(F) Subsurface Biogeochemical Research
(G) ARM Climate Research Facility
(H) Environmental Molecular Sciences Laboratory

In response to this charge, a committee of 23 members was formed in the spring of 2013 to perform the evaluation of CESD programs. Key findings are as follows:

- The COV found the PMs of the CESD to be knowledgeable, dedicated and energetic. Their commitment to managing their programs and seeking solutions of global problems such as climate change, climate prediction, carbon cycle, biogeochemical processes, facility improvement, and data stewardship is laudable. The PMs worked tirelessly to obtain the best ideas and scientists for their programs through workshops, annual meetings, visits to the labs, and communication with the PIs. There is great communication and coordination among the PMs in CESD.

- The solicitations, the proposal reviews, and the award decisions are rigorous. The communications with the investigators and feedbacks to the proposers were well documented. The funded projects were tracked closely through annual and final reports, workshops, site visits, regular reviews and direct communication. The award decision and management processes were appropriate and effective.

- The portfolio of scientific programs developed and supported is consistent with the missions of DOE, BER and CESD. These CESD programs are nationally respected with high profiles and many are unique. For example, DOE contributions to the Community Climate System Model (CCSM) and the Community Earth System Model (CESM) have been instrumental for the United States to maintain a leadership role in climate modeling. Results from CCSM and CESM have played major roles in the Inter-governmental Panel

for Climate Change (IPCC) Assessment Reports. Data obtained from the Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF) are used worldwide for climate modeling efforts. The selected investigators and teams are of world class quality.

Specific recommendations to each program are detailed in Section III. Key recommendations are as follows:

1) Funding to the National Labs has been shifting to large Scientific Focus Areas (SFAs) so that complex questions and large problems can be attacked more effectively. The COV supports this shift, but we recommend that CESD maintain flexibility and appropriate balance of funding to allow both SFAs and exploratory or cutting edge research by individual PIs at the Labs that does not necessarily fit into the SFAs. The COV also recommends that CESD consider options for reducing the administrative burden placed on the SFA teams by the reviews while still maintaining the quality of the research program.
2) The COV considers the current balance of laboratory and university research to be appropriate and we recommend that such balance be approximately maintained in the future.
3) The COV strongly recommends that DOE increase travel fund allocations to allow PMs to attend scientific meetings both domestically and internationally. It is imperative that CESD PMs attend some of these meetings in order to enhance the impact of DOE sciences, to exert leadership in setting research directions in the international community, and to leverage DOE resources.
4) The COV recognizes the tremendous workload and responsibilities of the PMs who made the CESD programs successful. We recommend that DOE improve its electronic grant information system to better assist the PMs and support staff for project management.
5) The COV encourages PMs to develop program-wide metrics of performance and progress synthesis in addition to the quantitative measure of publications to measure programs and to enhance their impact.
6) CESM and its component models are DOE's highly leveraged assets. The COV considers CESM as the single most important element contributing to the DOE's position of international leadership in its modeling portfolio. The COV strongly recommends that DOE maintain its proactive collaborations with the university community and continue its investments in CESM activities.
7) Given the history and scope of research activities in the Integrated Assessment Research (IAR) Program, the COV recommends consideration of the establishment of formal cooperation agreement in meeting its objectives.

8) The COV recommends that CESD engage other federal agencies to address how voids in ecosystem and carbon cycle research at DOE, including both managed ecosystems and the oceans, can be filled and information about these elements of the Earth system be included in DOE modeling efforts.

9) The COV recognizes the need of the NGEE Arctic project and sees that NGEE has necessitated the adjustment of some SFAs in the Subsurface Biogeochemical Research (SBR) Program from geochemical process research to carbon cycle research. However, the COV recommends that CESD maintain appropriate funding to retain key expertise and activities in radionuclide research.

10) The Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF) management was proactive in the development of the "best estimate" data sets. The COV encourages the PMs to continue these efforts.

11) The COV recommends that the Environmental Molecular Sciences Laboratory (EMSL) continue to increase the user pool, especially to attract new investigators.

12) Recognizing the growing costs of instruments and maintenance for the CESD facilities, the COV recommends that ACRF and EMSL PMs continue to engage the science community to set priorities and to maintain the proper balance of protecting legacy datasets and acquiring new instruments.

II. Introduction

A. COV Operation

The Climate and Environmental Sciences Division (CESD) in Biological and Environmental Research (BER) supports the key missions of DOE through its research to advance a robust predictive understanding of Earth's climate and environmental systems, and to inform the development of sustainable solutions to the Nation's energy and environmental challenges. The portfolio of research provides for investigations at hugely different scales ranging from regional to global predictions, from molecular to field studies and from modeling current conditions to centuries in the future. As a division that recommends and awards funds, CESD is subject to review by a Committee of Visitors (COV) every three years. This committee reports to the appropriate Federal Advisory Committee, in this case the Biological and Environmental Research Advisory Committee (BERAC).

This COV consists of experts from universities (13), National Laboratories (4), Non-Profit Organizations (2), and program managers from other federal agencies (4). Eight of the COV members were women. Three members were also BERAC members in the period covered by the review. Two members served on previous COV for the period of 2007-2009. Of the 23 COV members, 13 were not supported by DOE, thus the COV met the requirement of "at least 25% of the COV members are not directly supported by the programs being reviewed" in the *Guidance for DOE Office of Science Committee of Visitors Reviews*. The complete roster of the COV is found in Appendix B.

David Lesmes, Program Manager (PM) in CESD, was assigned liaison to the COV. Nver Mekerdijian was assigned to provide administrative assistance. In late June, the COV received an electronic packet from CESD of the following introductory materials that have been organized into a single comprehensive 434-page Acrobat pdf file, which were extremely helpful to the COV:

TAB A Welcome Letter
TAB B Agenda
TAB C Charge Letter
TAB D COV Guidance
TAB E List of COV Members
TAB F Review Assignments
TAB G SC Merit Review Guidance
TAB H Funding Opportunity Announcements (FOAs)
TAB I Managing BER Scientific Focus Area (SFA) Programs at the DOE National Laboratories
TAB J List of SFAs

TAB K Brief Program Descriptions
TAB L 2010 COV Report and Response
TAB M BER Organizational Chart
TAB N Program Staff and their Biosketches
TAB O GTN Building Map/Metro Map/Hotel

The review was conducted on July 8-10, 2013, at the DOE headquarters in Germantown, MD, and the agenda for the meeting is found in Appendix C. During the review, in addition to giving presentations to the COV and answering questions, CESD program managers also made available samples of selected and declined proposals in all programs, written decision information, and project monitoring and communications. The PMs also provided additional materials requested by the COV.

The COV reviewed the following eight programs and facilities:

(A) Atmospheric System Research (ASR)
(B) Earth System Modeling (ESM)
(C) Regional and Global Climate Modeling (RGCM)
(D) Integrated Assessment Research (IAR)
(E) Terrestrial Ecosystem Science (TES)/Carbon Dioxide Information Analysis Center (CDIAC)
(F) Subsurface Biogeochemical Research (SBR)
(G) ARM Climate Research Facility (ACRF)
(H) Environmental Molecular Sciences Laboratory (EMSL)

In conducting the review, the COV was divided into three groups in separate breakout rooms for introduction and questions with program managers. The three groups were further divided into eight subgroups to review the above eight programs or facilities, with TES and CDIAC jointly reviewed by one subgroup. One member of each subgroup was asked to chair the review team. Throughout the review, the relevant PMs made available, in each breakout room, copies of the Funding Opportunity Announcements (FOAs) and Program Announcements, review summaries and funding decisions, and all files relevant to the programs and timeframe under evaluation. In addition, the PMs presented an overview of the pertinent activities, answered questions, and were available for additional consultation throughout the COV visit. This report describes results of these eight program/facility assignments.

In the second day of the review, the COV was also divided into four groups in separate breakout rooms to examine the following four cross-cutting themes

(A) Facilities
(B) Interagency coordination
(C) Workshops and initiatives

(D) SFA management and CESD strategic plan

One member of each group was asked to chair the review team. PMs presented an overview of the pertinent activities, answered questions and were available for additional consultation. This report also describes results on these four cross-cutting theme assignments.

The whole review committee held plenary sessions to meet the CESD PMs, ask questions, and discuss the COV charges and recommendations. The COV also reported preliminary findings at the end of the review to BER Director Sharlene Weatherwax, CESD Director Gary Geerneart, and all CESD PMs.

B. Charge to COV

The COV was charged with providing an evaluation of the following:

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

The charge letter also asked the COV *to assess the management and oversight of the CESD EMSL and ACRF user facilities.*

C. CESD Program Administration

In the first year of the review period (2010), Gary Geernaert was recruited as the new Director of CESD. His energy and leadership skill brought very positive outcomes to the organization of programs and the strategic planning of CESD.

The responsibilities of the PMs are to 1) prepare solicitations for proposals, 2) review preproposals, 3) solicit external review of full proposals, 4) arrange for panel meetings (if employed), 5) make award recommendations to management based on reviewer evaluations and program priorities, 6) communicate decisions to PIs, 7) prepare budget requests, 8) monitor funded projects, 9) document all substantive communication with PIs, and 10) review annual and final reports. In the meantime, the PMs must arrange for the annual PI and Contractors' Meetings, hold workshops that help to define research paths, coordinate efforts with other Federal agencies, prepare for and respond to COV evaluations, attend research meetings, keep

abreast of relevant cutting-edge science, and constantly engage the community to define research needs and future directions.

The COV is tremendously impressed with the CESD PMs for their remarkable professionalism, dedication, and efficiency. The COV was also pleased that the PMs shared the same vision and ideals in pursuing the DOE missions relevant to climate and environmental sciences.

III. CESD Program Overviews and Recommendations

A. Atmospheric System Research (ASR)

1. Program Summary

The mission of ASR is to quantify the interactions among aerosols, clouds, precipitation, radiation, dynamics, and thermodynamics to improve fundamental process-level understanding, with the ultimate goal to reduce the uncertainty in global and regional climate simulations and projections. ASR utilizes continuous long-term datasets that provide measurements over a range of environmental conditions at several fixed and mobile ACRF sites situated in climatically diverse locations, as well as laboratory studies and shorter-duration ground-based and airborne field campaigns, to understand and parameterize the aerosol, cloud, and precipitation processes in numerical models.

2. Efficacy and quality of funding processes

The COV examined the ASR FOAs for the past 3 fiscal years: 10-291, 12-647, and 12-664 (joint with RGCM). These FOAs received 113, 93, and 22 proposals respectively, out of which 37, 27, and 5 proposals were selected for funding. The success rates were 33%, 29% and 23% respectively. No Lab calls were issued during this period. Funding levels for ASR were $26M in FY2010, $28M in FY2011, $26M in FY2012.

For the COV review, a random sampling of both the accepted and declined proposals was conducted which included all available documentation of the proposal, peer review process, and management decisions and communication to the proposers and review panels.

2(a). Solicit, review, recommend, and document application and proposal actions

Findings:

- ASR releases university FOAs twice in every three years on a staggered schedule. The FOAs laid out the scientific and technical goals of the program and any particular requirements (e.g., their required use of ARM data) in a clear manner. The 2012 FOA specifically requested proposals to analyze data from new ARM instruments that were obtained using funds from the American Recovery and Reinvestment Act (ARRA).
- Pre-proposals were generally required. Pre-proposal information was included within award jackets, but not declines. No information was provided to the COV on pre-proposals that were declined/discouraged but according to the Program Managers, the pre-proposal process was used to filter out proposals whose ideas do not fit the programmatic boundaries of ASR that were broadly defined.
- The review scores, the review process, and the rationale for funding the successful proposals for each FOA were well documented in the written materials provided and in the presentations, with any remaining questions cleared up by discussions with the program manager.
- The program manager successfully assembled large, diverse, and well-qualified sets of reviewers. Proposals were reviewed in four topical subgroups clearly defined within the FOAs, each with approximately 15 reviewers to review 25 proposals, which the COV viewed as a thorough and high quality process.
- The committee extensively reviewed the selected proposals including reviewer comments and program manager documentation. The committee also considered such materials for some declined proposals. The committee found the reviews and the documentations to be complete and thorough.
- Average numerical scores were used as guidance for award/decline decisions. The documentation indicates that several proposals were selected for funding despite having lower scores than the nominal cut-off. The rational for supporting these was convincingly documented.
- The COV considered the award portfolio to be of very high quality, being well balanced across the priorities of ASR, and adding value to the ARM collections of data and data archives.
- The relative weight given to scientific merit versus programmatic considerations in the decision making process was entirely appropriate and has provided a program portfolio that is firmly based on high quality science.
- The program managers have found an appropriate balance between the number of awards and the average amount per award.
- Progress reports were being submitted by PIs on an annual basis. The Committee reviewed several of these and found them to be substantive. The DOE PMs produced a

brief summary which is a clear indication that the report was reviewed and that the project is on track.

- ASR also at times issues FOAs for DOE Labs, but support for Lab research is now mostly through the SFAs.

Comments:

- The COV found the program managers of ASR to be very helpful to the review during the committee meeting, and were open and responsive to any questions raised by COV members.
- The program as a whole is embedded in DOE/BER/CESD priorities and is synergistic with the ARM program. Further interdisciplinary connections with other programs and facilities are possible and were discussed; however, no direct evidence for this was found in the portfolio except for the collaboration with the RGCM program. In the past decade, there was a significant trend in the programs towards better integration and collaboration with other activities, with clear overarching goals. On the other hand, programmatic goals should and do drive some of the decision making. It was not clear to what degree the reviewers were instructed to address this question. One of the goals of ASR is to support the use of ARM data and special deployments. The COV found a case where the analysis of the data for a field program was declined. The PM indicated that efforts were made to encourage and fund another submission on this subject. After reviewing the appropriate documents, the COV agreed that the action was appropriate.
- For the proposals from the more recent call, a summary of panel deliberations and conclusions was included and also provided to the PI. This is to be commended for several reasons: it gives helpful feedback to the PI in terms of how decisions were made, and it documents for management and COV what was done. It was be very helpful for PIs whose proposals were declined, and this possibly would not be too much of a burden on the PMs, since a brief summary of the rationale for the declination has to be prepared for the internal documentation anyway. Apparently the previous COV also recommended that decisions for declinations should be documented, and BER's response indicated that PMs commonly communicated with declined PIs via telephone. This COV agrees and encourages continuation of the practice of providing constructive feedback to PIs of declined submissions. It is also important to provide the full text of the reviews to applicants, declined or awarded, and apparently that is just what is done. The review scores were not provided to the applicants and the rationale for this is not clear.
- The COV discussed with the program manager the limitations of using numerical scores only as decision tools, such as the fact that some reviewers are generally more generous and others more critical, and that the average review scores of many proposals are very similar. The COV therefore commends the PMs for taking a more qualitative look at the

review comments and using careful judgment, informed by the reviewer and panel input, in making final funding decisions.

- To allow future COV to understand how the pre-proposal process affects the development of the research portfolio, it would be helpful if the PMs would track titles and abstracts of pre-proposals that are declined for full submission along with a very brief rationale for their declination.
- The COV judged the quality of the overall technical management of the ASR program to be excellent.

Recommendations:

- PMs should continue to provide as much constructive feedback as possible to PIs of declined proposals.

2(b). Processes to monitor active awards, projects and programs

Findings:

- The processes for monitoring active awards and projects within ASR are primarily based on annual reports, annual PI meetings, and research highlights. The committee considers these activities to be sufficient for project management and adequate for the overall program.
- The overarching program goal is to conduct research on radiative, aerosol, cloud and precipitation processes in order to improve the representation of those processes in atmospheric models. This goal, combined with a requirement to make use of ACRF data, has led to the development of a well-focused research portfolio. Cooperation with the modeling program has served to integrate the observational and theoretical aspects of the ASR program.
- One program manager is not sufficient for the size and the scope of the program. This has been addressed now. An additional PM, Sally McFarlane, has been added after the COV evaluation period.

Comments:

- As part of the award process, program managers endeavor to ensure that there are new investigators funded by each FOA in order to bring new ideas and approaches into the program. The COV considers this a good practice.

Recommendations:

- Although the program keeps a running tabulation of publications associated with activities funded by the Program, the COV encourages additional assessment or use of metrics to assess the effectiveness of the overall program.

3. Effect of the Award Process on Portfolios

3(a). Breadth and depth of portfolio elements

Findings:

- The funded research activities are entirely consistent with the goals and objectives in the FOAs. The program funded critical science within the missions of ASR. The quality of science conducted by the PIs is very high.
- The funded research activities are making important contributions to the mission of the DOE, the Office of Science, and CESD.

Comments:

- The program is funding leading scientists in the area of understanding and modeling of aerosol-cloud-precipitation-radiation processes within the context of improving climate models.

Recommendations:

- ASR should consider using both qualitative and quantitative metrics to assess the impact of the overall program portfolio.

3(b). National and international standing of the portfolio elements

Findings:

- The quality of work and the PIs of the ASR projects are well regarded, nationally and internationally, for their contributions to understanding aerosols, clouds, precipitation and their interactions within the context of climate. The publications record of ASR is very good in terms of the numbers and the quality of journals in which they are published.

Comments:

- The ASR annual meetings and workshops are very productive and useful.

Recommendations:

- The program can enhance its impact by having program-wide metrics and synthesis.

4. Other Review Criteria

- Are an adequate number of qualified reviewers (free from bias and/or conflicts of interest) selected for review of projects and grants? Yes
- Are the Office of Science (SC) merit review criteria applied appropriately in the evaluations? Yes
- Is documentation of the review process adequate and complete? Yes.
- What are the characteristics of the award portfolio? The COV found the portfolio to be well balanced and consistent with what were called for FOAs.
- Are progress reports on previously funded research useful in the evaluation of proposed research? The progress reports were useful and sufficient for project management.
- What is the quality of overall technical management of the program? Excellent.
- What are the relationships between award decisions, program goals, and DOE mission? Very well aligned.
- Are there significant impacts and advances that have developed since the previous COV review that are demonstrably linked to DOE investment? Difficult to fully quantify without the recommended assessment of the overall program recommended above.
- Were the responses of the program to the recommendations of the previous COV review appropriate? The program was responsive to the previous COV comments.

B. Earth System Modeling (ESM) Program

1. Program Summary

The mission of the ESM program is to improve the CESM's physical representations for clouds, aerosols, sea-ice, land-ice, ocean, land hydrology, land/ocean biogeochemistry and human activities. ESM utilizes DOE computational expertise under the BER-ASCR (Office of Advanced Scientific Computing Research Scientific Discovery through Advanced Computing--SciDAC) program to optimize model performance on leadership computer systems and to construct variable and high resolution model versions for improved climate and process representation. Sophisticated frameworks to test, analyze, calibrate, visualize and validate model results are also developed in order to calibrate the model against measurements, including DOE atmospheric and terrestrial data. The goal is to simulate climate over decadal to centennial time scales, projecting Earth system changes in coming decades as needed for DOE science and mission.

2. Efficacy and Quality of Funding Processes

The COV examined FOAs for the past 3 fiscal years: LAB 10-05, LAB 11-588 , 11-452, and 11-588 . The two Lab FOAs received 5 and 6 proposals each, out of which 3 proposals were funded for each call. The two university calls received 58 and 6 proposals each, with 32 and 3 proposals funded for these calls. The success rates were 60% and 50% for the Lab calls, 55% and 50% for the university calls. These success rates reflected the 20% to 50% reduction of pre-proposals that were discouraged for submission. Funding levels for ESM are $31M in FY2010, $36M in FY2011, $35M in FY2012.

2(a). Solicit, review, recommend, and document application and proposal actions

Findings:

- The committee found that the program solicitations were consistent with the priorities of the ESM program. The solicitations clearly stated the goals of the program, the expectations of the applicants, and the criteria for merit review.
- The committee found that the pre-application process was an effective means of providing feedback to applicant prior to generating a full proposal. This process reduced the total number of applications submitted to the program appropriate to ESM and therefore saved time for both the review process as well as PI teams who may otherwise have submitted a proposal that is unlikely to be funded.
- The committee found that the proposal reviews were conducted in compliance with DOE's published guidance. Review panels included at least 3 reviewers who have expertise in the fields relevant to the solicitation and the program. Panels consisted of both university and DOE National Lab reviewers. Reviewers were supplied with guiding questions to aid in the consistent review of each application.
- The award portfolio in its totality appeared to be well balanced and reflects a breadth of areas covered by the ESM program.
- The automatic renewal rate for ESM has declined in keeping with prior COV recommendations.
- The PMs felt the solicitation responses captured the right audience for their program. The COV noted that overall outcomes support that.

Comments:

- A random selection of both awarded and declined projects from three separate solicitations (university-only, and a lab-led joint solicitation) was evaluated. The committee determined that the documentation for making award recommendations was complete including the proposal, reviewer comments, and funding actions. The

efficiency, or the time to decision, was within or close to the stated goal of 6 months. The committee noted that applicants that were considered for funding were required to respond to panelist comments prior to their notification of award.

- The project portfolio within ESM in FY10-FY12 included two SFA awards already in progress and some existing laboratory and university awards. The solicitation phase of these was not reviewed.

Recommendations:

- If ESM moves to significant funding through a single SFA, care should be given to a selection process for an SFA team that garners sufficient balance and nurtures adequate competition. In particular it is important to continue to allow opportunities for universities and labs through regular open calls.
- Momentum toward using PAMS for submission should be maintained.
- Better ways to leverage Office of Science early career program to support ESM would be a good investment – for example using matching funds.

2(b). Processes to monitor active awards, projects and programs

Findings:

- The content of annual reports and reporting presentations varied widely. The program managers find the current annual reports adequate for their needs.
- The large lab boutique awards did not have a formal requirement for annual reports. The reports examined lacked obvious coherence.
- The reports for the two SFA activities were extensive and showed coherent leadership and active engagement of reviewers and program managers.
- The "highlights", that showcased specific project publications, were useful in providing narrow snapshots of progress. The community modeling development is not fully captured by these.
- The reporting to Office of Science of program outcomes and successes is limited to science journal publications.
- The office assistant staffing levels have improved since the last COV report. This has had a definite positive impact.
- A set of quantitative metrics has not yet been established by the programs. This is a challenging task. There is recognition that metrics beyond publications are critical. What the appropriate set of metrics for quantifying program success is still an open discussion.

- The CESD website is being used to showcase successful program outcomes.
- Program managers do not get a regular opportunity to present programs to BER, BERAC and Office of Science.
- Lack of travel funds is making project management much harder.
- ESM was able to provide most of the project documentation in an electronic and searchable format. This was very useful for the COV review.

Comments:

- It is critically important that program managers have adequate travel support for site visits to ensure effective interactions between program managers and PIs. This is especially true for larger projects (SFA and others).
- Large 5-year efforts (for example LAB projects) should all include proactive mechanisms to keep activities well aligned with program goals.

Recommendations:

- Consider adopting a standard template for common sections of annual reports across all funded activities. This could be at the PI or task level. Some flexibility in response should be allowed (e.g. N/A is OK for some sections). This would help both the program managers and the PIs.
- CESD and program managers need to devise a broad set of quantitative metrics to evaluate programs. Annual reporting should be used routinely to gather some of these metrics. Suggested metrics could include workshops, conference sessions, model development stages, international participation, diversity and career development.
- Continue to maintain adequate staffing for program management and support, as recommended by the last COV.

3. Effect of the Award Process on Portfolios

3(a). Breadth and depth of portfolio elements

Findings:

- The projects enabled by the award process cover the ESM program's modeling portfolio very well. An explicit identification of how advancement in predictive capability is measured was unclear.

- The awarded proposals span from single investigator initiatives to large multi-lab activities.
- Many of the projects involve modeling innovation that is in keeping with the stated goals of the ESM program. ASCR co-support appears balanced with model development in the FY10-FY12 portfolio.
- The ESM program has been effective at bringing new modeling approaches to community modeling efforts. In particular ESM support has been critical for the advancement of CESM and its implementation in IPCC. In turn ESM has effectively leveraged the proactive NCAR and university community involvement in CESM.

Comments:

- There are strong synergies between ESM and RGCM programs; the exact boundary between the two programs is sometimes subtle.
- The larger awards (LAB and SFA) can sometimes appear to be collections of individual science elements.

Recommendations:

- The ESM program should track evidence of an evolving predictive capability in a scientifically rigorous manner. This involves many elements of DOE, including computational advances (ASCR) and climate metrics (RGCM/ARM) as well other external research results. This could become a major program metric.
- Proactive engagement of NCAR and university community in the future ESM program activities should be maintained.

3(b). National and international standing of the portfolio elements

Findings:

- The overall collection of activities is world-class and the program is doing an excellent job at maintaining US global standing in many important climate-modeling areas.
- The program made significant contributions to the CCSM and CESM, which are clearly among the most important international assets for studying climate and climate change.
- Program development and visibility have been greatly harmed by the inability of DOE program managers to participate in major national and international meetings. This impedes promoting the program, fully assessing program gaps, forging strategic alliances, recruiting new participants and identifying future directions.

Comments:

- Program manager's visibility is relatively low in comparison to the roles that the programs played. The DOE leadership impact on climate modeling may not be adequately appreciated and leadership opportunities may be missed.

Recommendations:

- The continued collaborations with NCAR and the community to the development of the CESM should be maintained. CESM is a highly leveraged asset for both CESD and for the community to advance earth system modeling in the United States.
- The individual DOE program managers should have sufficient funding and management support to attend and participate in person in key national and international meetings.

4. Other Review Criteria

- Are an adequate number of qualified reviewers (free from bias and/or conflicts of interest) selected for review of projects and grants? Yes
- Are the Office of Science (SC) merit review criteria applied appropriately in the evaluations? Yes
- Is documentation of the review process adequate and complete? Yes.
- What are the characteristics of the award portfolio? The COV found the portfolio to be well balanced and consistent with what were called in the FOAs.
- Are progress reports on previously funded research useful in the evaluation of proposed research? Yes.
- What is the quality of overall technical management of the program? Very good.
- What are the relationships between award decisions, program goals and DOE mission?

  Very well aligned.
- Are there significant impacts and advances that have developed since the previous COV review that are demonstrably linked to DOE investment? The contribution of the program to the release of the CCSM, CESM and their component models.
- Were the responses of the program to the recommendations of the previous COV review appropriate? Yes.

C. Regional and Global Climate Modeling (RGCM) Program

1. Program Summary

The mission of RGCM Program is to improve the predictive understanding of Earth's climate by studying the dominant sets of governing processes that describe climate change on regional scales; evaluating robust methods to obtain higher spatial resolution for projections of climate and earth system change; and diagnosing model systems that are cause for uncertainty in regional climate projections. The program goal is accomplished through sensitivity studies and applications of regional and global earth system models that focus on various aspects of the climate system, including but not limited to, the understanding of feedbacks within the climate system, detection and attribution studies, developing capabilities for decadal predictability, and uncertainty characterization. RGCM investments are also dedicated to development of metrics for model validation.

2. Efficacy and Quality of Funding Processes

The COV examined FOAs for the past 3 fiscal years: LAB 10-04 , 10-242, 12-664 (joint with ASR). These calls received 8, 94, and 22 proposals, out of which 3, 32, and 5 proposals were funded. The success rates were 38%, 34% and 23% respectively. Funding levels for RGCM were $30M in FY2010, $32M in FY2011, $28M in FY2012.

2(a). Solicit, review, recommend, and document application and proposal actions

Findings:

- Funded proposals were consistent with priorities and criteria stated in program announcements.
- The reviewer panels were very strong, with leading scientists from universities and national labs, domestic and international.
- An overlapping score range of 10-15% was used in making funding decisions for the funded versus unfunded proposals. This allowed for providing program balance, with all funding decisions in this range documented. The COV found this to be appropriate.
- Time to make award decision was typically about 3 months from submission deadline and then about one month to decision letter, tending toward 6 months total in the longer cases. This is appropriate and reasonable.

Comments:

- All funded proposals were of high quality.

Recommendations:

- Unsolicited proposals should be specifically justified and documented for funding justifications.
- The COV recommends that the current standard of funding process be maintained.

2(b). Processes to monitor active awards, projects and programs

Findings:

- Progress reports were actively monitored to ensure that funded research is progressing well.
- Standard report forms were in place for university grants and SFAs, but not for lab "boutique" projects, which seem to be evaluated variably depending on the discretion of program managers.

Comments:

- Some additional attention will be useful to ask the PIs to keep publication reports up to date.

Recommendations:

- The nature of many CESD activities, e.g., model development, requires performance metrics beyond traditional measures like publication and impact factors. We support the clear articulation of these alternate metrics and rigorous evaluation against them.
- The lab "boutique" projects should be evaluated consistently with other funded projects.

3. Effect of the Award Process on Portfolios

3(a). Breadth and depth of portfolio elements

Findings:

- Program announcements were carefully formulated, partly in response to issues identified in workshops, to solicit proposals in important, cutting-edge areas.
- The portfolio is closely tied to the Office of Science goals related to climate and energy.
- The overall quality of the science is excellent.

Comments:

- There are strong synergies between ESM and RGCM programs; the exact boundary between the two programs remains vague to the outside community.
- The launch of the joint water workshop with IAR is to be commended.

Recommendations:

- Awards tend to run on a three-year cycle, including SFAs. For SFA projects where the most recent reviews are excellent, the COV recommends the program to explore options to reduce administrative burden on both the labs and program managers placed by the reviews.

3(b). National and international standing of the portfolio elements

Findings:

- The scientists represented in the portfolio are high caliber, both in the lab and non-lab components.
- The portfolio is high-stature, both nationally and internationally. In this regard, particular attention is drawn to the CESM, which is a central element in the portfolio. The most recent version of CESM, with the CAM5 atmospheric component, includes major advances in its physical and dynamical formulations, with higher skill in many regards than previous versions (positioning it at and near the top internationally in key areas) and new capabilities for advanced scientific inquiry. It is clearly among the most important international assets for studying climate and climate change. The contribution of RGCM to CESM is to be commended.
- The success of CESM represents a joint effort on the part of DOE labs and non-DOE-lab investigators, with the NCAR component of particular importance.

Comments:

- Rejection rates of proposals from many distinguished scientists indicate that the portfolio is highly competitive.

Recommendations:

- The individual DOE program managers should have sufficient funding and management support to enable them to attend and participate in person in key national and international meetings
- It is strongly recommended that the synergies and links among DOE labs, NCAR, and university investigators be maintained and cultivated to ensure the ongoing preeminence

of the CESM activity, which is probably the single most important element contributing to the DOE's position of international leadership in its modeling portfolio.

4. Other Review Criteria

- Are an adequate number of qualified reviewers (free from bias and/or conflicts of interest) selected for review of projects and grants? Yes
- Are the Office of Science (SC) merit review criteria applied appropriately in the evaluations? Yes
- Is documentation of the review process adequate and complete? Yes.
- What are the characteristics of the award portfolio? Well balanced, high quality, and consistent with what were called for the in FOAs.
- Are progress reports on previously funded research useful in the evaluation of proposed research? Yes.
- What is the quality of overall technical management of the program? Very good.
- What are the relationships between award decisions, program goals and DOE mission?

  Very well aligned.
- Are there significant impacts and advances that have developed since the previous COV review that are demonstrably linked to DOE investment? The contribution of the program to the understanding and evaluations of the CESM and its component models.
- Were the responses of the program to the recommendations of the previous COV review appropriate? Yes.
  - The 2010 COV recommended recruitment of additional program managers. Renu Joseph and Dorothy Koch have been appointed and have been effective in their roles.
  - The 2010 COV recommended moving to an electronic grants and information system. Transition to a new system is underway but not yet complete.
  - The 2010 COV expressed concern that computing resources are allocated separately from financial support. Program managers reported that scientists supported by CESD have been able to secure needed computer resources and that this decoupling has not posed problems. However, the formal decoupling remains in place.
  - The 2010 COV noted a critical need for PCMDI to remain stably supported and able to better provide access to climate model output. Similar concerns were expressed in the SFA review of LLNL and are understood to be under consideration by CESD.

D. The Integrated Assessment Research (IAR) Program

1. Program Summary

The mission of the IAR program is to understand the long-term, complex interactions of human and natural systems and their implications in a changing climate and changing world, delivering science based models and tools that inform national and regional decision-making, and integrated perspectives. The program supports the development of Integrated Assessment Models (IAM). These models compute climate change drivers, specifically sources of greenhouse gas emissions within common, most often economic and risk-based modeling frameworks. They also include the interactive effects of consequences from impacts and adaptation. They are tools for broad-based vulnerability analyses spanning multiple, interactive stressors; analysis of the role of science and technology in both mitigation and adaptation; assessment of the combined economic effects of different response strategies and policies.

2. Efficacy and Quality of Funding Processes

The COV examined FOAs for the past 3 fiscal years: LAB 10-06, 10-219. No calls were issued in FY2011 and FY2012. The Lab and university calls each received 3 proposals with 1 proposal funded, at a success rate of 33%. Funding levels for IAR were $11M in FY2010, $11M in FY2011, $10M in FY2012.

2(a). Solicit, review, recommend, and document application and proposal actions

Findings:

- The committee found that the program solicitations were consistent with the objectives of the program.
- The review process was done primarily by panels with some mail review supplementation. All the proposals we looked at had three to five reviews. A rating of very good (7 or higher) was regarded as the minimum requirement for funding. Proposals receiving at or close to 7 were regarded as marginal and selected according to program relevance, when funding was inadequate to support them.
- We found that the process of review, recommendation, and documentation of the review process was generally well done.
- We examined a sample of awarded and declined proposals from DOE labs and from outside DOE. We were impressed by the quality of the review panels and the reviews, and we found in essentially all cases, that the proposal evaluation was fair and appropriate and that appropriate procedures were adhered to.

Comments:

- The program manager summarized the review comments well and provided detailed justification for the determination of decisions.

Recommendations:

- The COV recommends that the current funding processes be maintained.

2(b). Processes to monitor active awards, projects and programs

Findings:

- The active awards, projects, programs, and cooperative agreement were effectively monitored and managed through a number of mechanisms: annual progress reports, annual PI meetings, workshop and working group meetings, and regular reviews/updates of major program
- All climate modeling PIs in CESD met together for the first time in 2010. The COV considered this as a valuable means of promoting interactions among different CESD programs.
- Workshops have proved to be effective means of obtaining community input for the evolution of program priorities.
- Program managers indicated that they rely, to a significant extent, on PI meetings to assess research progress, with the resulting slides summarizing the posters made available on a website.

Comments:

- We observe that the relationship between the Office of Science and the MIT Integrated Assessment (IA) program has matured to the point that both this program and its impact on the IA portfolio would benefit from systemization of the relationship, above and beyond the existing programmatic monitoring.
- We note that the SFAs under IAR produce annual progress reports, and that these reports are important to both the program management and to the project leaders as a means of measuring and documenting progress towards programmatic goals.

Recommendations:

- The joint meetings with other climate modeling programs should be continued to promote synergism between the different program elements.
- Given the maturity of the MIT Integrated Assessment (IA) program, the COV encourages the PM to explore the option of considering a cooperative agreement with MIT that would be subject to periodic review. This type of agreement could create a longer-term arrangement between the host institution and DOE to achieve certain specific goals.
- Annual progress reports can be better standardized with formal comments on them from the program managers to the PIs.
- Report requirements for the smaller boutique projects should be consistent with other projects.

3. Effect of the Award Process on Portfolios

3(a). Breadth and depth of portfolio elements

Findings:

- Based on thorough review of the materials and extensive discussions with the program managers, we would like to commend the IAR program for the excellent quality of the solicitations, the resulting award selections, the science produced through these awards, and the impact on the field.
- This excellence is reflected in the national and international standing of the program discussed in the next section.
- We commend the program manager for starting to organize a major workshop on water, energy and climate during the period of review of this COV. The PM and other BER colleagues did a superb job in identifying a critically important scientific frontier and soliciting the conceptual framework for a workshop from experts in their program.

Comments:

- In an era in which the program scope is appropriately expanding while the concomitant resources are not necessarily growing at the same pace, identification of mission-critical science challenges becomes increasingly important. This will be a continuing challenge for IAR because of its large scope.
- The launch of the water workshop is, in our view, exactly the same response that the COV feels is the strategic approach to address these challenges.

Recommendations:

- Given the scope of the IAR projects, the COV suggests possible consideration of the option of lengthening the period of performance for SFAs in IAR from three to perhaps four years for some projects, while retaining the mid-course review to assure progress and sustained performance. This longer period would be more consistent with the stated goals of the SFAs to both create a national capability and to apply that capability to major scientific challenges that require sustained investments.
- Targeted small workshops should be considered to frequently evaluate and refine the scope of the IAR program to meet new demands and take new opportunities.

3(b). National and international standing of the portfolio elements

Findings:

- DOE supports both of the major IA modeling efforts in the United States. As the international community supports four additional models of similar caliber, DOE's investments represent 1/3 of the global capabilities in state-of-the-science integrated assessment. Only Europe supports a greater number.
- The world-leading impact of DOE's IA program is reflected by its prominent role in the past and present CMIP, IPCC and national assessment efforts; by the large number of high-impact publications (especially since this is the smallest of the three modeling programs in CESD); by the prominent leadership of its scientists in international IA activities; and its rapidly growing impact on end-user communities.
- The program has created important decision support tools used by other DOE programs as well as other agencies.

Comments:

- The transition to community modeling has helped accelerate the impact of the program on both national and international IA research through the provision of two state-of-the-science IA codes through open source protocols to the international community.
- This impact is reflected by the several hundred users, and growing, of these models worldwide.
- This wide-spread use represents a significant leveraging of DOE's investments.

Recommendations:

- The COV strongly recommends that the IAR program continue leveraging the community efforts to carrying out its mission.

4. Other Review Criteria

- Are an adequate number of qualified reviewers (free from bias and/or conflicts of interest) selected for review of projects and grants? Yes
- Are the Office of Science (SC) merit review criteria applied appropriately in the evaluations? Yes
- Is documentation of the review process adequate and complete?

  Yes. The reviews of the proposals are detailed and the scores justified.
- What are the characteristics of the award portfolio? Well balanced. It includes
  - Integrated assessment modeling
  - Model development including climate modeling (link to CAM3), water, sea-level rise and infrastructure vulnerability, wind power, and probabilistic techniques.
  - Participation in some IAM community model inter-comparisons
  - Summer workshops on climate change impacts and integrated assessment of climate change
- Are progress reports on previously funded research useful in the evaluation of proposed research? Yes.
- What is the quality of overall technical management of the program? The programs are very well managed.
- What are the relationships between award decisions, program goals and DOE mission?

  The alignment of award decisions and CESD's strategic plan is particularly well realized for this program. This program sits at a unique intersection between science and the DOE mission.
- Are there significant impacts and advances that have developed since the previous COV review that are demonstrably linked to DOE investment?

  Yes. Major advances since the previous COV review include the addition of water markets to both DOE IA models, the reformulation of the GCAM model in terms of agro-ecological zones, and the advances toward an integrated Earth System Model. In addition, the DOE program has established itself in a dominant leadership position in the international IA community. This in turn helps determine the international scientific agenda and represents another form of significant leveraging of DOE investments.
- Were the responses of the program to the recommendations of the previous COV review appropriate?

Yes. We found that the responses to the recommendations in the previous review were fully appropriate for the issues that can be readily addressed or are within their control.

E. Terrestrial Ecosystem Science (TES)

1. Program Summary

The mission of the TES program is to improve the representation of terrestrial ecosystem processes in Earth system models thereby improving the quality of climate model projections and providing the scientific foundation of energy solutions for DOE. The program focuses on ecosystems and ecological processes that are globally or regionally significant, expected to be sensitive to climate change, and are insufficiently understood or inadequately represented in models.

2. Efficacy and quality of funding processes

The COV examined the RFAs and FOAs for the past 3 fiscal years: FY2010 through FY2012 disseminated by the Office of Biological and Environmental Research and found three TES program solicitations designated as 11-536 in FY2011 and 10-287 and LAB 09-16 in FY2010.

Given that two large lab projects, Ameriflux (LBNL) and the Next Generation Ecosystem Experiment (NGEE) (ORNL), represent significant investment, the general Lab vs. non-Lab funding is roughly proportionately balanced. Non-Lab solicitations resulted in 140 and 91 received proposals for 11-536 and 10-287 respectively, with a funding rate of 9% and 29%. Funding levels for TES were $22M in FY2010, $31M in FY2011, $40M in FY2012. For the $40 million in FY2012, 1/3 was non-Lab funding.

For the review, a random sampling of the both accepted and declined proposals was conducted which included all available documentation of the proposal, peer review process and management decisions and communication to the proposers and review panels. Tri-annual review of the SFAs was examined as were pertinent workshop reports, and individual annual investigator meetings.

2(a). Solicit, review, recommend, and document application and proposal actions

Findings:

- The solicitation, peer review, and selection processes are rigorous, of very high quality, well documented, and consistent. This is a real strength of the program and its management team.

- The descriptive call of the solicitations in terms of area of research interests was rather multifaceted and somewhat nuanced in terms of key words.
- Consistency from solicitation to award selection is very good. The program provides a fair balance of continuity/closeout funding for activities/topics being phased out.
- The program does excellent jobs in the use of 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.
- Processes are thorough and well documented – times to decision seem moderate/average, but given the quality of the final product, this is optimal.
- Documentation making recommendations is complete and usually much more than adequate -- documentation is thorough.

Comments:

- It is noted that diversity on some of the panels could be improved. Some panels had few women (others did seem to have a better balance).
- Also noted that the prior COV recommended striving for a greater percentage (~20%) of reviewers from international institutions and this has not been achieved to date. It is indeterminate how important a goal of 20% really is, but a few more would be beneficial.
- At least one selection decision was delayed by about 2 months, because one mail reviewer failed to deliver.

Recommendations:

- There may be a need to sharpen and prioritize the major elements of the research solicitation. It appears that priority topic areas may be somewhat buried in the narrative and these should be brought to the fore in the description of research interests. Avoid nuanced terms such as non-managed ecosystems or provided detailed descriptions.
- Keep up the good work.

2(b). Processes to monitor active awards, projects and programs

Findings:

- The most effective management practice is the use of regular peer review of the National Laboratory SFAs and related research activities. This is a highly effective means of keeping research projects on track. The monitoring process is of high quality, and aligned with agency directions and priorities. DOE is to be commended for establishing this practice and implementing it very effectively during the past 3 years.

- The annual investigator meetings are very effective in promoting coordination and communication and the program managers use them very effectively to monitor and assess progress. Workshops and annual meetings are used well as a management tool.
- Interactions of program manager, particularly through workshops and investigator meetings, with the funded scientists seem very good, with excellent dialogue regarding scientific issues, opportunities and priorities
- Written progress reports are adequate and informative.
- The effectiveness of the site visits is not clear.

Comments:

- Grant results do not appear to be tracked very closely or reported in any way other than through lists of publications. One would have expected to see a little more about scientific accomplishments in the overview presentations by the program managers – just a chart or two summarizing major progress toward established DOE program objectives.

Recommendations:

- Continue to maintain a strong and rigorous practice of frequent (at least every 3 years) external peer reviews of all large projects and National Laboratory research activities.

3. Effect of the award process on portfolios within the boundaries of DOE mission and available funding

3(a). Breadth and depth of portfolio elements

Findings:

- The selection and award process is resulting in the desired portfolio content that is consistent with program goals and solicitation objectives.
- There is good balance of awards with respect to innovation, risk, and interdisciplinary research. It is noted that the program managers are eager to make sure there is room for new ideas and a reasonable number of high risk research projects in the portfolio.
- The evolution of the portfolio with respect to new investigators and new science thrusts is evolving as DOE has prescribed and in an orderly way that allows for reasonable close out of projects or lines of research that must end. This is being very well done – although budget ups and downs have complicated the process and slowed some transitions into new areas of research.

- The relationship of the portfolio to other parts of the Division and the Office of Science was good, in particular the degree of substantive interaction among the program managers within BER and the Office of Science. It is evident that they have all been working to foster positive, collaborative, collegial relationships and it seems to be paying off in program integration. The Board of Directors for NGEE is a wonderful example. The evolution of the SBR-TES relationship is not so clear or predictable.
- The relevance of the portfolio with respect to the missions of the program, division, Office of Science, and DOE was well established, and the programs were well coordinated. The award scope, size, and duration were appropriate.

Comments:

- There was not enough information about the integrated content of the 2010-2012 funded investigations that would have better helped the COV review.
- Recent research solicitations are nuanced by terms such as "non-managed" ecosystems, meaning non-agricultural. The dividing line here is a bit fuzzy, i.e. grazing land. The TES is moving in a limited extent to urban ecosystems (which are managed ecosystems) and while this is a good transition, the terminology and its intended meaning were somewhat confusing.

Recommendations:

- Nothing major. It will be helpful to future COV reviews for the TES program managers to include a chart or two in their overview presentation to show the types of research activities conducted -- how each solicitation and SFA adds to the breadth or depth of research conducted toward the program's goals.
- One of the stated goals of CESD is to increase the predictive capacity of Earth System models. In the context of TES this places the focus on the Community Land Model, (CLM). This model was originally developed by NCAR as a component of the fully coupled CESM. We laud DOE's focus on improving process representation in the model. CLM is a very sophisticated highly engineered code designed to run efficiently in the context of a global model. It is not a simple matter for an individual scientist to change or add capability to CLM. Model development and testing at the research level is often more efficient in a modeling environment that is specific to the task at hand. Once the equations are developed and tested, new functions can be added to CLM. The COV recommends consideration of software engineering support within DOE - presumably at a National Lab to facilitate these activities.

- DOE should take note that recent analyses using data from the flux networks have shown that the predictive capacity of process models such as CLM is inferior to so called "data driven" models (Beer et al., 2010 Science 329:834-8). It is not clear that focusing on improved process representation alone will solve this problem. The COV recommends that TES consider a complementary focus on the model's performance at flux sites to identify emergent properties and overarching controls on ecosystem processes that may not be apparent from the bottom-up perspective.
- There is a stated bias in the portfolio toward non-managed ecosystems. This is understandable, but managed ecosystems are a significant component of the Earth System, and it is difficult to see how one can test the predictive capacity of such models without accurate representation of these ecosystems. The COV recommends that CESD develop a strategy to deal with this gap, perhaps through cooperation with agencies that do support modeling of managed ecosystems.

3(b). National and international standing of the portfolio elements

Findings:

- The new strategic focus on experimental work that advances predictive modeling is a unique aspect of the program. The approach in combining experimental ecosystems research with advanced land modeling has potential for major payoffs in the future and represents a bold leap forward. DOE is to be commended for making the decision to move in this way and acting decisively to implement its plan.
- Ecosystem manipulation continues to be a strength and DOE continues to be a world-leader in the supporting technologies as well as in having the capacity to field such studies and commit to a significant duration (e.g., ~10 yrs).
- CDIAC is an essential and treasured community facility that is providing important services to the national and international carbon science communities.
- The portfolio's principal investigators are top scientists in their fields. Many leaders are of international stature. Also, it is worth noting that there are several bright and promising newer scientists included in the program.

Comments:

- Much of the research is at the state of the art and comparable to top research internationally. It is not clear that DOE is as much in the "class by itself" as it used to be in leading advanced field capabilities like FACE and AmeriFlux. However, new investments like NGEE may prove to re-establish that leadership position (it is too early to tell at this point).

Recommendations:

- If DOE is to maintain a scientific leadership role and spread the word regarding its new approach, DOE scientists and managers need to be able to attend key national and international scientific conferences and serve on international coordination groups. In order to do this, they need to be able to travel. You cannot have an influence and you certainly cannot lead, if you are not at the table, in the hallways, and part of the side discussions. DOE senior management needs to work harder to justify the need for scientific coordination and communication-related travel – even a modest increase could make a big difference.

4. Other Review Criteria and Questions

- Are an adequate number of qualified reviewers (free from bias and/or conflicts of interest) selected for review of projects and grants? Yes to all questions. Excellent!
- Are the Office of Science (SC) merit review criteria applied appropriately in the evaluations? Yes. No deviations were found.
- Is documentation of the review process adequate and complete? Yes
- What are the characteristics of the award portfolio?

  Portfolios were consistent with what was solicited and/or with the analyses of the peer reviewers. In one case (NGEE) what was selected was modified significantly from what was solicited based on the findings of the peer reviewers.
- Are progress reports on previously funded research useful in the evaluation of proposed research?

  They are for the SFA's and other Lab activities – those reports appeared to be quite useful. Relatively few progress reports for grants were examined, but those did serve their purpose.
- What is the quality of overall technical management of the program? Excellent.
- What are the relationships between award decisions, program goals and DOE mission? Tightly coupled, with appropriate flexibility/adaptability. They are staying on course and making smart decisions.
- Are there significant impacts and advances that have developed since the previous COV review that are demonstrably linked to DOE investment?

  Yes. SFAs are being implemented well and appear to be very successful scientifically and the management strategy adopted to oversee and guide them is working well.

Since the last review, plans for stabilizing the AmeriFlux network were implemented and a more secure future and a sound management structure for the core sites are now established. These actions have addressed a long-standing concern of the community and DOE is to be commended for taking such strong and forward-looking actions.

- Were the responses of the program to the recommendations of the previous COV review appropriate?

  Yes, for the most part – a few things of note are itemized below.

  - DOE has begun development of an electronic grants information system, but it is not available yet. The paper files were in good order and easy to access and understand.
  - We did not see any quantitative metrics on output publications. That could have been quite helpful – although it may be more work than is reasonable to expect on the part of the program managers.
  - There may still be room for improvement on communicating out to the public regarding accomplishments and activities (COV recommended Web pages for TES) – we did not hear or see much on that in our visit.
  - Major kudos for stabilizing the support and future of AmeriFlux. Good follow through on the plans discussed back in 2010.
  - Recommendation on annual solicitation for National Labs was not followed up on, but since this was not the intent for the SFAs, DOE inaction here seems appropriate.
  - Recommendation to increase recruitment of reviewers from outside the US to ~20% has not been implemented. This is a challenging requirement and the failure to meet it is not a significant problem. There has been appropriate use of international reviewers on panels and a few more per panel might be helpful, but this does not necessarily impact the quality of the review if not achieved.

F. Subsurface Biogeochemical Research (SBR)

1. Program Summary

The mission of the SBR program is to advance a predictive understanding of the biogeochemical structure and function of subsurface environments to enable systems-level environmental prediction and decision support. It supports research activities to advance the development of fully coupled models that incorporate metabolic modeling of microbial processes; molecular-scale understanding of geochemical stability, speciation, and biogeochemical reaction kinetics; and diagnostic signatures of the system response at varying spatial and temporal scales. The program aims to understand how the behavior and interactions of contaminants, carbon, and

nutrients affect their mobility, reactivity, and stability in complex subsurface environments that encompass the vadose and saturated zones and key interfaces between ground and surface waters.

2. Efficacy and quality of funding processes

The COV examined FOAs for the past 3 fiscal years: 09-07, 10-311. These calls received 106 and 99 proposals respectively, out of which 27 and 26 proposals were funded. The success rates were 26% for both calls. Funding levels for SBR were $50M in FY2010, $49M in FY2011, $27M in FY2012.

2(a). Solicit, review, recommend, and document application and proposal actions

Findings:

- The solicitations evaluated in this cycle had clearly stated goals and aligned well with program goals.
- Pre-applications in the 09-07 and 10-311 solicitations were encouraged but not mandatory. The pre-applications were reviewed by three PMs and categorized as 'encourage', 'marginal' and 'discourage'. In case of disagreement, the PMs would meet and further discuss the pre-proposals. The reviews were sent to the PIs to help them decide whether to submit and, if so, how to better align the proposal with the program's programmatic goals. It is evident that the pre-applications were carefully reviewed by the PMs and the feedback was very constructive for the PIs. The division has discontinued this practice and now the PMs do not provide feedback, just the decision. Pre-applications are also mandatory now and once discouraged, the PI cannot submit a full proposal.
- SFAs have been implemented as a means to fund a coherent group of investigators focusing on a collaborative research thrust relevant to DOE's mission. Previously National Laboratory investigators submitted their individual proposals, which was both inefficient and did not result in cross-disciplinary collaborations. The SBR SFA portfolio consists of three larger Core SFA Programs with interdisciplinary teams (PNNL, LBNL, ORNL) and four smaller focused SFA Programs (ANL, LLNL, SLAC, INL). The INL SFA has been closed due to budgetary constraints. Some SFAs are directed to change focus from contaminant transport to carbon cycling research. Different SFAs are in the process of adapting to these changes, some more successfully than others. Below is a summary of findings:
    - LBNL: We understand from conversations with the PMs that LBNL submitted a plan for this transition that was recently reviewed successfully (this plan was not reviewed by this COV).

- PNNL: There is significant correspondence between PNNL's PI and PMs to identify ways to face the challenges inherent to directing their SFA towards carbon cycling.
- LLNL: Its SFA focuses on plutonium chemistry and transport. Plutonium is a major problem for DOE and this COV recommends that DOE continues to fund this research to address its mission.

- The SFA monitoring system implemented by DOE is consistent among all SFAs. The close interaction between PIs and PMs has been very beneficial for the success of the SFA activities, as indicated by the significant improvement in the SFA program planning and review outcome. Careful examination of the SFA reviews is consistent with a general trend of improvement, in the sense that the SFAs have more coherent, cross-cutting, and well-planned research efforts. This positive outcome is perhaps stimulated by the significant interactions that we observed between PMs and PIs prior to the reviews (the PIs discuss an outline of the presentation and proposal with the PMs and receive feedback prior to the review).
- The review panels were composed of a good mix of multidisciplinary scientists, both funded and non-funded by the program, thus providing a good balance of expertise for a successful review. The peer-review process based on recommendations by the reviewers and panels was very good and showed knowledge of the science and the program goals. The documentation regarding the review process was significantly improved in the 10-311 solicitation. We commend the PMs for this improvement and encourage them to continue to improve the review process and its documentation.
- All the proposals evaluated by the COV included a summary of the reviews and review panel discussion and recommendation. The documents were sent to those PIs whose proposals were not funded.
- In general, there was excellent agreement between the reviewers' evaluations and scores and the funding decisions by the PMs. This is important to ensure that only the best and most innovative science is funded.
- We were happy to see that the internal documentation for declined proposals in the 10-311 solicitation included a short summary or statement with the reasons for declination, which was absent in the documentation of proposals declined in the 09-07 solicitation. This is a good practice that we encourage the PMs to continue and share with the PIs. We understand that a new procedure was implemented in 2012 in which all PIs receive the reviews and the panel summary of the decision. We encourage the PMs to continue this practice.
- The COV reviewers were particularly impressed by the positive outcomes of the feedback submitted to non-funded PIs. Feedback included very helpful, detailed and specific recommendations to improve future submissions. There were several examples of proposals not funded in the 09-07 competition, which were successfully funded in the

10-311 competition after using the reviewers and panelist's recommendations to strengthen the resubmission.

Comments:

- An exciting and recent outcome of the Oak Ridge SFA since the last review was the discovery of the genetic basis for mercury methylation. This finding will have major repercussions in understanding and managing mercury contaminated soils/sediments/and groundwater systems.

- There was a notable exception to the selection of one individual PI proposal for a prominent researcher whose proposal was unanimously reviewed very poorly by the primary reviewers, a mail-in reviewer and the review panel. Despite the poor reviews and serious concerns about the experimental approaches, feasibility of the proposed work, and programmatic relevance, this proposal was funded generously and over other proposals deemed competitive and relevant to the program's goals and portfolio. This type of instance compromises the fairness of the peer review process and the program's reputation and should be avoided in the future.

Recommendations:

- There has been significant correspondence between the PMs and the PI to help redirect the PNNL SFA (Role of Microenvironments and Transition Zones in Subsurface Reactive Contaminant Transport) and give guidance on focusing on contaminants and using the Hanford site for non-contaminant processes. Given the unique expertise of radionuclide geochemistry and fate and transport plus the long-term problems at Hanford, this COV feels that it is beneficial for this SFA to continue focusing on radioisotope fate and transport, perhaps even including problems at other facilities. It is clear from the reviews that the proposal needs to reach competitiveness and we commend the PMs to engage in conversations with the PNNL that can result in a successful SFA in this important area.
- Plutonium is a major problem for DOE and this COV recommends that DOE continue to fund this research at the LLNL SFA to address its mission.

2(b). Processes to Monitor Active Awards, Projects and Programs

Findings:

- We noticed that a good number of funded proposals in the 09-07 solicitations did not have progress or final reports. It was difficult for the COV reviewers to assess progress. This was corrected in the 10-311 solicitation and the funded proposals all included

progress reports. The progress or annual report was detailed with respect to scientific results.

- The 2010 COV review mentioned the positive practice of PMs preparing a synopsis of the progress reports. However, this synopsis was absent in the 09-07 proposals. This was corrected on the 10-311 solicitation.
- The COV was impressed with the PMs' knowledge and involvement in the programmatic details of each SFA. SFAs submitted detailed annual reports, except on years where they were reviewed, when a more detailed report and research plan was submitted.

Comments:

- The COV was pleased to see the PMs' knowledge of activities and expertise of individual investigators, research progress (new and exciting findings) and directions as well as potential new directions of each SFA.
- The COV was also pleased by the ample correspondences between the PMs and SFA PIs, which is consistent with a highly communicative environment that is so critical to the success of these activities.

Recommendations:

- We recommend that the program continue the requirements of annual progress or final reports of funded projects.
- We encourage the PMs to continue the practice of preparing a synopsis of the progress reports.

3. Effect of the award process on portfolios within the boundaries of DOE mission and available funding

3(a). Breadth and depth of portfolio elements

Findings:

- The quality of the science resulting from this program has been outstanding. The program has pioneered system approaches to investigating complex environmental issues that are relevant to the program and DOE's missions. There was a good balance of innovative and risky and more traditional research, which is necessary to maintain a high quality science portfolio and to advance knowledge.

- It is important to note that, despite the dramatic budget reductions, the PMs have done a great job at adapting to the budget cuts, maintaining some research in radionuclides and steering the focus of the National Labs towards complementary areas for which more funds are available. Yet despite these efforts, the reality is that a critical mass of expertise in radionuclide research has disappeared and the SBR portfolio has lost the breadth of science that is so critical to its mission and to address some of the BER and DOE missions. Specifically, this COV review concluded that:
    - This type of research and expertise is unique and critical to the DOE mission.
    - The SBR program is a great example of a successful interdisciplinary portfolio designed to address a critical component of DOE's mission.
    - The science resulting from the program has impacted other programs in this division and nationally has led to the training of professionals with internationally stature. Because of the budget cuts to radionuclide research and current shift to a carbon science focus, DOE faces the loss of critical expertise in the field and national and international leadership. This could potentially compromise DOE's overarching mission "to advance the national, economic, and energy security of the United States; to promote scientific and technological innovation in support of that mission; and to ensure the environmental cleanup of the national nuclear weapons complex".

Comments:

- The COV has serious concerns about the funding reduction on radionuclides research, which has shifted the focus of some national labs to carbon science and has put university solicitations on hold for several years. SFAs also had to adjust to the decreasing SBR budget. Budget cuts have resulted in the termination of the INL SFA and further cuts would most likely result in the closure of another SFA since many SFAs are close to a minimum level of funding to be able to be functional.
- The COV discussed extensively the benefits of having the TES and SBR programs fully integrated. It is clear that subsurface research provides critical knowledge to ecosystem functioning and global ecosystem responses and feedbacks to climate, yet the subsurface is often excluded in global ecosystem research and climate models. SBR has also been successful at promoting interdisciplinary research and studying subsurface environments at all relevant scales. It has also developed powerful reactive transport models that integrate the biological and physical parameters that control the subsurface dynamics. These approaches and expertise would be an asset to the TES portfolio. The NGEE-Artic effort is a great example of how SBR could contribute to the success of other programs. For this to happen, full integration of the programs is necessary.

Recommendations:

- The COV recommends that the SBR program continues the radionuclides research efforts. This can only be accomplished by continuing to support the program with appropriate funds. We encourage the agency to capitalize on the available expertise in subsurface research in the SBR program to complement and fill gaps of knowledge in other programs such as the TES program.
- The COV recommends DOE to consider better integrating the SBR program with the TES program so that the missions of both SBR and TES programs can be accomplished more effectively.

3(b). National and international standing of the portfolio elements

Findings:

- The SBR portfolio includes top researchers in subsurface biogeochemical research, with a good blend of scientific disciplines and interdisciplinary projects. The portfolio includes lab and non-lab individual PIs and small team research projects and SFAs at the National Labs. The SBR portfolio also included a significant investment in Exploratory Projects. This element of the program helped bring new investigators and innovative research to the program.
- While the IFRCs no longer exist as program elements, BER supported research is still being conducted at these sites through SFAs and university led research projects.

Comments:

- There had not been any more non-lab open calls since 2010, which has limited the breadth of science of the program and participation of the science community in the program.

Recommendations:

- The COV recommends that when budget permits, field research sites should be revisited or restored, and include participation of University and other non-National Laboratory PIs.

4. Other Review Criteria and Questions

- Are an adequate number of qualified reviewers (free from bias and/or conflicts of interest) selected for review of projects and grants? Yes.

- Are the Office of Science (SC) merit review criteria applied appropriately in the evaluations? Yes, except in one case as noted before.
- Is documentation of the review process adequate and complete? Yes
- What are the characteristics of the award portfolio?

  Portfolios are consistent with what were solicited.
- Are progress reports on previously funded research useful in the evaluation of proposed research? Yes.
- What is the quality of overall technical management of the program? Very good.
- What are the relationships between award decisions, program goals and DOE mission? Tightly coupled, with appropriate flexibility/adaptability.
- Are there significant impacts and advances that have developed since the previous COV review that are demonstrably linked to DOE investment?

  Yes. The new finding of the genetic basis for mercury methylation will have major repercussions in understanding and managing mercury contaminated soils/sediments/and groundwater systems. The budget cuts have led to significant reduction of the radionuclide geochemistry research that is needed for DOE.
- Were the responses of the program to the recommendations of the previous COV review appropriate? Yes.

G. Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF)

1. Project Summary

The Atmospheric Radiation Measurement (ARM) Climate Research Facility is a multi-platform scientific user facility that supports research for addressing the major uncertainties of climate models – clouds and aerosols. ARM provides the national and international research community the infrastructure for obtaining precise observations of key atmospheric phenomena needed for the advancement of atmospheric process understanding and climate models. The primary ARM objective is improved scientific understanding of the fundamental physics related to interactions between clouds, aerosols, and radiative feedback processes in the atmosphere. ARM maintains four fixed sites situated in climatically distinct locations to sample continental and marine conditions in tropical, midlatitude, and Arctic environments (U.S. Southern Great Plains, Tropical Western Pacific, North Slope of Alaska, and the Azores). ARM also has an aerial measurement capability and two mobile facilities that can be used in experiments across the globe. An effective data processing and archive facility has been put in place to support the

observation data collection and preservation. The ARM facilities are internationally recognized as the state of the art of in-situ atmospheric climate observations and constitute an essential element of national and international climate research and development of climate data records, and climate modeling improvement.

2. Efficacy and Quality of the Funding Processes

The COV examined the process to solicit, review, recommend and document applications, proposal and award actions. The ACRF funding process is different from the other BER/CESD elements in that allocation of funds is conducted at two different levels: 1) at the facility level, funding is directed from DOE Headquarters toward infrastructure maintenance and expansion, data archive and dissemination, and basic operations and management; and 2) at the ACRF site level, here defined broadly to include both fixed and mobile platforms, individual PI proposals (campaign) are submitted directly to the ARM Science Board (SB), not to DOE Headquarters. Funding levels for ACRF were $43M in FY2010, $46M in FY2011, $68M in FY2012.

2(a). Solicit, review, recommend, and document application and proposal actions

Findings:

- We find the Science Board review of proposals and the PM decision-making procedures appropriate and adequate.
- Laboratory (ARM infrastructure) proposals are mostly done as annual "Field Work Proposals" (FWPs) by which the laboratory lead PI typically describes the work to be done as part of the overall DOE laboratory funding, including maintenance and replacement of instrumentation and other support infrastructure such as hardware and software to operate and manage the ARM data Archive.
- From discussions with the PM, and our review of the Infrastructure Management Board (IMG) agenda and minutes, it is clear that these proposals are a result of input from the SISC, the IMG, and/or other very appropriate science based discussions and close guidance from the PM. The process is sound and robust.

Comments:

- The ACRF has reached an unprecedented standing as a national and international facility, and therefore it is expected to remain in place and expand in the future. It is important to develop a record of institutional memory to inform future leadership and new generations of PIs of the review process and the rationale for reaching certain decisions.
- Most of the written proposals give general references to ARM and DOE goals, but tend to be meager in details, and generally do not cite specific guidance from the PM, the SISC

(Science Infrastructure Steering Committee) or the three-yearly Facility Review documents.

Recommendations:

- We recommend that the PM require the proposals to have explicit specific references to DOE or web based documents. Additionally, we recommend that the PM include the relevant SISC and IMG notes to the proposal files so that the history and reasons for the specific actions can more easily be tracked.

2 (b). Processes to monitor active awards, projects and programs

Findings:

- Progress monitoring is robust overall. The PMs have weekly meetings/telecons with the IMB, which cover all critical management and operation aspects of the ACRF. The IMB minutes show that these meetings also constitute a venue for reporting.
- The ARM data archive is an essential and well-functioning part of the ARM program. The PMs have encouraged increased interaction with users of the data, which have been successful.
- The history record and tracking of lab and external proposals can be easily improved with better referencing of past proposals/activities, and documentation of notices of change.

Comments:

- The annual FWPs include a "boiler-plate" section on site level performance metrics such as for example data yield, but they do not report on specific challenges or problems that had to been addressed, how they were addressed, and whether there was a successful resolution.
- A critical challenge in the context of Data Archiving is to maintain pace with innovations in IT and the ever increasing requirements for data stewardship and storage. Similar comments can be made with regard to the Data Archive regarding better documentation and referencing of past proposals/activities, including notices of change and rationale for technological decisions.
- ARM publishes very nice annual reports that contain very useful information. However, the text does not always offer adequate explanations for the material contained in the figures presented. We recommend that ARM take care to have the document reviewed perhaps by the SISC for content before it is released to the general public.

Recommendations:

- In the interest of building ACRF institutional memory, we recommend that the PM require the proposals to have a succinct summary of previous year activities with a strict focus on critical events and achievements.

3. Effect of the award process on portfolios within the boundaries of DOE mission and available funding

3(a). Breadth and depth of portfolio elements

Findings:

- Open and timely data sharing and data access is a fundamental element of ARM's success, and it features prominently in ARM web-based literature.
- ACRF has established itself as a world-class facility in measuring atmospheric processes of radiation, cloud, aerosols, precipitation and their interactions.

Comments:

- The MOU with India is noteworthy in two ways. First, the activity helped to cement the international acclaim of ARM. Second, it leveraged the ARM resources in making measurements in a climate-sensitive region of the world. However, the lack of the data agreement appears to have caused considerable difficulty in obtaining data from ARM campaigns in India.
- As the spatial resolution of climate models is nearing the scale of the footprint of ACRF platforms, and as Earth System Model efforts ramp up, there is a need for closer interaction in designing integrated data infrastructure including both observations and model results. Whereas elements of this are already being addressed by producing the ARM Climate Modeling Best Estimate (CMBE) product and in other project such as Obs4MIPS, it seems the timing is right to consider a coordinated Data Infrastructure Activity to anticipate future needs and maximize longevity and utility of ARM data beyond e.g. the pilot study.

Recommendations:

- We recommend that all future MOUs with other countries or other organizations explicitly include language specifying protocols between the host country and the ACRF to meet ARM data sharing requirements.
- ARM has relied on facility displays at professional meetings such as the AGU and AMS Annual Meetings to interest scientists to submit proposals for use of the facility.

However, the current budget restrictions do not allow sufficient infrastructure personnel to travel to the meetings and host a display concerning the ACRF. Since this is very important to increased usage of ACRF, we recommend that this activity be allowed for future meetings.

- The COV commends ACRF to produce best-estimate products for use by modelers. The COV recommends that ACRF continue these efforts.

3(b). National and international standing of the portfolio elements

Findings:

- The ACRF is a world class state of the art observational program indispensable to national and international climate research. More specifically, the fixed sites (and the planned expansion) have proven to be invaluable anchor points in climate research, climate process studies and climate data records worldwide. Similarly the mobile and aerial facilities have contributed extensively to the overall ARM and CESD program objectives while adding the flexibility to adhere to changing priorities and circumstances as well as promoting and establishing necessary international research links and activities.

Comments:

- In addition to past activities, the development of international collaborations with like-minded European agencies and development of international field campaigns, such as in the case of India and other upcoming campaigns, are very positive and demonstrate the standing and international recognition of ACRF.

Recommendations:

- The COV encourages the program to continue exploring collaboration opportunities with international partners to leverage DOE resources and to enhance its impact on the climate science research.
- Any budget cuts will threaten the maintenance of important climate records and obtaining data from process oriented observations in climatically important areas. Such records are impossible to replace if they are missed and may indeed require substantially larger investments in the future to obtain an adequate record. Thus, we recommend that existing facilities and data collection and archiving activities be protected from losses and that any sun-setting plan be developed based on scientific analysis.
- Although technology improvements have made it easier to conduct some scientific research, the human thought and analysis speed has not increased at the same rate. In

addition, to maintain the scientific and observational edge that characterizes ARM activities, significant technological investments will continue to be required in the future. The flat budgets in an inflationary period have resulted in a significant reduction in the number of personnel available to work on the various projects over the years. Therefore, we recommend that steps be taken to assure program support to maintain adequate infrastructure and programmatic excellence.

4. Other Review Criteria and Questions

- Are an adequate number of qualified reviewers (free from bias and/or conflicts of interest) selected for review of projects and grants? Yes.
- Are the Office of Science (SC) merit review criteria applied appropriately in the evaluations? Yes.
- Is documentation of the review process adequate and complete? Yes, but this can be improved.
- What are the characteristics of the award portfolio?

  Portfolios are consistent with what were solicited.
- Are progress reports on previously funded research useful in the evaluation of proposed research? Not applicable.
- What is the quality of overall technical management of the program? Excellent.
- What are the relationships between award decisions, program goals and DOE mission? Tightly coupled, with appropriate flexibility/adaptability.
- Are there significant impacts and advances that have developed since the previous COV review that are demonstrably linked to DOE investment?

  Yes. The fourth fixed site, the second mobile facility, and a suite of new scanning radars have been successfully added to the facility as a result of funding from the American Recovery and Reinvestment Act (ARRA).
- Were the responses of the program to the recommendations of the previous COV review appropriate? Yes.

H. Environmental Molecular Sciences Laboratory (EMSL)

1. Project Summary

The William R. Wiley Environmental Molecular Sciences Laboratory (EMSL) at the Pacific Northwest National Laboratory in Richland, Washington offers extensive experimental and computational resources to investigators in environmental, biological, and materials science disciplines in which the primary interest is to understand processes at the molecular scale. The facility includes suites of mass spectrometry capabilities, high resolution and unique imaging capabilities, nuclear magnetic resonance capabilities, x-ray and laser spectroscopy capabilities, and many other capabilities for molecular-level studies. In addition, EMSL provides a High Performance Computing (HPC) capability optimized for molecular-level modeling and simulation, the open source *NWChem* computational chemistry code, data storage systems, and collaborative software tools. Co-allocation of experimental and computational access is unique to the EMSL. The facility is staffed by research scientists who both have their own research programs and are available to partner with and assist users. The facilities are accessed via a competitive proposal process that encourages independent and team investigators, partnering with EMSL staff, and topics in general and science theme areas. Annually, the EMSL has approximately 750 users who produce approximately 400 publications.

2. Efficacy and Quality of the Funding Processes

For the review, a random sampling of both the accepted and declined proposals was conducted which included all available documentation of the proposal, peer review process and management decisions and communication to the proposers and review panels. Funding levels for EMSL were $53M in FY2010, $52M in FY2011, $51M in FY2012.

2(a). Solicit, review, recommend, and document application and proposal actions

Findings:

- The EMSL's detailed proposal submission and review procedure for FY10-12 was available online. Proposal solicitation occurs through EMSL's bimonthly online newsletter, to which one can subscribe via a listserv; advertising on Facebook; and via Twitter. The COV considers the current processes of proposal solicitation to be adequate.
- A variety of proposal types existed during the review period, each with different durations, specific guidelines, and submission deadlines. These include independent investigators and teams, science themes, general science, grand challenges, and rapid access proposals. Partnering with EMSL staff was encouraged. The COV noted that the designation of primary authors of proposals was not defined in the guidelines; that post-doctoral researchers could not be designated as primary authors; and, that in the description of proposal ratings (1 to 5, with 5 being the highest rating), ratings of 4 and 5 referred only to proposal teams. Upon discussion with the DOE manager for EMSL, it

was learned that the primary author was designated as a point of contact for following up on publications.

- The number of proposals submitted in FY10-12 averaged 326 per year, 43 to 54% of which, depending on year, were in the three science themes: Biological Interactions and Dynamics (BID); Geochemistry/Biogeochemistry and Subsurface Science (G/B&SS); and, Science of Interfacial Phenomena (SIP). The majority of funded proposals were either Science Theme or General with the percentage of Science Theme to General proposals decreasing from about 70% to 55% from FY10 to FY12.
- Proposals are reviewed and retained at EMSL, and not at DOE Headquarters. Therefore, the COV requested and examined only a small subset from one year: 8 of 182 proposals with corresponding reviews that were submitted to the FY12 Science Themes and with a distribution from laboratory, EMSL staff, and university PIs. The subset included some proposals awarded and some denied. The 8 proposals were prepared according to posted guidelines. Six had two external reviewers and two had three external reviewers who evaluated the Scientific Merit and Team Qualifications. The EMSL staff member in charge of the science theme evaluated Relevance to Mission, Impact on the Science Theme, and Appropriateness of Resources. Proposal scores were an average of the scores of the five criteria, with Scientific Merit weighted by 60% and the average of the other four criteria weighted by 40%. Proposals were ranked by average score and either recommended or not depending on resource availability. In one instance, a proposal was ranked in the bottom 45% of 89 submitted to a Science Theme, yet was awarded because the PIs did not require EMSL staff assistance and the usage request fulfilled an internal metric. Overall, the award decisions were consistent with the evaluation scores.
- The external reviewers were dominantly from academia, with 28% from U.S. and foreign national laboratories, industry, and other U.S. federal agencies. Reviewers who declined to review were documented as not having time or not being qualified. All review criteria were followed and review documentation was complete.

Comments:

- Overall the proposal submission and review process followed protocol with complete documentations. Relevant concerns from the previous COV have been addressed, in particular that regarding strict enforcement of proposal length.

Recommendations:

- The COV recommends that the definition of "primary author" be described clearly in the proposal guidelines. The COV also recommends EMSL to consider stating that anyone

can be project PI, as opposed to "anyone can write and submit", and that primary authors are designated separately as points of contact for follow-up.

- Because the requirement for staff assistance is an internal criterion in making awards, the COV recommends further examination of this aspect of awarding proposals as a mechanism for evaluating increases in staffing levels.
- COV recommends that EMSL provide access to proposal submissions and reviews to the COV at the beginning of the review. It is understood that EMSL controls the proposal process, so either simple instructions to select from a listing for transmission from the EMSL to BER during the review, or provision of a cross-section of sample proposals and reviews would help the COV review process.

2(b). Processes to monitor active awards, projects and programs

Findings:

- EMSL management has developed a useful quarterly Dashboard for monitoring awards in terms of scientific innovation and productivity, which also had value for this COV review.
- EMSL site review is held on a three-year interval alternating with the three-year COV reviews. This schedule for review periods results in a highly effective real-time monitoring of the facility.
- EMSL's plan-of-action response to the 2011 site review was timely. EMSL's implementation of the plan-of-action by October 2012 is well documented. There is clear documented evidence of ongoing communications between the DOE manager in charge of the facility, Paul Bayer, and the EMSL director, Allison Campbell.

Comments:

- The user-tracking process is well established and useful for monitoring EMSL success. The Dashboard developed for internal use by EMSL and BER management is a good format for monitoring metrics, but not as useful for the COV as suggested below.

Recommendations:

- Add categories to the EMSL Dashboard for ease of use by the COV and program management, for example, % of new users funded, % of awards relative to submissions by proposal category, % of proposals that required staff time, % general (and other types of) proposals awarded, % of awards by type of organization (academic, national lab, PNNL, industry, other).

3. Effect of the award process on portfolios within the boundaries of DOE mission and available funding

3(a). Breadth and depth of portfolio elements

Findings:

- The review process run by EMSL resulted in an appropriate equitable distribution of awards across proposal categories that was well aligned with the mission of DOE, BER, and the CESD. Some trends were observed in the Science Theme proposals that may or may not apply to other categories. The proportion of awarded Science Theme to General proposals decreased from ~75% in FY10 to ~55% in FY11 and FY12. The number of funded versus submitted proposals also decreased (see Table below) suggesting more awarded instrument and computational time per proposal, and possibly a greater number of larger team proposals in the Science Themes. The following table is a breakdown of proposal submissions, funded proposals and success rates in the three science themes of Biological Interactions and Dynamics (BID); Geochemistry/Biogeochemistry and Subsurface Science (G/B&SS); and Science of Interfacial Phenomena (SIP).

FY	Total	Science Theme Overall	BID	G/B&SS	SIP
10	349	182 (150) 82%	54 (45) 83%	37 (28) 76%	91 (78) 86%
11	289	125 (48) 38%	35 (14) 40%	22 (14) 64%	68 (20) 29%
12	341	184 (48) 26%	71 (16) 23%	27 (11) 41%	92 (24) 26%
In the breakdowns, the first number represents submissions; numbers in parentheses are total awards; percentages are for total awards relative to submissions.					

- EMSL has an internal goal of receiving 20% of submissions from new investigators. To achieve this, EMSL advertises extensively and effectively using social media (Twitter, Facebook) and regular participation in both national and international conferences. On-site workshops are effective at providing guidance for acquisition of new instrumentation and new areas of science focus. The user committee obtains feedback from the user community via surveys. Information in this review was insufficient to follow-up on a recommendation in the previous COV report that industrial users should be increased.

Comments:

- The COV could not evaluate all types of proposals given the limited time and access to proposals. From examination of those reviewed in the Science Themes, EMSL awards

and research are meeting the goals of the DOE, BER, and CESD missions. Ongoing discussions regarding the activities at the EMSL and the scientific missions of the programs are oriented in a strategy that will insure continued growth and relevance of the user facility and its application to DOE's goals. The facility has a unique set of experimental and computational resources that are being effectively employed to advance knowledge in environmental and energy-related science.

Recommendations:

- We recommend EMSL to increase the user pool, especially to attract new investigators. Relevant new program proposals should require a budget item for funds to visit EMSL during the first year of a project. Such a visit could be orchestrated at one time to minimize demands on EMSL staff. This recommendation could be generalized to other facilities where appropriate.
- As another form of advertisement, BER could consider holding an annual PI meeting at the EMSL (or another facility).
- We recommend that BER staff discuss if industry should be a significant focus for EMSL. If so, EMSL should clarify how industry can participate on the user access website and appoint an industry representative to the User Executive Committee.
- More staffing may be needed to optimize instrument and computer usage and fund higher ranked proposals. Attraction and retention of staff likely hinges on having dedicated instrument time. We recommend EMSL to consider increasing instrument time for staff; offering larger percentages of instrument time (> 10%) to new staff as a "start-up" package over a five-year period, similar to start-up packages offered to Assistant Professors to attract researchers and increase retention; increasing staff in key areas or on key instrumentation so that higher ranked proposals can be awarded usage time.
- The post-doctoral programs of the EMSL and related programs at PNNL are in good order, but more post-doctoral access could be achieved to increase the user pool of new investigators. We recommend that EMSL consider initiating post-doc internships (e.g., 6-month internships), in which a post-doctoral associate from a university or another national laboratory could focus efforts on a particular set of experiments using EMSL instrumentation or computational facilities; having all CESD programs fund post-doctoral research proposals, similar to that recently started by the TES program.

3(b). National and international standing of the portfolio elements

Findings:

- EMSL has both a national and international reputation as a unique and exceptional user facility. The COV recognizes that it is a highly valuable national asset. The facility is well managed from a technical perspective. The EMSL and DOE headquarters managers interacted frequently and documentation of data and metrics was conveyed to DOE regularly. The COV found that Paul Bayer was a knowledgeable, dedicated, and effective manager.
- Since the previous COV review, the EMSL has made facility improvements that are world class.

Comments:

- EMSL is a well-run facility unique to DOE Office of Science facilities. It is continually improving and adding to its instrumentation and had a good process in place for making decisions on when to acquire, replace, and retire instrumentation.

Recommendations:

- Continue with current processes to maintain, enhance, and grow the facility.
- Maintain EMSL as a national asset with an international reputation.

4. Other Review Criteria and Questions

- Are an adequate number of qualified reviewers (free from bias and/or conflicts of interest) selected for review of projects and grants? Yes.
- Are the Office of Science (SC) merit review criteria applied appropriately in the evaluations? Yes.
- Is documentation of the review process adequate and complete? Yes.
- What are the characteristics of the award portfolio?

  Portfolios are consistent with what were solicited.
- Are progress reports on previously funded research useful in the evaluation of proposed research? Not applicable.
- What is the quality of overall technical management of the program? Very good.
- What are the relationships between award decisions, program goals and DOE mission? Tightly coupled.
- Are there significant impacts and advances that have developed since the previous COV review that are demonstrably linked to DOE investment? Yes. These are listed below.

- Acquired increased computer power initiated with a 2010 workshop.
- Continued the project to acquire the 21 TESLA high resolution mass spectrometer, which began with a 2008 workshop and was initiated in 2009
- Acquired the Environmental TEM, NanoSIMS, and instrument for Oxygen Plasma Assisted Molecular Beam Epitaxy (OPA-MBE).
- Completed the radiochemistry annex and the quiet wing.

➢ Were the responses of the program to the recommendations of the previous COV review appropriate? Yes.

IV. Crosscutting Themes

The COV appreciated the opportunities to examine several cross-cutting activities within CESD and BER. The CESD PMs made presentations to the COV to share their knowledge on cross-cutting issues and opinions. They made themselves available for questions and for open discussions on these issues.

A. Facilities

The COV met with the PMs to learn about the various interactions between three user facilities: the EMSL, the ACRF, and the JGI (Joint Genome Institute). The activities were summarized in a presentation by Paul Bayer, the EMSL PM.

Findings:

➢ The presentation illustrated there were regular meetings in BER to discuss metrics for evaluating the facility usage, operational and management practices and triennial reviews. Additionally, Dan Drell, the JGI program manager, discussed the recent joint EMSL-JGI proposals. It was clear from discussions that the program managers for all three facilities are in constant communication with one another and using each other as a resource.

➢ All three facilities added substantial new or improved observing, analysis, or computing capabilities using funds from the American Recovery and Reinvestment Act (ARRA). These infrastructure investments will benefit the divisions' research programs for many years to come.

➢ The committee and the PMs had a very interesting discussion concerning potential new interactions. These included the research to be done under the joint JGI-EMSL proposal call, possible ACRF-EMSL interactions under the EMSL Science of Interfacial Phenomena (SIP) program, and potential data processing/computer interfaces amongst the data archives and computing centers associated with each program.

- It is clear from the presentations that these BER facilities are meeting the overall needs of CESD, being managed and organized with high quality and standards, and working well individually and collectively.

Comments:

- The various facilities are different and offer different services that cater to different groups of scientists. Thus, the users and their needs are very different. We recommend that DOE management recognize the diversity of users when making decisions concerning these facilities.

B. Interagency coordination

Mike Kuperberg and Bob Vallario initiated this session with a short, well-organized presentation on internal (within DOE) and external (interagency and international) coordination.

Findings:

- Internal coordination is very good across research programs and across major organizational divisions.
- The COV also looked at the interagency and international coordination activities and challenges. We were impressed by the number and diversity of external coordination activities and groups supported. DOE managers have multiple, significant responsibilities and leadership roles under the U.S. Committee on Environment, Natural Resources, and Sustainability (CENRS), and especially the USGCRP, as well as quite a few other interagency committees and working groups. CENRS and USGCRP interactions are strong, productive, and they are serving to advance US science. Leadership in IARPC and Integrated Assessment coordination is effective and good progress is being made. The international ARM sites are of great value and have been used as role models by other countries. Research conducted in association with these sites has high scientific impact.
- The coordination roles and responsibilities presented are also providing valuable scientific input and perspective that meet the needs of the U.S. Government as a whole.

Comments:

- In light of CESD's limited resources, the prioritization is well done. However, it also must be pointed out some opportunities can be better used (e.g. to influence the design

and priorities for international manipulative experiments, to exert leadership in the Global Carbon Project).

- Travel restrictions are limiting the ability of the program managers to do their jobs and to serve as leaders in the international arena. The CESD program managers do not interact internationally to the extent necessary to maintain a leadership role in setting international science priorities, directions, etc. A very modest amount of additional travel to key international science meetings would make an enormous difference. Travel restrictions are also an impediment to attending high priority domestic meetings especially those directly impacting the program manager's portfolio. It is certain that opportunities are being lost to identify new science avenues or make key connections and linkages.
- The BER staff is geographically distant from central Washington, DC, and the time necessary to travel to interagency meetings is a significant time sink for the program managers. While participation via a variety of remote/electronic options is feasible today and may be practical for many of these meetings, the tools available to the program managers for remote participation are not adequate for substantive interactions and are nowhere near the state-of-the-art in capability. This situation can be improved.
- Given DOE's goal of improving Earth system model predictability and its decision to not conduct research in "managed" systems (and the ocean), the COV would have expected to see presented interagency coordination activities to ensure research findings on managed systems (and ocean carbon/biogeochemistry) from the research activities of other agencies are made available and coordinated with DOE land and Earth system modeling efforts. However, nothing of this nature was presented in the DOE's summary on coordination. This appears to be an issue in need of future attention, planning, and potential coordination. BER should develop a plan for how it will obtain the ecosystem data and process understanding necessary to include managed and ocean systems in its next generation of land and Earth system models.

C. Workshops and initiatives

Findings:

- CESD maintains an active program of workshops to assist in both its implementation and formulation of program goals. CESD led or sponsored 17 workshops between 2009 and 2012. CESD also participated in the preparation of reports to BERAC to provide guidance on strategic planning for DOE. Four reports have been prepared over 2010 to 2012.
- The workshops played an important role in developing program announcements. These announcements, which by setting the agenda for CESD and determining the extent to

which proposals are responsive, determine the direction of the program. The program announcements in ESM and RGCM, for example, reflected very well current crucial scientific issues and indicated that mechanisms available to program management in crafting the portfolio were sound. The workshops are to some extent assisting CESD in developing collaborations with other agencies, and enhancement of their use along these lines is recommended.

- The importance of diverse participation in the workshops cannot be understated, and it is recommended that special attention be directed to ensuring this going forward.

Comments:

- Detailed documentation of particular workshops revealed some issues among agency collaborations. For example, in a case of DOE attempting to transfer funds to NSF for a co-sponsored workshop, difficulties were encountered in transferring funds between the agencies due to differing procedures at the agencies. Constant dialogues with other agencies to leverage DOE resources and to promote multi-agency cooperation are encouraged.

D. SFA management and CESD strategic plan

Findings:

- The SFAs provide a great mechanism for integration of experimental and modeling approaches that are critical to support BER's strategic goals 'to encourage, facilitate, and effectively manage integrative and collaborative programs at the DOE National Laboratories to achieve scientific research and solutions of the highest quality'.
- The COV concurred that the SFA management and organization is of the highest quality. The PMs are very knowledgeable of the SFA activities. Their frequent interactions with the funded teams and the feedback they provide are very positive. This has allowed the SFAs to successfully evolve.
- By integrating activities from previously isolated teams, the research has strengthened the expertise across the national labs. The result is high quality interdisciplinary science that is often very difficult to achieve. They had also developed integrative approaches and tools and, in the end, they are creating new science.

Comments:

- Most COV participants, particularly those with program manager experience, noted that the three-year review is essential for good management and the success of the

SFA. Some thought the review and formal reporting could be in the fifth year with annual PM visits, especially if said visits went well. The COV majority recommends that CESD should pursue the three-year review cycle that is standard in most other similar government science programs unless there are other reasons to question the appropriateness of the present review cycle. The COV recommends DOE to explore options to minimize the administrative burdens on the SFA teams associated with the reviews of SFAs.

- There was concern that some very accomplished scientists, who are not part of the large SFA effort, may become isolated and disconnected from the mainstream science efforts. There needs to be a balance in the allocation of funds between the open calls that support the individual investigator research and the SFA projects.
- By creating a single, large overarching model framework there is no flexibility to integrate individual modeling components in a hierarchical system of modeling. This greatly limits the use of the model by investigators outside the team. Some flexibility should be built to complement the large SFAs as appropriate to allow flexibilities.
- It was also noted that the scientists in the SFA teams would benefit from software engineering support. Individual investigators who are expected to work with community models would benefit by the availability of software engineering support.
- The SFA model may not work well for some programs such as Earth System Modeling.
- The terrestrial environment is highly heterogeneous and a successful model would benefit from having modules that address the scales needed to predictively measure the system's responses and dynamics.
- The SFA mechanism transfers substantial management responsibility to the principal investigator or director who is expected to be highly productive scientists. DOE should share with the PI or PD the best methods and facilitate them to manage the projects effectively and efficiently.

V. Responses to Previous COV Review (July 2010)

Item-by-item responses to the former COV recommendations have been documented in the report by the CESD PMs. Most recommendations have been satisfactorily adopted or addressed. The following changes have been made at the division level and across all programs.

- CESD has hired PMs in the ESM, ASR, TES that have alleviated the personnel shortage highlighted by the previous COV.
- Documentation of responses to reviewer comments for all funded research is now quite satisfactory. Letters and phone calls provided comprehensive exchanges with potentially

successful PIs. Feedbacks of review comments were communicated to the declined proposals in many programs.

- A communications team led by the BER Chief Scientist and composed of PMs across BER programs has been assembled and has been developing new methods and communication products to showcase BER science. Highlights of BER science are collected weekly within BER for transmittal within SC, DOE, and to the public.
- BER conducts rigorous on-site or reverse site-visit reviews of SFA programs every three years as described in the document entitled "Managing BER Scientific Focus Area (SFA) Programs At the DOE National Laboratories." These reviews are both retrospective and prospective in nature and are informed by renewal proposals.
- Metrics of performance and annual reports are collected and used to monitor projects and make renewal funding recommendations.

Most issues to each specific program have been satisfactorily addressed. Listed below are those that still need attention.

- An electronic tracking system for all documentation is still not in place.
- To play the leadership role that DOE deserves, participation in national and international meetings and workshops of PMs is needed.
- Interagency collaborations should continue to be explored and enhanced to leverage DOE resources and to address CESD objectives, particularly with respect to ecosystem response to climate change in the oceans.
- Increasing the high risk and innovative research is a challenge for all programs in BER and continues to be a high priority for all PMs. There are no fixes for this concern other than vigilance.
- How resources will be allocated between National Labs versus university scientists and other agency labs and between SFAs versus no-SFAs at the Labs requires continuing vigilance.

APPENDIX A — Charge Letter

Department of Energy
Office of Science
Washington, DC 20585

Office of the Director

August 30, 2012

Dr. Gary Stacey
Associate Director, National Soybean Biotechnology Center
Department of Microbiology and Molecular Immunology
271E Christopher S. Bond Life Sciences Center
University of Missouri
Columbia, MO 65211

Dear Dr. Stacey:

By this letter I am charging the Biological and Environmental Research Advisory Committee (BERAC) to assemble a Committee of Visitors (COV) to review the processes used by the Climate and Environmental Sciences Division (CESD) within the Office of Biological and Environmental Research (BER) to manage CESD research programs and its user facilities, the William R. Wiley Environmental Molecular Sciences Laboratory (EMSL) and the Atmospheric Radiation Measurement Climate Research Facility (ARM).

The COV should assess the operations of the CESD's programs for fiscal years 2010, 2011, and 2012. This includes funding at national laboratories and universities and other activities handled by the program during this time period. It should also assess the quality of the resulting scientific portfolio, including its breadth and depth and its national and international standing. Additionally, the COV should also assess the division's management and oversight of the ARM and EMSL user facilities for the same time period. Specifically, I would like the panel to consider and provide an evaluation of the following:

1. For both the DOE national laboratory projects and university grants, assess the efficacy and quality of the processes used by CESD programs during the past three years to:
   a) solicit, review, recommend and document application and proposal actions, and
   b) monitor active awards, projects and programs.

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

COV members will be given access to all program documentation completed during the period under review including applications, proposals, review documents and other requests. COV members may also request, at their discretion, a representative sample of the program portfolio be provided. In response, CESD may suggest a sample of actions, including new, renewal and

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supplemental applications and proposals, awards and declinations. In addition, COV members may also choose to review files through a random selection process. The guidance for all COV reviews within the Office of Science can be found at http://science.energy.gov/sc-2/committees-of-visitors/ and attachments therein.

The COV should take place in the third quarter of FY2013 (Summer 2013) at the BER/DOE Germantown location at 19901 Germantown Road, Germantown, Maryland 20874-1290. A discussion of the COV report by BERAC should be held no later than the Fall 2013 BERAC meeting. Following acceptance of the full BERAC membership, the COV report with findings and recommendations is to be presented to me, as the Director, Office of Science.

If you have any questions regarding this charge, please contact Gary Geernaert, 301-903-3281 or by email Gerald.Geernaert@science.doe.gov.

Sincerely,

W. F. Brinkman
Director, Office of Science

cc. David Thomassen
Sharlene Weatherwax

APPENDIX B — Committee of Visitors (2013)

Department of Energy
Office of Science
Washington, DC 20585

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APPENDIX C — COV Agenda

Department of Energy
Office of Biological and Environmental Research
Climate and Environmental Sciences Division
2013 Committee of Visitors' Meeting Agenda
July 8-10, 2013

Monday

6:00-6:15 pm	Working Dinner (Hotel, TBD)
6:15-6:30 pm	Overview of BER (Sharlene Weatherwax, BER Associate Director)
6:30-7:00 pm	Overview of CESD (Gary Geernaert, Division Director)
7:00-7:30 pm	Review of Charge Letter and Agenda (Minghua Zhang, COV Chair)
7:30-8:00 pm	Review of Meeting Logistics, Conflicts of Interest, Q&A (David Lesmes, Program Manager)

Tuesday

7:00-7:45 am	Breakfast on your own
7:45 am	Reviewers Leave with DOE Staff from Hotel Lobby
8:00 – 8:45 am	Badging and Security
8:45 – 9:15 am	Introductions and Logistics (E-401)
9:15-10:15 am	Briefings by Program Staff to Breakout Groups
10:30-12:00 am	Breakout Sessions (CESD staff as needed)
12:00-1:00 pm	Lunch (Provided for COV in E-401)
1:00-3:00 pm	Breakout Sessions continue (CESD staff as needed)

3:15-5:00 pm	Crosscutting Topical Breakouts with CESD Staff Topic 1: Facilities Team Management (Wanda Ferrell, Paul Bayer, Dan Drell) Room TBD Topic 2: Interagency Coordination (Mike Kuperberg, Bob Vallario) Room TBD Topic 3: Workshops and Initiatives (Dan Stover and Renu Joseph) Room TBD Topic 4: SFA Management and Alignment with CESD Strategic Plan (Dorothy Koch, Ashley Williamson, David Lesmes) Room TBD
5:00-5:30 pm	Meeting with CESD Staff (Questions/Requests for Further Information) Room E-401
5:30 pm	CESD Staff transport Reviewers to the Hotel
5:30-7:30 pm	Dinner on your own
7:30-9:00 pm	Executive Session: Reviewers at Hotel

Wednesday

7:00-7:45 am	Breakfast on your own
7:45 am	Reviewers Leave with DOE Staff from Hotel Lobby
8:30-12:00 am	Breakout Sessions and Writing (CESD staff as needed)
12:00-1:00 pm	Lunch (Provided for COV in Room E-401)
1:00-2:00 pm	Executive Session Room E-401
2:00 am-3:00 pm	Committee Report Preliminary Findings to BER Staff Room E-401
3:00 pm	Meeting Adjourn
3:00 pm	Staff available to transport Reviewers to the Hotel, Metro, etc.

APPENDIX D
Table of CESD Program Funding Opportunities and Outcomes

Solicitation Number	Title	Program Manager
FY 2012		
12-647	Atmospheric System Research	Williamson, Ashley
12-664	Reduction of Tropical Cloud and Precipitation Biases in Global High Resolution Models	Joseph, Renu Williamson, Ashley
FY 2011		
11-452	SciDAC: Earth System Model Development	Koch, Dorothy
11-536	Terrestrial Ecosystem Science	Stover, Dan
11-588	Scientific Discovery through Advanced Computing: Scientific Computation Application Partnerships in Earth System Science	Koch, Dorothy Joseph, Renu
LAB 11-588	Scientific Discovery through Advanced Computing: Scientific Computation Application Partnerships in Earth System Science	Koch, Dorothy Joseph, Renu
FY 2010		
10-219	Research in Integrated Assessment Inter-Model Development, Testing and Diagnostics	Vallario, Bob
10-242	Regional and Global Climate Modeling Program: Modes of Low Frequency Variability in a Changing Climate	Joseph, Renu
10-287	Terrestrial Carbon Cycle Research	Kuperberg, Mike
10-291	Atmospheric System Research	Williamson, Ashley Alapaty, Kiran
10-311	Subsurface Biogeochemical Research	Anderson, Todd Lesmes, David
09-07	Environmental Remediation Science Program (currently: Subsurface Biogeochemical Research)	Lesmes, David
LAB 09-16	Climatic Change Research in Terrestrial Ecosystems	Amthor, Jeff Kuperberg, Mike
LAB 10-04	Climate Uncertainties at Regional and Global Scales	Joseph, Renu
LAB 10-05	Earth System Modeling: Advanced Scientific Visualization of Ultra-Large Climate Data Sets	Williamson, Ashley
LAB 10-06	Regional Models for Climate Change Integrated Assessment	Vallario, Bob

CESD Solicitation Funding Statistics for FY 2010-2012

			Success Rate (%)			
Solicitations/Year	Pre-applications Received	Proposals Received	Renewal Awards	New Awards	Awards by Other Agency	
FY 2012						
12-647	149	93	0	27	0	29%
12-664	NA	22	0	5	0	23%
FY 2011						
11-452	73	58	0	32	0	55%
11-536	189	140	0	13	0	9%
11-588	12	6	0	3	0	50%
LAB 11-588	12	6	0	3	0	50%
FY 2010						
10-219	7	3	0	1	0	33%
10-242	96	94	0	32	0	34%
10-287	95	91	0	26	0	29%
10-291	137	113	0	37	0	33%
10-311	135	99	0	26	0	26%
09-07	143	106	0	27	0	26%
LAB 09-16	8	4	0	1	0	25%
LAB 10-04	13	8	0	3	0	38%
LAB 10-05	N/A	5	0	3	0	60%
LAB 10-06	N/A	3	0	1	0	33%