Report
To the
Basic Energy Sciences Advisory Committee

Committee of Visitors
Division of Materials Sciences and Engineering
Office of Basic Energy Sciences
U. S. Department of Energy

August 3, 2006

Executive Summary

A Committee of Visitors was assembled under the auspices of the Basic Energy Sciences Advisory Committee to review the activities of the Division of Materials Sciences and Engineering within the DOE Office of Basic Energy Sciences. A committee of 28 external visitors met at the DOE facility for two days in April of 2006. The committee was charged to review the processes and decisions concerning awards granted during the 2002 to 2005 period. In addition the committee was asked to evaluate the progress of the Division toward the long term goals specified in the OMB Program Assessment Rating Tool (PART) for each of the above six components of the program within he Materials Sciences and Engineering Division.

Overall the committee was impressed with the management of the program by the Division, especially in light of staffing shortages at the program manager level. Some recommendations were made that could enhance the performance of the Division, especially in light of the anticipated increased work load that is anticipated in current budget planning and requests. These recommendations are enumerated below:

1. The Office of Science management should begin planning to meet these needs before crisis sets in again, likely in 2007. Aggressively expanded recruiting of program managers and support staff is a necessity, especially if high quality program managers are to be recruited and retained. Planned increased staffing beyond currently approved levels should begin in 2007.

2. The resources and staff should be immediately be allocated to implement comprehensive and effective information management within the Office of Science. While it will not be as effective to build such a system just within BES, this should be done if the Office of Science cannot or will not make it a priority.

3. The planning of and resources for continued "Basic Research Needs" workshops to identify grand energy challenges should continue and be expanded to the extent that the BES budgets and staff can manage the activity.

4. The present management of initiatives by folding them into the dynamically managed CRAs is a model for effective management and should be continued.

5. The COV supports the idea that the balance of support between laboratories and universities be determined by open competition wherever and whenever feasible.

6. The COV suggests that BESAC be used as a sounding board (formally and informally) as the details of university based multi-investigator programs are being explored and developed.

The committee also reviewed the progress toward the OMB PART goals. There are four goals that support energy-related applications that should be achieved by 2015, summarized as:

- demonstrate progress in designing, modeling, fabricating, characterizing, analyzing, assembling, and using a variety of new materials and structures– particularly at the nanoscale.
- demonstrate progress in understanding, modeling, and controlling chemical reactivity and energy transfer processes.
- develop new concepts and improve existing methods for major energy research needs identified in the 2003 Basic Energy Sciences Advisory Committee workshop report, Basic Research Needs to Assure a Secure Energy Future.
- demonstrate progress in conceiving, designing, fabricating, and using new instruments to characterize and ultimately control materials.

The committee judged that the progress toward all these goals is excellent.

Introduction

This report presents a summary of findings from a Committee of Visitors (COV) that was assembled under the auspices of the Basic Energy Sciences Advisory Committee (BESAC) to evaluate the processes and programs of the Materials Sciences and Engineering Division in the Office of Basic Energy Sciences (BES). The COV met at the Department of Energy facilities in Germantown, Maryland for two and a half days from April 3 through April 5, 2006. This was the second COV that reviewed the Division of Materials Sciences and Engineering; the first COV met three years ago in March of 2003.

This report is organized in to the following sections: the charge to the Committee of Visitors, the composition of the COV, the process that was utilized for the COV, an overview of the activities of the Division, and the conclusions and recommendations of the committee.

I. The Charge to the Committee of Visitors

The Charge to the COV was provided in a letter from Professor John C. Hemminger, the Chair of BESAC to Professor Francis DiSalvo, a member of BESAC who agreed to chair the COV. The letter is attached (Appendix I). The charge letter requests that the committee review all the components of the Materials Sciences and Engineering Division of the BES program, which are organized as Core Research Activities (CRAs):

- Structure and Composition of Materials
- Mechanical and Physical Behavior of Materials
- Synthesis, Processing and Engineering Sciences
- X-ray and Neutron Scattering Science
- Condensed Matter Physics
- Materials Chemistry and Biomolecular Materials

Specifically the committee was asked to assess, for both DOE laboratory and university projects, four major elements:

Assess the efficacy and quality of the processes used to:

- Solicit, review, recommend and document proposal actions
- Monitor active projects and programs

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

- The breadth and depth of portfolio elements
- The national and international standing of the portfolio elements

In addition to the above elements, the committee was asked to evaluate the progress of the Division toward the long term goals specified in the OMB Program Assessment Rating Tool (PART, attached as Appendix II) for each of the above six components of the program within he Materials Sciences and Engineering Division. The OMB guidelines specify ratings of (1) excellent, (2) good, (3) fair, (4) poor or (5) not applicable for each of the long-term objectives and goals.

Finally, the COV was asked to evaluate the DOE Experimental Program to Stimulate Competitive Research (EPSCoR) within the Division.

The COV was charged to evaluate the programs for the years 2003, 2004 and 2005 using the above guidelines.

III. The Committee Membership

The large range of scientific and engineering activities within the Division and the large number of university grants and laboratory programs to be reviewed necessitated a fairly large committee. The original committee consisted of 31 people, including the chair (attached as Appendix III). Due to illness and other unforeseen emergencies, three panel members were unable to attend: Prof. Neil Ashcroft, Prof. Adam Kaminski, and Dr. Bhakta Rath. The 28 panel members who took part provided an appropriate balance of expertise to cover the research activities of the Division. The panel that gathered at DOE is a very talented and accomplished group. Five are members of the National Academy of Sciences, three more are members of the National Academy of Engineering. Three are current members of BESAC and three others are past BESAC members. Eight of the panel members had served as COV members in the Division review in 2003, providing informed perspective on changes in the BES program and processes. As in the earlier COV it was considered valuable to have a significant number of panel members who receive no direct research support from DOE. 14 of the 28 panel members in attendance receive no current support from BES. Of those, three were sub-panel leaders (out of seven). Twenty one of the 28 panel members were from universities, 5 from national laboratories (including non-DOE national laboratories) and 2 from industrial research laboratories. There were no panel members whose current place of employment is in an EPSCoR designated state, but this was not considered a liability in evaluating the programs as outlined in the charge.

Francis J. DiSalvo of Cornell University, a member of BESAC and a member of the previous COV committee, chaired the COV. The committee was organized into six sub-panels, each assigned to one of the program areas under review. These sub-panels and their chairs are listed below. On the second day of the COV visit, sub-panel members were assigned to different sub-panels than the first day (while the sub-panel chair remained the same) in order to achieve as broad a perspective as possible. This session was labeled “second read.” A seventh sub-panel was also constituted on the second day for a review of the EPSCoR program. Later that day the original sub-panel members reassembled in a “merge” session for further deliberation. The sub-panel members in attendance, as well as the members of the second read sub-panel sessions, are all listed in Appendix IV.

Sup-Panel I: Structure and Composition of Materials
Prof. Ron Gronsky (Leader), University of California - Berkeley
Prof. John Spence, Arizona State University
Prof. Robert Hull, University of Virginia
Dr. Frances Ross, IBM Research
Prof. Mark Asta, University of California – Davis

Sub-Panel II: Mechanical and Physical Behavior of Materials
Prof. Paul Peercy (Leader), University of Wisconsin
Prof. Ron Gibala, University of Michigan
Dr. Bill Wolfer, Lawrence Livermore National Laboratory

Dr. Bill Boettinger, National Institute of Standards and Technology

Sub-Panel III: Synthesis, Processing and Engineering Sciences
Dr. Cherry Murray (Leader), Lawrence Livermore National Laboratory
Dr. David Johnson, retired from Bell Laboratories
Prof. Harry Atwater, California Institute of Technology
Prof. Gang Chen, Massachusetts Institute of Technology
Prof. Tom Russell, University of Massachusetts

Sub-Panel IV: X-ray and Neutron Scattering
Dr. Patrick Gallagher (Leader), National Institute of Standards and Technology
Prof. Franz Himpsel, University of Wisconsin
Dr. Gabrielle Long, Argonne National Laboratory
Prof. Cyrus Safinya, University of California – Santa Barbara

Sub- Panel V: Condensed Matter Physics
Prof. Myriam Sarachik (Leader), City College of New York
Prof. Paul Fleury, Yale University
Prof. Marc Kastner, Massachusetts Institute of Technology
Prof. John Wilkins, Ohio State University

Sub-Panel VI: Materials Chemistry and Biomolecular Materials
Prof. Anna Balazs (Leader), University of Pittsburgh
Prof. Bob Cava, Princeton University
Prof. Robert Haddon, University of California – Riverside
Prof. Kim Dunbar, Texas A&M
Prof. Galen Stucky, University of California – Santa Barbara

IV The Review Process

The committee assembled at DOE in Germantown, MD on Monday morning April 3 at 8 am and completed its work on Wednesday morning at 11 am. The overall agenda for the COV visit is included as Appendix V. The review began with a general overview of the Office of Science and especially of the Office of Basic Energy Sciences by Dr. Patricia Dehmer, the Director of BES. This presentation was followed by an overview of the Division of Materials Sciences and Engineering by the Division Director, Dr. Harriet Kung. Both Drs. Dehmer and Kung reiterated the charge to the committee and discussed the (PART) program that has been jointly instituted by BES and the office of Management and Budget (OMB). Dr. Kung also discussed the recommendations of the previous COV and the actions/response by the Division to those recommendations taken to date. Dr. Jim Horwitz then presented an overview of the budgets for the of Materials Sciences and Engineering and the statistics on grant applications and approval rates. Finally, the committee chair summarized the salient points of the charge to the committee.

Following a short break, the committee broke into the sub-panel groups outlined above in section III. The “first-reading” session began with an overview of the appropriate program(s) by the program manager(s). The presentation included details on the program scope and a description of the portfolio of supported research, distinguishing features, relevance to the DOE mission, program evolution and anticipated changes, and budget profiles The sub-panel then evaluated program "jackets" containing proposals, referee reports and documentation of the timeline and details of the decision making process. The program managers provided program jackets that included both laboratory and university projects and positive and negative decision outcomes on support. The managers were asked to provide several easy "fund" or "decline" cases, as well as a number of jackets that represented cases at the "decision margin." The sub-panels were free to request any further information, including other jackets, from the program managers, who were not present during the review of the jackets but who were available to the sub-panel at all times to provide any requested information.

The broad expertise and research/management backgrounds of the sub-panel members allowed them to evaluate not only decision-making procedures, but also the appropriateness and quality of the referees selected, the breadth of the review, and the quality of the referees reports. Most especially, the members' expertise allowed them to provide informed evaluations of the judgments exercised by the program manager in making funding decisions, especially for the difficult cases at the margin. Finally, the sub-panels reviewed the adequacy and quality of the documentation of the decision process.

The first reading of the jackets occupied the remainder of the morning and a good part of the afternoon of the first day of the review. The sub-panels prepared preliminary conclusions that were presented to the COV as a whole in executive session, followed by a meeting for discussion and questions asked of Drs. Dehmer and Kung. Informal discussion between COV members and program managers continued over dinner well into the evening.

At the beginning of the second day, panel members were assigned to a different sub-panel, chaired by the same leader of the first read for that topic. In this way the leader, together with the new sub-panel, continued to review and refine the findings of the group. During both sessions the leader was responsible for collecting input from each sub-panel member and preparing a written consensus report of the sub-panel for both BESAC and OMB. A seventh sub-panel was also assembled to do a "first and only read" of the EPSCoR program.

In the afternoon, the original "first read" panels reassembled to further consider their recommendations and that of the "second read" group, seek further data from jackets or program managers and begin to prepare the final report. The committee adjourned and went to dinner in informal smaller groups to continue discussing the BES program and their findings.

During the morning of the third day the entire committee met in executive session for an hour and a half to consider broader and "cross-cutting issues." The committee then invited Drs. Dehmer and Kung into the committee room for feedback and final comments to/from the committee. Finally, all the program managers and staff were invited to join the meeting and a short summary of the findings was presented to the assembled group by the COV chair, Prof. Francis J. DiSalvo.

The written reports of the sub-panels and the conclusions drawn during executive session form the basis for the recommendations of this report.

V Overview of Division Activities

This COV reviewed one of the two research Divisions in BES (the other Division is the Chemical Sciences, Geosciences and Biosciences Division, which has its own COV). Much of the BES budget supports the construction and operation of large national facilities. The budget for research activities in BES is about 37 % of the total BES budget (about 1.1 B$ in 2006). The Materials Sciences and Engineering Division budget was approximately 235 M$ in 2003, 240 M$ in 2004 and 250 M$ in 2005, the years the COV considered in the review. We note, however, that the budget in 2006 decreased to 227 M$. Happily, the president's budget request for 2007 includes a significant increase to 287 M$. It remains to be seen if this will be approved and if it will be free if earmarks.

The Division is organized into two teams, Materials and Engineering Physics and Condensed Matter Physics and Materials Chemistry. In each team there are a number of Core Research Activities (CRAs) that are managed by a program manager. In the review, the sub-panels reviewed either a single CRA, or two smaller or closely related CRAs together – making seven sub-panels in total.

The research supported by the Division is carried out at DOE laboratories or in universities, using different funding mechanisms. The laboratory activities are generally collaborative programs involving several to a few dozen principal investigators that submit Field Work Proposals (FWPs) that are reviewed and selected for funding. The university research is managed through an open proposal system. Again proposals are reviewed and selected for funding through grants. In FY 2005, there were 179 FWPs and 392 grants that were supported through the Division. However, the total university support through grants was about 72 M$ while that for DOE laboratories was about 178 M$, so that the university part of the program represents about 29 % of the budget. The FWP budgets typically range from 250,000 $/yr to several million $/yr (lows and highs of about 50 K$ to 9 M$), for an average of close to 1 M$/yr per FWP.

University grants, however, have typically been single investigator awards, with several exceptions, most notably for the MRL at the University of Illinois. The non-MRL awards averaged about 150 K$/yr, with a small percentage (about 20 %) receiving grants of 200 K$/yr or larger (largest is 750 K$). Some of these larger awards are multi-investigator grants.

The large number of proposals received from universities (about 350 per year) coupled with the large number of active grants, leads to a large work load for the CRA program managers. The work load increases substantially when new initiatives are announced. It is anticipated that in FY 2007 the work load will increase further still, since the increase called for in the president's budget is 26.5%. At the same time the Materials Sciences and Engineering has had a number of expected and unexpected vacancies at the CRA manager and Team level and have been operating at about 60 % of authorized staffing levels for some time. While they have been under considerable stress, they have managed to keep everything afloat. Several of the vacancies have been filled in the spring of 2006, with the hope that most of the vacancies will be filled in the remainder of 2006. As discussed further in the following sections, it is likely that the staffing level will need to be increased to handle larger budgets if they materialize as expected.

VI Discussion and Recommendations

The COV concluded that the research being funded by the Division is both centrally relevant to the DOE mission and of exceptionally high quality. In particular, there was resounding affirmation of the quality and soundness of the decisions to fund/not fund by the program managers. The program managers have some latitude and freedom in making such decisions and have exercised that freedom with wisdom and responsibility. The COV strongly affirms the degree of discretion given to program managers, especially when some oversight by a COV is in place to verify continued good judgment.

The COV considered issues specific to the seven sub-panel topical program areas as well as cross cutting issues that apply BES or even Office of Science wide. We consider the latter issues first.

Of particular concern to the COV is the very large work load of the program managers in the Division, which continued to intensify through the review period because of retirements and an untimely death. For much of 2004 and 2005, the Division was staffed at levels significantly below approved levels, reaching a low of 60 % of normal. That staff performed well above the call of duty in carrying out their responsibilities in such a professional manner, in spite of the high stress levels that the lack of support produced. In the spring of 2006 several new hires have been approved and have just come on board. It is hoped that the staffing will be up to a full complement by the end of 2006.

Yet even at full complement, the staffing of the Division is likely to be too low in the near future. There are a number of convergent factors that are driving this need.

- First, if the president's requested increase of 26 % in the BES budget is approved by Congress, then the work load will correspondingly increase (assuming the mix of award sizes and numbers remains the same). If a real doubling of US research expenditures is in fact approved, then similar increases in budget can be expected in subsequent years as well.
- Second there are two changes in program management and strategy that have been instituted in 2006. A closer coupling of the BES program to the technology areas of DOE is being encouraged and an open door policy has been instituted to allow PIs and potential PIs to visit program officers at DOE. Both of these actions are in fact desirable and will likely further increase the impact of the BES program. Yet these will increasingly take more time on the part of the program managers and BES staff.
- Third, the program managers have been unable to attend meetings, visit PIs (especially at universities), and generally keep informed about opportunities at the forefront and promote their program to the broadest potential group of talented PIs – especially in times of evolving portfolios and large new initiatives, as is the present.
- Fourth, the number of supported proposals per program officer and the total budget managed by each is large. This is in part due to the large number university grants which have been averaging about $150,000 per grant per year. While the grant size has grown about 7 % (in real dollars, using a GDP deflator) over 3 years, university inflation is larger than general inflation. Tuition, stipends and health care for graduate students in

particular are growing at approximately double the national inflation rate at many universities.

Recommendation:
The Office of Science management should begin planning to meet these needs before crisis sets in again, likely in 2007. Aggressively expanded recruiting of program managers and support staff is a necessity, especially if high quality program managers are to be recruited and retained. Planned increased staffing beyond currently approved levels should begin in 2007.

A very large issue has been and continues to be information management. The issue was one raised by the previous COV. The only action has involved the building of a Divisional data base of reviewers that provides program managers with lists of reviewers. It also tracks the number of times a particular reviewer has been utilized and status of such requests. While this is laudable, much remains to be done.

The Office of Science Information Management system (IMSC) is a collection of compartmentalized databases tracking all activities in the Office of Science. The main deficiency of the system for Basic Energy Sciences is the complexity associated with retrieving information from the database, especially for activities that are indexed in multiple compartments. For example, data related to BES university grants on submitted proposals, awarded proposals and funding documents are stored in three different compartments. Pre-programmed search functions only search one compartment at a time. Linked searches between the compartments can not be performed. The system does not readily allow one to track activities in the Office of Science at the program level. On the proposal submission side, IMSC offers limited tracking capabilities of PI and reviewer data. DOE currently does not record information such as PI years of experience, gender and ethnic identity. IMSC appears to have been designed as a budgeting tool. Only in the funding compartment does IMSC track the relevant Budget and Reporting Code, which corresponds to specific scientific area. The inability to search the entire database for a user defined target makes the information in the database of limited use to anyone inside or outside the DOE. Within the Office of Science, shadow databases are maintained, independent of IMSC, in order to have ready access to information needed for routine program management. A newly added function in IMSC is the abstract tracking system to track and search the abstract of projects funded. While the function is quite laudable, it would be much more useful if the different databases could be combined and fully integrated into one uniform system that could track the life span of a proposal, from submission, reviewer selection, funding decision, award action, to tracking project information including the abstract. Such a system should also be extended to include laboratory projects, which are not currently available in IMSC. To make the database truly user friendly, a web-based system to interface with the community will be needed. In brief, the Committee sees a major gap in the current capabilities offered in IMSC and those needed for the efficient management of a world-class research program. The gap cannot be bridged by incremental patching of the individual databases and would need a major commitment from Office of Science to revamp the whole information management system.

This is an important productivity issue. This situation will lead to gridlock if the budgets of the Division begin growing at anything like 25 % per year, as is anticipated. Further, some of the data needed by the COV to evaluate the programs is just not available. For example, it is impossible to tell if the program is bringing in enough younger PIs that will be the backbone of BES research in the future, since that data is not available from the present system. Dr. Kung and the program managers consider this to be the second most important problem faced by the Division, second only to the issue of staffing levels. The COV concurs.

Recommendation:
The resources and staff should be immediately be allocated to implement comprehensive and effective information management within the Office of Science. While it will not be as effective to build such a system just within BES, this should be done if the Office of Science cannot or will not make it a priority.

The workshops carried out by both Divisions of BES have been a huge success. They have galvanized the research community to take on grand challenges (Hydrogen Economy, Solar Energy, etc). They have also been a very important tool for the Office of Science in communicating the mission and goals of the BES program to OMB and to Congress. It is clear that there are more areas of research connected to present and future energy technologies that could benefit from such workshops; and they are being planned.

Recommendation:
The planning of and resources for continued "Basic Research Needs" workshops to identify grand energy challenges should continue and be expanded to the extent that the BES budgets and staff can manage the activity.

There was some discussion of the mode of management and organization within BES and specifically the Materials Division, especially related to initiatives. In particular, the committee strongly supported the decision to fold the initiatives into the Core Research Areas (CRAs). The CRAs are not static but in fact evolve, both within a CRA by changing emphasis and exploiting new discoveries, and between CRAs by adjusting budgets or even phasing out whole areas. A case in point is the phasing out of the CRA entitled "Engineering Physics", which was started two years ago and will be complete in the next year. The COV agreed with the Division management that this phase out was a sound decision. Since the CRAs are actively managed in this way, the kinds of research called for in various initiatives are best managed over the long term by not setting up programs and managers which are separate from the CRAs or created as new CRAs. The COV strongly agrees that the present system offers maximum flexibility and prevents initiatives from becoming entitled programs. However, this is an issue that the COV should continually monitor. That is, the current management is clearly effective in managing program evolution, but there is nothing to guarantee that it will remain so in the future, especially as the higher management and program managers change. However, even as individuals in charge change, program evolution is a part of the current culture and cultures usually do not change quickly even when change is warranted.

Recommendation:
The present management of initiatives by folding them into the dynamically managed CRAs is a model for effective management and should be continued.

The full portfolio of supported research is divided approximately 70:30 (in terms of the budget) between mostly collaborative multi-investigator programs at the National Laboratories (70 %) and mostly single investigator programs at universities (30 %). The supported research in both cases was considered world class. The past history that led to the present distribution is long and partly forgotten, but the ratio has been relatively steady for many years. However, we note with interest that in recent initiatives, that were open to full competition at the labs and universities, the ratio of support is closer to 50:50. It appears that this ratio arose purely on the merits of the proposed research.

The COV supported the notion that university research support should generally be in the form of single investigator grants. However, when appropriate, and as is done on a small scale already (with the exception of substantial support for programs at the MRL at the University of Illinois), multi-investigator grants at universities can be an important tool to attack key areas, especially those identified with grand challenges in energy research that require an interdisciplinary team approach. The committee did not think that setting up "Centers" like the NSF's MRSEC program or more University of Illinois-like MRLs was a good idea. While centers have a place in the nation's portfolio of research activities (for example, in providing shared experimental facilities), they are often perceived as too static and difficult to terminate. Rather, teams that come and go as the needs, challenges and findings evolve were considered more appropriate. Such teams may also lead to a greater interaction between university and laboratory researchers, as dictated by the needs and opportunities inherent in the research. Perhaps some could even be jointly funded. In any case, these teams will need to be managed differently than the single investigator grants, since they represent a larger investment. For example, some kind of site visit should probably be held every three or so years, and program managers should be able to "drop in" for occasional up-dates.

However, at present there is not a defined set of criteria for these multi-investigator (and necessarily larger) grants. Since the notion of formally encouraging such multi-investigator grants is still being formulated, it is not surprising that complete criteria are not yet defined.

Recommendations:
The COV supports the idea that the balance of support between laboratories and universities be determined by open competition wherever and whenever feasible.

The COV suggests that BESAC be used as a sounding board (formally and informally) as the details of university based multi-investigator programs are being explored and developed.

Remarks specific to sub-panels
In this section we address observations that are specific to particular CRA areas that were reviewed by the sub-panels. In general, the section below focuses on topics not specifically covered above that apply to the entire Materials Division. The following remarks are in the order suggested by the report templates provided (Appendix VI).

The sub-panel reports are at least several pages long, with detailed observations and suggestions. Those reports are not repeated here, but a significant point or two is emphasized. The entire sub-panel reports, unedited and in various formats, were completed by the end of the COV visit and are found in Appendix VII.

Sub-panel 1: Structure and Composition of Materials

The *process to solicit, review, recommend and document proposal actions* meets high professional standards. It is noted that few of the proposers or reviewers specifically address the energy significance of the proposed work. It would make the program managers job easier if this was specifically requested from both. Finally, the time to notification could be reduced in the "easy" declination cases.

Monitoring of the projects and programs is reasonable, given the extreme time pressures on program managers. However, more extensive contact with the community through attending meetings and making site visits is clearly desirable – when the proper staffing in BES is attained.

The *breadth and depth of the portfolio* is stellar. There is some concern over increasing the number of new program starts.

The *national and international standing of the portfolio* is superb and unique.

The *Progress toward the long-term goals of the Office of Basic Energy Sciences* is deemed Excellent in all four categories.

Sub-panel 2: Mechanical Behavior and Radiation Effects & Physical Behavior of Materials (2 CRAs)

The *process to solicit, review, recommend and document proposal actions* is well documented and managed. Staff vacancies and workload challenges specifically noted.

Monitoring of the projects and programs is carried out in an efficient manner and is valuable to both the PIs and the program managers.

The *breadth and depth of the portfolio* is very high. It is world leading in most cases. However, the radiation effects area is sub-critical and should be rebuilt.

The *national and international standing of the portfolio* is excellent. While the building up of computational materials science has been very successful, the experimental part of the program needs strengthening.

The *Progress toward the long-term goals of the Office of Basic Energy Sciences* is deemed Excellent in two categories (A and C). The other categories were not considered relevant.

Sub-Panel 3: Synthesis and Processing & Engineering Physics (2 CRAs)

The *process to solicit, review, recommend and document proposal actions* is high quality. Plans to have joint PI meetings with some programs in EERE is encouraged. Cooperation with NSF, AFOSR and other DOE managers is laudible. It would be helpful to permit subscription to the BES website for email notification of new solicitations, especially for university PIs.

Monitoring of the projects and programs is rigorous, especially at DOE labs. But more time to visit university PIs is needed.

The *breadth and depth of the portfolio* is technically excellent. The phase out of the Engineering Physics program made sense, since the portfolio was very broad and diffuse. The best parts of that program are now parts of other CRAs.

The *national and international standing of the portfolio* is high. Encouraging program managers and PIs to attend the best international conferences in the field is recommended in order for all to be aware of and make connections to the best world science.

The *Progress toward the long-term goals of the Office of Basic Energy Sciences* is deemed Excellent in all four categories.

<u>Sub-Panel 4: X-ray and Neutron Scattering</u>
The *process to solicit, review, recommend and document proposal actions* was excellent. The panel was impressed with the use of the program manager's flexibility to address new opportunities. Request capturing of statistics on why a proposal is declined (merit, program priority, mission relevance, mix of programs, availability of funding).
Monitoring of the projects and programs is appropriate, but concern over the ability of the program manager to maintain an active and current knowledge of the field due to the very high work load in the Division.
The *breadth and depth of the portfolio* is uniformly outstanding. The panel was impressed with the number of new starts in the portfolio, but suggest increasing the levels of investment in enabling technologies, such as detector development, advanced optics, software, etc.
The *national and international standing of the portfolio* is clear. A number of elements of the portfolio have had world-wide scientific impact. This program has a high potential to make a revolutionary impact on the state of X-ray and neutron scattering.
The *Progress toward the long-term goals of the Office of Basic Energy Sciences* is deemed Excellent in two categories (A and D), the two others were not considered applicable.

<u>Sub-Panel 5: Condensed Matter Physics</u>
The *process to solicit, review, recommend and document proposal actions* was generally sound. Suggest that, when the time-to-decision is longer than 9 months, the program manager inform the investigator that there is a delay, the reason for the delay and to provide guidance.
Monitoring of the projects and programs is well done, but the reviews at the National Laboratories are perhaps too onerous and time-consuming.
The *breadth and depth of the portfolio* is excellent. There are four Nobel Laureates and many who have won prestigious awards. The advantage of this program is that it provides much-needed continuity to excellent programs. The disadvantage is that it leaves insufficient resources to fund young investigators. Recommend instituting an early career research award program for young investigators in academia (such as the Outstanding Junior Investigator Awards within the Office of Science at DOE).
The *national and international standing of the portfolio* is obvious.
The *Progress toward the long-term goals of the Office of Basic Energy Sciences* is deemed Excellent in three categories (A, B, C), the fourth was not considered relevant

<u>Sub-Panel 6: Materials Chemistry and Biomolecular Materials.</u>
The *process to solicit, review, recommend and document proposal actions* was very well documented and an excellent example of good stewardship.
Monitoring of the projects and programs is reasonable, but the reviews of the smaller FWPs at the Labs appear to be overly burdensome and time consuming. Perhaps the smaller FWPS should be merged into large groups.
The *breadth and depth of the portfolio* is notable. Good balance between high risk and innovation and continuity of funding of strong, established programs.

The *national and international standing of the portfolio* is high, supporting many PIs who are already leaders in their fields as well as young investigators who have clearly demonstrated exceptional promise.
The *Progress toward the long-term goals of the Office of Basic Energy Sciences* is deemed Excellent in three categories (A, B and C). D is not applicable to this program.

Sub-Panel 7: EPSCoR Program
The *process to solicit, review, recommend and document proposal actions* were uniformly applied within the context of the EPSCoR defined boundaries.
Monitoring of the projects and programs is spotty. The reports from Implementation Grants lacked details and in general were not convincing. Real time information exchange among participating groups needs to be implemented. There is a general concern that there are no metrics for success in this program
The monitoring of the Laboratory Partnership Grants is much better.

The next two evaluation topics are unique to the EPSCoR program.
How has the award process addressed the EPSCoR program goals? While the objectives were addressed in the proposals, the level of monitoring to assure progress toward the objectives in inadequate. This is not attributed to the lack of diligence of the program manager, but rather to an absence of any metric to measure effectiveness. BES should consider coordinating an interagency assessment program for EPSCoR.
How has the Laboratory Partnership program taken advantage of the unique DOE laboratory assets? The Laboratory Partnership Program has been quite effective in accomplishing this objective.

END OF REPORT

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UNIVERSITY OF CALIFORNIA, IRVINE

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JOHN C. HEMMINGER
PROFESSOR OF CHEMISTRY
DEPARTMENT OF CHEMISTRY

IRVINE, CALIFORNIA 92697-2025
949-824-6020
FAX: 949-824-3168
JCHEMMIN@UCI.EDU

September 15, 2005

Dr. Francis DiSalvo
Director, Cornell Center for Materials Research
John A. Newman Professor of Physical Science
Department of Chemistry
Cornell University
Ithaca, NY 14853

Dear Professor DiSalvo:

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

The panel should assess the operations of the Division's programs during the fiscal years 2003, 2004, and 2005. The panel may examine any files from this period for both DOE laboratory projects and university projects. The components of the Division that you are being asked to review are:

(1) Structure and Compositions of Materials
(2) Mechanical and Physical Behavior of Materials
(3) Synthesis, Processing and Engineering Sciences
(4) X-ray and Neutron Scattering Science
(5) Condensed Matter Physics
(6) Materials Chemistry and Biomolecular Materials

You will be provided with background material on these program elements prior to the meeting. The COV is scheduled to take place during the first week of April 2006 at the BES/DOE Germantown location at 19901 Germantown Road, Germantown, Maryland 20874-1290. A presentation to BESAC is requested at its Summer 2006 meeting (as yet unscheduled). Following acceptance of the report by the full BESAC committee, the COV report with findings and recommendations will be presented to the Director of the Office of Science.

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

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

In addition to the above elements, the panel is asked to provide input for the Office of Management and Budget (OMB) evaluation of Basic Energy Sciences progress toward the long-term goals specified in the OMB Program Assessment Rating Tool (PART, attached). Each of the six components (or sub-components, if appropriate) of the Materials Sciences and

Engineering Division should be evaluated against each of the four PART long-term goals. If a particular long-term goal is not applicable to a specific program component, please indicate so in the evaluation. Note that the OMB guidelines specify ratings of (1) excellent, (2) good, (3) fair, (4) poor or (5) not applicable. In addition to these ratings, comments on observed strengths or deficiencies in any component or sub-component of the Division's portfolio, and suggestions for improvement, would be very valuable.

The Division of Materials Sciences and Engineering also manages the DOE Experimental Program to Stimulate Competitive Research (EPSCoR) program. The DOE/EPSCoR program supports research cluster activities in materials science, chemical science, biological and environmental science, high energy and nuclear physics, fusion energy science, advanced computer science, fossil energy science, and energy efficiency and renewable energy science at EPSCoR states, Puerto Rico, and Virgin Islands.

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

1. For both the Implementation grants and individual investigator projects through Laboratory-Partnership grants, assess the efficacy and quality of the processes used to:
   (a) solicit, review, recommend, and document proposal actions and
   (b) monitor active project and programs.

2. Within the boundaries defined by DOE missions and available funding, comment on:
   (a) how the award process has addressed the EPSCoR program goals and
   (b) how the Laboratory-Partnership program has taken advantage of the unique DOE laboratory assets.

Since the EPSCoR program covers the broad range of the DOE research portfolio, it will not be evaluated against the BES PART long-term measures.

If you have any questions regarding BESAC or its legalities, please contact Karen Talamini, Office of Basic Energy Sciences at 301-903-4563 or by e-mail at karen.talamini@science.doe.gov. Christie Ashton, the Program Analyst for the Materials Sciences and Engineering Division, will provide logistical support for the COV meeting. She may be contacted by phone at 301-903-0511 or by e-mail at christie.ashton@science.doe.gov. For questions related to the Division of Materials Sciences and Engineering, please contact Harriet Kung, 301-903-0497, or by e-mail at harriet.kung@science.doe.gov. Also, if I can be of any help with the process, please feel free to contact me, 949-824-6020 or by email at jchemmin@uci.edu.

Sincerely,

John C. Hemminger, Chair
Basic Energy Sciences Advisory Committee

cc: P. Dehmer
H. Kung
K. Talamini
C. Ashton

Office of Management and Budget
Program Assessment Rating Tool (PART)
Long Term Measures for DOE Basic Energy Sciences

- By 2015, demonstrate progress in designing, modeling, fabricating, characterizing, analyzing, assembling, and using a variety of new materials and structures, including metals, alloys, ceramics, polymers, biomaterials and more – particularly at the nanoscale – for energy-related applications.
    - Definition of "Excellent" – BES-supported research leads to important discoveries that impact the course of others' research; new knowledge and techniques, both expected and unexpected, within and across traditional disciplinary boundaries; and high-potential links across these boundaries.
    - Definition of "Good" – BES-supported research leads to a steady stream of outputs of high quality.
    - Definition of "Fair" – BES-supported research leads to modest outputs of good quality.
    - Definition of "Poor" – BES-supported research leads to limited outputs.
    - How will progress be measured? – ***Expert Review every three years will rate progress as "Excellent", "Good", "Fair" or "Poor".***

- By 2015, demonstrate progress in understanding, modeling, and controlling chemical reactivity and energy transfer processes in the gas phase, in solutions, at interfaces, and on surfaces for energy-related applications, employing lessons from inorganic, organic, self-assembling, and biological systems.
    - Definition of "Excellent" – BES-supported research leads to important discoveries that impact the course of others' research; new knowledge and techniques, both expected and unexpected, within and across traditional disciplinary boundaries; and high-potential links across these boundaries.
    - Definition of "Good" – BES-supported research leads to a steady stream of outputs of high quality.
    - Definition of "Fair" – BES-supported research leads to modest outputs of good quality.
    - Definition of "Poor" – BES-supported research leads to limited outputs.
    - How will progress be measured? – ***Expert Review every three years will rate progress as "Excellent", "Good", "Fair" or "Poor".***

- By 2015, develop new concepts and improve existing methods for major energy research needs identified in the 2003 Basic Energy Sciences Advisory Committee workshop report, Basic Research Needs to Assure a Secure Energy Future.
    - Definition of "Excellent" - BES-supported research leads to important discoveries that are rapidly and readily available and feed, as appropriate, into use or projected use by the Department's technology offices, by other federal agencies, and/or by the private sector. There is evidence of substantive interactions with the Department's technology offices in most BES program areas.
    - Definition of "Good" - BES-supported research leads to a steady stream of outputs of high quality that show the potential to impact energy research.

- Definition of "Fair" – BES-supported research leads to modest outputs of good quality that show the potential to impact energy research.
- Definition of "Poor" – BES-supported research leads to limited outputs that show the potential to impact energy research.
- How will progress be measured? – ***Expert Review every three years will rate progress as "Excellent", "Good", "Fair" or "Poor".***

- By 2015, demonstrate progress in conceiving, designing, fabricating, and using new instruments to characterize and ultimately control materials.
    - Definition of "Excellent" - BES-supported research leads to new concepts and designs for next-generation instruments and detectors for x-ray, neutron, and electron-beam scattering.
    - Definition of "Good" - BES-supported research leads to new instruments that are world class.
    - Definition of "Fair" – BES-supported research leads to modest outputs of good quality that show the potential to impact the concepts and designs for next generation instrumentations.
    - Definition of "Poor" – BES-supported research leads to limited outputs that show the potential to impact the concepts and designs for next generation instrumentations.
    - How will progress be measured? – ***Expert Review every three years will rate progress as "Excellent", "Good", "Fair" or "Poor".***

BES Division of Materials Sciences and Engineering Committee of Visitors
April 3-5, 2006
Chair: Frank DiSalvo
Cornell University
Email: fjd3@cornell.edu

Panel Members Contact Information

Neil Ashcroft
531 Clark Hall
Cornell University
Ithaca, New York 14853
Phone: 607-255-8613
E-mail: nwa@ccmr.cornell.edu

Mark Asta
Dept. of Chem. Eng. & Matls. Sci.
University of California
One Shields Avenue
Davis, CA 95616
Email: mdasta@ucdavis.edu
Phone: 530-752-0400

Harry Atwater
California Institute of Technology
Applied Physics
M/C 128-95
1200 East California Blvd.
Pasadena, CA 91125
Email: haa@daedalus.caltech.edu
Phone: 626-395-2197

Anna Balazs
Dept. of Chemical Eng.
University of Pittsburgh
1231 Benebum Hall
Pittsburgh, PA 15261
Email: balazs1@engr.pitt.edu
Phone: 412-648-9250

Bill Boettinger
Metallurgy Division
Materials Science and Engineering Laboratory
NIST
Gaithersburg, MD 20899
Email: wboettinger@nist.gov
Phone: 301-975-6160

Robert Cava
Department of Chemistry
Princeton University
Princeton, NJ 08544
E-mail: rcava@princeton.edu
Phone: 609-258-0016

Gang Chen
Dept. of Mech. Eng.
Room 3-158
Massachusetts Inst. Of Tech.
77 Massachusetts Avenue
Cambridge, MA 02139-4307
Email: gchen2@mit.edu
Phone: 617-253-0006

Kim Dunbar
Department of Chemistry
Texas A&M University
College Station, TX 77842
Email: dunbar@mail.chem.tamu.edu
Phone: (979) 845-5235

Paul Fleury
Dean of Engineering
Yale University
New Haven, CT 06520-8267
Email: paul.fleury@yale.edu
Phone: 203-432-4220

Patrick Gallagher
National Institute of Standards & Tech.
Stop 8560
100 Bureau Drive
Gaithersburg, MD 20899-8560
Email: Patrick.gallagher@nist.gov
Phone: 301-975-6210

Ronald Gibala
College of Engineering
University of Michigan
1221 Beal Avenue
Ann Arbor, MI 48109-2102
Email: rgibala@engin.umich.edu
Phone: 734-936-0178

Ronald Gronsky
Dept. of Matls. Sci. & Eng.
University of California
210 Hearst Memorial Mining Bldg.
Room 218
Berkeley, CA 94720
Email: rgronsky@berkeley.edu
Phone: 510-643-5792

Robert Haddon
University of California
Perce Hall Annex 203
Riverside, CA 92521
Email: robert.haddon@ucr.edu
Phone: 951-827-2044

Franz Himpsel
Department of Physics
University of Wisconsin
1150 University Avenue
Madison, WI 53706-1390
Email: fhimpsel@wisc.edu
Phone: 608-263-5590

Robert Hull
Dept. of Matls. Sci. and Eng.
University of Virginia
116 Engineers Way
Charlottesville, VA 22904
Email: rh5c@virginia.edu
Phone: 434-982-5658

David Johnson
5 Oakura Lane
Bedminster, NJ 07921
Email: johnsond@stevens.edu
Phone: 908-658-9766

Adam Kaminski
Dept. of Physics & Astronomy
Iowa State University
Ames, IA 50011
Email: Kaminski@ameslab.gov
Phone : 515-294-0849

Marc Kastner
Department of Physics
Massachusetts Inst. Of Tech.
NE25-4101
77 Massachusetts Avenue
Cambridge, MA 02139-4307
Email: mkastner@mit.edu
Phone: 617-253-4801

Gabrielle Long
Associate Div. Dir./XFD
Argonne National Lab.
Building 401/Room B4195
Argonne, IL 60439
Email: gglong@aps.anl.gov
Phone: 630-252-6012

Cherry Murray
Lawrence Livermore National Lab.
7000 East Avenue
Livermore, CA 94550-9234
Email: murray38@llnl.gov
Phone: 925-422-7624

Paul Peercy
College of Engineering
University of Wisconsin
2610 Engineering Hall
1415 Engineering Drive
Madison, WI 53706-1692
Email: peercy@engr.wisc.edu
Phone: 608-262-3482

Bhakta Rath
Matls. Sci. & Component Tech. Direct.
Naval Research Lab.
Code 6000
Washington, DC 20375-5341
Email: rath@utopia.nrl.navy.mil
Phone: 202-767-3566

Frances Ross
IBM
T. J. Watson Research Center
1101 Kitchawan Road
Yorktown Heights, NY 10598
Email: fmross@us.ibm.com
Phone: 914-945-1022

Thomas Russell
Matls. Res. Science & Eng. Ctr.
University of Massachusetts
120 Governor's Drive
Amherst, MA 01003
Email: Russell@mail.pse.umass.edu
Phone: 413-545-2680

Cyrus Safinya
Materials Department
University of California
MRL Building, Room 2204
Santa Barbara, CA 93106-5050
Email: Safinya@mril.ucsb.edu
Phone: 805-893-8635

Myriam Sarachik
Physics Department – J419
City College of SUNY
Convent Avenue and 138th St.
New York, NY 10031
Email: sarachik@sci.ccny.cuny.edu
Phone: 212-650-5618

John Spence
Dept. of Physics & Astronomy
Arizona State University
Tempe, AZ 85287-1504
Email: john.spence@asu.edu
Phone : 480-965-6486

Galen D. Stucky
Dept. of Chemistry & Biochemistry
University of California
Santa Barbara, CA 93106
Email: stucky@chem.ucsb.edu
Phone: 805-893-4872

John Wilkins
Ohio State University
Department of Physics
191 West Woodruff Avenue
Columbus, OH 43210-1117
Email: wilkins@mps.ohio-state.edu
Phone: 614-292-5193

Bill Wolfer
Lawrence Livermore National Lab.
Mail Stop L-353
7000 East Avenue
Livermore, CA 94550-9234
Email: wolfter1@llnl.gov
Phone: 924-423-1501

BES Division of Materials Sciences and Engineering Committee of Visitors
April 3-5, 2006
Chair: Frank DiSalvo (Cornell University)

First Read

	Panel 1 (G-426)	Panel 2 (E-301)	Panel 3 (E-114)	Panel 4 (G-207)	Panel 5 (E-401)	Panel 6 (A-453)
Chair	**Ron Gronsky (UC-B)**	**Paul Peercy (Wisc.)**	**Cherry Murray (LLNL)**	**Patrick Gallagher (NIST)**	**Myriam Sarachik (CCNY)**	**Anna Balazs (Pitt.)**
2	John Spence (ASU)	Bhakta Rath (NRL)	David Johnson (ret. Bell Labs)	Franz Himpsel (Wisc)	Paul Fleury (Yale)	Bob Cava (Princeton)
3	Robert Hull (Virginia)	Ron Gibala (Mich)	Harry Atwater (CalTech)	Gabrielle Long (APS/ANL)	Marc Kastner (MIT)	Robert Haddon (UC-R)
4	Frances Ross (IBM)	Bill Wolfer (LLNL)	Gang Chen (MIT)	Cyrus Safinya (UCSB)	John Wilkins (OSU)	Kim Dunbar (Texas A&M)
5	Mark Asta (UC, Davis)	Bill Boettinger (NIST)	Tom Russell (UMass)			Galen Stucky (UCSB)

Second Read

	Panel 1 (G-426)	Panel 2 (E-301)	Panel 3 (E-114)	Panel 4 (G-207)	Panel 5 (E-401)	Panel 6 (A-453)	EPSC
Chair	**Ron Gronsky**	**Paul Peercy**	**Cherry Murray**	**Patrick Gallagher**	**Myriam Sarachik**	**Anna Balazs**	**T**
2	Robert Haddon	John Wilkins	Bill Boettinger	John Spence	Harry Atwater	Paul Fleury	E
3	Franz Himpsel	Marc Kastner	Frances Ross	Bob Cava	Bill Wolfer	Cyrus Safinya	
4	Kim Dunbar	Gang Chen	Gabrielle Long	Robert Hull	David Johnson	Ron Gibala	G
5							

Merged Session

	Panel 1 (G-426)	Panel 2 (E-301)	Panel 3 (E-114)	Panel 4 (G-207)	Panel 5 (E-401)	Panel 6 (A-453)	EPSC
Chair	**Ron Gronsky**	**Paul Peercy**	**Cherry Murray**	**Patrick Gallagher**	**Myriam Sarachik**	**Anna Balazs**	**T**
2	John Spence	Ron Gibala	David Johnson	Franz Himpsel	Paul Fleury	Bob Cava	E
3	Robert Hull	Bill Wolfer	Harry Atwater	Cyrus Safinya	Marc Kastner	Robert Haddon	
4	Frances Ross	Bill Boettinger	Gang Chen	Gabrielle Long	John Wilkins	Kim Dunbar	G
5							

Panel 1: Structure and Composition of Materials
Panel 2: Mechanical and Physical Behavior of Materials
Panel 3: Synthesis, Processing and Engineering Sciences
Panel 4: X-ray and Neutron Scattering Science
Panel 5: Condensed Matter Physics
Panel 6: Materials Chemistry and Biomolecular Materials

EPSCoR: Experimental Program to Stimulate Competitive Research

AGENDA
Committee of Visitors Review of the Materials Sciences and Engineering Division
April 3-5, 2006, DOE Germantown Complex

Monday, April 3, 2006

Time	Activity	Participants/Lead	Location
7:50 am	Shuttle Pickup	COV Members/Christie Ashton	In Front of Hotel
8:00 am - 8:30 am	Check-in Germantown Facility	BES Staff/Christie Ashton	North Lobby
8:30 am - 8:45 am	Welcome and Charge to the Committee	John Hemminger, BESAC Chair	A-410
8:45 am - 9:15 am	Welcome and SC-BES Overview	Patricia Dehmer, BES Director	A-410
9:15 am - 9:45 am	DMS&E Overview	Harriet Kung, DMS&E Director	A-410
9:45 am - 10:00 am	DMS&E Grant Statistics	Jim Horwitz, DMS&E	A-410
10:00 am - 10:15 am	Instructions, procedures, and schedule	Frank DiSalvo, COV Chair	A-410
10:15 am - 10:30 am	Break	Coffee and Refreshments in	A-410
10:30 am - 12:15 pm **First Read** Panel Breakout **Session I**	Panel 1 - Structure and Composition of Materials Panel 2 - Mechanical and Physical Behavior of Materials Panel 3 - Synthesis, Processing, and Engineering Sciences Panel 4 - X-ray and Neutron Scattering Panel 5 - Condensed Matter Physics Panel 6 - Materials Chemistry and Biomolecular Materials • Panel Overview by DMS&E Rep (~ 15 min.) • Q & A with DMS & E Rep • Preliminary Review of Folders	Panel 1 - Ron Gronsky, Lead DMS&E Rep: Jane Zhu	G-426
		Panel 2 - Paul Peercy, Lead DMS&E Reps: Don Parkin, Yok Chen, Michael O'Keefe	E-301
		Panel 3 - Cherry Murray, Lead DMS&E Rep: Tim Fitzsimmons	E-114
		Panel 4 - Pat Gallagher, Lead DMS&E Rep: Helen Kerch	G-207
		Panel 5 - Myriam Sarachik, Lead DMS&E Reps: Jim Horwitz & Dale Koelling	E-401
		Panel 6 - Anna Balazs, Lead DMS&E Reps: Dick Kelley & Arvind Kini	A-453
12:15 pm - 1:00 pm	Working Lunch COV Members		A-410
1:00 pm - 3:30 pm **First Read** Panel Breakout **Session II**	Same Breakout Panels and Meeting Locations as Listed in Session I • Review Folders • Formulate Panel Comments		
3:30 pm - 3:45 pm	Break	Coffee and Refreshments in	A-410 and E-414
3:45 pm - 4:15pm	COV Executive Session	COV members and BES management only	A-410
4:15 pm - 4:45 pm	COV and BES General Discussion	COV members and BES Staff	A-410
4:45 pm - 5:00 pm	Check-out Germantown Facility	COV members/Christie Ashton	North Lobby
5:00 pm	Shuttle Return to Hotel	COV members/Christie Ashton	Germantown Front Entrance
6:00 pm - 7:30 pm	BES-hosted Dinner	BES/DMS&E/COV members	Carrabba's
8:00 pm - 9:30 pm	Initiate Report Preparation and Writing	COV Chair/COV Panel Leads/Other Writers	Hotel Meeting Room

Tuesday, April 4, 2006

7:50 am	Shuttle Pick-up	COV members/Christie Ashton	In Front of Hotel
8:00 am - 8:30 am	Check-in Germantown Facility	COV members/Christie Ashton	North Lobby
8:30 am - 11:30 am **Second Read** Panel Breakout	Panel 1 - Structure and Composition of Materials Panel 2 - Mechanical and Physical Behavior of Materials Panel 3 - Synthesis, Processing, and Engineering Sciences Panel 4 - X-ray and Neutron Scattering Panel 5 - Condensed Matter Physics Panel 6 - Materials Chemistry and Biomolecular Materials Panel 7 - EPSCoR • Review of Folders • Formulate Panel Comments • Review 1st Read Comments (Coffee and Refreshments in E-414 and A-410)	Panel 1 - Ron Gronsky, Lead DMS&E Rep: Jane Zhu	G-426
		Panel 2 - Paul Peercy, Lead DMS&E Reps: Don Parkin, Yok Chen, Michael O'Keefe	E-301
		Panel 3 - Cherry Murray, Lead DMS&E Rep: Tim Fitzsimmons	E-114
		Panel 4 - Pat Gallagher, Lead DMS&E Rep: Helen Kerch	G-207
		Panel 5 - Myriam Sarachik, Lead DMS&E Reps: Jim Horwitz & Dale Koelling	E-401
		Panel 6 - Anna Balazs, Lead DMS&E Reps: Dick Kelley & Arvind Kini	A-453
		Panel 7 - Tom Russell, Lead DMS&E Rep: Arvind Kini	A-410
11:30 am - 12:30 am	Working Lunch COV Members		A-410
12:30 pm - 1:00 pm	COV Executive Session Preliminary Panel Findings	COV members and BES management only	A-410
1:00 pm - 4:50 pm Breakout Panels Merge Sessions	• Merge 1st and 2nd Reads Comments • Formulate Panel Final Comments • Finalize Points/Ratings • Outline Summary for Briefing • Prepare Draft Panel Report (Coffee and Refreshments in E-414 and A-410)	Panel 1 - Ron Gronsky	G-426
		Panel 2 - Paul Peercy	E-301
		Panel 3 - Cherry Murray	E-114
		Panel 4 - Pat Gallagher	G-207
		Panel 5 - Myriam Sarachik	E-401
		Panel 6 - Anna Balazs	A-453
		Panel 7 - Tom Russell	A-410
4:50 pm - 5:00 pm	Check-out Germantown Facility	COV members/Christie Ashton	North Lobby
5:00 pm	Shuttle Return to Hotel	COV members/Christie Ashton	Germantown Front Entrance
6:00 pm - 7:30 pm	No-Host Working Dinner	COV Members Only	TBD
8:00 pm - 9:30 pm	Continue Drafting Report	COV Chair/Panel Leads/Other Writers	Hotel Meeting Room

Wednesday, April 5, 2006

7:50 am	Shuttle Pick-up	COV members/Christie Ashton	In Front of Hotel
8:00 am - 8:30 am	Check-in Germantown Facility	BES Supporting Staff	North Lobby
8:30 am - 9:15 am	Breakout Panels – Final Wrap-Up	COV Members only	A-410
9:15 am - 10:00 am	COV Executive Session	COV and BES management	A-410
10:00 am - 11:00 am	Closeout Session	COV Members and BES staff	A-410
11:00 am	Adjourn		

FY 2006 REPORT TEMPLATE

BES COMMITTEE OF VISITORS (COV)
Reviewing the Materials Sciences and Engineering Division
Fiscal Years 2003, 2004, and 2005

First or Second Read Subpanel
Program: ____________________________

Charge to the COV:

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

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

III. Assess the program's contribution to progress in achieving the Office Basic Energy Science long term goals (shown in III, below) that are being tracked by the Office of Management and Budget (OMB).

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

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

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

Findings:

Comments:

Recommendations:

(b) Monitor active project and programs
Consider, for example
- written progress reports
- contractors meetings
- site visits
- interactions at topical, national and other meetings;

Findings:

Comments:

Recommendations:

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

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

(a) the breadth and depth of portfolio elements
Consider, for example:
- the overall quality of the science
- the balance of projects with respect to innovation, risk, and interdisciplinary research
- the evolution of the portfolio with respect to new investigators and new science thrusts
- the relationship of the portfolio to other parts of the Division
- the appropriateness of award scope, size, and duration

Findings:

Comments:

Recommendations:

(b) the national and international standing of the portfolio elements
Consider, for example:
- the uniqueness, significance, and scientific impact of the portfolio
- the stature of the portfolio principal investigators in their fields
- the leadership position of the portfolio in the nation and the world

Findings:

Comments:

Recommendations:

III. PROGRESS TOWARD THE LONG-TERM GOALS OF THE OFFICE OF BASIC ENERGY SCIENCES

In this section the COV should evaluate the program's contribution to *progress* toward achieving the Office Basic Energy Science long-term goals (shown below) that are being tracked by the Office of Management and Budget (OMB). The BES goals are shown below. The progress toward successfully achieving the individual goals should be rated based on the definitions given below.

Excellent: the program contributes in at least one of the following ways:

a) supported research leads to important discoveries that impact the course of others' research; new knowledge and techniques, both expected and unexpected, within and across traditional disciplinary boundaries; and high-potential links across these boundaries.

b) supported research leads to important discoveries that are rapidly and readily available and feed, as appropriate, into use or projected use by the Department's technology offices, by other federal agencies, and/or by the private sector. There is evidence of substantive interactions with the Department's technology offices.

c) supported research leads to new concepts and designs for next-generation instruments and detectors for x-ray, neutron, and electron-beam scattering and for research using electric and/or magnetic fields.

Good: the program contributes in at least one of the following ways:

a) supported research leads to a steady stream of outputs of good quality that show the potential to impact energy research.
b) supported research leads to new instruments that are world class

Fair: the program contributes in at least one of the following ways:

a) supported research leads to modest outputs of good quality that show the potential to impact energy research.
b) supported research leads to new instruments that are of high quality

Poor: supported research could contribute to the long term goals but currently does not contribute.

Not Applicable: the goal is not applicable to the program or sub-program being reviewed.

A. By 2015, demonstrate progress in designing, modeling, fabricating, characterizing, analyzing, assembling, and using a variety of new materials and structures, including metals, alloys, ceramics, polymers, biomaterials and more – particularly at the nanoscale – for energy-related applications.

Progress rating for the program under review (select one):
__ Excellent

__ Good
__ Fair
__ Poor
__ Not Applicable
Comments:

B. By 2015, demonstrate progress in understanding, modeling, and controlling chemical reactivity and energy transfer processes in the gas phase, in solutions, at interfaces, and on surfaces for energy-related applications, employing lessons from inorganic, organic, self-assembling, and biological systems.

Progress rating for the program under review (select one):
__ Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable
Comments:

C. By 2015, develop new concepts and improve existing methods for major energy research needs identified in the 2003 Basic Energy Sciences Advisory Committee workshop report, Basic Research Needs to Assure a Secure Energy Future.

Progress rating for the program under review (select one):
__ Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable
Comments:

D. By 2015, demonstrate progress in conceiving, designing, fabricating, and using new instruments to characterize and ultimately control materials.

Progress rating for the program under review (select one):
__ Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable

Comments:

FY 2006 REPORT TEMPLATE

BES COMMITTEE OF VISITORS (COV)
Reviewing the Materials Sciences and Engineering Division
Fiscal Years 2003, 2004, and 2005

First or Second Read Subpanel I
Program: Structure and Composition of Materials

Charge to the COV:

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

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

III. Assess the program's contribution to progress in achieving the Office Basic Energy Science long term goals (shown in III, below) that are being tracked by the Office of Management and Budget (OMB).

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

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

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

Findings: Solicitations for proposals in this area, including submission guidelines and criteria for success, are publicized on the Basic Energy Sciences website, offering detailed instructions to potential applicants. The COV notes that neither proposers nor reviewers regularly cite the energy significance of the proposed work, despite the emphasis on these topics in the solicitations. Reviewers of proposals for experimental work are very thoughtfully chosen, have clear and demonstrated expertise in the areas of the solicitation, represent a broad and talented cross-section of the scientific community, and are closely monitored to avoid conflicts of interest. If needed, supporting expertise should be solicited from other program managers in those cross-cutting proposals that specifically incorporate theory and experiment. Program managers are diligent about reminding reviewers who have committed to the process, and about sustaining the review calendar by replacing delinquent reviewers when necessary. The time to decision varies according to reviewer response, convolved by the normal business cycle of BES, including a quiet phase between July and December of each year when other matters dominate the program calendar. When decisions are rendered, the full spectrum of reviews is considered, evidenced most prominently in the program manager's internal decision memo explaining funding decisions. These are candid and compelling documents that reveal the rationale exercised by the program manager throughout the process, including thoughtful consideration of DOE's mission, as well as the objectives of the CRA, justifying decisions that might otherwise be at odds with the scientific reviews. Internal memos attached to negative decisions are less detailed, but reflective of the rationale involved in the decision-making process. When renewal proposals are under consideration, reviewers are presented with a progress report from the last year of funding but none from prior years. In every instance, the proposal dossier is complete and fully documented.

Comments: The involvement of the program manager in the proposal process is distinctive, based upon the experience of COV members with other agencies, especially the wide latitude enjoyed by the program manager seeking to arrive at a funding decision in light of scientific merit, relevancy, and payoff potential. Every effort seems to be made to provide the PIs with constructive feedback when proposals are going well, and considerable effort in guiding PIs on renewal proposals when difficulties are encountered. Members of the COV do not understand why in some instances of a negative decision (declination), even when all of the scientific reviews were negative and received within a 6 week period, that the PIs were not notified for several months, sometimes close to one year later.

Recommendations: Reduce notification time on "easy" declinations (all reviews are negative).

(b) Monitor active project and programs

Consider, for example

- written progress reports
- contractors meetings
- site visits
- interactions at topical, national and other meetings;

Findings: Progress reports for individual grants are solicited from the PIs on a regular basis and apparently received in timely fashion, facilitated by digital format appended to electronic mail. Larger programs at the national labs comply with the FWP process, and present both highlights and progress reports on a regular basis. Program managers expend considerable effort in summarizing the FWP submissions from the national labs for publication as internal memos. Program managers also attend contractors meetings and site visits, and wherever possible, topical and national meetings of the professional societies to sustain contact with PIs.

Comments: Program managers should be given staff support at a level commensurate with their need to travel to meet PIs in site visits and professional society meetings.

Recommendations: If not already enacted in more recent amendments to the website, program managers should be offer specific instructions for the content of progress reports.

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

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

(a) the breadth and depth of portfolio elements
Consider, for example:
- the overall quality of the science
- the balance of projects with respect to innovation, risk, and interdisciplinary research
- the evolution of the portfolio with respect to new investigators and new science thrusts
- the relationship of the portfolio to other parts of the Division
- the appropriateness of award scope, size, and duration

Findings: This program addresses the fundamental structure and composition of materials that are currently used in, or could be used in, the energy technologies, and judging from published highlights, stakes rightful claim to a stellar level of scientific accomplishment. Based upon the hypothesis that the internal structure (and composition) of matter determines its performance in energy-related applications, this CRA provides the essential scientific understanding that underpins the development of new materials, explains the performance of existing materials, and sets the course for future materials science across a broad horizon. Emphasis has been placed on the development of techniques for investigating the structure and composition of materials at the highest levels of spatial and energy resolution, now expanded to include temporal resolution, as well as the applications of those techniques for their intended goals, up to and including direct atomic resolution and identification. Recently the user facilities (photon, neutron, and electron) that were spawned under this program have been clustered under a new management structure in a new program, giving this CRA a tighter focus on its science mission. The portfolio elements funded under this CRA are both deep and broad, with good balance between innovation and sustained contribution in scientific program topics. The traditional tendency for high renewal rates fosters sustained contribution but necessarily restricts the number of new investigators that could be involved in the portfolio.

Comments: The COV notes that increasing the number of new PIs will most often encourage portfolio depth.

Recommendations: Recognizing that this program as high proposal pressure, it is recommended that the program manager strive for a higher number of new program starts each year.

(b) the national and international standing of the portfolio elements
Consider, for example:

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

Findings: The scientific impact of the CRA portfolio stands in very high regard by members of the COV and in fact the international scientific community. The uniqueness of the CRA includes its emphasis on electron beam methodologies for enhanced spatial and energy resolution.

Comments: The COV finds that in the international context, the work supported by this CRA is highly competitive. The stature of the US scientific community in the development and application of electron microscopy techniques is intimately tied to this CRA. As DOE develops its database capabilities, the case will be even more strongly made that this program area offers unique and essential capacity to the US scientific effort.
Recommendations:

III. PROGRESS TOWARD THE LONG-TERM GOALS OF THE OFFICE OF BASIC ENERGY SCIENCES

In this section the COV should evaluate the program's contribution to *progress* toward achieving the Office Basic Energy Science long-term goals (shown below) that are being tracked by the Office of Management and Budget (OMB). The BES goals are shown below. The progress toward successfully achieving the individual goals should be rated based on the definitions given below.

Excellent: the program contributes in at least one of the following ways:

a) supported research leads to important discoveries that impact the course of others' research; new knowledge and techniques, both expected and unexpected, within and across traditional disciplinary boundaries; and high-potential links across these boundaries.

b) supported research leads to important discoveries that are rapidly and readily available and feed, as appropriate, into use or projected use by the Department's technology offices, by other federal agencies, and/or by the private sector. There is evidence of substantive interactions with the Department's technology offices.

c) supported research leads to new concepts and designs for next-generation instruments and detectors for x-ray, neutron, and electron-beam scattering and for research using electric and/or magnetic fields.

Good: the program contributes in at least one of the following ways:

a) supported research leads to a steady stream of outputs of good quality that show the potential to impact energy research.
b) supported research leads to new instruments that are world class

Fair: the program contributes in at least one of the following ways:

a) supported research leads to modest outputs of good quality that show the potential to impact energy research.
b) supported research leads to new instruments that are of high quality

Poor: supported research could contribute to the long term goals but currently does not contribute.

Not Applicable: the goal is not applicable to the program or sub-program being reviewed.

A. By 2015, demonstrate progress in designing, modeling, fabricating, characterizing, analyzing, assembling, and using a variety of new materials and structures, including metals, alloys, ceramics, polymers, biomaterials and more – particularly at the nanoscale – for energy-related applications.

Progress rating for the program under review (select one):
X Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable
Comments: The relevance of the advanced materials research funded under this CRA to energy-related applications is not always clear.

B. By 2015, demonstrate progress in understanding, modeling, and controlling chemical reactivity and energy transfer processes in the gas phase, in solutions, at interfaces, and on surfaces for energy-related applications, employing lessons from inorganic, organic, self-assembling, and biological systems.

Progress rating for the program under review (select one):
X Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable
Comments:

C. By 2015, develop new concepts and improve existing methods for major energy research needs identified in the 2003 Basic Energy Sciences Advisory Committee workshop report, Basic Research Needs to Assure a Secure Energy Future.

Progress rating for the program under review (select one):
X Excellent

__ Good
__ Fair
__ Poor
__ Not Applicable
Comments: Atomistic models, confirmed or suggested by microscopy, guide the science-based development of new materials.

D. By 2015, demonstrate progress in conceiving, designing, fabricating, and using new instruments to characterize and ultimately control materials.

Progress rating for the program under review (select one):
X Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable

Comments:

FY 2006 REPORT TEMPLATE

BES COMMITTEE OF VISITORS (COV)
Reviewing the Materials Sciences and Engineering Division
Fiscal Years 2003, 2004, and 2005

Committee of Visitors Review of the Materials Sciences and Engineering Division
March 17-19, 2003April 3-5, 2006

Panel II: Mechanical Behavior and Radiation Effects and Physical Behavior of Materials Report

The Panel on Mechanical Behavior & Radiation Effects and Physical Behavior of Materials met with the Program Managers who provided a brief overview of the programs and addressed questions during the review. In addition, the Panel reviewed the 17 proposal folders selected by the Program Managers. The folders included awards and declinations from both university and laboratory researchers.

The overall impression of the Panel was very favorable. Even though there was some variation in the material contained in the folders, a majority of the folders was complete and the assessment path leading to DOE's decision on funding was clear. Folders contained a proposal, a copy of a letter from DOE acknowledging receipt of the proposal, a copy of at least one of the letters to the reviewers that explicitly included a listing of the primary review criteria, reviewer reports and an internal DOE document with the Program Manager's assessment of the proposal and reviewer input, along with a recommendation. Some of the folders also contained a timeline/check-off list with the critical milestones of the proposal review process on the inside front cover. This document allows the Program Manager to readily track when an action occurred (or didn't), The Panel thought this was a best practice that should be uniformly implemented.

Program: Mechanical Behavior and Radiation Effects and Physical Behavior of Materials

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

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

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

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

III. Assess the program's contribution to progress in achieving the Office Basic Energy Science long term goals (shown in III, below) that are being tracked by the Office of Management and Budget (OMB).

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

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

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

- consistency with priorities and criteria stated in the program's solicitations, announcements, and guidelines
- *The program solicitations, announcements, and guidelines are on the DOE Website. We consider this to be adequate.*
- 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
- *Proposal writers currently inform BES of recent collaborators, graduate students, post docs etc.; this does not disqualify these people as reviewers, but it lets the Program Managers know so they can take this information into account in their decision process. The Panel feels this is excellent procedure.*
- efficiency/time to decision
- *The decision time seems reasonable, with ranges from four to 8 months.*
- completeness of documentation making recommendations
- *As noted above, the documentation is quite comprehensive.*

Findings: *Documentation is very clear; the Panel saw all email communication with the reviewers. In most cases, the path to the decision was transparent and based on adequate reviewer input, i.e., at least 3 external reviews. The reviewer input was generally of high quality and the review reports were reflective of a careful assessment of the proposal based on the review criteria provided by DOE. The timeliness of the review and decision process seems to be good. Proposals appeared to be processed in typically 6-8 months, with a few exceptions. It is also clear that the Program Managers are willing to terminate poorly reviewed projects and support changes to the program. A renewal is not guaranteed, and this is commendable. In addition, there was evidence that the Program Manager often sought other input including clarification from the PI on issues raised during the review. The flexibility exercised by the Program Managers is valuable and used wisely. The dedication and commitment of the Program Managers is admirable. The Program Managers are willing to seek reviewers from outside the U.S. to ensure high-quality reviews.*

Comments: *The level of staffing of the Mechanical Behavior and Radiation Effects and Physical Behavior of Materials programs is a concern. The Physical Behavior of Materials Program Manager position is vacant and the program is currently being managed by the Mechanical Behavior and Radiation Effects Program Manager with the help of a detailee. The Panel urges DOE to work with the program to guarantee that adequate staffing is available.*

Recommendations:

(b) Monitor active project and programs
Consider, for example

- written progress reports

- contractors meetings
- site visits
- interactions at topical, national and other meetings;

Findings: *Reviewers' comments were consistent in their evaluations, indicating that BES has established an excellent review process, including clear instructions to the reviewers on purpose, objectives, and research goals of the Office of Science.*

Comments: *The Panel was impressed with the actions taken by BES and Laboratory Management to use the results of the review process to improve the research programs.*

Recommendations: *There was a real effort in the Mechanical Behavior Program to get the grantees together to monitor active projects and programs. The Panel feels this practice is valuable and should be continued and extended to other program areas as appropriate.*

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

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

(a) the breadth and depth of portfolio elements
Consider, for example:

- the overall quality of the science
- the balance of projects with respect to innovation, risk, and interdisciplinary research *The Panel was pleased to see high risk, potentially high payoff, projects included in the portfolio.*
- the evolution of the portfolio with respect to new investigators and new science thrusts –
- *The portfolio reviewed demonstrated closing highly regarded research programs by well known scientists to fund new investigators and new science areas. The Panel commends this practice.*
- the relationship of the portfolio to other parts of the Division
- the appropriateness of award scope, size, and duration

Findings: *The quality of science in this program is very high. It is world leading in most cases.*

Comments:

Recommendations: *The radiation effects area is sub-critical and should be rebuilt. New technologies will be required for Generation IV nuclear reactors, including the development of radiation-tolerant materials for reactors, nuclear waste processing and storage. Particular attention must be paid on how to make available "legacy data" from previous radiation effects studies and reactor technology programs.*

(b) The national and international standing of the portfolio elements
Consider, for example:

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

Findings: *The Mechanical Behavior Program underwent a dramatic change in recent years with the application of computational materials science to this area. The experimental component of this program at BES needs to be rebuilt.*

Comments: *Based on the folders reviewed, the research portfolio and quality of the principal investigators are excellent. Program Managers have sufficient flexibility to rearrange the portfolio, which they do based on input from the community, workshops, and input from DOE/BES. This approach is designed to keep the research portfolio focused on leading edge scientific issues.*

Recommendations: *Immediate attention needs to be paid to filling staffing vacancies and the staffing level in these programs. The growth in funding that is anticipated, and the need for Program Managers to spend more time connecting with other parts of the DOE and to the materials community they serve, will require more than simply filling the existing vacancies.*

III. PROGRESS TOWARD THE LONG-TERM GOALS OF THE OFFICE OF BASIC ENERGY SCIENCES

In this section the COV should evaluate the program's contribution to *progress* toward achieving the Office Basic Energy Science long-term goals (shown below) that are being tracked by the Office of Management and Budget (OMB). The BES goals are shown below. The progress toward successfully achieving the individual goals should be rated based on the definitions given below.

Excellent: the program contributes in at least one of the following ways:

a) supported research leads to important discoveries that impact the course of others' research; new knowledge and techniques, both expected and unexpected, within and across traditional disciplinary boundaries; and high-potential links across these boundaries.

b) supported research leads to important discoveries that are rapidly and readily available and feed, as appropriate, into use or projected use by the Department's technology offices, by other federal agencies, and/or by the private sector. There is evidence of substantive interactions with the Department's technology offices.

c) supported research leads to new concepts and designs for next-generation instruments and detectors for x-ray, neutron, and electron-beam scattering and for research using electric and/or magnetic fields.

The Panel thinks that the programs reviewed are performing excellently in this area.

Good: the program contributes in at least one of the following ways:

a) supported research leads to a steady stream of outputs of good quality that show the potential to impact energy research.
b) supported research leads to new instruments that are world class

Fair: the program contributes in at least one of the following ways:

a) supported research leads to modest outputs of good quality that show the potential to impact energy research.
b) supported research leads to new instruments that are of high quality

Poor: supported research could contribute to the long term goals but currently does not contribute.

Not Applicable: the goal is not applicable to the program or sub-program being reviewed.

A. By 2015, demonstrate progress in designing, modeling, fabricating, characterizing, analyzing, assembling, and using a variety of new materials and structures, including metals, alloys, ceramics, polymers, biomaterials and more – particularly at the nanoscale – for energy-related applications.

Progress rating for the program under review (select one):
_X_ Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable
Comments: *The members of the Panel were impressed with the high quality of the work the Program Managers do and the level of work they handle.*

B. By 2015, demonstrate progress in understanding, modeling, and controlling chemical reactivity and energy transfer processes in the gas phase, in solutions, at interfaces, and on surfaces for energy-related applications, employing lessons from inorganic, organic, self-assembling, and biological systems.

Progress rating for the program under review (select one):
__ Excellent
__ Good
__ Fair
__ Poor
_X_ Not Applicable
Comments:

C. By 2015, develop new concepts and improve existing methods for major energy research needs identified in the 2003 Basic Energy Sciences Advisory Committee workshop report, Basic Research Needs to Assure a Secure Energy Future.

Progress rating for the program under review (select one):
_X_ Excellent
__ Good
__ Fair

__ Poor
__ Not Applicable
Comments: *The folders we examined contained many examples of excellent project results that are contributing new concepts toward improving existing methods for major energy needs by the year 2015. For example, the research by Kurt Sickafus at LANL promises to characterize universally the nature of structural imperfections in crystalline ceramics that will allow better definition of paths toward radiation-resistant materials. Other examples are connected with the outstanding research opportunities provided by the x-ray and neutron scattering facilities and electron microscopy. These facilities have enabled scientific breakthroughs in many areas of materials science and condensed matter physics and chemistry.*

D. By 2015, demonstrate progress in conceiving, designing, fabricating, and using new instruments to characterize and ultimately control materials.

Progress rating for the program under review (select one):
__ Excellent
__ Good
__ Fair
__ Poor
_X_ Not Applicable

Comments:

FY 2006 REPORT: SUBPANEL 3

BES COMMITTEE OF VISITORS (COV)
Reviewing the Materials Sciences and Engineering Division
Fiscal Years 2003, 2004, and 2005

Combination First and Second Reads Subpanel III
Program: Synthesis and Processing, Engineering Physics

Charge to the COV:

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

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

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

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

III. Assess the program's contribution to progress in achieving the Office Basic Energy Science long term goals (shown in III, below) that are being tracked by the Office of Management and Budget (OMB).

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

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

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

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

Findings:

- Workshops have been excellent and effective; solicitations are consistent with the outcomes and grand challenges from the workshops; future plans for joint PI meetings with applied DOE areas such as EERE will be an excellent way to

encourage interactions and collaborations as well as relevance to the DOE energy mission
- Solicitations on the web are well written and provide all the information except email addresses of DOE personnel; Lab PI information dissemination mechanisms appear to work well; university PI's need to be searching the web constantly
- Documentation of the review process is exceptionally good; as is reviewer selection and follow up; detailed review reports and documentation of each step of the process including sign offs is excellent – all documentation is currently done by hand and contained in the jackets – memos to file are beautifully written and provide appropriate justification for the actions as well as broad contextual detail; actions are justified on review input, program relevance to BES mission and program manager's familiarity with the opportunities in the field and the research community
- Process for Lab committee review and subsequent individual reviewer reports is very rigorous and complete; appears to be more comprehensive than the process for review of university proposals
- Highly qualified reviewers were selected; there was no discernable conflict of interest found
- The proposals are being reviewed in a timely fashion; usually within 2-4 months; it is clear that much energy was spent on pursuing reviewers to obtain detailed quality reviews; decisions on funding have taken up to a year

Comments:

- The Synthesis and Processing program area has a very large proposal pressure; we expect that this will only increase due to the relevance of this area in new solicitations in H and solar energy
- The program manager has cooperated with both NSF, AFOSR, and other DOE managers in managing programs
- The number of referees for each proposal is impressively large; often 6-7
- We did not see a single incidence where the panel felt that an incorrect decision was made

Recommendations:

- Email notification of solicitations to university PI's: It would be helpful to allow a subscription from the BES website for email notification of new solicitations
- More staff is needed: Program managers need to have adequate time for visiting conferences and PI's and keeping in touch with the state of the art; we expect that the proposal rate will go up in the near term so that more staffing (both program managers and support staff) is critical to maintain the current high quality of the program
- Better Information system: Clearly a information system for more automated proposal handling and a better reviewer and PI database is needed

(b) Monitor active project and programs
Consider, for example
- written progress reports
- contractors meetings
- site visits
- interactions at topical, national and other meetings;

Findings:

- Monitoring of Lab programs is rigorous through site visits; monitoring of university PI's is through written reports; good reminders are being sent
- Site visits to labs are comprehensive and thorough and show evidence of extensive effort

Comments:
- Contractors meetings are planned between MS&E and EERE for solar programs, solid state lighting and H – this is important for establishing contacts, common understanding of program relevance
- Site visits are always a mix of evaluating past performance and recommending future funding; program manager appears to be compensating well for the familiarity factor of visitors

Recommendations:
- Travel budgets and staff time: it is important for the program managers to attend topical, national and international meetings; visiting university PI's when convenient would be beneficial.

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

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

(a) the breadth and depth of portfolio elements
Consider, for example:
- the overall quality of the science
- the balance of projects with respect to innovation, risk, and interdisciplinary research
- the evolution of the portfolio with respect to new investigators and new science thrusts
- the relationship of the portfolio to other parts of the Division
- the appropriateness of award scope, size, and duration

Findings:

- The Engineering Physics portfolio consisted of technically excellent programs that were diffuse and too broad; we concur with the difficult decision of terminating this

program in hard budget times rather than cutting across all programs; the program manager has done a good job in transferring the relevant components of this area to other areas in BES
- The Synthesis and Processing Science program is excellent overall; new science thrusts are H and solar; growth has been good despite difficult budgets
- The program manager has done well in striking a balance between new and renewal programs; also between high risk – high payoff and well known researchers; is able to make sound judgments about reviews
- Award scope, size and duration appear to be fine

Comments:
- The division offsite retreat to coordinate and align programs is important
- Previous team leader's use of a kitty to fund top 5 proposals from each manager appears to be a method of getting the top proposals vetted across the team
- Two decades ago, around 10% of new proposals were funded; now it is over 20%. This is a healthy trend, however the continuity of funding for the best BES programs is exemplary. The discretion given program managers - in balancing the continuity of programs versus adding new ideas and PIs – and also in understanding the nuances of the refereeing process facilitates this strength.

Recommendations:
- Materials science and engineering is a continuum between fundamental science and engineering and is by nature interdisciplinary; it is important that the word "engineering" be retained in the name of the Division and Team and that materials engineering science research be retained in the research portfolio.

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

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

Findings:
- The whole program has high international stature as are many of the supported PI's

Comments:
- Research on large novel high quality crystal growth has almost entirely moved to Japan except for BES support; MS&E has been supportive, this needs to continue to grow in order to supply Spallation Neutron Source samples for excellent science.

Recommendations:
- Send program mangers and PI's to the best international conferences in the field to acquaint them with the competition.

III. PROGRESS TOWARD THE LONG-TERM GOALS OF THE OFFICE OF BASIC ENERGY SCIENCES

In this section the COV should evaluate the program's contribution to *progress* toward achieving the Office Basic Energy Science long-term goals (shown below) that are being tracked by the Office of Management and Budget (OMB). The BES goals are shown below. The progress toward successfully achieving the individual goals should be rated based on the definitions given below.

Excellent: the program contributes in at least one of the following ways:

a) supported research leads to important discoveries that impact the course of others' research; new knowledge and techniques, both expected and unexpected, within and across traditional disciplinary boundaries; and high-potential links across these boundaries.

b) supported research leads to important discoveries that are rapidly and readily available and feed, as appropriate, into use or projected use by the Department's technology offices, by other federal agencies, and/or by the private sector. There is evidence of substantive interactions with the Department's technology offices.

c) supported research leads to new concepts and designs for next-generation instruments and detectors for x-ray, neutron, and electron-beam scattering and for research using electric and/or magnetic fields.

Good: the program contributes in at least one of the following ways:

a) supported research leads to a steady stream of outputs of good quality that show the potential to impact energy research.
b) supported research leads to new instruments that are world class

Fair: the program contributes in at least one of the following ways:

a) supported research leads to modest outputs of good quality that show the potential to impact energy research.
b) supported research leads to new instruments that are of high quality

Poor: supported research could contribute to the long term goals but currently does not contribute.

Not Applicable: the goal is not applicable to the program or sub-program being reviewed.

A. By 2015, demonstrate progress in designing, modeling, fabricating, characterizing, analyzing, assembling, and using a variety of new materials and structures, including metals, alloys, ceramics, polymers, biomaterials and more – particularly at the nanoscale – for energy-related applications.

Progress rating for the program under review (select one):
_X_ Excellent
__ Good

__ Fair
__ Poor
__ Not Applicable

Comments:

Examples: Work by Yang at al. on the synthesis of semiconductor nanowire arrays that has potential low cost photovoltaic and light emitting device applications has stimulated major interest.

B. By 2015, demonstrate progress in understanding, modeling, and controlling chemical reactivity and energy transfer processes in the gas phase, in solutions, at interfaces, and on surfaces for energy-related applications, employing lessons from inorganic, organic, self-assembling, and biological systems.

Progress rating for the program under review (select one):
X__ Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable

Comments:

Example: World leading effort by Bozovic at al. at BNL on superconducting oxide thin film growth by MBE which has shown unprecedented monitoring and control of stoichiometry and structure. They have observed giant proximity effects in layered oxides.

C. By 2015, develop new concepts and improve existing methods for major energy research needs identified in the 2003 Basic Energy Sciences Advisory Committee workshop report, Basic Research Needs to Assure a Secure Energy Future.

Progress rating for the program under review (select one):
__X Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable

Comments:

Example: Winston's work in nanoscale non-imaging optics is a new concept of non-effective-medium optical modeling at the subwavelength scale which is likely to have relevance for future nanostructured photovoltaic and light emitting devices; his previous work on macroscopic ray tracing is already having an impact on solar energy with commercial applications.

D. By 2015, demonstrate progress in conceiving, designing, fabricating, and using new instruments to characterize and ultimately control materials.

Progress rating for the program under review (select one):
X__ Excellent
__ Good
__ Fair
__ Poor
__ Not Applicable

Comments:

Example: Work by Majumdar on fabricating and measuring the suppression of thermal conductivity in semiconducting nanowire materials for enhancing the thermoelectric figure of merit.

Summary report
Subpanel IV: X-ray and Neutron Scattering

I. Efficacy and Quality of the Program's Processes

a. Processes and management used to solicit, review, recommend, and document proposal actions:

Findings:
The panel was impressed with the overall process used to solicit, review and approve or disapprove proposals for funding. The quality of the program was exceptionally high, and the portfolio of funded grants and FWPs represents some of the best researchers in the areas covered in this program area.

The review process used to evaluate proposals was excellent. The panel was impressed with the quality and breadth of the selected reviewers. We were also very impressed with the responsiveness of reviewers to requests from the Program Manager and the timeliness and thoughtfulness of the reviews.

The panel was very impressed with the level of detail and careful analysis in the internal memorandum documenting funding decisions. These memoranda are excellent methods for summarizing and analyzing the results of the merit review process, as well as the other programmatic and funding factors that entered into the funding recommendation.

Comments:
The DOE program managers have considerable latitude to tailor the process to suit the particular circumstances surrounding a proposal. The panel was impressed with the Program Manager's use of that flexibility to address new opportunities in this area, and to address balance issues in the portfolio, particularly in the mix between university-based and laboratory-based activities. It is clear that the Program Manager feels considerable responsibility for the stewardship of this research field in the United States and is very conscientiously addressing the highest priority needs in those areas.

Recommendations:
We recommend capturing statistics on why a proposal is declined, e.g. due to merit review results, various types of programmatic issues (e.g. program priority, mission relevance, mix of programs, etc), or due to availability of funding. This type of information would be very useful for documenting proposal pressure and quality and for monitoring merit versus programmatic reasons for funding decisions.

b. Monitor active project and programs:

Findings:

The panel felt that the documentation in the folders for ongoing program review, including continuation of funding, were appropriate to the size of the grants and adequate to ensure a high quality program.

Comments:
The panel was generally concerned that the ability of the Program Manager to engage in the types of activities needed to maintain an active and current knowledge of the field and of work in the program was being diminished by the high work load within the Division. We found evidence that the high work loads have prevented Program Managers from attending important meetings to identify emerging scientists and new research directions.

Recommendations:

The panel felt that the level of ongoing review for both university grants (annual reports) and for the lab-based programs was adequate and should not be increased.

II. Effect of the Award Process on Portfolios

(a.) Breadth and Depth of Portfolio elements

Findings:

The panel concluded that the instrumentation programs in the program were uniformly outstanding. The overall quality in the science portions generally excellent. In the few exceptions, it was evident that the Program Manager was intentionally taking a risk for well founded reasons (e.g. new researcher, diversity, new activity area, etc).

The panel was impressed with the percentage of new awards in this portfolio. There are a significant number of new and excellent projects funded in this area.

Funding levels seem realistic to carryout proposed research (includes evidence of BES requesting proposer to increase funding).

This appears to be a high priority area within BES.

The panel did not find adequate levels of investment in enabling technologies, such as detector development, advanced optics, software, etc.

The panel noted that the balance within the portfolio was clearly dominated by research activities in the hard condensed matter sciences and in x-ray and neutron instrumentation.

Comments:

It was not clear to the panel how x-ray/neutron research in the soft condensed matter area was related to other program areas within the Division. It appears that this process is very informal and dependent on the interactions between the various Program Managers. While this can be highly effective, it can also lead to significant duplications or omissions if there is not an effective process within the Division to address research issues that cross program areas. For this reason in particular, the panel applauds the effort to enhance communication between the Program Managers in the Division.

Recommendations:

There should be an increased emphasis on developing new x-ray/neutron tools for characterizing structure and dynamics of collective behavior in biomaterials and soft condensed matter. This is important to meet the anticipated needs of these research fields.

The development of enabling technologies for x-ray and neutron scattering should be a very high priority within this portfolio.

(b) National and international standing of the portfolio elements

Findings:
A number of elements of the portfolio have had major world-wide scientific impact, for example in the areas of correlated electron systems, high-pressure/high-temperature x-ray materials research, and soft condensed matter interfacial systems. The polarized He3 work is among the best in the world.

Comment:
The panel was very impressed with the quality and breadth of research in this program area. This area is responsible for the stewardship of the nation's efforts in neutron and synchrotron instrumentation and the use of that instrumentation in high impact research. The Program Manager takes this responsibility very seriously and has a very high quality program to demonstrate this commitment. Many of the most important research programs using x-ray and synchrotron radiation are funded in this program area, as well as some of the most innovative instrumentation efforts in the world. This program has a high potential to make a revolutionary impact on the state of x-ray and neutron scattering.

III. Progress toward the long-term goals of the Office of Basic Energy Sciences

A. Good – the panel felt that the work in this program area on advances in materials for energy-related applications was generally outstanding, particularly in the traditional areas support by this CRA. However, in the more recent calls – particularly for the recent hydrogen initiative – the panel felt that the supported research was not yet at the same caliber as the rest of the portfolio.

B. N/A

C. N/A *

DOE's current strategy is focused on improving existing methods, and not on generating new concepts. This may be appropriate.

D. Excellent – BES through the activities of this program (and through the Facilities Division) is clearly a world-leader in the area of x-ray and neutron instrumentation. There is no question that much of the most innovative work in the world is included in this research portfolio and all indications are that this area will continue to excel.

REPORT OF SUB-PANEL 5 – CONDENSED MATTER PHYSICS

The panel found that the Office of Basic Energy Sciences executes its responsibilities effectively, with adequate planning and clear vision. DOE is fortunate to have such a skilled and committed leadership and staff.

The mission of the Condensed Matter Program, both experiment and theory, is focused on fundamental investigations that are tied to the mission of the Department of Energy, broadly interpreted. In a climate that has leaned increasingly toward funding work that has (identifiable) potential applications, the program managers of CMP are to be commended for placing high value on expansion of the knowledge base and operating with a long-time horizon. In addition to funding and operating facilities such as neutron and synchrotron sources, the DOE provides substantial funding to Condensed Matter Physics through individual grants. Its role in funding CMP is indispensable.

I – EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

A - Solicit, review, recommend, and document proposal actions:

Findings: Insufficient information was provided to the panel to enable a detailed assessment of the solicitation procedures. The rolling admissions approach to proposal submissions is generally regarded as positive, especially for experienced investigators. However young investigators, particularly in institutions lacking adequate mentoring would benefit from a more aggressive marketing or solicitation process by BES. We also suggest below that BES consider establishing a separate program to fund young investigators.

The panel was very favorably impressed by the review procedures. The choice of reviewers is sufficiently broad-based and includes many prominent people in the field. Where fewer than three substantive reviews were received, more reviews were solicited. Although this process sometimes entailed a longer time-to-decision, the outcome was based on complete and solid information. Although the number of reviews varies from proposal to proposal, the reviews generally provide solid, in-depth information on which to base a decision. The reviews are careful, thorough and detailed, and the documentation in each folder is thorough and complete. The program managers' reports provide excellent summaries of the proposed work, of the reviewers' comments, and provide a clear rationale for the recommendation on whether to fund. One component of the recommendation is how well the proposed project fits within the purview of the CMP core program.

Comments: The panel is unanimous in its opinion that, although the reviews are an important component in determining the funding decision, the program managers should continue to have flexibility and discretion in making their recommendations.

Recommendations: A minor recommendation is to organize the individual folders better and in a more consistent format. When time-to-decision is longer than 9 months, we recommend that the program manager inform the investigator that there is a delay, give the reason for the delay and provide guidance.

B – Monitor active projects and programs:

Findings: Copious information is obtained in the case of the work done at the National Laboratories. Some of the review processes are viewed as too onerous and time-consuming. In the case of university-based projects, the simple annual progress report serves well.

For example, the review of Oak Ridge National Laboratory provided constructive feedback. In individual reports on this program all the reviewers arrived at similar recommendations in this case. Very timely actions were taken by both BES and ORNL management. The review process was very effective.

The panel is concerned that the task of overseeing proposal reviews and monitoring funded programs, particularly in view of the anticipated growth in funding for CMP, may not allow the program managers to continue to stay in close touch with the community due to lack of time for attendance at conferences and visits to universities.

Recommendation: It is important that program managers be allotted sufficient time and resources to attend meetings, and to visit grantees when appropriate. This is essential to insure that they stay closely tuned to the community, to be aware of the latest developments and of who is doing the most exciting work.

The Division urgently needs more personnel to handle the current load, as well as the increased load associated with an anticipated increase in the budget and the Department directive to increase coordination with other components of DOE. More personnel is needed both at the level of program managers and in the form of support staff.

II – EFFECTS OF THE AWARD PROCESS ON PORTFOLIOS.

Rather than establishing new programs, the BES policy is to incorporate money obtained for initiatives into the existing BES core program. An example is the new emphasis on research on solar energy that resulted from a recent workshop. The panel strongly supports this approach. It is an excellent method for involving many areas of expertise and different disciplines in investigations of an overarching problem. Although this will influence to some degree the focus of existing core programs, it is important that core programs be maintained as the central structure.

A – Breadth and depth of portfolio elements

Findings: The quality of the portfolio is excellent. Four Condensed Matter Physics PIs are Nobel Laureates and many have won other prestigious prizes (the E. O. Lawrence Award, the Buckley Prize,….), Grant funding is dominated by renewals of proposals submitted by established investigators. The advantage of this is that it provides much-needed continuity to excellent programs. The disadvantage is that it leaves insufficient resources to fund young proposals, particularly those from young investigators.

Recommendation: the long term goal of BES, and indeed any fundamental research effort, requires the success of outstanding scientists and engineers early in their careers. BES should consider implementing an early career research award program for young investigators in academia (similar to the Outstanding Junior Investigator Awards in other programs within the Office of Science in DOE).

B - The national and the international standing of the portfolio elements.

Findings: The program supports the work of highly regarded scientists with international stature.

III – PROGRESS TOWARD THE LONG-TERM GOALS OF THE OFFICE OF BASIC ENERGY SCIENCES

A – Excellent. This program supports fundamental research in experimental condensed matter physics emphasizing discovery and understanding of new phenomena in complex materials and the relationship between electronic structure and physical properties in new materials, especially in those exhibiting correlated electron behavior. The theoretical work includes the development of new theoretical insights, suggestions for new experiments, and interpretation of experiments. This enhances the effectiveness of the overall scientific effort to understand the properties of important materials, including nanostrucures, low-dimensional systems, high-temperature superconductors, magnetic materials.

B – Excellent. Work is being done by several investigators on issues that are important for energy applications. This includes, for example, self-assembly, energy transfer, ferroelectrics, high-temperature superconductors and nanomagnets.

C – Excellent. Knowledge and insight into the fundamental physical basis of material properties, especially at the nanoscale, is essential to provide the basis for future energy technology. For example, understanding high-temperature superconductivity, energy conversion in photo-voltaics, and hydrogen storage will provide the underpinnings for future energy technology.

Sub-Panel 6

I. Efficiency and Quality of the Program's Processes

a) Solicit, review, recommend and document proposal actions

Findings: **Overall the quality and balance of reviewers chosen was excellent, with constructive comments being given to the PI(s) involved in the research. This is probably the most fundamental and important component of the process. The program managers were effective at directing the PI's to appropriately follow the guidelines and stated priorities of the program. There were occasional apparent cases of self-interest on the part of the referees, but not beyond that expected in the context of the necessity of having reviewers who are also at the cutting edge of the research being reviewed. The documentation that was generated to make the final recommendation always presented both the pro's and con's as described by the reviewers.**

Study of the review process employed found it to be very well documented. Proposals were refereed by between 3 and 6 reviewers. These reviewers in very large part were clearly experts in the field of the proposal, and almost exclusively wrote quality reviews, indicating that they were fully engaged in the process. The program officers' internal PM memos indicated very careful consideration of referee comments, and excellent syntheses of their comments and opinions. In several cases that we studied, program officers had to use their judgment to distinguish among conflicting opinions reported by the reviewers about the quality of the proposed work. In all cases, the program officers provided good rationale for their choices for what should be funded in spite of possible difficulties. In one case, the program officer shepherded a proposal that received relatively poor reviews but nonetheless showed the kernel of an innovative idea that was worth pursuing. The referee reports were sent to the PI for rebuttal. The PI's rebuttal was extensive, and the program officer asked that information in the rebuttal be accommodated into a new grant submission. That new submission was funded based on the program officer's personal assessment that it was now worthy of funding. This was an excellent example of stewardship, which is a vital role that can be played by effective grant officers.

In all cases we examined, the program officers' judgments appeared to be thoughtful, knowledgeable, and sound. The program officers considered not only the quality of the research, but also how the research fit into the mission of DOE BES, as well as the track record of the PI.

Comments: **It seemed to one panel member that there were frequent disconnects between proposed research and realistic project objectives. The proposal should present the PI's vision for would will actually be realized if the research is successfully carried out. This issue should be strongly addressed in the program solicitation and by the reviewers. If the research is successfully completed, what is the "deliverable" that will actually be realized—what new scientific understanding or technology will be enabled?**

The 'rolling admissions' approach to proposal submissions is generally regarded as a positive, especially for experienced investigators. Young investigators benefit from a more aggressive marketing or solicitation process by BES. On way of accomplishing this goal is to have the grant officers attend national and international scientific meetings.

Recommendations: **Make sure the PI's are aware of their responsibility to produce or to provide quantitative "proof of principle" for whatever they propose as being their high impact items.**

b) Monitor active projects and programs

Findings: **We find the level of monitoring for the academic grants to be just at the right level. The review process for small FWP's at DOE labs appears out of balance, with relatively large resources devoted to reviewing relatively small elements of the program.**

Comments: **The committee members especially liked the recent implementation of the crosscutting workshops.**

Recommendations: **We encourage that very small FWP's at DOE labs be merged into larger groups.**

Effect of the Award Process on the Portfolios

a) The breadth and depth of portfolio elements

Findings: **The project managers have demonstrated the judicious use of the flexibility that they have been given in awarding grants to constructively generate high profile projects that are notable for their scientific quality and breadth. The committee found that this was done in a way that promotes innovative and high-risk research.**

As a positive example of a program manager balancing innovation with high risk, we cite the example of the Ames lab proposal. In particular, four reviewers were positive and two reviewers negative. The program manager was convinced that the detailed response of the PI to the negative reviewers was adequately addresses in the revised proposal. The program manager decided that the proposal contained new ideas and, although risky, was worth funding. The funding decision demonstrates the latitude available to DOE managers.

Comments: **DOE is one of the very few granting agencies that provides this opportunity to investigators. We view the latitude afforded to the DOE program managers as a positive attribute. Four-year contracts are desirable to give potential "break through" projects the time to come to fruition, and should continue.**

Recommendations: **Better personnel support must be provided to the existing project managers and there must be an increase in the number of project managers to deal with the upcoming new Energy related initiatives.**

b) The national and international standing of the portfolio elements

Findings: **The program funds a wide range of research topics in materials chemistry, ranging from fabrication of biopolymers to crystal growth of intermetallic compounds. It includes, among other topics, studies of nanoparticles, polymers, structures and spectroscopy of**

surfaces, and magnetic and optical materials. The range of topics covered is a good representation of active, current research topics in materials chemistry. Renowned scientists in their fields head many of the funded programs. Overall the portfolio comprises principal investigators who are already leaders in their fields and young investigators who have clearly demonstrated exceptional promise as research scientists.

Comments: **We would like to commend the program officers for their very long record of funding high quality research. Further, we commend the DOE BES program in general for both the stability of its funding for individual PIs, and relatively high success rate for new submissions, while still being highly selective for the best submitted work.**

Recommendations: **None**

Progress toward the Long Term Goals of the Office of Basic Energy Sciences

Overall comment: Since the fundamental research effort requires the success of outstanding scientists and engineers early in their careers, the program should continue to bring young investigators into the system

Overall, we rate the current program, together with the new initiatives, as excellent in its contributions to BES under categories A-C in the template. (D is not applicable to this program.)

Subpanel VII: EPSCoR Report

BES COMMITTEE OF VISITORS (COV)
Reviewing the Materials Sciences and Engineering Division
Fiscal Years 2003, 2004, and 2005

I. EFFICACY AND QUALITY OF THE PROGRAM'S PROCESSES

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

Findings:

The solicitation, priorities and criteria were uniformly applied within the context of the DOE EPSCOR defined boundaries. The selection of the referees was consistent with the proposed studies and the comments of reviews returned was more than suitable for the program officer to make a decision on funding or not funding the proposed studies. This was true for the Laboratory Partnership and Implementation Grants. The maximum time between receipt of the proposal and final decision was ~7 months which, given the peer-review process, is a very reasonable turn-around time. The documentation provided by the EPSCoR program in BES was sufficient for the panel to follow the course of the proposed studies and the ultimate decision that was made. Based on discussions with the acting program manager, it was clear that the program manager had the opportunity to weigh in extenuating factors that could be used to influence the ultimate decision. The panel felt that this flexibility on the part of the program officer was and is an important component of the decision making process for EPSCoR proposals, in that parameters other than excellence in science must be taken into account to properly execute the mission of this program.

State industrial representatives are apparently involved in the selection of the final EPSCOR grant applications that are submitted to DOE. Can they be induced to provide direction and input to the EPSCOR program at the state level on an "in kind" basis so that the program will be attractive to them from their point of view by, for example, developing a new local skilled technical base that would ultimately enhance their own bottom line and/or visibility? Is there a mechanism by which the participation of the industrial sector can be used to leverage and augment the funds provided by the DOE? Industry is clearly a sector that can be used to stimulate competitiveness in research at a local level (provided the industry is located near the home institution of the PI) which would further enhance the impact of the program. This is particularly poignant for the Implementation Grants where consortia of institutions are involved.

The Laboratory Partnership Grants, with active participation of the DOE National Laboratories, provide an excellent opportunity for students, particularly those from non-Ph.D. granting institutions. Every effort should be made to identify the top students at these latter institutions, their interests, which may or may not be directly related to the specifics of the EPSCOR research program that is funded, and to make the appropriate connections with a DOE laboratory that might best develop their motivation and technical and research skills.

A concern and question is that the funding for implementation grants be properly used for all members of the cluster grants. What are the metrics for the successful participation of a non-Ph.D. granting institution in the research cluster? Can the states be leveraged to provide virtual web networking that can be effectively utilized by members for the cluster on a weekly basis? What specifically is being done to bring about the active participation of students from the non-Ph.D. granting institutions? Summer internships and tutorials were never discussed in the proposals examined, though this may be a very effective way to achieve the goals of the program.

(b) Monitor active project and programs

The progress reports of the Implementation Grants in the files that were examined lacked details and, in general, were not convincing in terms of items such as contractors meetings, site visits, specifics about the interactions among PI's and researchers that had actually taken place, and the effort being put forth by the individual PI's in the research cluster. In one case where a DOE lab was part of the cluster, the funding seemed to be listed as thought DOE and EPSCOR funding were two separate entities, but it was not clear exactly what the EPSCOR funding was being implemented. Statements such as those made in a progress report by a PI regarding one of the cluster partners that "Very little work is coming out of (a particularly laboratory)…" and "(Investigator) will work more closely with (another investigator) over the next year to increase productivity." and "…work to form a closer working relationship with scientists at (a DOE lab).", were disturbing to the panel Such vague statements without an action plan or any evidence that implementation has been initiated to truly create a research cluster are meaningless.

For Implementation Grants with a research cluster, it is critical that there be a mechanism for real time information exchange among the collaborators, and that researchers and PI's have workshops or regular meetings to discuss their projects, findings and plans on a scheduled basis (e.g. weekly or biweekly) so that a coordinated effort can be realized. While much of this could be virtual, by web-casting at shorter intervals, on a longer term basis they should also have "face to face" time to become familiar with the needs and interests of their collaborators. These latter meetings might also be used to bring in outside scientists who specialize in the project area of research to review their program, give seminars, etc Documentation on the use of the resources by all participants and their respective contributions to the project should be required as part of the annual progress report.

The monitoring of the Laboratory Partnership Grants, on the other hand, were much more complete. While these grants are smaller in size, it was clear that progress in research was being made, students were involved in research with national laboratory scientists, and that effective use was being made of the funding. From the viewpoint of the panelists, it appeared that the LPG's were far more effective in addressing the objectives of the EPSCoR program and that more efficient use of funding was being made, in comparison to the Implementation Grants.

II. EFFECT OF THE AWARD PROCESS ON PORTFOLIOS

(a) How the award process has addressed the EPSCoR program goals

The objectives of the EPSCoR Program was addressed in each of the proposals that were reviewed. This can be said for both the LPG's and Implementation Grants that were examined. Yet, the panel was far less impressed with the level of monitoring the effectiveness of the program in achieving the goals of EPSCoR once the funding was in place. This cannot be attributed to the lack of diligence on the Program managers' parts but, rather, to the absence of any metric to measure the effectiveness of the funds provided. In the opinion of the panel, it is necessary for BES to coordinate an interagency assessment program for EPSCoR funds. Since the funds provided are subject to different or specialized criteria, then the scrutiny of the funded awards should be to a greater level. The panel felt that there needs to be a more stringent accountability of funds, progress of research, and assessment of the "Stimulated Competitiveness", particularly concerning the Implementation Grants, that has resulted from these awards. At present, the assessment is simply too loose or non-existent.

(b) How the Laboratory-Partnership program has taken advantage of the unique DOE laboratory assets.

The LPG program provides a unique opportunity for both PhD and non-PhD-granting institutions to provide students with a research experience at a national laboratory. Exposure to a national laboratory research environment and the instrumentation and facilities available at the national laboratories is an extraordinary opportunity to stimulate students in scientific research. The LPG, from the reports that the panel examined, were quite effective in accomplishing this objective.