Report of the 2014 Committee of Visitors

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What is a COV?

- **What**—A panel to assess the efficacy and quality of the processes used to solicit, review, recommend, monitor, and document funding actions and to assess the quality of the resulting portfolio
  - The national and international standings of the programs' sub-elements are part of the evaluation of the breadth and depth of the portfolio
- **Who**—Each COV panel is composed of a group of recognized scientists and research program leaders with broad expertise in the designated program areas
- **When**—Each program element must be reviewed once every three years
- **Why**—To ensure quality and fairness and to help foster improvements
- **Where**—A two- to three-day visit to DOE Germantown to review documents and meet with DOE program managers

Charge from Dr. P. Dehmer to Prof. M. Koepke, April 8, 2014

I am writing to request that the Fusion Energy Sciences Advisory Committee (FESAC) establish a Committee of Visitors (COV) to review the management processes of the Department of Energy Office of Science Fusion Energy Sciences (FES) program. The panel should consider and provide evaluation of:

- The efficiency and quality of the processes used by FES to solicit, review, recommend, monitor, and document awards and declinations for universities, national laboratories, and industry.
- The breadth, depth, and quality of the resulting program portfolio, and providing an evaluation of the program's national and international standing.
- FES's management of its portfolio of line item construction and Major Items of Equipment projects, including the U.S. Contributions to ITER project. Assessment of FES projects' performance, including contractor and Federal Project Director management of projects, is performed by periodic Office of Science Independent Project Reviews, and is not part of this COV.

U.S. DEPARTMENT OF ENERGY
Office of Science

More on COV scope

- **Period for evaluation**
  - The last COV activity evaluated the FES program through FY 2009.
  - Accordingly, in this assessment the COV should review the entire FES program for activities during FY 2010, FY 2011, FY 2012, and FY 2013.

- **Action items**
  - The panel should also comment on FES's progress in addressing action items from the previous COV review.

Caution: The scope of the COV deals primarily with management processes, and does *not* encompass matters of policy and budget appropriations that are the domain of FES or its advisory arm, FESAC.

2014 COV Members

- William Amatucci, NRL
- Joseph Arango, JLAB
- Amitava Bhattacharjee, PPPL/Princeton University, Chair
- Russ Doerner, UCSD
- Dustin Froula, University of Rochester
- David Gates, PPPL
- Jerry Hughes, MIT
- Alice Koniges, LBNL
- Richard Kurtz, PNNL
- Brian Nelson, University of Washington
- Mark Nornberg, University of Wisconsin-Madison
- Mark Reichanadter, SLAC
- John Tapia, LANL
- Richard Temkin, MIT
- Steven Vincena, PPPL

Topics and Sub-Committees

Project Management, including US ITER

Joseph Arango (Thomas Jefferson Site Office)
Mark Reichanadter (SLAC National Acceleration Laboratory)
John Tapia (Los Alamos National Laboratory)

Program on Toroidal Experiments, International Collaborations, and Diagnostics

Dustin Froula (Laboratory for Laser Energetics, University of Rochester)
Alice Koniges (Lawrence Berkeley National Laboratory)
Steven Vincena (University of California-Los Angeles)

Program on Experimental Plasma Research and HEDLP

Jerry Hughes (MIT)
Russ Doerner (University of California-San Diego)

Program on Theory and Computation

William Amatucci (Naval Research Laboratory)
Brian Nelson (University of Washington)

Topics and Sub-Committees (continued)

Program on General Plasma Science

Richard Temkin (Massachusetts Institute of Technology)
Richard Kurz (Pacific Northwest National Laboratory)

Program on Enabling Technologies

David Gates (Princeton Plasma Physics Laboratory)
Mark Nornberg (University of Wisconsin-Madison)

COV Chair

Amitava Bhattacharjee (Princeton Plasma Physics Laboratory/ Princeton University)

On call today (remotely)

- Mark Reichenadter (Program Management, including US ITER)
- Dustin Froula, Steven Vincena (Toroidal Experiments)
- Jerry Hughes (Experimental Plasma Research and HEDLP)
- Brian Nelson (University of Washington)
- Richard Temkin (General Plasma Science)
- David Gates (Enabling Technology)

Organization of Report

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COV Process

- Dates of Germantown visit: December 2-4, 2014
- Before visit: COV met by teleconference and interacted extensively through e-mail. FES (J. Mandrekas and J. Van Dam) responded to request for information by e-mail and teleconference. FES staff met with COV Chair by telecon
- Meetings with FES leadership and staff during visit.
- After meeting, COV finalized Report through extensive e-mail exchanges and teleconferences.

Selected Findings

- The COV was very pleased with the quality of the information provided, and the openness, accessibility, and professionalism of the FES personnel during the entire process. The documentation and presentation provided by FES management and staff was thorough and well organized.

- The implementation and use of the Portfolio Analysis and Management System (PAMS) has been a huge benefit for the efficacy and quality of FES processes. All programs in FES appear to be making effective use of PAMS, reducing drastically irregularities reported by the 2009 COV.

- Despite the regularization of the process made possible by PAMS, the COV was concerned with the statistically insignificant differences in reviewer rankings between proposals approved and declined in some of the programs.

- The COV was impressed with certain efforts introduced to improve the quality of the proposal review process. In the HEDLP program, for example, virtual panel reviews were implemented, allowing group discussion of proposals and, in some cases, clarification of technical issues discussed in the proposals prior to the writing of the reviews.

Selected Findings (continued)

- In response to the 2009 COV recommendation on defining, collecting, and analyzing metrics of performance for the programs reviewed, FES is beginning to use IT toolsets (e.g., Web of Science) and engage the US DOE Office of Science and Technical Information, located ORNL. While we commend FES for undertaking a preliminary study, much more needs to be done for a thorough evaluation of the national and international standing of the various programs, required by the charge to this COV.

- The COV is concerned that FES continues to be under-staffed in both managers and administrative assistants in moving forward with leadership of some its key programs and data collection.

- It was troubling for the COV to learn that there was no community input or peer review sought for the decision to close Alcator C-Mod. The COV notes that this lack of external input to FES is damaging to the fusion community as a whole and has eroded trust between the community and the FES management. The COV recognizes that budget exigencies can and do arise in the program as a whole, but the manner in which the C-Mod process was communicated and handled was cause for concern.

Selected Findings (continued)

- The COV was concerned that there were no targeted solicitations for research at DIII-D or C-Mod, nor were any proposals with new PI's funded at these facilities over the period reviewed.

- The breadth of the Experimental Plasma Research (EPR) Program is excellent. However, only one solicitation was issued for the period covered by this COV, with one-year extensions granted to key experimental programs for the remaining period. This practice encourages continuation of the status quo, and inhibits innovation in the EPR Program.

- In the Enabling Technology area, since the funding of proposals from the last solicitation on materials, OFES has decided to make a change in direction. All of the PIs have been informed by the Program Manager that there will not be a renewal of the awards from the last solicitation. When asked about the processes being followed for the closeout of these proposals, no plan for review was proffered. When asked what the follow on process for funding activities in the materials area would be, it was stated that no decision had been made.

- The project portfolio managed by the Facilities, Operations and Projects (FOP) Division for the FES is not broad and will be limited to the US ITER project, with completion of the NSTX-U project expected in 2015.

Selected Recommendations

- Consider vetting programmatic decisions on the potential shutdown of a major US facility by the peer-review process and community participation in order to maintain the integrity of the US Fusion Program and faith in OFES.

- Make sure future plans are well formulated and communicated before canceling a program (e.g., in the Enabling Technology area, and in the closure of Alcator C-Mod). (This echoes a similar recommendation from the 2009 COV, made with respect to the ICC program, regarding transparency in redirection of funds.)

- Restore the Budget Planning Meeting (or variant thereof) that provides the community with a forum to discuss future plans openly, and can inform FES decision-making.

Selected Recommendations (continued)

- Continue defining, collecting, and analyzing meaningful metrics, and develop capabilities in PAMS to enable this objective. (This repeats a 2009 COV recommendation.)

- Consider extending the virtual panel review mechanism employed in HEDLP to other programs in FES. Such a mechanism could be useful in mediating cases in the absence of a site visit for panelists.

- Offer regular, targeted Funding Opportunity Announcements (FOAs) for research on DIII-D and future major tokamak facilities as well as the EPR program.

- FOP Division should utilize the impending FES strategic plan in conjunction with a series of user and scientific community workshops to develop its project portfolio to further define science and project needs that could be considered for CD-0 (see Section III).

Project Management, including ITER

FES Project Status and Performance Metrics

				Performance Metrics			
Project	**Description**	**TPC**	**Most Recent CD**	**% Complete**	**Cum CPI**	**Cum SPI**	**As Of**
U.S. Contributions to ITER (U.S. ITER) -ORNL	Line-Item	$4.1B	CD-1	25%	0.99	0.97	Nov-14
National Spherical Torus Experiment Upgrade (NSTX-U) - PPPL	MIE	$94.3M	CD-3	93%	0.96	0.96	Nov-14
Materials in Extreme Conditions (MEC) - SLAC	MIE (ARRA Funded)	$19.97M	CD-4	100%	–	–	–
Neutralized Drift Compression Experiment (NDCX-II) - LBNL	MIE (ARRA Funded)	$11M	CD-4	100%	–	–	–

FINDINGS

- The FES Strategic Planning effort is ongoing and the Plan is expected to be issued in 2015. The COV strongly encourages this effort and its socialization within the FES scientific community when complete.
- For FY15, the FES Program was given a budget of $464.5M, with 47% devoted to science and 53% supporting facility operations and projects under the FOP Division (US ITER @ $150M). To date, all projects have met or are meeting baseline delivery objectives.
- The efficacy of the processes to monitor and review active projects, programs and facilities is adequate – 4 projects were reviewed:
    - MEC – Completed on time, on budget
    - NDCX-II – Completed on time, on budget
    - NSTX-U on track to be completed on time, on budget
    - US ITER - Active, currently at CD-1
- US ITER is the dominant project within FES. US ITER contribution to the ITER IO is fixed at 9.09% of total ITER cost. The US ITER is at CD-1 with a TPC currently estimated at $4.055B, which is a mix of hardware and cash contributions to ITER IO. US ITER uses a tailored approach to O 413.3B to manage the US ITER project.
- ITER IO has experienced a number of significant management challenges over several years. Recently, a new ITER IO Director General has been nominated to lead the project and if appointed, will be implementing several recommendations from the ITER Council and Management Assessment Report which are intended to improve the cost and schedule performance of the project.

- FES (and FOP and US ITER) is to be commended for its active involvement in supporting the IO and the development of recommendations for improvements. The committee concluded that there is active US representation in the various ITER advisory panels and governing boards including the ITER Council (currently U.S. Chair) as well as active representation in the Management Advisory Committee (MAC), Science and Technology Advisory Committee (STAC), as well as the recent ITER Management Assessment, which was U.S. led. *(See Appendix C for detailed representations).*

- The COV noted that many ITER IO programmatic issues (e.g., cash contributions, program risks, off-project dependencies including international issues such as the ITER international school, taxation, IO HR policies, French regulatory environment, etc.) are currently being directly managed by the US ITER project team, which are a distraction from US ITER project execution efforts.

- The project portfolio is not broad and will be limited to the US ITER project, with completion of the NSTX-U project expected in 2015.

- While successful in executing projects now, the trend in reduced projects could result in the eventual dilution of project management expertise and possibly jeopardize continued success.

RECOMMENDATIONS

- Consider separating the ITER program from the US Contributions to the ITER Project and managing the program issues from Headquarters.

- Consider developing a defined set of roles, responsibilities, and processes that include metrics for decision making codified in a FES Program Management Plan.

- FOP Division should utilize the impending FES strategic plan in conjunction with a series of user and scientific community workshops to develop its project portfolio to further define science and project needs that could be considered for CD-0.

Toroidal Experiments, International Programs, and Diagnostics

US Programs

FINDINGS

- It was troubling for the COV to learn that there was no community input or peer review sought for the decision to close C-Mod. The COV notes that the lack such input to FES is damaging to the fusion community as a whole and has eroded trust between the community and FES management.

- There were no targeted solicitations for research at DIII-D or C-Mod over the period reviewed and it appears that this limits consideration of new proposals. Over the period reviewed by this COV, there were no proposals with new PI's funded at DIII-D or C-Mod.

- The NSTX three-year proposal cycle is effective in minimizing disruption to the NSTX program as only 1-2 collaborations are likely phased out at any time.

- We are concerned about the low number of new proposals overall that are funded for research on NSTX in this COV period. For example, DE-FOA-0000576, "National Spherical Torus Experiment: Diagnostic Measurements of Spherical torus Plasmas," resulted in 15 grant applications with a nearly even split between new and renewal proposals, but only two of the nine funded proposals were new.

- Reviewer rankings were often statistically insignificant between proposals.

RECOMMENDATIONS

- Programmatic decisions on the potential shutdown of a major US facility need to be vetted by the peer-review process and community participation in order to maintain the integrity of the US Fusion Program and faith in OFES.

- Offer regular, targeted FOAs for research on DIII-D and future major tokamak facilities.

- Consider more balance between new and renewed proposals when evaluating closely ranked proposals.

- Consider using a virtual panel of reviewers to foster discussion on selected proposals that will further help the Program Managers in selecting the final proposals, particularly when the reviewer rankings do not statistically guide the process.

International Programs

FINDINGS

- During the period reviewed by this COV, a single FOA was offered; 13 proposals were submitted and 3 projects were selected for funding. There are now semi-annual reviews, and current projects are due to end in 2016, with a new solicitation expected approximately in December 2015. This is a strong program with depth, but the breadth of projects is limited.

- The research supports projects that complement work on US experiments.

RECOMMENDATIONS

- The move towards a specific FOA and a peer-reviewed process for international projects is an important step forward and should continue. Because of the large number of extremely highly rated projects, a more discerning peer review process should be considered.

- When possible, the targeted experimental facilities should have a chance to give input on the proposed research projects in a way similar to the process used to distinguish between projects proposed for research on US facilities. This should go beyond simply writing a letter of support, but instead should involve asking a panel of international facility experts to give a ranking to the specific proposals.

Advanced Diagnostics

FINDINGS

- The major activity for the advanced diagnostics systems for magnetic fusion energy sciences consisted of a single FOA during 2012. The FOA was developed with input from an *ad hoc* FES Workshop Group in diagnostics and the solicitation was published on June 22, 2012 as DE-FOA-0000744. The close date for receipt of completed proposals occurred on a very short time frame, with the proposal deadline being August 14, 2012. Despite this, 39 total proposals were received. Thirty-two proposals were sent for review after filtering for redundant or proposals that were not responsive to the solicitation.

- Of the 32 proposals reviewed under DE-FOA-0000744, 14 were described by the program manager as "truly outstanding." Of these 14, only 9 were funded, primarily due to budgetary constraints. Of these nine, eight were renewal awards and one was new. This ratio was of some concern to the sub-committee since we could not properly evaluate its impact on what would constitute an "advanced" diagnostic from the time of the original proposal, through the renewal, to its eventual implementation as a proven diagnostic.

RECOMMENDATIONS

- Explore alternate ways to ensure that truly outstanding and innovative proposals do not have to wait four years to re-compete.

E. Breadth and Depth of Program Portfolio

FINDINGS

- We are concerned that the lack of targeted FOAs for research at DIII-D is preventing growth and innovation for new science. It is not clear that there are sufficient pathways for unfunded investigators to join the collaborations and the facility is limited to a very tight knit community, rather than the breadth in community participation one expects of a User Facility.

- Both the depth and breadth of the NSTX program are excellent, and are anticipated to grow as the NSTX upgrade is completed.

- During the period reviewed by this COV, a single FOA for International Collaborations was offered; 13 proposals were submitted and 3 projects were selected for funding. This is a strong program with depth, but the breadth of projects is limited.

- For the only *Advanced Diagnostics* solicitation under this COV's review, just 9 out of 14 proposals described by the program manager as "truly outstanding" could be funded due to budgetary constraints. This suggests that the breadth of the program can be expanded.

RECOMMENDATIONS

- The breadth of *International Collaborations and Advanced Diagnostics* programs should be expanded to include more funded proposals.

Program on EPR and HEDLP

A. Scope of Program Area

The Experimental Plasma Research (*EPR*) Program (formerly known as the ICC Program) emphasizes plasma physics and plasma-material interaction studies across a wider range of regimes than those provided by the major tokamak facilities. The EPR Program includes a diverse set of small and medium scale facilities, including stellarators, spherical tori, compact tori and advanced tokamaks. The reorganization of FES has resulted in the division of the EPR Program into three different areas in the new organization structure and it no longer exists beyond the scope of this COV.

The High Energy Density Laboratory Plasma (*HEDLP*) Program comprises the study of ionized matter at extremely high density and temperature, including both matter at order megabar pressures, and warm dense plasmas at somewhat reduced pressures. During the period under consideration the balance of the program has shifted largely toward discovery driven science.

FINDINGS

- Awards in both programs are made considering both numerical rankings and reviewer commentary, as well as programmatic priorities. Thorough justification for award recommendations has been maintained within the office.

EPR

- One solicitation for proposals was issued in EPR during the period under review.

- The review of submitted proposals consisted of a standard mail-in peer review process utilizing both numerical ratings and textual comments.

- Anonymous and redacted copies of the reviews were provided to all PIs after the outcome of the solicitation was finalized.

- For projects not being renewed, closeout funding was provided.

- Subsequent to the expiration of the issued awards resulting for this solicitation, two one-year extensions were used to continue funding of the selected projects. The reason given was that the program elements were to be redistributed under an updated FES organizational structure, and thus it made sense to defer a new solicitation until the reorganization was approved. The COV understood the rationale for such a procedure, yet is concerned about the long duration between solicitations.

HEDLP

- HEDLP made good progress toward its goal of issuing solicitations on a yearly basis, with the intent of awarding grants for three-year periods.

- Because all current activities are fully funded, existing activities in HEDLP are protected from yearly contractions in the program budget.

- The panel review process appears very effective and mitigates potential deficiencies in having isolated mail-in reviews.

RECOMMENDATIONS

- Regular solicitations should continue in order to allow new projects and ideas to compete for funding in these programs. Within the new FES structure, the projects formerly in EPR would benefit from new competitive FOAs, which would both strengthen existing projects and bring in new ideas. (This recommendation is duplicated under Section V.D, E.)

- The virtual panel review mechanism employed in HEDLP should be considered for use in evaluating proposals under other FES programs.

E. Breadth, Depth, and Quality of Program Portfolio

FINDINGS

EPR

- The breadth of the EPR program has been excellent, resulting in EPR research projects being reassigned in the new FES structure into Foundations (LTX, Pegasus, HBT-EP), Long Pulse (HSX, CTH, theory support), as well as Discovery Science (SSX, HIT-SI, Caltech, and other non-stellarator/non-tokamak confinement research). The EPR community is unique in its representation in three of the new FES categories.

- We are concerned that, due to the rather long period of time that has elapsed since the last solicitation in this area, the program has suffered by not incorporating new ideas and currently relevant topics.

- Since the Program no longer exists in the form that was reviewed during this COV, thought should be given on how effectively it is continuing its mission within the new management framework.

HEDLP

- Significant changes have occurred in the HEDLP program composition since the previous COV, partly in response to serious budget pressures. Using both the output of the 2009 ReNeW process, and the makeup of proposals that were submitted to the recent solicitations in HEDLP, the program has been significantly rebalanced in proportion to the needs of the research community.

- Currently around 50 active projects are supported at universities and labs. There is good utilization of several world-class facilities, including MEC, NIF, Z and Omega.

- A deliberate refocusing of the program onto the MEC instrument occurred during the period under consideration, with cuts announced in other parts of the program. This appears to have been done in a thoughtful way, and the reasons for the programmatic decisions were communicated to the research community in an open and candid manner. The premier facilities besides MEC remain productive, and represent a good opportunity for program expansion, in the event additional HEDLP funding becomes available.

- A number of mid-scale user facilities have declined in scientific productivity in the past several years, due to reduced investment in facilities. Re-investment in these facilities would have a positive impact on the quality of scientific research performed, and provide critical needs for research and workforce training.

RECOMMENDATIONS

- Within the new FES structure, the projects formerly in EPR would benefit from new competitive FOAs, which would both strengthen existing projects and bring in new ideas. (This recommendation is duplicated under Section V.B, E.)

- Organize a HEDLP community workshop on how best to couple theory and simulation support for shot time on MEC.

- Solicit community input on how best to utilize the portfolio of HEDLP user facilities, should additional funds become available. Special attention should be given to the status of mid-scale facilities and needed investment.

Program in Theory/Computation

A. Scope of program area

The Theory and Computation Program manages 57 grants (~$25M/year) and 8 SciDAC programs (~$8M/year; 5 solely funded by FES and 3 jointly-funded with ASCR).

FINDINGS

- Theory solicitations have been made each year during the period 2010 to 2013.
  - 117 proposals were reviewed (63 new/54 renewals)
  - 57 awarded (9 new/48 renewals)
  - 60 declined (54 new/6 renewals)
- SciDAC solicitations were made in 2010 and 2011 (partnership w/ASCR)
  - 23 proposals were reviewed (18 new/5 renewals)
  - 7 awarded (3 new/4 renewals – 2 (new) partnership with ASCR, 5 solely funded by FES)
  - 16 declined (15 new/1 renewals)
- Review criteria appear to be consistently and appropriately applied to balance between programmatic priorities and long-term continuity of research projects. A sound review process is maintained by recognizing "outlier" reviews, both low and high. Notes on both successful proposals and the highest-ranked unsuccessful proposals are retained.

- The Theory program tends to have higher renewal vs. new approvals than other FES programs.
- However, the renewal programs are of very high quality, which is reflected in the reviewer ratings.

RECOMMENDATION

- If in-person panel reviews are impractical, strongly encourage the use of virtual panels, including input from applicants during review process

F. National and International Standing

FINDINGS

US computational work in fusion science continues to be recognized as world class:

- There is continued strong international requests for use of US codes.
- This excellence is recognized by US researchers winning international prizes, such as the Alfven Prize and the *Nuclear Fusion* journal prize (twice).
- US theorists give the majority of plenary presentations at international fusion conferences.
- International organizations model their programs after SciDAC.

RECOMMENDATIONS

- Encourage the use of open-source codes and open proxy applications in FES-sponsored computational activity.

Program on General Plasma Science

C. Solicitation, Review and Documentation

NSF/DOE Partnership

Proposals in this research area were solicited in an annual announcement. The announcement was well written and described opportunities in all areas of general plasma science. Reviews were carried out jointly with the NSF. Three to four reviews were obtained for each proposal. Proposals were selected at random for review by the Committee of Visitors, including proposals that received awards and proposals that were declined. In all cases, the proposal summary review reflected the content of the reviewers' comments. The highest rated proposals were excellent and were funded although the low success rate, about 15%, is a concern since many excellent proposals were not funded. The declined reviews received a form letter of declination but were also offered a copy of the comments of the reviewers after eliminating any information that would identify the reviewer. The process was conducted very well and in a fair, consistent and transparent manner.

Laboratory General Plasma Science

In the time period of 2010-2013, there was one solicitation (Lab 12-01) for research on general plasma science at the National Laboratories. The proposals all received three to four reviews. Each proposal received a summary numerical score based on the reviewer ratings. The highest rated proposals were excellent and were funded. Declined proposals received a form letter and the proposers had access to reviewer comments. The Committee reviewed two proposals, one accepted and one declined. The procedures for these two proposals were done correctly. The entire process was very well done and there were no issues. However, there have been no new solicitations since 2012 and a new solicitation seems very advisable.

Plasma Science Centers

There are two Plasma Science Centers within the General Plasma Science portfolio, the Center for Predictive Control of Plasma Kinetics (University of Michigan lead) and the Center for Momentum Transport and Flow Organization (University of California---San Diego, lead). The solicitation for these Centers was in 2009 and thus predates the time period covered by this Committee. We can comment that it is important for DOE FES to issue a new solicitation for Plasma Science Centers with allowance for Centers of both smaller size and intermediate size.

RECOMMENDATION

- Issue new solicitations for National Laboratory General Plasma Science and for Plasma Science Centers.

Madison Symmetric Torus

The Madison Symmetric Torus is a major basic research facility conducting important and unique research. It occupies a unique position within the DOE FES portfolio, being larger than other general plasma science experiments but much smaller than the major facilities such as DIII-D and NSTX. There is no existing long term plan for MST, either in terms of a non-competing or competing renewal. DOE FES should provide a plan for a review and a decision on the future of this important research program.

RECOMMENDATIONS

- DOE FES should provide a plan for a review and a decision on the future of the MST research program.

- A path to continue the Plasma Centers for a longer term should be established following peer review, in order to take advantage of the mature capabilities of the Centers once they have been established.

Program on Enabling Technology

A. Scope of Program Area

The Enabling Technology program includes R&D activities related to development of hardware and materials relevant to existing fusion experiments, ITER, and future facilities. Development areas include RF heating, fueling, superconducting magnets, fusion systems studies, structural materials, plasma-facing components, breeding blankets, neutron degradation, and safety analysis. While the new FES budget structure specifically calls out Materials and Fusion Nuclear Science under the "Burning Plasma Science: Long Pulse" category, the rest of the enabling technology program is expected to be carried forward under the "Advanced Tokamak" sub-category under "Burning Plasma Science: Foundations."

C. Solicitation, Review, and Documentation

During the review period one FOA was issued that covered the areas of Plasma-facing Materials, Structural Materials, and Blankets in 2011. The solicitation was quite broadly defined encompassing the entirety of the fusion materials area. A very large number of pre-proposals (92) were submitted and only four were rejected for being non-responsive. Many actual proposals (79) were submitted indicating wide spread interest in the solicitation. A large review panel (24 members) was assembled and each proposal was assigned a numerical score by three reviewers and the proposals were ranked according to average numerical score. Eight of the proposals were funded (all at the full funding request). All of the top four ranked proposals were funded. The next four were selected from a large number of proposals with high average scores, with a programmatic rationale for each proposal selected. This process appears to have been extremely well run and responsive to the suggestions of the 2009 COV.

D. Monitoring Active Awards

- In response to the previous COV recommendations the program managers have initiated, and very nearly completed, a comprehensive review of the entire portfolio of continuing projects within the Enabling Technologies activity. For each program area a review panel of experts was formed, with each panel generating a status report. Copies of the reports were made available to the COV review panel. The information in the reviews has been taken into account when making continuing funding decisions. One final review is pending. The processes followed during this review were exemplary.

- These ongoing proposals are being monitored directly with regular conference calls between the program manager and the PIs. No written reports were available.

- Since the funding of proposals from the materials solicitation, OFES has decided to make a change in direction in the materials research area. All of the PIs have been informed that there will not be a renewal of the proposals. When asked about the processes being followed for the closeout of these proposals, no plan for a review was proffered. When asked what the follow on process for funding activities in the materials area would be, it was that stated no decision had been made.

RECOMMENDATION

- Make sure future plans are well formulated and communicated before canceling programs.

E. Breadth and Depth of Program Portfolio

- Most of the Enabling Technology program consists of continuing research and, as a result, the overall breadth and depth of the program is not changed much by the new funding decisions. However, during the review period the breadth and depth of the Enabling Technology portfolio has temporarily increased due to the expanded activities in materials research. Some of the researchers were new to fusion materials research, but are highly respected scientists in the materials research community. It is unfortunate to have enticed these researchers into the field for such an abbreviated period and the abrupt end to the funding stream in basic materials research is likely to dissuade further interest from the materials research community. No review of the ongoing activities is planned, nor is there a clearly articulated plan for future activities in this area.

- The loss of community leadership that came with the retirement of the Director of the Virtual Laboratory for Technology has concentrated coordination of the VLT activities within OFES.

RECOMMENDATION

- Revise VLT structure to separate program management from project leadership, and move leadership of the program to outside of FES.