

Committee of Visitors

Tokamak Research and Enabling Technologies

Final Report
May 2006

I Introduction

This report summarizes the findings and recommendations of the third Committee of Visitors (COV) whose charge was to review the manner in which the Office of Fusion Energy Science (OFES) manages certain programs under its charter. The specific programs reviewed by this COV involve Tokamak Research and Enabling Technologies. The first COV completed its work two years ago (Theory and Computation), and the second COV last year (Confinement Innovation and Basic Plasma Sciences). The present committee used the previous two years' reports as models for their task, and this COV would like to acknowledge the efforts of those committees and their chairmen (Dr. Bill Nevins, and Prof. Jeff Freiberg).

This report is organized as follows. The second section sets the background for the report by describing the charge to the Committee, the third section discusses the actual program elements reviewed, the fourth section describes the composition of the Committee, and the fifth describes the process used to arrive at the conclusions. The sixth section provides the COV observations and recommendations, and section seven has the committees overall conclusion.

II The Background and Charge to the Committee

The request to establish a series of Committee of Visitors (COVs) was made by Dr. Ray Orbach, Director of the Office of Science, in August 2003. He transmitted his request to Prof. Richard Hazeltine, Chairman of the Fusion Energy Sciences Advisory Committee (FESAC). This COV is the third of three COVs requested by Dr. Orbach, thus this report fulfills Dr. Orbach's original charge.

The charge to the committee is given in Appendix A. Basically the Committee was asked to review the way that OFES manages its program elements with respect to:

- The complete review process involved in selecting proposals for awards
- The manner in which progress is monitored
- The connection between proposal awards and the overall program goals

The Committee is also asked to comment on the following:

- The breadth, quality, and portfolio balance
- The national and international standing of the portfolio elements

III Program Elements Reviewed by this COV

The present COV was charged with reviewing program elements associated with Tokamak research and Enabling Technologies. The specific program elements that fall in these categories are:

- Enabling Research & Development
 - Plasma Technologies
 - Advanced Design
 - Materials Research
 - ITER Support
- Alcator C-Mod
- Diagnostics
- DIII-D
- NSTX
- MST

These elements represent annual funding of about \$148M. The funding for each element is \$55M for DIII-D, and \$34M for NSTX, \$27M for Enabling Technologies, \$22M for C-MOD, \$6.3M for MST, and \$3.7M for Diagnostics.

NCSX was not reviewed by this COV, nor previous ones. It is the most recently funded large project. Reviewing it would be useful from that perspective as well as understanding the process of monitoring construction projects as the fusion program enters the ITER construction phase.

IV The Committee

The Committee membership was chosen by Dr. Richard Hazeltine and Dr. Kathryn McCarthy (who served as Chair). The committee was made up of eight members (including the Chair) from universities, laboratories, and industry. The original committee membership was nine members, however one member was unable to participate on the dates selected, and it was not possible to find an alternate. All members have had considerable experience writing and reviewing technical proposals. Some members had research interests that were directly involved in parts of the programs being reviewed. Overall, the Committee was well-balanced.

Name	Institution
Dr. Kathryn McCarthy (Chair)	Idaho National Laboratory
Dr. Bruce Lipschultz	Massachusetts Institute of Technology
Dr. David Rasmussen	Oak Ridge National Laboratory
Dr. Jeff Candy	General Atomics
Dr. Boris Breizman	University of Texas
Dr. David Brower	University of California, Los Angeles
Dr. David Gates	Princeton Plasma Physics Laboratory
Dr. Andrew Ware	University of Montana

V The Process

The process by which the COV arrived at its findings included a series of conference calls between the COV Chair and OFES staff, review of written summaries of the processes used by OFES to review and select proposals, review of the results of earlier COVs, and a two-day meeting at OFES headquarters on February 13-14, 2006 (see agenda in Appendix B).

The presentations given by OFES staff provided the committee with an overview of the processes used by the OFES staff, and gave the COV an opportunity to ask questions.

After the presentations by OFES staff, the COV split into three groups to review proposal traffic. The groups were formed such that there were no conflict of interest problems. One group reviewed Enabling Technology and MST, a second group reviewed Diagnostics and C-MOD, and the third group reviewed NSTX and DIII-D. The proposals, reviewer comments, rebuttals and other documentation are kept in individual proposal "Folders" maintained by the OFES program managers. These Folders were provided to the groups and were the primary basis of their review. The process used to review each of the program elements is described below.

Enabling Technology

The group received a large number of proposal Folders. A random sample of these was taken and examined for content, and later, organization and completeness. Each of the three COV members in this group then discussed the notable features of their subset of Folders with the other two members of this group.

MST

There was a comparatively small amount of MST proposal data, so no subsampling was needed. Each of the members of this group read through the information provided.

DIII-D

The group briefly examined the 5-year program plan for the DIII-D project focusing on the reports of the reviewers. A sampling of the proposals from the DIII-D collaborators was also examined.

NSTX

The group examined the 5-year program plan, focusing on the reports of the reviewers. For the university and industry collaborators, the group members read the summary of the review and decision process from the program manager and examined a sampling of the proposals, both for the physics collaborators and the hardware collaborators. The committee focused on the highest rated proposals that did not get funding, to check for decision consistency and justification.

Diagnostics

The group reviewed the summary information in the folders, and focused on the proposals that were not continued in the last review round, as well as a new proposal that had been submitted but hadn't been funded. A sampling of successful proposals and the associated reviews were also reviewed. Reviews were read, and proposals were skimmed. Questions were addressed to the OFES program manager.

Alcator C-MOD

The group read all reviews and skimmed the proposal. Questions were addressed to the OFES program manager.

On the second day, each group provided their observations to the entire COV. Report findings and observations were agreed upon, and were reported to OFES staff. A draft report was subsequently prepared and approved through a series of e-mails.

VI Findings

General Observations

This COV agreed with the recommendations of earlier COVs, and in this report, rather than repeating those recommendations, the Committee tried to focus on new observations and recommendations.

The DOE program managers were very helpful in providing the requested information and answering questions. The proposal folders were all well organized and were generally complete (this was a result of an earlier COV recommendations). This provided significant assistance to this COV. Overall, there was much evidence that the DOE program managers have already implemented many of the recommendations of earlier COVs. Overall, it is clear that DOE is working to improve the programs and processes.

The COV observed that different review/solicitation/recommendation for funding processes are used in different parts of these programs. For example, DIII-D and C-MOD do not have formal competitive review for university and industry collaborators, while the NSTX and Diagnostics programs do. Enabling Technologies uses a mix of competitive and non-competitive review. In some cases the quality of the process relies on the expertise of the DOE program managers rather than on the process itself. The mix

of competitive and non-competitive review exists primarily for historical reasons. Discussions with DOE program managers indicated that within DOE there is not an agreed set of metrics for deciding what type of review process to implement, but overall, the trend is towards competitive processes as recommended by earlier FESAC panels.

There is a general announcement (solicitation) every year, but it appears to be used only to accommodate proposals that should have been submitted to other calls, but for various reasons were not (for example, they may have missed a deadline). Discussions with OFES staff indicated that they don't feel there is adequate budget to warrant funding proposals submitted to the general call.

As the groups reviewed the reviews and proposals, they found that not all folders included documentation on why decisions were made. Later discussions with OFES program managers indicated that this is being done now as recommended by earlier COVs, but wasn't done for earlier reviews. An additional observation was that reviewers' suggestions for improving proposals are not tracked.

The COV agreed that the quality of the reviews, proposals, and documentation was generally excellent for the larger and competitively reviewed proposals. The COV observed that the quality of the grant proposals and reviews was more varied for smaller, noncompetitive proposals.

Committee Response to Questions in Charge

There were a series of specific questions that the charge asked each COV to consider. The questions and the COV response are shown below.

Consistency between award decisions and the Office of Fusion Energy Science's programs and goals

- Based on the sample examined by the panel, proposals that were funded were focused on OFES programs and goals
- Proposals that are funded are generally strong in both technical merit and programmatic relevance

Monitoring of active programs and projects

- The oversight of the major fusion experiments (DIII-D, C-MOD, NSTX, MST) is comprehensive and appropriate (progress reports from collaborators were not always included in the folders, however the COV understands that this was remedied in later review processes)
- In other parts of the program, the level of oversight is not always clearly documented in the folders (the COV understands that this was remedied in later review processes)

How has the award process affected the breadth, quality, and balance of portfolio items?

- The panel felt it had no basis to judge whether a different award process would result in a better portfolio
- Although different award processes are used in the programs, the overall impression is that the breadth, quality, and balance of portfolio items is good

COV Recommendations

A first recommendation is that **the content of the folders should be complete and consistent across the programs**. This is similar to earlier COV recommendations, but this COV felt it was important enough to repeat. It is clear that DOE is working in this direction, and folders documenting more recent actions are generally more complete than those documenting earlier actions.

There were several instances where the COV felt that **statistics would have been helpful in the evaluation process, as well as to DOE programs managers**. For example, the fraction of projects that are renewed, funding awarded versus funding requested, the correlation between ratings and funding, the duration of contracts that do not undergo competitive review, and demographics for awards. This should not be considered an exhaustive list, but rather examples of statistics that would be useful.

The COV recommends that **the review sheet used for program renewals should explicitly include a review of progress**. The reviewer should have a copy of the original proposal as well as the associated progress report.

Some form of the proposal score should be communicated to the PI in addition to reviewer comments. It may be better to communicate the quartile in which the proposal fell rather than the raw score to compensate for variability in scoring and OFES management actions.

The reviewer pool size should be increased. This is important both to spread the work around amongst a larger number of reviewers, and to increase the overall quality of the reviews. The COV recognizes that recruiting reviewers is very difficult as potential reviewers are very busy. The COV recommends using more international reviewers, and using reviewers outside fusion (*but only where appropriate*).

During our discussions with OFES staff, the COV learned that Junior faculty awards are eligible only to those working in basic plasma science. Although the Junior Faculty Award program was not within the responsibility of this COV, the COV agreed that **the Junior Faculty Award program should be eligible to those outside of basic plasma science**.

The recommendation above was part of a larger discussion as to whether there are enough opportunities being made available to new/junior researchers, and whether there

is enough flexibility in the fusion program to be able to quickly incorporate discoveries and support new ideas. The COV observed that NSTX competitively reviews university and industry proposals every three years, potentially providing an opportunity for new researchers. DIII-D doesn't have a formal re-compete process, but newcomers have an opportunity to get in through DIII-D management. While DOE does request new proposals via a general announcement (solicitation) every year, as mentioned earlier, this has never been used as a means to fund new/junior researchers. The COV discussed what (if anything) should be done formally in a flat-budget environment to bring in new researchers. This COV did not come to a conclusion on this topic, and felt that a focus on this issue in the future is needed.

Finally, there were two issues that the COV agreed warranted attention. The first is providing opportunities to young/new PIs. The COV recommends that DOE consider ways to provide new opportunities in various funding environments (flat, increasing, decreasing). The second is the balance between competitive versus noncompetitive processes, especially for the collaborations on the large machines. The process is not uniform across the various parts of the fusion program. The COV recommends that DOE look into this issue, and determine whether it warrants further attention.

VII Conclusions

Based on this COV's review of the proposal folders and discussions with OFES staff, it is the opinion of this COV that the OFES supports a high-quality research program in Tokamak Research and Enabling Technologies. The OFES staff is working diligently to improve processes, and thus the quality of the overall program.

Appendix A - Charge Letter

Professor Richard D. Hazeltine,
Chair Fusion Energy Sciences Advisory Committee
The University of Texas at Austin
Institute for Fusion Studies
1 University Station, C 1500
Austin, TX 78712-0262

Dear Professor Hazeltine:

This letter provides a charge to establish a Committee of Visitors (COV) through which the Fusion Energy Sciences Advisory Committee can assess matters pertaining to program decisions on a regular basis. It is our desire to have the COVs review program management every three to four years, on a rotating basis, for the following elements of the Fusion Energy Sciences program:

- Theory and computation
- Confinement innovation and basic plasma science
- Tokamak research and enabling technologies

Specifically, the committee is asked to assess, for the National Laboratory, University and private industrial participants, the efficiency and quality of the processes used to:

- Solicit, review, recommend and document proposal actions
- Establish the consistency between award decisions and the Office of Fusion Energy Sciences' programs and goals
- Monitor active projects and programs

The committee is asked to comment on how the award process has affected:

- The breadth, quality and balance of portfolio elements
- The national and international standing of the portfolio elements

The first area that I would like you to address is the theory and computation program. You should work with the Associate Director for the Office of Fusion Energy Sciences to establish the processes and procedures for the first COV.

I believe that the COV will help us maintain a high standard of scientific research. I look forward to your feedback on how the Office of Fusion Energy Sciences is making program decisions, and how that decision process can be improved.

I would like to have a final report from you by late spring of 2004.

Sincerely,

Raymond L. Orbach Director

Appendix B – Agenda for February 13-14, 2006

Agenda COV 2006

Feb 13, 2006 G207

9-9:15	Panel Discussion	COV
9:15-9:30	Welcome	Davies
9:30-9:50	Diagnostics	Markevich
9:50-10:10	NSTX	Eckstrand
10:10-10:30	D3D	Oktay
10:30-10:45	Break	
10:45-11	CMOD	Rosenberg/Dagazian
11-11:10	MST	Rosenberg
11:10-11:30	Technology	Nardella
11:30-12:30	Lunch	DOE Cafeteria (or other)
12:30-4:30	Reading Reviews (G207)	COV Panel
12:30-4:30	Reading Reviews (G258)	COV Panel
12:30-4:30	Reading Reviews (Res. Dir Office)	COV Panel
12:30-4:30	Reading Reviews (BER Conf Room)	COV Panel
4:30-5	COV Discussion	COV Panel
5	Issues for DOE	COV Panel and DOE

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9:00	DOE Response (if needed)	COV and DOE
9:30-12	Report Creation	COV
12-1	Lunch	DOE Cafeteria (or other)
1-3	Report Creation (cont)	COV
3-4	Review Results Presented to DOE	COV and DOE
4-5	Report Creation Finished	COV