Scientific/Technical Reviews of the Materials Research, Fusion Nuclear Science, and Enabling Research and Development (R&D) Programs

**Status and Plans**

The following attachment provides information pertaining to the peer-based reviews of the scientific and technical quality and progress of R&D activities in the Materials Research, Fusion Nuclear Science, and Enabling R&D programs funded by the Fusion Energy Sciences (FES) program and integrated within the framework of the Virtual Laboratory for Technology (VLT):

Attachment 1: Purpose and Background

Attachment 2: Review Guidelines

Attachment 3: Program Input Guidelines

Attachment 1

**Purpose and Background for the Scientific/Technical Review**

**of the Materials Research, Fusion Nuclear Science, and Enabling Research and Development (R&D) programs within the overall Fusion Energy Sciences (FES) program**

**Purpose**

The foundational mission of the FES program is to “*Expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source. This is accomplished through the study of plasma, the fourth state of matter, and how it interacts with its surroundings.*”

As part of this mission, the FES Materials Research, Fusion Nuclear Science, and Enabling R&D programs seek to provide the scientific basis required to create and sustain a controlled nuclear fusion reaction for long pulse operation from materials science and engineering perspectives. Management of these programs includes stewardship of a large, diverse set of institutions spanning the national laboratory, university, and private industry complex, as well as an equally diverse set of goals aimed at addressing grand challenges and key hurdles for developing fusion energy.

As part of a Committee of Visitors (COV) review of the FES program that took place in August 2009, several recommendations were made with regard to improving the overall management of the then Enabling Technologies program elements, which now comprise the Materials Research, Fusion Nuclear Science, and Enabling R&D subprograms under the current budget structure. This document is aimed at addressing one of the specific recommendation, namely:

* Peer review all of these activities on a regular basis with a 3 to 5 year time scale and document the results so they are available to future COVs.

This document therefore provides guidelines for conducting peer reviews of the scientific and technical quality and progress of R&D activities in these program elements consistent with funding provided by FES. FES program managers will then summarize the peer-based reviews and make them available for future COV usage.

**Background**

The January 1996 Fusion Energy Advisory Committee report recommended that “all elements of the fusion program should be peer reviewed and held to the highest standards of excellence.”

The August 1996 *Strategic Plan for the Restructured U.S. Fusion Energy Sciences Program* states that “the peer review process will be used as the primary mechanism for evaluating proposals, assessing progress and quality of work, and for initiating and terminating facilities, projects, research programs, and groups.”

The March 1999 US General Accounting Office report*, Federal Research: Peer Review Practices at Federal Science Agencies Vary* , concluded that “DOE has no formal definition of peer review, but practices peer review as merit review with peer evaluation – a formal, competent, and objective evaluation process using specific criteria and the review and advice of qualified peers. Peers must be technically competent in the scientific or technical field under review and must be free from conflict of interest. Peers may come from any source, including industry, academia, private and non-governmental institutions, governmental agencies, and their associated laboratories.”

The April 1999 Virtual Laboratory for Technology (VLT) Management Plan states that “A scientific review system will be implemented wherein all program elements will be peer reviewed on a periodic basis. The approach will be to utilize a panel of independent experts to evaluate individual program areas against standard criteria. The program elements being reviewed would involve all of the institutions working in the area so that conclusions reached would cover an entire Enabling Technologies area.”

The above provides the basis for implementing a scientific/technical review system supplementing the established review processes that focus on matters of policy, programmatic strategies, and cost/schedule performance against work plan baselines.

It is intended that this scientific/technical review system will help the Materials Research, Fusion Nuclear Science, and Enabling R&D programs achieve a stronger scientific research orientation with high levels of R&D excellence, as well as aid FES in obtaining the greatest possible return on investment of Federal R&D funds.

Attachment 2

**Review Guidelines for the Scientific/Technical Review**

**of the Materials Research, Fusion Nuclear Science, and Enabling R&D Programs**

**Scope**

This review process is intended to provide an evaluation of scientific/technical quality and progress of the Materials Research, Fusion Nuclear Science, and Enabling R&D programs. The reviews will be focused on the details of research performed in individual programs over the period of the last four fiscal years, spanning FY 2014 to FY 2017. Included in the reviews, to a lesser degree, will be plans for future work that emphasize anticipated thrust areas and research directions as they are related to and build off of the performance period in question.

**Not included** in the scope are matters of policy, programmatic strategies, and overall prioritization as determined by FES, which are the subject of other review processes.

# **Approach**

Scientific/technical reviews of the Materials Research, Fusion Nuclear Science, and Enabling R&D programs will be based on independent review by peers according to the following definitions:

A "program element" is a reasonably coherent set of activities with similar technical objectives.

A “base program” is a university, private industry, or laboratory program that is participating in the review process as a currently ongoing research activity funded by the FES Materials Research, Fusion Nuclear Science, and Enabling R&D programs.

A “peer” is a person with sufficient technical knowledge and experience to ensure a competent review based on their ability to provide balanced and reasonable technical judgments about the subject matter. To the extent possible, people selected for a peer review panel should have been actively engaged in R&D work related to the subject matter.

All reviewers must be “independent” in that they cannot have a conflict of interest that would prevent them from providing a fair and impartial evaluation. A conflict of interest would arise if a potential reviewer has at least one of the following situations: (1) is funded to participate in the program element under review, including serving as a funded consultant, (2) has a financial interest that would significantly diminish impartiality, or (3) would gain an unfair advantage in a future competitive situation.

A proposed schedule for reviews will be developed by FES and distributed via the VLT.

At least two months advance notice will be provided to institutions affected by a review.

# **Review Procedure**

The appropriate FES program manager will appoint members of a peer review panel and issue a charge to panel members.

Panels will consist of at least three peers.

Charge letters to panel members will provide the general evaluation criteria discussed below. Additional guidelines and instructions unique to a particular review may also be provided.

FES will provide the review panel with appropriate preparatory briefing documents one month prior to the review meeting in accordance with input from the programs affected by the review. See Attachment 3 for more detail.

An individual review panel is expected to carry out its review over a period of 1-2 continuous days, depending on the size and complexity of the program element being reviewed.

In accordance with Federal Advisory Committee Act rules, panel members will not attempt to reach consensus views, although they are free to discuss among themselves any matters for the purposes of information exchange and clarification.

Each panel member will provide to the appropriate FES program manager, within a month after the review meeting, an individual report that evaluates the reviewed programs relative to the major categories of the general evaluation criteria listed below. The evaluation reports will not be distributed beyond FES personnel without permission of the author.

Based on the evaluation reports by panel members, the appropriate FES program manager will then prepare a summary of the evaluation reports, which will be distributed to the panel members. The summary of evaluation reports will identify specific issues, concerns, and weaknesses raised by panel members, as well as suggestions for improvements that would strengthen program activities.

Following the review, FES will work to develop actions plans, if necessary, which address the issues and concerns raised by panel members, that identify opportunities for program activity improvement, and that specify steps to implement corrective actions.

**General Evaluation Criteria**

Each panel will conduct their scientific/technical review of R&D activity quality and progress using the following general evaluation criteria:

1. **Scientific and/or Technical Merit of the Project**

* What was the scientific/technical merit of the program?
* What were the scientific/technical goals of the program? Are they sufficiently ambitious and has meaningful progress been made towards those goals during the performance period?
* How did the program compare with other research in its field in terms of scientific/technical merit, originality, and uniqueness?

1. **Appropriateness of the Proposed Method or Approach**

* How logical and feasible were the research approaches?
* Were the conceptual framework, methods, and analyses well justified, adequately developed, and comprehensive enough to produce scientifically valid conclusions?
* How did the program approach potential problems, mitigate risks, and consider alternative strategies?

1. **Competency of Personnel and Adequacy of Resources**

* How well qualified were the personnel to carry out the research?
* Were the resources (personnel, facilities, and budget) adequate for performing the research scope?
* Were the program leadership and resource management effective and efficient?

1. **Relevance and Impact**

* How did the program contribute to the mission of the FES program during the performance period?
* How has the program impacted the field of fusion science and technology during the performance period?
* Has the program adequately disseminated scientific results through publications in peer-reviewed journals, meetings and conference presentations, workshops, or other appropriate means?
* Are there additional areas of impact that should be considered when evaluating this program (e.g. educational benefits, contributions to other scientific fields, leadership activities, etc.)?

**Terminology for Scoring/Grading**

In order to compare evaluation results from the reviews of different program elements, standardized terminology should be used by review panel members. Provided below is suggested terminology that is drawn from several sources related to reviews of grant proposals and to annual evaluations of DOE laboratory performance. While numerical scoring/grading is not required, suggestions are included for completeness.

9-10 = Excellent. Among the best of R&D programs; truly outstanding; quality and progress is in the top 10% of comparable R&D programs

7-8 = Very Good. Very strong R&D program; quality and progress is in the upper third of comparable R&D programs; no notable deficiencies  
  
5-6 = Good. Sound R&D program; quality and progress is in the middle third of comparable R&D programs; any notable deficiencies are minor with clear pathways to resolution  
  
3-4 = Marginal. Much of R&D program is good, but there are notable deficiencies that cannot be considered minor and may not be easily resolvable; quality and progress is in the bottom third of comparable R&D programs  
  
1-2 = Unsatisfactory. R&D program has significant deficiencies that are not clearly resolvable; quality and progress is clearly lacking when measured against comparable R&D programs

Attachment 3

**Programmatic Input Guidelines for the Scientific/Technical Review**

**of the Materials Research, Fusion Nuclear Science, and Enabling R&D Programs**

**Overview**

In order for the review process to proceed as intended, a meaningful and consistent amount of input must be obtained from the programs under review. This document provides guidance to the programs with regards to what type of information will need to be provided during the review process.

There will be two primary mechanisms for information transfer, a summary report and an oral presentation to the review panel. Detailed information and requirements for these two items are given below.

**Summary Report Guidance**

All programs must provide a written report encompassing all activities pursued over the assessment period spanning FY 2014 to FY 2017 (October 2013 through September 2017). Summary reports will be due to the appropriate program manager one month prior to the in-person panel review meeting. All reports should include the following sections and information.

COVER PAGE: The cover page should include the following information: program title; name of institution; name of program director/principal investigator, and name of FES program manager.

ABSTRACT OR EXECUTIVE SUMMARY: A one page, self-contained program summary written in terms understandable by an educated layperson. The project summary must not exceed one page when printed using standard 8.5” by 11” paper with 1” margins (top, bottom, left, and right) with font not smaller than 11 point.

BUDGET SUMMARY & JUSTIFICATION: This information is used to assess the scale and quality of usage of FES provided budgetary resources available to the program during the assessment period. This section should provide a high-level overview and justification of the base programs typical annual budget in reference to objectives, tasks, and accomplishments described in the program narrative. Exact organization is not prescribed, but should include a general breakdown into important items such as personnel support, materials and supplies, facility/rental fees, travel, indirect costs, etc. Programs should also list any major equipment purchases made during the performance period.

PROGRAM NARRATIVE: The Program Narrative should summarize details of the program over the performance period. The specific content of the narrative is not prescribed, but should instead focus on providing sufficient information to judge the progress of the program with respect to the review criteria described in Attachment 2. It should be written concisely and convey all information at a relatively high level. Where possible this report should not duplicate information available in publications, and should instead cite reference as appropriate. Additionally, programs should expect that reviewers are familiar with challenges in the field and the report should only contain enough introductory material as in necessary to justify the tasks and objectives presented in the narrative. The bulk of the narrative should focus on providing a clear statement of the specific tasks, themes, and objectives of the program, and succinctly highlight accomplishments made under the performance period with regards to these items. A timeline for the major activities and accomplishments of the program over the performance period should also be included.

The project narrative MUST NOT EXCEED 10 PAGES IN LENGHT, including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5” by 11” paper with 1 inch margins (top, bottom, left, and right). The font must not be smaller than 11 point.

BIBLIOGRAPHY & REFERENCES CITED: Provide a bibliography of any references cited in the Program Narrative. Programs should follow scholarly practices in providing citations for source materials relied upon when preparing the narrative. This section should be seen as an appendix to your project narrative and will not count against the project narrative page limitation.

PRODUCTS: List any products resulting from the program during the performance period. Examples of products include: publications, conference papers and presentations; student theses and dissertations, website(s) or other Internet site(s); technologies or techniques; inventions, patent applications, and/or licenses; etc.

KEY PERSONNEL & BIOGRAPHICAL INFORMAITON: Provide brief biographical sketches for the project director/principal investigator (PD/PI) and each senior or key person. The biographical information (curriculum vitae) for each person must not exceed 2 pages when printed on 8.5” by 11” paper with 1 inch margins (top, bottom, left, and right) with font not smaller than 11 point.

EQUIPMENT, FACILITIES & OTHER RESOURCES: This information is used to assess the scale and quality of non-budgetary resources available to the program. At a high level, identify the equipment, facilities, and other resources utilized by the program during the performance period. If appropriate, indicate capabilities, location, and extent of availability to the base program. Describe only those resources that were directly applicable to the research performed.

**Oral Presentation Guidance**

In addition to the written report described above, all program will have the opportunity to provide an oral overview of their program during an in-person panel review meeting. Each program will be given a time slot of ONE HOUR for their presentation, including questions and discussion. It is recommended that all PI’s aim for a time breakdown of 2/3 presentation to 1/3 question and discussion. To ensure a reasonably sized and equitable review meeting, each program can bring up a MAXIMUM OF TWO REPRESENTATIVES to the in-person meeting. Again, the specific content of the presentation is not prescribed to allow programs maximum flexibility, but the presentation should be focus on providing a high-level overview of the program consistent both with the review criteria and summary report described above. Additional information on time, location, and scheduling of this panel review will be forthcoming from the appropriate program manager.

**Additional Information for Large Programs (those programs exceeding $1.5 million in annual budget)**

In an attempt to make the review process as equitable as possible, programs which receive funding in excess of $1.5 million annual will be given expanded parameters for their project narrative length and presentation time. The project narrative for these programs MUST NOT EXCEED 15 PAGES IN LENGTH and will be given a time slot of ONE HOUR AND THIRTY MINUTES for their oral presentation.