
Charge to the External Review Team

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Next Step Option/ Virtual Laboratory for Technology

Presented at

**External Review of FIRE Engineering
PPPL, Princeton, NJ**

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<http://fire.pppl.gov>

FIRE

Lighting the Way to Fusion



External Review of FIRE Major Engineering Subsystems

The overall purpose of an External Review of FIRE is to have an independent technical review of the major subsystems that are critical to the success of the mission, assess the adequacy of the present approach, identify areas of concern and to offer suggestions for modifications. Due to limitations of time and resources, we plan a External Review meeting scheduled for June 5-7, 2001 at Princeton Plasma Physics Lab that will concentrate on magnets, structures, vacuum vessel, plasma -facing components, internal remote maintenance (IRM), fueling and pumping. Other subsystems such as Tritium, Neutronics and Activation, and Facilities will be done individually by mail/conference call this fiscal year, while remote handling, and ICRF heating will be done next fiscal year.

The External Review Committee includes Charles Bushnell (Chair), Saurin Majumdar (Argonne), Fred Puhn (GA), Jim Irby (MIT), Peter Mioduszewski (ORNL), Ron Parker (MIT), Aldo Pizzuto (Frascati) for the meeting at PPPL. The individual system reviewers are Scott Wilms (LANL-Tritium), Yousry Gohar (ANL-Neutronics and Activation) and John Commander (INEEL-Facilities).

Charge to the FIRE External Review Committee

June 5 Magnet Systems

1. Adequacy of the FIRE Magnet Engineering Designs to Meet Mission Requirements

- a. Are the engineering design choices that have been made appropriate for FIRE's mission and cost goals?
- b. Are the proposed structural design criteria appropriate?
- c. Are the structural and thermal margins of the baseline magnet systems adequate? Are some of the margins too conservative?
- d. Are the proposed materials choices appropriate from both the structural, neutron damage, and manufacturing points of view? Are there better materials?

2. Adequacy of the magnet R&D plans and costing methodology to meet the FIRE design requirements

- a. Is the proposed R&D adequate? If not what items should be added?
- b. Is the methodology used to develop cost estimates appropriate? Are there concerns about the magnet cost estimates?

3. Choice between Bucked and Bucked and Wedged TF System Designs

- a. Considering performance, manufacturability, and risk tradeoffs between the baseline wedged TF magnet systems and the bucked and wedged variant:
 - b.
 1. Does the appraisal of these factors by the FIRE project appear to be reasonable?
 2. Is the choice of system design that FIRE made the most appropriate?

June 6 Vacuum System, PFCs, IRH, Fueling and Pumping

4. Adequacy of the Vacuum Vessel, PFCs, IRH and Fueling and Pumping Systems

- a. Is the design, fabrication, and assembly approach for the vacuum vessel appropriate? Are the RH plans adequate for servicing in-vessel components?
- b. Has the vacuum vessel been adequately analyzed for this stage of the design, and does it have adequate design margins for both normal and disruption conditions?
- c. Does the vacuum vessel have an adequate number and size of ports for diagnostics and maintenance?
- d. Are the proposed VV R&D plans adequate?
- e. Is the vessel costing methodology reasonable?
- f. Is the choice of first wall materials appropriate?

g. Have the PFCs been adequately analyzed and do they have adequate:

1. design margins for electromagnetic loads resulting from normal operation and plasma disruptions.?

2. Erosion lifetimes.

h. Are the planned PFC design concepts flexible enough to accommodate design and material changes that operational experience may bring?

i. Are the planned PFC maintenance methods reasonable ?

j. Are the PFC R&D plans adequate?

k. Is the methodology used to develop the PFC cost estimates reasonable?

l. Is the type, number and location of fueling injection locations adequate?

m. Does the vacuum pumping system have adequate performance and operational characteristics to support FIRE's planned operation?