

A Review of the DOE Plan for U.S. Fusion Community Participation in the ITER Program

Committee to Review the U.S. ITER Science Participation Planning Process

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on behalf of the full committee

Committee Membership

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Staff

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Statement of Task

- Review the document "Planning for U.S. Fusion Community Participation in the ITER Program." Determine whether the plan provides a good initial outline for effective participation of U.S. plasma scientists in research at ITER.
- Evaluate the following required elements of the plan: (1) an agenda for U.S. research at ITER, (2) methodologies to evaluate ITER's contribution to progress toward a power source, (3) description of the anticipated relationship between the U.S. ITER research program and the overall U.S. fusion program.
- The committee will recommend next steps in the development of the plan, including: (a) appropriate elements and/or goals for the plan; (b) procedures to facilitate further development of the plan; and (c) metrics for measuring progress in establishing robust U.S. participation in the ITER research program.

Activities

- Teleconference prior to first meeting
- One meeting in Dec. 2007 to hear presentations from agencies, US ITER team, and international partners
- Evaluation of written plans and supporting documents
- Follow-up teleconferences
- NRC review process

Overview of Findings

- The DOE plan for ITER is operating and has proven effective – further evolution is expected
- The DOE plan is well-aligned with DOE goals
- The US fusion program is already well-engaged in ITER planning activities; this should continue
- *The committee's greatest concern is that the US commitment to ITER appears to be uncertain at the present time. This uncertainty threatens the US role in ITER and the future benefit of ITER to US fusion program goals and national energy goals.*

Further Findings

- US ITER research program is at least as mature as that of the other ITER participants
- A vigorous and strategically-balanced domestic program is required to ensure that participation in ITER is successful and valuable for the U.S.
- The DOE plan includes well thought-out metrics for measuring progress towards development of fusion energy as a power source.
- The DOE plan includes well thought-out metrics to measure its successful participation in the ITER project.

Recommendations I

- **The Department of Energy should take steps to seek greater U.S. funding stability for the international ITER project to ensure that the United States remains able to influence the developing ITER research program, to capitalize on research at ITER to help achieve U.S. fusion energy goals, to participate in obtaining important scientific results on burning plasmas from ITER, and to be an effective participant in and beneficiary of future international scientific collaborations.**
- **Important considerations that are not reflected in the current DOE plan for U.S. participation in ITER should be addressed during the further development of the DOE plan. These considerations include:**
 - Existing gaps in planning for DEMO;
 - Dissemination of ITER research activities to the broader scientific community; and
 - Planning for the recruitment and training of young scientists and engineers.

Recommendations II

- **The committee recommends the goals below be adopted as the foundation of DOE planning activities:**
 - Ensuring broad academic and industrial participation in ITER;
 - Enabling the US to contribute substantially to and reap the reward from ITER;
 - Recruiting and training young fusion scientists and engineers.
- **The committee recommends the below procedures to accomplish U.S. planning goals, and to facilitate the further development of the plan:**
 - DOE should create a long-term strategic plan for the U.S. burning plasma fusion program within the context of global fusion energy development activities;
 - The USBPO should continue to be an essential point of communication, and serve as a “home team” to encourage broad cooperation and collaboration;
 - DOE should maintain a vibrant domestic program through strong support for basic research and facilities;
 - The DOE plan should consider what capabilities exist and need to exist at U.S. plasma science facilities; and
 - The DOE plan should consider the needed operating availability of domestic tokamaks.

Recommendations III

- **The committee recommends that the below metrics be considered for inclusion during the future development of the plan for U.S. fusion community participation in ITER.**
 - Periodic evaluation by expert and knowledgeable members of the scientific, engineering, and industrial communities of the U.S. return on its ITER investment.
 - Periodic assessments by independent, external bodies of the effectiveness of domestic project management.
 - Balance in the fraction of U.S. published research conducted on ITER according to author's institutional affiliation (university, national laboratory, and industry).
 - Achievement of predictive capability, to be evaluated by peer review.
 - Number of research and technology publications documenting results obtained on ITER that are cited by or produced in collaboration with U.S. researchers, students, and technologists across U.S. plasma science and physics.

Origin of the Study

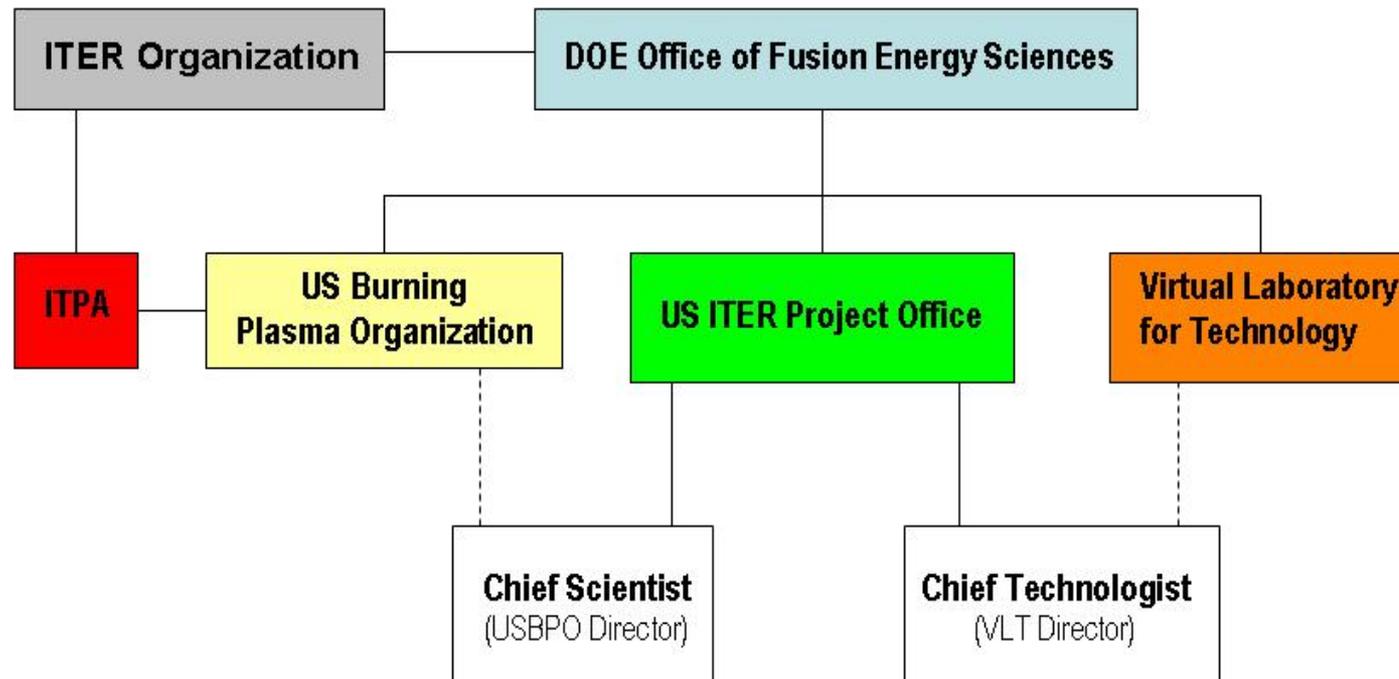
- The development of a plan for the participation of the U.S. fusion community in the ITER program was mandated by the Energy Policy Act of 2005 (EPAAct).
- The Under Secretary for Science of the Department of Energy submitted the plan on August 10, 2006. After completion of the plan, the EPAAct, in Sec. 972 (c)(4)(B), directed DOE to request an external review of its content. In response, the NRC organized this committee to review the DOE plan with the following charge:

The ITER Project

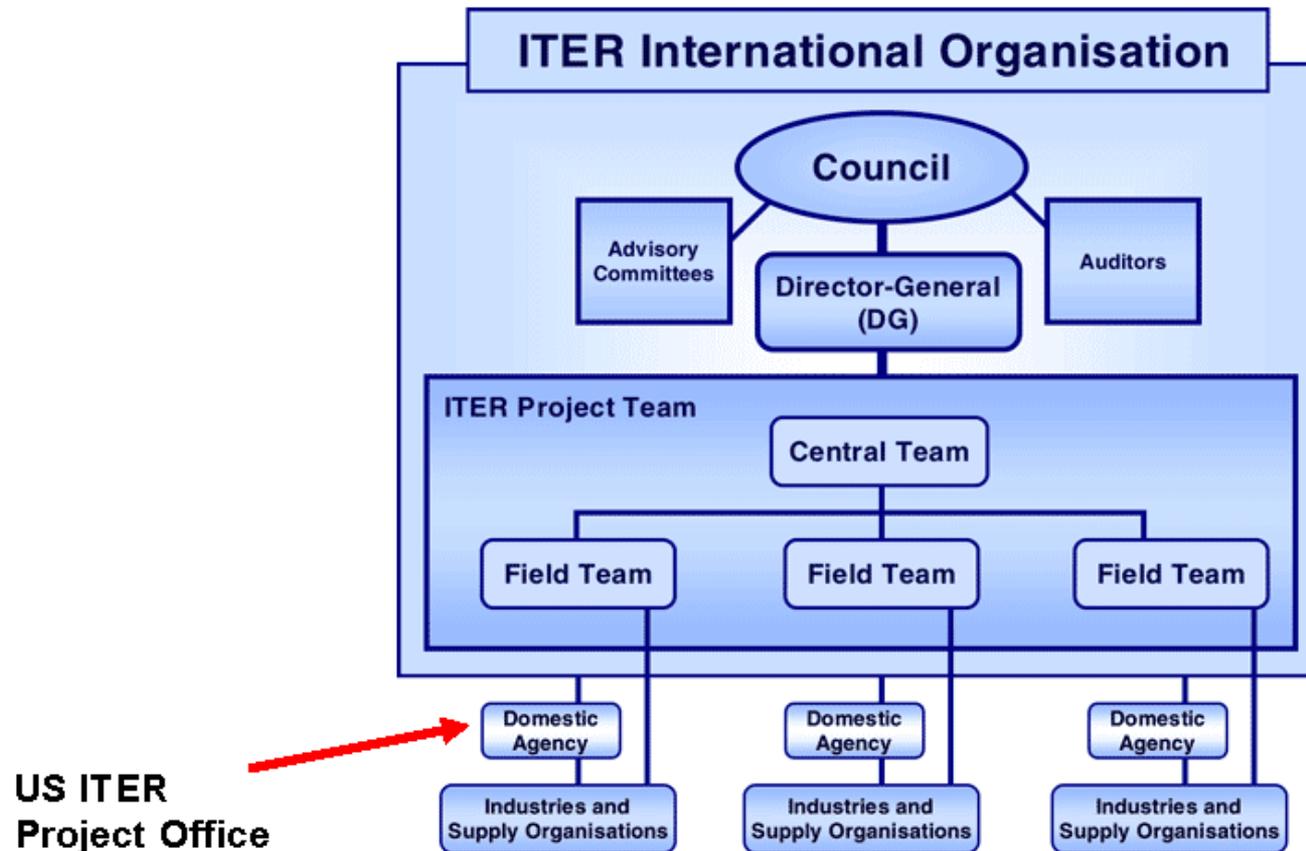
- The objective of the ITER project is “to demonstrate the scientific and technological feasibility of fusion energy for peaceful purposes, an essential feature of which would be achieving sustained fusion power generation.” (JIA)
 - Demonstrate high power amplification and extended burn of deuterium-tritium plasmas, with steady-state as an ultimate goal
 - Demonstrate technologies essential to a reactor in an integrated system
 - Perform integrated testing of the high-heat-flux and nuclear components required to utilize fusion energy for practical purposes
- Produce 500 MW of fusion power for 400 seconds by 2024

Organizational Context

Major Entities of the U.S. ITER Project Effort



Overall Organization of the ITER Project



ITER Project Schedule

