October 2007

FUSION ENERGY

Definitive Cost Estimates for U.S. Contributions to an International Experimental Reactor and Better Coordinated DOE Research Are Needed

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Highlights

Highlights of GAO-08-30, a report to congressional committees

Why GAO Did This Study

The United States is pursuing two paths to fusion energy—magnetic and inertial. On November 21, 2006, the United States signed an agreement with five countries and the European Union to build and operate the International Thermonuclear Experimental Reactor (ITER) in Cadarache, France, to demonstrate the feasibility of magnetic fusion energy. The United States also built and operates facilities to pursue inertial fusion energy research. This report discusses (1) U.S. contributions to ITER and the challenges, if any, in managing this international fusion program and (2) the Department of Energy's (DOE) management of alternative fusion research activities, including National Nuclear Security Administration (NNSA) initiatives. In performing this work, GAO analyzed budget documents, briefings, and reports that focused on research and funding priorities for the fusion program. GAO also met with officials from DOE, NNSA, and the ITER Organization in France.

What GAO Recommends

GAO recommends, among other things, that (1) DOE and NNSA develop a research plan to coordinate fusion research activities to advance inertial fusion and (2) DOE develop a strategy to hire, train, and retain staff with the specialized skills needed to accomplish its mission. DOE neither agreed nor disagreed with our recommendations, but questioned several of our findings.

To view the full product, including the scope and methodology, click on GAO-08-30.
For more information, contact Gene Aloise at (202) 512-3841 or aloisee@gao.gov.

What GAO Found

Over 9 years, DOE estimates it will spend $1.12 billion to help build ITER, but this is only a preliminary estimate and may not fully reflect the costs of U.S. participation. This preliminary estimate has not been independently validated, as DOE guidance directs, because the reactor design is not complete. Moreover, the $1.12 billion for ITER construction does not include an additional $1.2 billion the United States is expected to contribute to operate and decommission the facility. In addition, the ITER Organization, which manages the construction and operation of ITER, faces a number of management challenges to build ITER on time and on budget that also may affect U.S. costs. For example, the ITER Organization must develop quality assurance standards, test the reliability and integrity of components built in different countries, and assemble them with a high level of precision. Many of these challenges stem from the difficulty of coordinating international efforts and the need for consensus before making critical management decisions.

GAO has identified several challenges DOE faces in managing alternative fusion research activities. First, NNSA and the Office of Fusion Energy Sciences (OFES), which manage the inertial fusion program within DOE, have not effectively coordinated their research activities to develop inertial fusion as an energy source. For example, they do not have a coordinated research plan that identifies key scientific and technological issues that must be addressed to advance inertial fusion energy and how their research activities would meet those goals. Second, DOE may find it difficult to manage competing funding priorities to advance both ITER-related research and alternative magnetic fusion approaches. DOE officials told GAO they are focusing limited resources on ITER-related research activities. As a result, as funding for ITER-related research has increased, the share of funding for the most innovative alternative magnetic fusion research activities decreased from 19 percent of the fusion research budget in fiscal year 2002 to 13 percent in fiscal year 2007. According to DOE officials, this level of funding is sufficient to meet research objectives. However, university scientists involved in fusion research told us that this decrease in funding has led to a decline in research opportunities for innovative concepts, which could lead to a simpler, less costly, or faster path to fusion energy, and reduced opportunities to attract students to the fusion sciences and train them to fulfill future workforce needs. Finally, while the demand for scientists and engineers to run experiments at ITER and inertial fusion facilities is growing, OFES does not have a human capital strategy to address expected future workforce shortages. These shortages are likely to grow as a large part of the fusion workforce retires over the next 10 years.