



Testimony

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Committee on Science, Space, and
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FUSION ENERGY

Observations on DOE's Cost and Schedule Estimates for U.S. Contributions to an International Experimental Reactor

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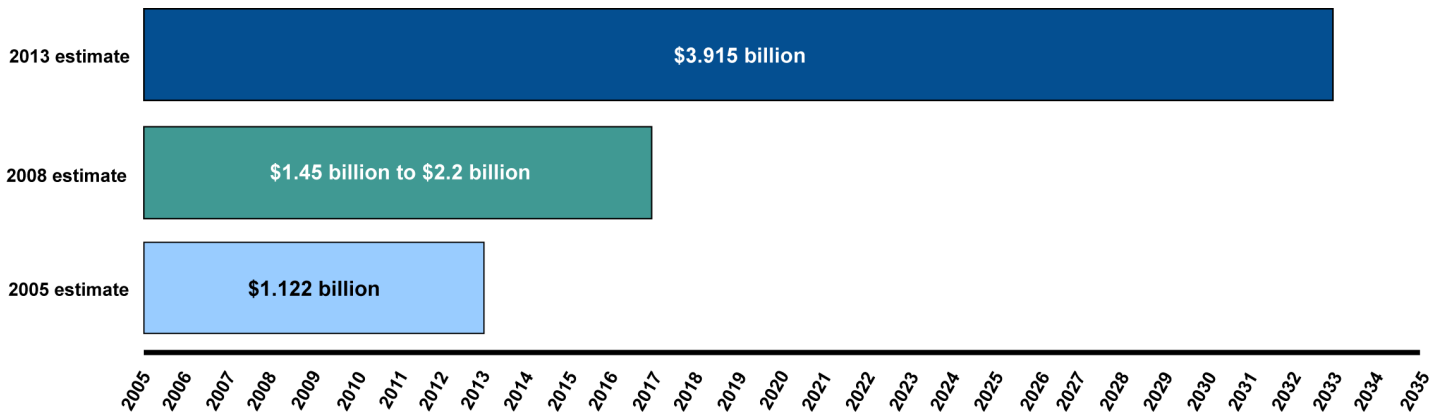
Chairman Lummis, Ranking Member Swalwell, and Members of the Subcommittee:

I am pleased to be here today to discuss our recent report on the Department of Energy's (DOE) cost and schedule estimates for U.S. contributions to the International Thermonuclear Experimental Reactor, now known as ITER.¹ As you know, ITER is an international research facility being built in France to demonstrate the feasibility of fusion energy. Fusion occurs when the nuclei of two light atoms collide and fuse together at high temperatures, which results in the release of large amounts of energy. The United States has committed to providing about 9 percent of ITER's construction costs through contributions of hardware, personnel, and cash, and DOE is responsible for managing these contributions, as well as the overall U.S. fusion program. Agreeing to share the cost of building ITER allows the United States to benefit from the scientific and technological expertise of the other six ITER members and have full access to ITER's research results.² However, since the ITER Agreement was signed in 2006, ITER's expected construction cost has grown by billions of dollars, and its construction schedule has slipped by years, as have the cost and schedule estimates for U.S. contributions to the project's construction (see fig. 1).

¹GAO, *Fusion Energy: Actions Needed to Finalize Cost and Schedule Estimates for U.S. Contributions to an International Experimental Reactor*, [GAO-14-499](#) (Washington, D.C.: June 5, 2014).

²The other six ITER members are the European Union, India, Japan, the People's Republic of China, the Republic of Korea, and the Russian Federation.

Figure 1: Total Estimated Cost and Completion Date for U.S. Contributions to ITER's Construction



Source: GAO analysis of DOE data. | GAO-14-750T

The ITER Agreement established a management framework under which the international ITER Organization manages the overall project and is governed by a council, known as the ITER Council, which is composed of high-level government officials from each of the seven ITER members. During ITER's construction, each individual ITER member is responsible for managing the cost and schedule of its assigned contributions within the overall goals set in the international schedule. DOE manages U.S. contributions through the U.S. ITER Project Office at the Oak Ridge National Laboratory in Tennessee. In fiscal year 2014, the U.S. ITER Project received \$199.5 million, which is about 40 percent of that year's overall U.S. fusion program budget. The ITER Agreement includes a provision that allows any ITER member except the European Union to withdraw from the project after the agreement has been in force for 10 years, which would be in October 2017. However, withdrawing members still have the responsibility of providing the entire cost of their assigned hardware components and cash contributions to the construction phase, and they could be responsible for other costs as well if they withdraw during ITER's operation phase.

In 2007, when the United States was just beginning to participate in ITER, we reported on the importance of DOE assessing the full costs of U.S.

participation in ITER and setting a definitive cost estimate for the project.³ Specifically, we reported that DOE had made a commitment to provide hardware components to ITER without a definitive cost and schedule estimate or a complete project design. We reported that, as a result, DOE's preliminary cost estimate of \$1.122 billion for U.S. contributions to ITER's construction might be subject to significant change. We also reported that the management challenges facing the ITER Organization could result in ITER construction delays and further increase costs for the United States. Today, significant questions remain about how much the U.S. ITER Project will cost, when it will be completed, and how DOE plans to manage the impact of U.S. ITER Project costs on the overall U.S. fusion program in a constrained federal budget environment.

In this context, my testimony today discusses the findings from our recent June 2014 report on DOE's cost and schedule estimates for the U.S. ITER Project. Accordingly, this testimony addresses (1) how and why the estimated cost and schedule for the U.S. ITER Project have changed since 2006; (2) the reliability of DOE's current cost and schedule estimates for the U.S. ITER Project and the factors, if any, that have affected their reliability; and (3) the actions DOE has taken, if any, to reduce U.S. ITER Project costs and plan for their potential impact on the overall U.S. fusion program. In addition, I will highlight several key actions that we recommended in our report that DOE can take to help reduce uncertainty about the U.S. ITER Project's cost and schedule.

To conduct this work, among other things, we reviewed the ITER Agreement, relevant laws, and DOE guidance, DOE's most recent cost and schedule estimates for the U.S. ITER Project—as developed by the U.S. ITER Project Office in August 2013—and DOE's internal peer review of those estimates, and we interviewed DOE officials and U.S. ITER Project Office representatives. Our June 2014 report includes a detailed explanation of the methods used to conduct our work. We conducted the work on which this testimony is based in accordance with generally accepted government auditing standards.

³GAO, *Fusion Energy: Definitive Cost Estimates for U.S. Contributions to an International Experimental Reactor and Better Coordinated DOE Research Are Needed*, [GAO-08-30](#) (Washington, D.C.: Oct. 26, 2007).

The Estimated Cost and Schedule of the U.S. ITER Project Has Grown Substantially Since 2006 for Several Reasons

DOE's estimated cost for the U.S. ITER Project has grown by almost \$3 billion since the ITER Agreement was signed in 2006, and the agency's expected schedule for completing the project has slipped by 20 years.

DOE identified several reasons for the growth in its cost and schedule estimates, including

- higher estimates for U.S. hardware components as designs and requirements have been more fully developed over time;
- higher contingency amounts added to address risks from the project's significantly longer schedule;
- U.S. schedule delays due to international project schedule delays and U.S. funding constraints; and
- higher cash contributions to the ITER Organization due to growth in ITER construction costs.

Nonetheless, DOE's current estimates remain preliminary because DOE has not approved a performance baseline for the U.S. ITER Project. A performance baseline captures a project's key performance, scope, cost, and schedule parameters, and it represents a commitment from DOE to Congress to deliver a project within those parameters.

Despite Reflecting Most Characteristics of Reliable Cost and Schedule Estimates, DOE's Estimates Cannot Be Used to Set a Baseline

DOE's current cost and schedule estimates for the U.S. ITER Project reflect most characteristics of reliable estimates.⁴ However, DOE's estimates cannot be used to set a performance baseline that would represent a commitment from DOE to Congress to deliver the project at a specific cost and date. DOE's target date for setting such a performance baseline has slipped from fiscal year 2007 to late in fiscal year 2015. DOE's current estimates cannot be used to set a performance baseline because of three factors, two of which DOE can only partially influence. First, the overall international project schedule that DOE uses as a basis for the U.S. schedule is not reliable, in part, because of management deficiencies within the ITER Organization. Second, DOE has not proposed a final, stable funding plan for the U.S. ITER Project. DOE's most recent plan was to provide a flat \$225 million per year for the project, but that plan could change depending on the outcome of the

⁴GAO, *GAO Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Capital Program Costs*, [GAO-09-3SP](#) (Washington, D.C.: Mar. 2, 2009) and *GAO Schedule Assessment Guide: Best Practices for Project Schedules—Exposure Draft*, [GAO-12-120G](#) (Washington, D.C.: May 30, 2012).

ITER Organization's reassessment of the international project schedule. The third factor that has kept DOE from setting a performance baseline is within the agency's direct control. Specifically, an August 2013 DOE internal peer review found that the methodologies used to develop the agency's current cost estimate of \$3.915 billion and its schedule estimate were appropriate, but the estimates do not sufficiently consider all the project's risks and uncertainties. This review found that when these risks and uncertainties are accounted for, the U.S. ITER Project was more likely to cost from \$4 billion to \$6.5 billion.

DOE has taken several actions to try to get the ITER Organization to address international project management and scheduling deficiencies including: (1) participating in early ITER Agreement negotiations leading to the adoption of biennial management assessments; (2) advancing project management principles such as competitive procurement actions in ITER Council Management Advisory Committee meetings; and (3) providing position papers to other ITER members on DOE's concerns about ITER Organization management. To address the uncertainty of the funding plan for the U.S. ITER Project, DOE has evaluated a range of funding scenarios for executing the project. To ensure that all risks and uncertainties are sufficiently incorporated into its estimates, DOE officials told us the U.S. ITER Project Office held a series of risk workshops. These efforts may have helped improve ITER Organization project management and helped jump-start efforts to develop a reliable international project schedule, but such a schedule is not expected until June 2015 when the ITER Organization hopes to complete its schedule reassessment. Further, project management and schedule deficiencies in the ITER Organization and uncertainty in the U.S. ITER Project funding plan continue to delay the agency's efforts to set a performance baseline.

DOE Has Taken Several Actions to Reduce U.S. ITER Project Costs but Has Not Adequately Planned for Their Impact on the U.S. Fusion Program

According to DOE documents and officials, DOE has taken several actions that have reduced the cost of the U.S. ITER Project by about \$388 million as of February 2014. However, DOE has not adequately planned for the potential impacts of U.S. ITER Project costs on the overall U.S. fusion program. In fiscal year 2014, the U.S. fusion program budget was approximately \$505 million, of which \$199.5 million, or about 40 percent, went toward the U.S. ITER Project. We have previously reported that strategic planning is a leading practice that can help clarify priorities,⁵ and the House and Senate Appropriations Committees have directed DOE to complete a strategic plan for the U.S. fusion program. DOE has begun work on such a plan but has not committed to a specific completion date. Without a strategic plan for the U.S. fusion program, DOE does not have information to create an understanding among stakeholders about its plans for balancing the competing demands the program faces with the limited available resources or to help Congress weigh the trade-offs of different funding decisions for the U.S. ITER Project and overall U.S. fusion program.

DOE Can Take Action to Reduce Uncertainty about the U.S. ITER Project's Cost and Schedule

To reduce uncertainty about the expected cost and schedule of the U.S. ITER Project and its potential impact on the U.S. fusion program, we made several recommendations to DOE in our June 2014 report. These included the following:

- direct the U.S. ITER Project Office to revise and update the project's cost estimate by including a comprehensive sensitivity analysis and conducting an independent cost estimate to meet all characteristics of high quality, reliable cost estimates;
- develop and present at the next ITER Council meeting a formal proposal describing the actions DOE believes need to be taken to set a reliable international project schedule and improve ITER Organization project management, and continue to formally advocate for the timely implementation of those actions at future ITER Council meetings;
- once the ITER Organization completes its reassessment of the international project schedule, use that schedule, if reliable, to

⁵For example, see GAO, *Environmental Protection: EPA Should Develop a Strategic Plan for Its New Compliance Initiative*, [GAO-13-115](#) (Washington, D.C.: Dec. 10, 2012) and *Environmental Justice: EPA Needs to Take Additional Actions to Help Ensure Effective Implementation*, [GAO-12-77](#) (Washington, D.C.: Oct. 6, 2011).

propose a final, stable funding plan for the U.S. ITER Project, approve a performance baseline, and communicate this information to Congress; and

- set a specific date for completing, in a timely manner, a strategic plan for the U.S. fusion program that addresses DOE's priorities for the overall U.S. fusion program in light of U.S. ITER Project costs, and involve the Fusion Energy Sciences Advisory Committee in the development of the plan.

DOE agreed with all of our June 2014 report's recommendations and said it has taken steps or plans to take additional steps to fully implement them.

In conclusion, in 2007 and now again in 2014, we have found that the U.S. ITER Project is subject to a significant amount of uncertainty and may continue to face significant changes or delays in the future. In addition, the cost of U.S. contributions to ITER could continue to grow. ITER provides an opportunity to develop a clean, abundant source of energy, but it should be considered in terms of its likelihood of success, broader impacts on the U.S. fusion program, and federal budget constraints.

Chairman Lummis, Ranking Member Swalwell, and Members of the Subcommittee, this concludes my prepared statement. I would be pleased to answer any questions that you may have at this time.

GAO Contact and Staff Acknowledgments

If you or your staff members have any questions concerning this testimony, please contact me at (202) 512-3841 or ruscof@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. Other individuals who made key contributions to this testimony include Dan Haas, Assistant Director; David Marroni, and Andrew Moore.

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