US ITER Project Office
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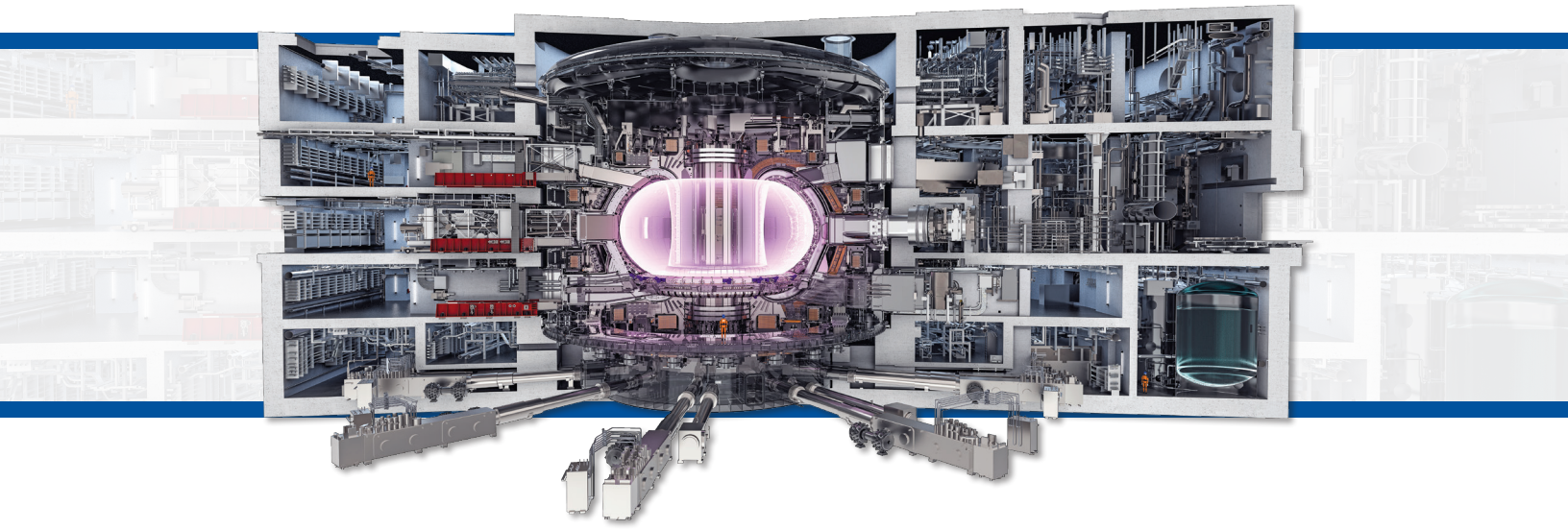
US ITER
PROJECT



ITER Mission

The mission of the international ITER project is to demonstrate the scientific and technological feasibility of fusion energy, using strong magnetic fields to confine fusion fuels in a plasma state hotter than the sun. Fusion has the potential to yield clean, abundant, safe energy that can be a major contributor to the US energy portfolio in the future. ITER will allow scientists to study reactor-scale burning plasmas and explore technical challenges related to the development of a power-producing fusion reactor. ITER will be the largest tokamak ever constructed and is designed to deliver 10 times more fusion power than the plasma heating power. As a research facility, ITER is expected to have a 20 year operational lifespan and will provide supporting R&D for the development of a demonstration fusion power plant.

US Participation in ITER

As an ITER member, the United States receives full access to all ITER-developed technology and scientific data, but bears less than 10% of the total construction cost. Over 80% of US ITER funding for hardware contributions goes to US industry, universities and national laboratories. The US contribution consists of R&D, hardware design and manufacturing for 12 different ITER systems, plus assignment of personnel and funding for the US share of common expenses. As of June 2019, over $1B has been awarded to US industries and universities and obligated to DOE national laboratories in 46 states plus the District of Columbia. To complete its contributions to ITER, the project plans to award and manage an estimated $800M in future contracts to US industry.

The tokamak complex (May 2019).
Photo: ITER Organization

Scientific Foundations

Fusion reactions power the sun and the stars. To achieve fusion power on earth, a fusion reactor requires a burning plasma, where plasma energy is maintained primarily by self-heating due to internal fusion reactions. A 2002 US fusion–community study assessed a range of approaches for creating a burning plasma. Following a 2003 letter report, the Fusion Energy Sciences Advisory Committee noted ITER's advanced stage and comprehensive science and technology program, and recommended that the US seek to join ITER. The Department of Energy initiated a National Research Council study and the President then decided to enter ITER negotiations. The scientific significance and readiness of ITER was documented in the 2004 National Research Council report Burning Plasma: "The next large-scale step in the effort to achieve fusion energy is to create a burning plasma…The ITER design is the most mature and is also sufficiently conservative to provide great confidence in achieving burning plasma conditions while being flexible enough to test critical advanced tokamak operating regimes in near-steady-state burning plasma conditions." A half-century of US and international magnetic confinement fusion research is behind the science and engineering of ITER, and US research continues to

provide critical development for ensuring optimal exploitation of ITER. The 2018 National Academy Report on a Plan for U.S. Burning Plasma Research affirms the importance of ITER for achieving US burning plasma goals. Specifically, the report recommended that the US remain a partner in ITER and the US start a program leading to construction of a compact pilot fusion plant.

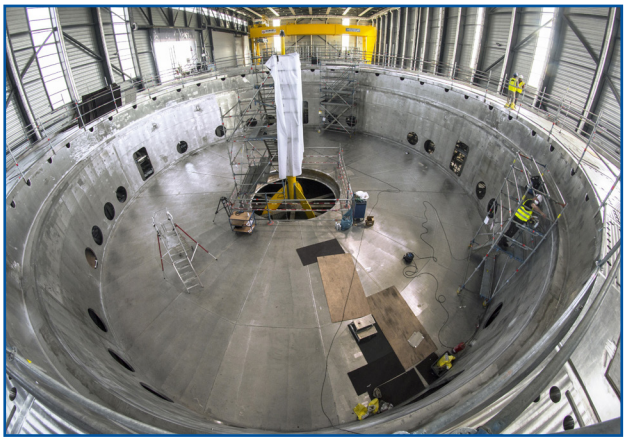
Partners and Management

The ITER project is being designed and built by seven partners: China, the European Union, India, Japan, South Korea, the Russian Federation, and the United States. The ITER Agreement, signed November 21, 2006 and in force October 24, 2007, established a membership duration of 35 years for the participating partners. The Members have divided the scope and are strongly mutually dependent, sharing the work and the benefits. US participation in the ITER Agreement is essential to ITER's success.

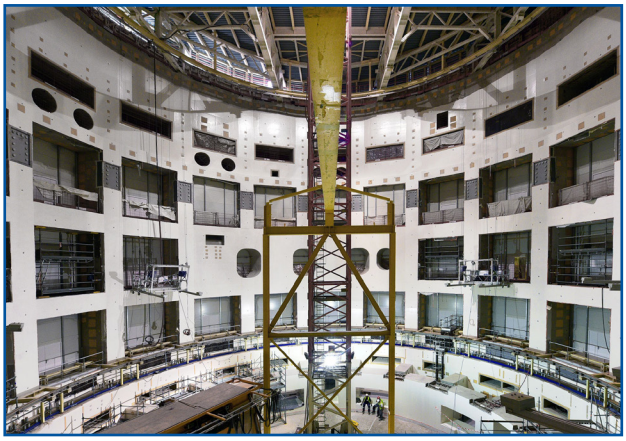
The partners are jointly responsible for the construction, operation, and decommissioning of this experimental fusion facility. The European Union, as host for the ITER facility, is responsible for 45% of ITER's construction cost; the remaining partners contribute roughly 9% each. The facility will be assembled at St.-Paul-lez-Durance, France, using components fabricated in the United States and in other partner nations. The ITER Organization serves as the coordinating body of the project, and is led by an experienced international team. The ITER Council, which consists of high-level government officials from the member nations, governs the ITER Organization.

US Project Status

The US project has already completed contributions for two systems, toroidal field conductor and the steady state electrical network, and is advancing fabrication and design for the remaining hardware. The Department of Energy has divided the US scope into two sub-projects: Sub-project 1, for first plasma hardware, was baselined in January 2017. The overall estimate for all US contributions to ITER, including financial contributions to the ITER Organization for assembly, installation, and commissioning of the ITER machine was also updated in January 2017. From an international perspective, it is significant to note that the global partners continue to allocate substantial annual budgets to the ITER project. The European Union, the project host, has awarded over 750 contracts and 150 research grants related to ITER. Other partners are maintaining project funding consistent with achieving the first plasma schedule.



The cryostat base is complete. At 1250 tonnes, it will be the single largest load of ITER tokamak assembly. Photo: ITER Organization



The interior of the tokamak assembly pit is painted in preparation for the start of assembly. Photo: ITER Organization

US project execution is managed by Oak Ridge National Laboratory in Tennessee, with partner labs Princeton Plasma Physics Laboratory in New Jersey and Savannah River National Laboratory in South Carolina.

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