OAK RIDGE NATIONAL LABORATORY

ITER: Unprecedented Global Collaboration for Fusion Energy

Fusion reactions power the sun and the stars, and fusion has the potential to produce clean, safe, abundant energy on Earth. By fusing light hydrogen atoms such as deuterium and tritium, fusion reactions can produce energy gains about a million times greater than chemical reactions with fossil fuels. Fusion is not vulnerable to runaway reactions, and long-term waste is limited.

The ITER project seeks to demonstrate the scientific and technological feasibility of fusion energy by building the world's most advanced tokamak magnetic confinement fusion research facility. ITER will demonstrate a sustained burning plasma, an essential step for fusion energy development.

The United States signed the ITER Agreement in 2006, along with China, the European Union, India, Japan, Korea, and the Russian Federation. The ITER members—representing more than 70% of annual global GDP and half the world's population—are now actively fabricating and shipping components to the ITER site in France for assembly of the first "star on Earth."

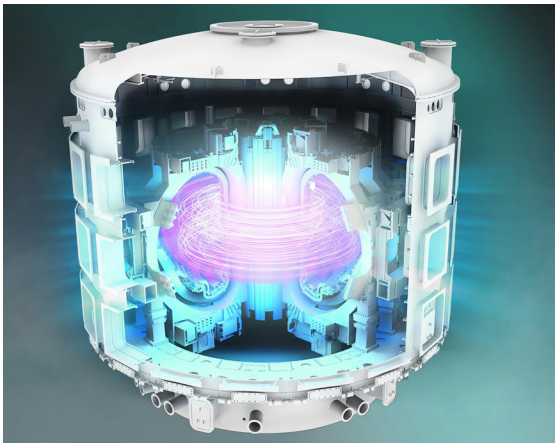

Illustration of ITER tokamak with plasma

Source: US ITER

The ITER Tokamak

Fusion thermal power has already been demonstrated in tokamaks; however, for practical fusion, sustained, self-heating fusion reactions are essential. The ITER tokamak is designed to achieve an industrial-scale burning plasma producing 500 megawatts of fusion power for 400 seconds. ITER assembly is underway now, and deliveries to the ITER site continue. Cryostat closure is planned for 2033; research operations will begin in 2034.

9%
Amount of ITER construction costs funded by the United States

100%
Access to the research facility and scientific findings

1000s
of contracts to U.S. industry, universities, and labs

70%
Global economic output represented by ITER members

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U.S. Innovation

The United States' contributions to ITER are overseen by the U.S. Department of Energy Office of Science. The US ITER project is managed by Oak Ridge National Laboratory with partners Princeton Plasma Physics Laboratory and Savannah River National Laboratory. US ITER R&D, design, and fabrication rely on industries, universities, and national laboratories in nearly all states plus the District of Columbia. U.S. hardware contributions to ITER require exceptional scale, power, and precision, challenging U.S. industry to produce:

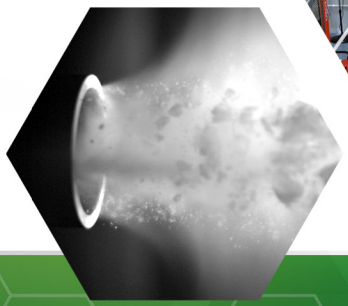
- Miles of superconductors for magnet systems
- A 1,000 metric ton, 13 tesla central solenoid superconducting magnet (the "heart" of ITER)
- High-powered microwave and radio-frequency transmission lines
- Cryogenic pellet plasma fueling with demanding repetition rates
- High-throughput tritium processing systems
- Instrumentation for nuclear environments

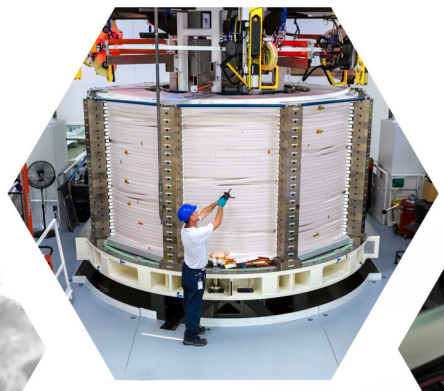
U.S. fusion and related industries benefit from the technologies, know-how, and experience that results from U.S. engagement in ITER.

—National Academies of Sciences, Engineering, and Medicine (2021). *Bringing Fusion to the U.S. Grid.*

Construction of the ITER facility in Cadarache, France, began in 2010. The United States began deliveries to ITER in 2014. Hundreds of deliveries to ITER have been completed, and tokamak assembly is underway.
Source: ITER Organization

Source: US ITER





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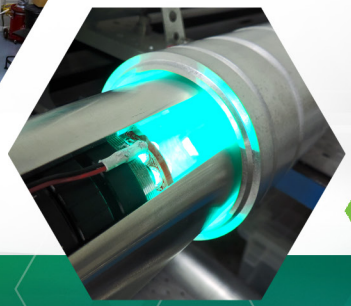

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