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Japanese Contribution to the ITER Project

Japan Domestic Agency of the ITER Project

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ITER Project to demonstrate the feasibility of fusion energy

Expectations for ITER

Utilization of fusion energy is one of the most attractive solutions to a future long-term energy source and global warming which respond to a common demand of mankind. The overall programmatic objective of ITER (originally the International Thermonuclear Experimental Reactor) is to demonstrate the scientific and technological feasibility of fusion energy for peaceful purposes. Technical objectives of ITER can be summarized as follows:

Plasma Performance

- Extended burn in inductively driven plasmas with the ratio of fusion power to auxiliary heating power, Q, of at least 10 with a duration sufficient to achieve stationary conditions on the timescales characteristic of plasma processes.
- Demonstrating steady-state operation using non-inductive current drive with the ratio of fusion power to input power for current drive of at least 5.
- Possibility of controlled ignition should not be precluded.

Engineering Performance and Testing

- Demonstrating the availability and integration of technologies essential for a fusion reactor (such as superconducting magnets and remote maintenance).
- Testing components for a future reactor (such as systems to exhaust power and particles from the plasma).
- Testing tritium breeding module concepts that would lead in a future reactor.

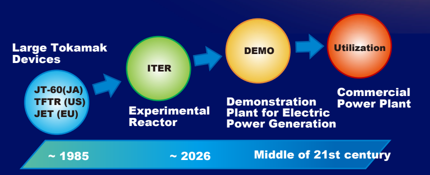
Domestic Agencies' contribution

The idea for ITER originated from the Geneva Superpower Summit in 1985 and is a research cooperation using international resources and expertise toward the practical realization of fusion energy.

The ITER Agreement was signed by Japan, USA, Russia, European Union (EU), China, Korea, and India in 2006. The ITER project is managed by the ITER Organization, based in Cadarache, in the South of France. Japan Atomic Energy Agency was designated as a domestic agency of ITER Project in Japan, and procures the equipments and devices such as the superconducting coils and plays a role as the contact points of a personnel contribution of Japan to the ITER Project.

Cost sharing for construction of host (EU) is 45.46 % and other 6 parties are 9.09 %. In-kind procurement (construction and secondment of human resources to the ITER Organization) is 78 % and cash contribution is 22 %.

A Way Towards Practical Use of Fusion Energy



ITER is a bridge from the Large Tokamak Devices toward demonstrating the feasibility of a large-scale reactor for electrical power production, called DEMO. DEMO will lead the way to the first commercial fusion power plant.

Schedule of ITER

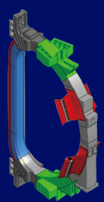
The ITER project is planned to last for 30 years – 10 for construction and 20 years of operation.

In-kind Procurement by Japan

Japan contributes to the construction of ITER by producing major components in collaboration with the ITER Organization and Participating Parties.

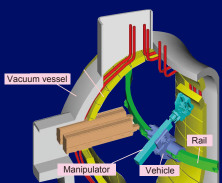
Central Solenoid Coils

Superconducting coils for controlling the start up, fusion burning and shut down of the plasma. Japan shall procure all conductors for Central Solenoid Coils.



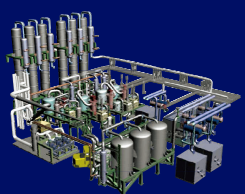
Toroidal Field Coils

Superconducting coils for confinement of the high temperature plasma. Japan shall procure 25% conductors, nine windings, all structures and nine coils for Toroidal Field Coils.



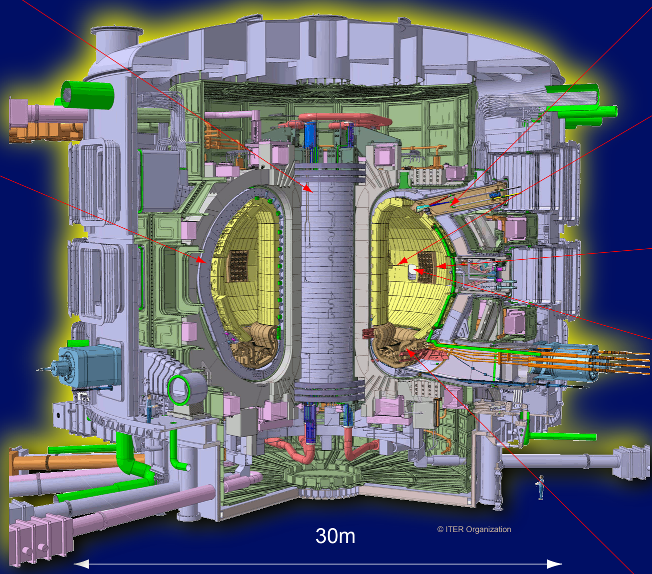
Remote Handling Equipment

Remote handling equipment for shield blanket maintenance and replacement.



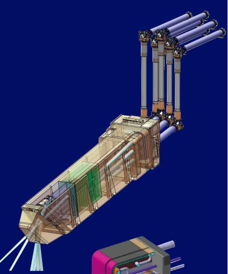
Tritium Plant

A tritium separation, purification and re-fueling facility. Japan shall procure Air Detritiation System.



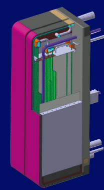
Main Parameters of ITER

Total fusion power	500 MW
Plasma major radius	6.2 m
Plasma minor radius	2.0 m
Plasma Current	15 MA
Toroidal field at 6.2 m radius	5.3 T
Plasma inductive burn time	300 - 500 s



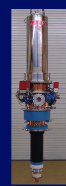
Diagnostics

Devices for measuring the temperature and density of ions and electrons in plasma and the distribution of impurities and neutrons.



Test Blanket Module

Test Blanket module will lead to a DEMO reactor blanket through the experimental operations in ITER. This is prepared for the test at the ITER, and outside of the scope of in-kind procurement.

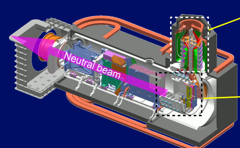


Electron Cyclotron Radio Frequency Resonance Heating System

Plasma heating device using electromagnetic waves in the electron cyclotron wave range.

Neutral Beam Injector

Plasma heating device using high energy neutral beam. Developments of 1 MV bushing with large bore ceramic and 1 MeV accelerator are in progress.

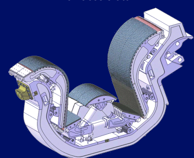


1 MV bushing with large bore ceramic ring

1 MeV five stage negative ion accelerator

Divertor

In-vessel components for heat removal and exhaust of helium ash and impurities.



Fusion Research Test Facility for ITER Procurement

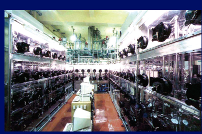
JADA pursues the procurement of ITER components through R&D and testing in these existing facilities in use for fusion research in JAEA.

Superconducting Coil Test Facility

Testing of superconducting magnets.

Gyrotron Test Facility

Testing of the RF heating system

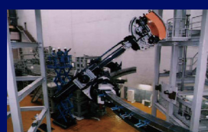


Tritium Process Laboratory

A series of demonstration tests for the tritium removal system has been carried out to provide the data related to licensing of ITER.

Diagnostics Test Facility

Developing a high-energy-output (5 J) and high-repetition-rate (100 Hz) YAG laser for edge Thomson scattering system.

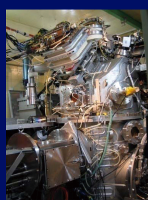


Remote Handling Test Facility

Testing of remote handling equipment.

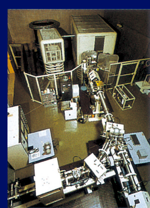
MeV Class Ion Source Test Facility

Testing of a 1 MeV accelerator for the neutral beam injection system.



High Heat Flux test Facility

High heat flux testing of the test blanket module and divertor.



Fusion Neutronics Source Facility

Testing using 14 MeV neutrons.