

International Thermonuclear Experimental Reactor (ITER)

Why in news?

Prime Minister Shri Narendra Modi and the President of France, H.E. Mr. Emmanuel Macron, jointly visited the International Thermonuclear Experimental Reactor (ITER) in France recently.

- **ITER** - Is a large-scale scientific experiment intended to prove the viability of fusion as an energy source by building the world's largest tokamak.
- **Tokamak** - A magnetic fusion device that has been designed to prove the feasibility of fusion as a large-scale and carbon-free source of energy based on the same principle that powers our Sun and stars.
- **Location** - ITER is currently under construction in the south of France.

***Fusion** is the nuclear reaction that powers the Sun and the stars, is a promising long-term option for sustainable, non-carbon-emitting energy.*

- **ITER Council** - Is the governing body that supervises the work of the ITER Organization.
- The ITER Council is responsible, in accordance with the ITER Agreement, for the promotion and overall direction of the ITER Organization.
- **ITER Organization** - Is an intergovernmental organization that was created by an international agreement signed in 2006, and formally established on 24 October 2007 after its ratification by all Parties.
- **ITER Members** - China, European Atomic Energy Community (Euratom), **India**, Japan, Korea, the Russian Federation and the United States of America.
- **India** - Is among the seven ITER members contributing to the project over the last two decades.
- Around 200 Indian scientists and associates, as well as notable industry players such as L&T, Inox India, TCS, TCE, HCL Technologies, among others, are engaged in the ITER project.

THE TOKAMAK

A machine to harness the heat energy produced in fusion reactions

BLANKET MODULES 4

Protect the vacuum vessel and magnets from heat and high-energy neutrons

1 VACUUM VESSEL

Provides a high vacuum environment for the plasma, houses fusion reactions and acts as a first safety containment barrier

830m³

will be the plasma volume of the ITER tokamak. The maximum plasma volume in tokamaks operating today is 100m³

7 CRYOSTAT

Surrounds the vacuum vessel and magnets, and ensures an ultra-cool, vacuum environment

SUPPORTING SYSTEMS

These include powerful heating and current drive, diagnostics, cryogenics, cooling, fuelling, vacuum and power supply systems. They enable conditions to create a 150 million °C plasma

2 HEATING UNIT

Uses three sources to heat the plasma—a neutral beam injection and two radio-frequency electromagnetic waves

6 DIAGNOSTICS UNIT

Evaluates and optimises the performance of plasma

5 DIVERTOR

Controls the exhaust of waste gas (helium) and impurities from the reactor

3 MAGNETS

Produces magnetic field to initiate, confine, shape and control the plasma

SUPER FIGURES



1,00,000km niobium-tin (Nb3Sn) superconducting strands are necessary for ITER's toroidal field magnets



150 million °C will be the temperature in the reactor core (*ten times the temperature at the sun's core*)



23,000 tonnes will be the weight of the ITER machine (*as heavy as three Eiffel Towers*)



60 meganewtons will be the force of the **1,000**-tonne electromagnet at the centre of the machine (*twice the thrust of a space shuttle lift-off*)

THEWEEK GRAPHICS

GRAPHICS SREEMANIKANDAN S./ RESEARCH NIRMAL JOVIAL

References

1. [PIB - ITER](#)
2. [Official website - ITER](#)



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