

## 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

**830m<sup>3</sup>**

will be the plasma volume of the ITER tokamak. The maximum plasma volume in tokamaks operating today is 100m<sup>3</sup>

### 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



**1,00,000**km 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*)

## References

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

