# WHAT IS ITER?

ITER is the biggest international partnership in the field of energy and will demonstrate the viability of fusion. The project brings together half of the world's population (China, Europe, Japan, India, the Republic of Korea, the Russian Federation and the United States) and represents 80% of the global GDP. It will be the world's largest experimental fusion facility and the first in history to produce net energy of 500 MW. The site of the ITER project is in Cadarache, in the south of France.

## WHAT IS FUSION?

Fusion is the process which powers the sun and the stars. When light atomic nuclei fuse together form heavier ones, a large amount of energy is released. Fusion research is aimed at developing a safe, limitless and environmentally responsible energy source. The fuels needed for fusion are abundant on Earth. With fusion there are neither greenhouse gas emissions nor long-lasting radioactive waste. Fusion reactors are intrinsically safe with no risk of a chain reaction.

### **HOW IS EUROPE CONTRIBUTING TO ITER?**

Europe, as host of the project, is responsible for nearly half of the ITER components and the construction of 39 buildings on site. Fusion for Energy (F4E) is the EU organisation managing Europe's contribution to ITER in collaboration with industry, SMEs and

### WHY INVESTING IN FUSION IS IMPORTANT?

The EU is the largest energy importer in the world. To meet our daily needs and fight climate change we need to develop a diversified and sustainable energy mix, and fusion can be part of it. Investing in fusion will give European companies the opportunity to improve their expertise and acquire new skills, increase their competitiveness, help them tap into new markets, create jobs and generate spin-offs with significant economic benefits.

#### ITER IN FIGURES

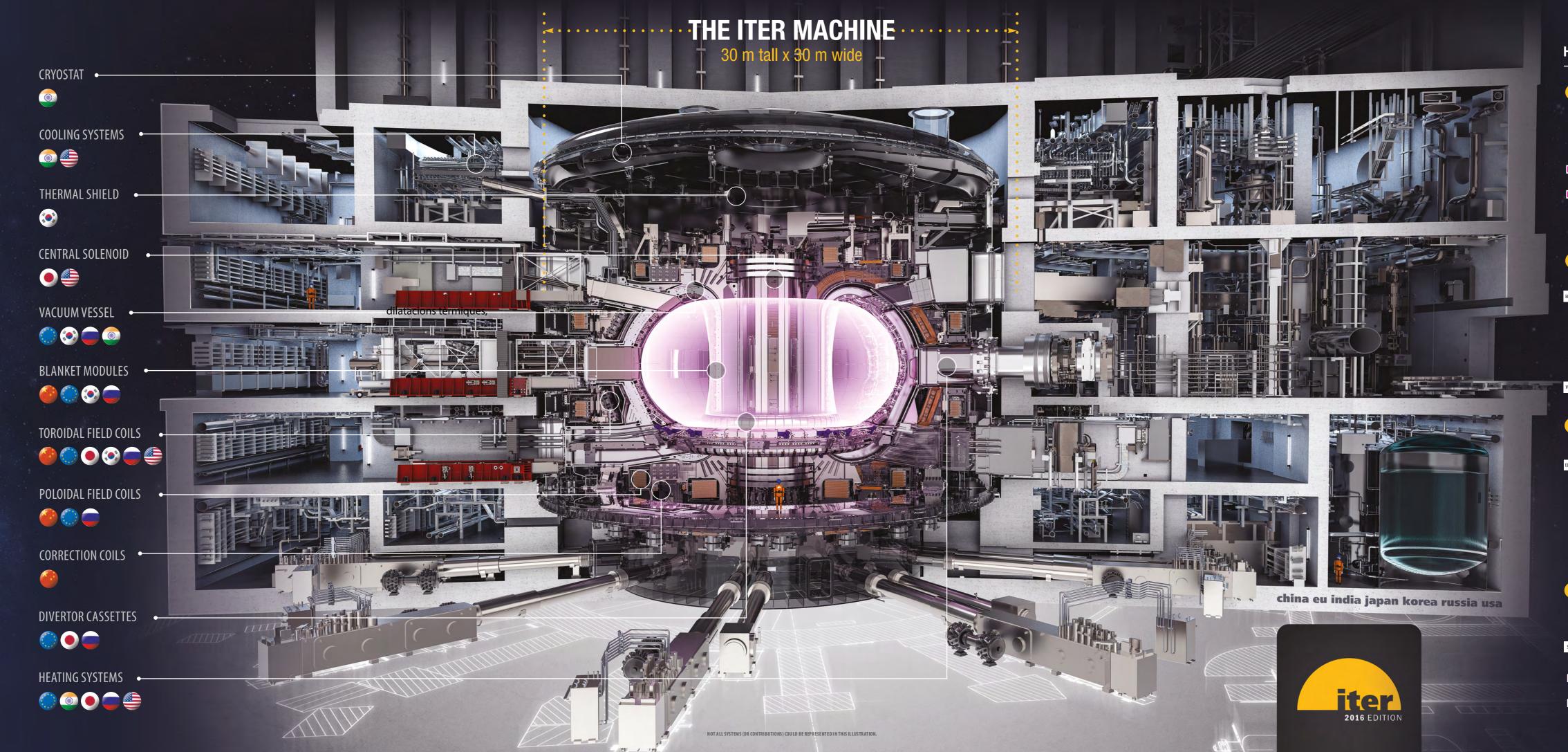
Size of the site : 42 hectares Weight of the machine: 23 000 tonnes Number of components : 1 000 000 Plasma volume: 840 m<sup>3</sup> Temperature at plasma core : 150 000 000°C Fusion power : 500 MW



the power of the sun

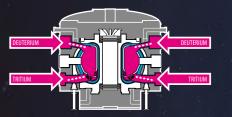
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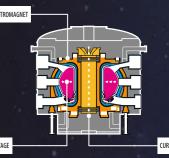


## **HOW ITER WORKS**

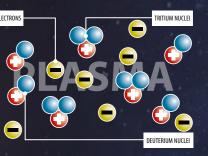
Puffs of deuterium and tritium hydrogen gas are injected into the doughnut shaped vacuum vessel. The gas weighs less than a postage stamp and fills a volume one-third that of an Olympic swimming pool.



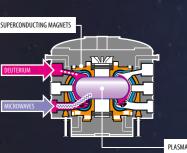
Electricity flowing through the central solenoid magnet produces a voltage across the gas.



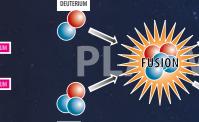
Voltage rips electrons from the deuterium and tritium atoms. They turn into charged atoms (ions) within a few microseconds,

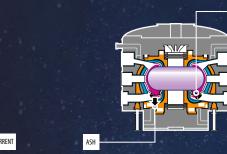


The plasma is trapped in the centre of the vacuum vessel by strong magnetic fields created by an array of superconducting coils.Collisions within the plasma bring temperatures to approximately 10 million °C, but that's not enough for fusion to take place.

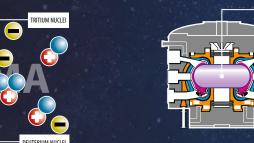


To raise the temperature further, scientists fire radio and microwaves into the plasma and high-energy beams of deuterium atoms. The plasma then reaches 100 - 200 million °C, hot enough for the deuterium and tritium pue





Neutrons and other particles bombard the tiles on the plasmafacing components and heat them. In a future power station this heat will be harnessed to make electricity.



The plasma must be continuously refuelled with deuterium and tritium for the process to continue. Unspent fuel is also recovered from the gaseous exhaust and the reaction is fine-tuned by firing frozen pellets of fusion fuel deep into the plasma.

