TOC

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What is ITER?

ITER

The ITER or International Thermonuclear Experimental Reactor is a joint international research and development project that aims to demonstrate the scientific and technical feasibility of fusion power: a safety source of energy with abundant fuel resources, to meet the needs of a growing world population. The participants are: Republic of China, European Union, India, Japan, Republic of Korea, Russia and United States of America.

Formula

The animation takes a while to download and requires QuickTime. Starmakers animation from the ITER official website in high quality is available here (also in portuguese). Other animations are available here.

Why ITER?

The world is starting to face up to increasing energy demands, ever scarcer resources and a growing awareness of the dangers of global warming and the environmental risks of continuing to burn fossil fuels intensively. In this context, the international ITER project is a key step in developing a new energy source – fusion energy.

Fusion is the energy source of the sun and the stars. On earth, fusion research is aimed at demonstrating that this energy source can be used to produce electricity in a safe and environmentally benign way, with abundant fuel resources, to meet the needs of a growing world population.

What is the Nuclear Fusion?

Fusion is the process that powers the sun and the stars. It is the reaction in which two atomic nuclei combine, or fuse, to form a heavier atom. When light atoms such as

hydrogen fuse, a lot of energy is released. Fusion is the opposite of nuclear fission, where heavy atoms are split into smaller pieces.

The most suitable fusion fuels on Earth are the Deuterium and Tritium. The current resources of Deuterium and Tritium are sufficient for millions of years of energy supply. For instance, 10 grams of Deuterium and 15 grams of Tritium would meet the entire lifetime energy needs of a citizen living in a developed country.

Formula

Where will be the ITER implemented?

The ITER will be build in Cadarach, south of France. The ITER reactor is installed on a building (the Tokamak Building) with dimensions equivalent to a football field. Another building with similar dimensions provides the infrastructure for maintenance, the Hot Cell Building.

Cadarache - France

When and how long?

After increasingly detailed phases, the design of ITER was sufficiently complete in 2001 for the potential future Parties to be able to discuss the sharing of hardware construction costs.

The design is currently being developed in finer detail to allow procurement of hardware to start as soon as the ITER Organisation (which will own and build ITER for the Parties) has been created.

Detailed plans exist for the construction (the building foundations have already started), operation and decommissioning of ITER. Since the ITER Organisation has been established in 2006, the first plasma should be possible in ITER by the end of 2016.

ITER operation, nominally expected to last 21 years overall. The radiological conditions at the end of operation can be predicted based on the planned phases of operation and transition phases between them, the expected distribution of activated materials and their dose rates as well as the amounts of bulk Be and dust, and tritium distribution around the plant. Actual operation will of course lead to somewhat different conditions,

but the present decommissioning plans are indicative of what will be required (between one and two decades).