

KOREA'S FUSION REACTOR SUSTAINED TEMPERATURES 7 TIMES HOTTER THAN THE SUN FOR 30 SECONDS

- South Korea's KSTAR (Korea [Superconducting Tokamak](#) Advanced Research) reactor reached and held a temperature of 100 million degrees Celsius for a full 30 seconds.
- This achievement highlights that nuclear fusion is somewhat at odds with its hardware.
- KSTAR is an important feeder project for ITER in France, making this record even more important.
- ITER ("The Way" in Latin) is one of the most ambitious energy projects in the world today.
- In southern France, 35 nations* are collaborating to build the world's largest 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.
- The experimental campaign that will be carried out at ITER is crucial to advancing fusion science and preparing the way for the fusion power plants of tomorrow.
- Thousands of engineers and scientists have contributed to the design of ITER since **the idea for an international joint experiment in fusion was first launched in 1985. The ITER Members—China, the European Union, India, Japan, Korea, Russia and the United States**—are now engaged in a 35-year collaboration to build and operate the ITER experimental device, and together bring fusion to the point where a demonstration fusion reactor can be designed.

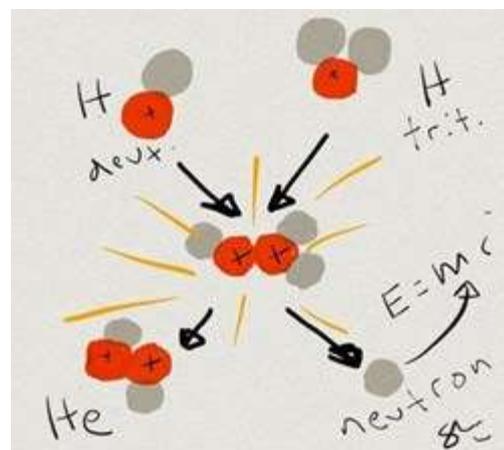


WHAT WILL ITER DO?

- 1) ITER will produce a significant amount of heat in the range of 500 MW for about 7 minutes.
- 2) Demonstrate the integrated operation of technologies for a fusion power plant

WHAT IS FUSION?

- Fusion is the **energy source of the Sun and stars**. In the tremendous heat and gravity at the core of these stellar bodies, hydrogen nuclei collide, fuse into heavier helium atoms and release tremendous amounts of energy in the process.
- Twentieth-century fusion science identified the most efficient fusion reaction in the laboratory setting to be the reaction between two hydrogen isotopes, **deuterium (D) and tritium (T)**. The DT fusion reaction produces the highest energy gain at the "lowest" temperatures.



WHAT IS A TOKAMAK?

The **tokamak** is an experimental machine designed to harness the energy of fusion. Inside a tokamak, the energy produced through the fusion of atoms is absorbed as heat in the walls of the vessel. Just like a conventional power plant, a fusion power plant will use this heat to produce steam and then electricity by way of turbines and generators.

WHO IS PARTICIPATING?

- The ITER Project is a globe-spanning collaboration of 35 nations. The ITER Members **China, the European Union, India, Japan, Korea, Russia** and the **United States** have combined resources to conquer one of the greatest frontiers in science—reproducing on Earth the boundless energy that fuels the Sun and the stars.
- As signatories to the ITER Agreement, concluded in 2006, the seven Members will share of the cost of project construction, operation and decommissioning. They also share the experimental results and any intellectual property generated by the fabrication, construction and operation phases.



Location of ITER

- European Union suggested France, but Japan wanted it to be installed in Japan.
- EU and Japan decided to come to a solution
- Finally, in Moscow, on 28th June 2005, all the member countries decided **France** as the location where the ITER project will be installed and run.
- Construction began in 2007.



INDIA And ITER

Realizing that ITER is an important step on the path to develop fusion energy, India initiated the process of joining ITER as an equal partner by showing its desire to the already existing six partners.

- After a series of steps and negotiations, India has become a partner in the ITER project.
- India will contribute equipment worth nearly 500 million US dollars to the experiment and will also participate in its subsequent operation and experiments.
- This equipment will largely be made by Indian industries.
- India has committed to this long term programme with the following objectives, namely,
 - To fulfil the commitment of delivering Procurement Packages accepted by India.
 - To contribute to the research in burning fusion plasma in the ITER.
 - To acquire self-sufficiency in the critical area of fusion reactor technologies by actively participating in the construction and operation of ITER.
- At the successful completion of this project, India will be ready to build its fusion reactor.

Domestic agencies

Each member of the ITER project – The European Union, China, India, Japan, Korea, Russia, and the United States – has created a domestic agency to meet its contributions and procurement responsibilities. These agencies employ their own staff, have their own budget, and directly oversee all industrial contracts and subcontracting.

ITER EU

The ITER Agreement was signed by [Euratom](#) representing the EU. [Fusion for Energy](#), often referred to as F4E, was created in 2007 as the EU's domestic agency, with headquarters in [Barcelona](#), Spain, and further offices in [Cadarache](#), France, [Garching](#), Germany, and [Rokkasho](#), Japan. F4E is responsible for contributing to the design and manufacture of components such as the vacuum vessel, the divertor, and the magnets.

ITER China

China's contribution to ITER is managed through the China International Nuclear Fusion Energy Program or the CNDA. The Chinese agency is working on components such as the correction coil, magnet supports, the first wall, and shield blanket. China is also running experiments on their [HL-2M](#) tokamak in [Chengdu](#) and HT-7U ([EAST](#)) in [Hefei](#) to help support ITER research.

ITER India

ITER-India is a special project run by India's [Institute for Plasma Research](#). ITER-India's research facility is based in [Ahmedabad](#) in the [Gujarat](#) state. India's deliverables to the ITER project include the cryostat, in-vessel shielding, cooling and cooling water systems.¹

ITER Japan

Japan's National Institutes for Quantum and Radiological Sciences and Technology, or QST, is now the designated Japanese domestic agency for the ITER project. The organization is based in [Chiba](#), Japan. Japan collaborates with the ITER Organization and ITER members to help design and produce components for the tokamak, including the blanket remote handling system, the central solenoid coils, the plasma diagnostics systems, and the neutral beam injection heating systems.

ITER Korea

ITER Korea was established in 2007 under Korea's National Fusion Research Institute and the organization is based in [Daejeon](#), South Korea. Among the procurement items that ITER Korea is responsible for four sectors of the vacuum vessel, the blanket shield block, thermal shields, and the tritium storage and delivery system.

ITER Russia

Russia occupies one of the key positions in the implementation of the international ITER Project. The Russian Federation's contribution to the ITER project lies in the manufacture and supply of high-tech equipment and basic reactor systems. The Russian Federation's contribution is being made under the aegis of [Rosatom](#) or the State Atomic Energy Corporation. The Russian Federation has multiple obligations to the ITER project, including the supply of 22 kilometers of conductors based on 80 tons of superconducting [Nb₃Sn](#) strands for winding coils of a toroidal field and 11 km of conductors based on 40 tons of superconducting [NbTi](#) strands for windings of coils of a poloidal field of the ITER magnetic system. Russia is responsible for the manufacture of 179 of the most energy-intensive (up to 5 MW/sq.m) panels of the First Wall. The panels are covered with [beryllium](#) plates soldered to [CuCrZr](#) bronze, which is connected to a steel base. Panel size up to 2 m wide, 1.4 m high; its mass is about 1000 kg. The obligation of the Russian Federation also includes conducting thermal tests of ITER components that are facing the plasma. Today, Russia, thanks to its participation in the Project, has the full design documentation for the ITER reactor.

ITER US

US ITER is part of the US Department of Energy and is managed by the [Oak Ridge National Laboratory](#) in Tennessee.¹ US ITER is responsible for both the design and manufacturing of components for the ITER project, and American involvement includes contributions to the tokamak cooling system, the diagnostics systems, the electron and ion cyclotron heating transmission lines, the toroidal and central solenoid magnet systems, and the pellet injection systems.

Criticism

The ITER project has been criticized for issues such as its possible environmental impacts, its usefulness as a response to climate change, the design of its tokamak, and how the experiment's objectives have been expressed.

RBI SELLS \$13 BILLION IN AUGUST TO HOLD RUPEE AT 80

- The Reserve Bank of India is estimated to have sold about \$13 billion in the spot market in August to defend the rupee from falling further against the US dollar, top dealers told ET, citing the depletion in the country's forex reserves.
- This is the highest monthly currency market intervention so far in 2022-23 as the central bank is said to be defending the psychological mark of 80.
- Foreign exchange reserves plunged by nearly \$21 billion to \$553.1 in five consecutive weeks between July 29 and September 2, show latest data from RBI. A stable exchange rate is quintessential for foreign portfolio investors who are flocking back to India, experts said.
- "If India wants to be a destination of choice for overseas investors, we need to have a stable exchange rate. Also, higher oil prices and a falling rupee will only stoke inflation fear for a country, which is now aiming for higher economic growth," said Bhaskar Panda, executive vice president at HDFC Bank. "Such combination of factors including global volatility may have prompted the central bank to stabilise USDINR in the currency market."
- On record, the central bank always denies protecting any level but bats for cutting high volatility.
- "RBI is clearly protecting the 80 level as we could see aggressive dollar selling over the past one month," a chief currency dealer at a large bank said on condition of anonymity.
- The rupee plunged to a lifetime low of 80.13 against the US dollar on August 29.
- A majority of India's foreign exchange reserves is held in US dollar-denominated currency while the rest comes from investment in non-dollar assets.
- Out of \$21 billion forex reserves depletion between July 29 and September 2, a chunk of \$7 billion can be attributed to the devaluation of non-dollar assets, show internal estimates. During the period, the dollar index, which measures the US unit against other major currencies, gained 3.6%.
- The rest over \$13 billion the central bank had likely sold in the spot market, cutting the rupee's wild move while draining India's US dollar stock, dealers said.
- "RBI's intervention intensified since July end as we observed," said Amit Pabari, founder and managing director of CR Forex, a Mumbai-based foreign exchange firm. "The central bank is clearly defending the psychological level at 80 as it triggers more panic than actual reality."
- He said the forex reserves depletion "can well be replenished once India is included in the global bond index".
- While a part of the rupee outperformance is attributed to speculation of Indian government bonds in the JPMorgan Government Bond Index-Emerging Markets (GBI-EM) index, it now turns out that the interventions also helped, banking insiders told ET.