ITER
The way to new energy

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ITER Organization
Communication and
External Relations

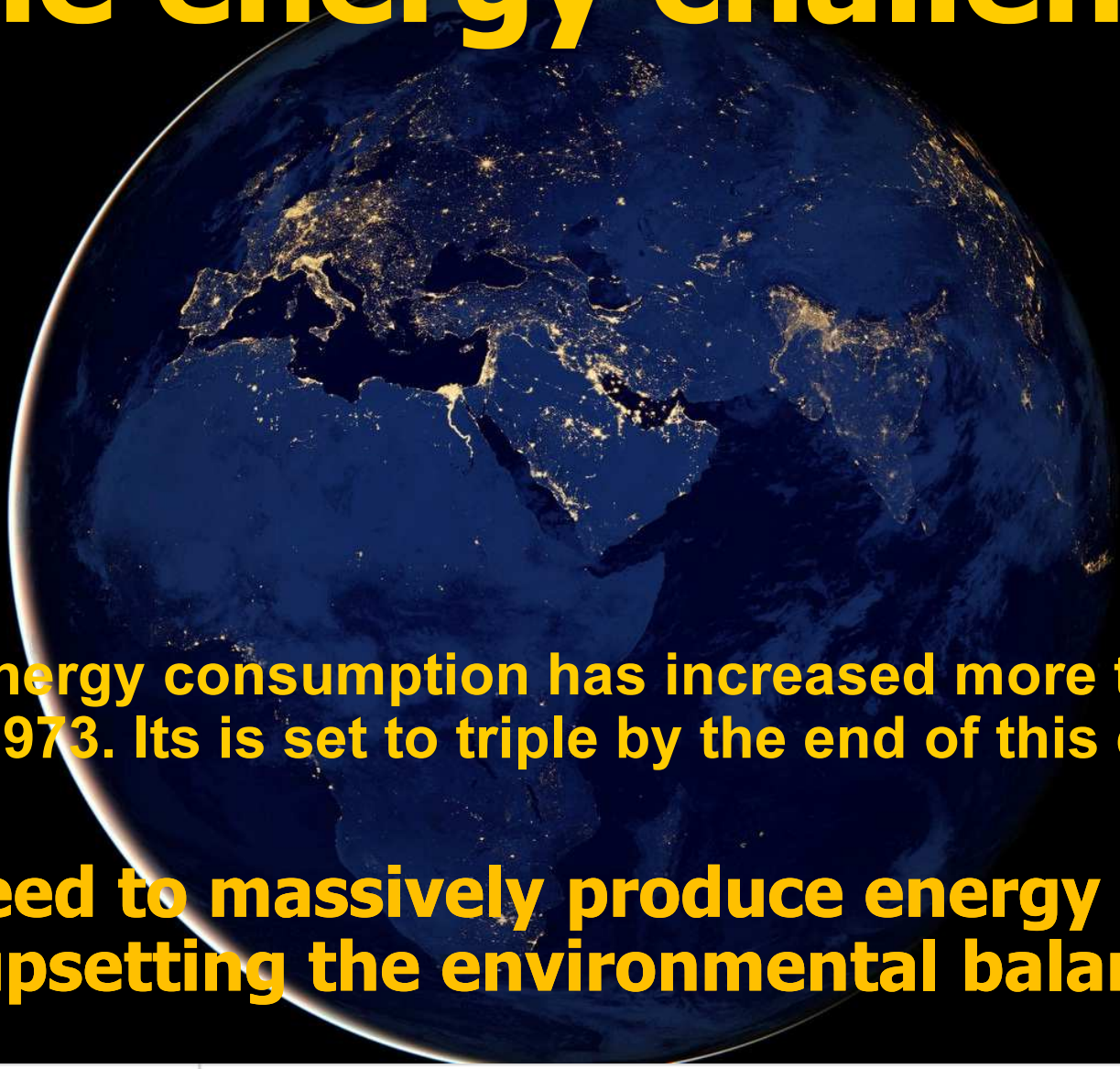
ITER

- The Latin word for "the way"
- The largest and most powerful fusion device ever built

ITER

A unique international collaboration to demonstrate the feasibility of fusion energy

The energy challenge

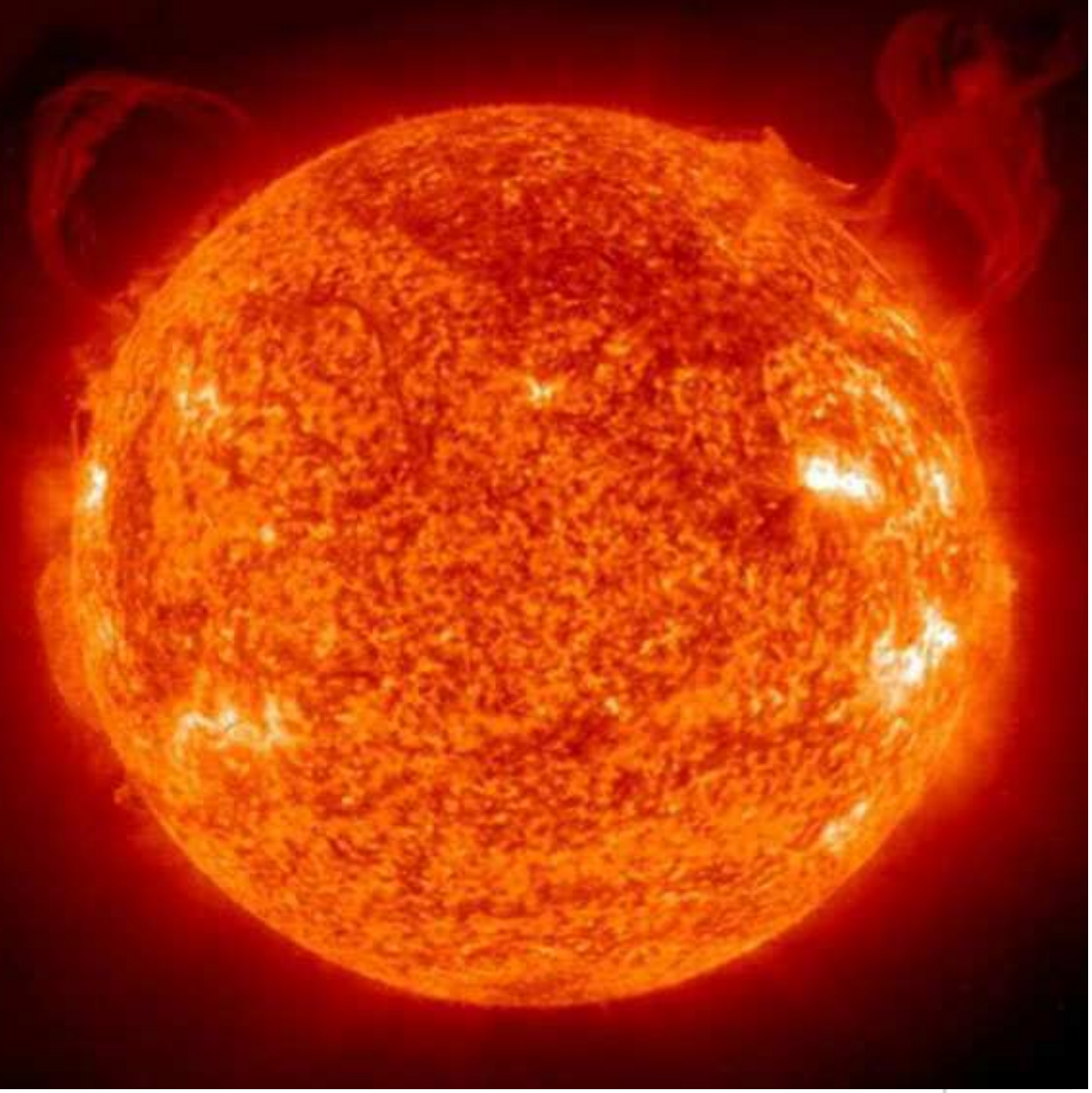


World energy consumption has increased more than 50% since 1973. Its is set to triple by the end of this century.

We need to massively produce energy without upsetting the environmental balance

Fusion in the Universe

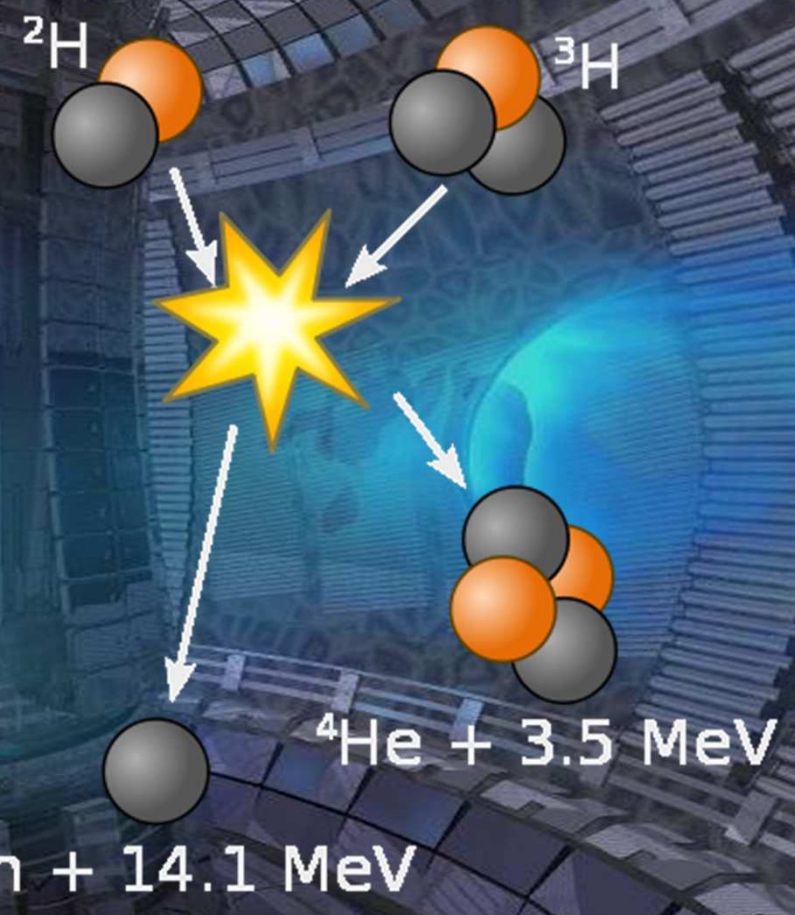
- Fusion powers the Sun and stars.
- In a fusion reaction, two light atomic nuclei combine, form a heavier nucleus and release energy.
- Magnetic fusion aims at reproducing a similar reaction on Earth.



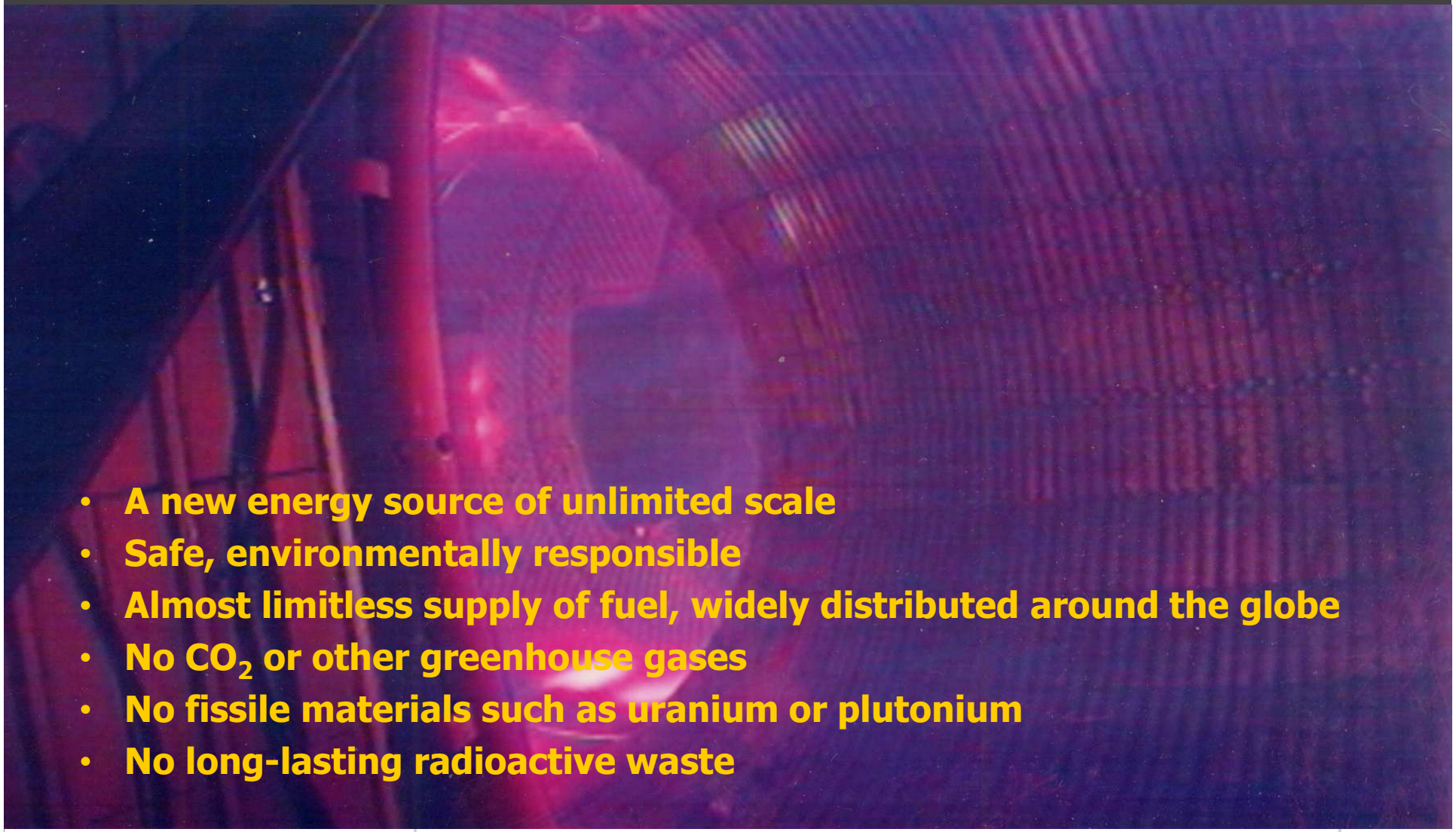
Fusion on Earth

1 gram of fusion fuels = 8 tons of oil

- Heat Deuterium + Tritium (DT) plasma to more than 100 million °C
- Keep hot plasma away from walls by strong magnetic fields.
- "High energy " helium nuclei sustain burning plasma.
- Neutrons transfer their energy to the Blanket .
- In a fusion power plant, conventional steam generator, turbine and alternator will transform the heat into electricity.



Fusion's attractions



- A new energy source of unlimited scale
- Safe, environmentally responsible
- Almost limitless supply of fuel, widely distributed around the globe
- No CO_2 or other greenhouse gases
- No fissile materials such as uranium or plutonium
- No long-lasting radioactive waste

Of bathtubs and laptop batteries…

+

Lithium* contained in the battery of a single laptop computer and deuterium from half a bathtub of water can provide 200,000 kilowatt/hours of electricity.

That's enough to cover for 30 years the energy needs of one person in Western Europe.

**** Neutrons impacting Lithium generate Tritium***

ITER

Global challenge, global response

28 June 2005: The ITER Members unanimously agreed to build ITER at Cadarache

21 November 2006: The ITER Agreement was signed at the Élysée Palace, in Paris.

The seven ITER Members represent more than 50% of the world's population and about 80% of the global GDP

China EU India Japan Korea Russia USA

The ITER Project:

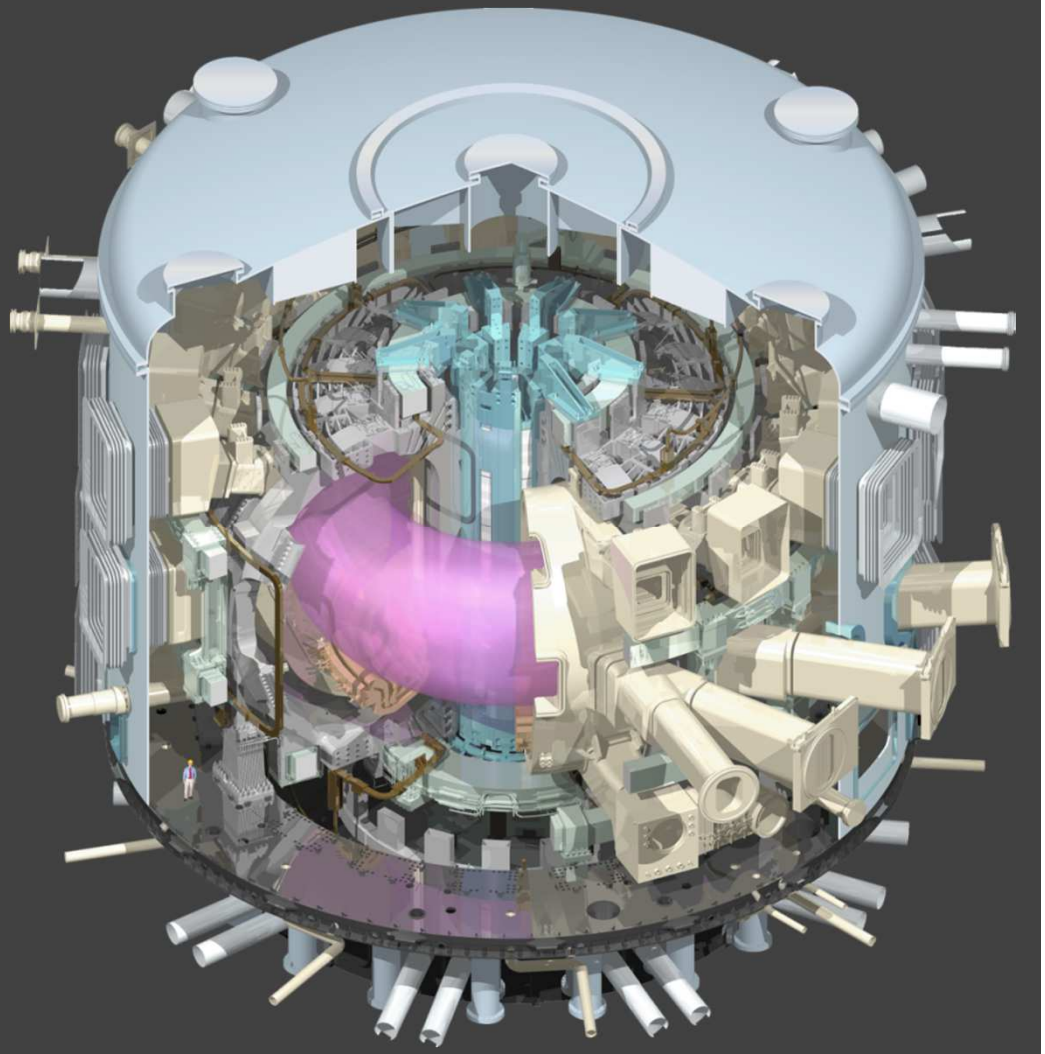
ITER Organization & Seven ITER Members

- The 7 ITER Members make cash and in-kind contributions to the ITER Project. They have established Domestic Agencies
- The ITER Organization manages the ITER Project in close collaboration with the 7 Domestic Agencies
- The ITER Members share the intellectual Property

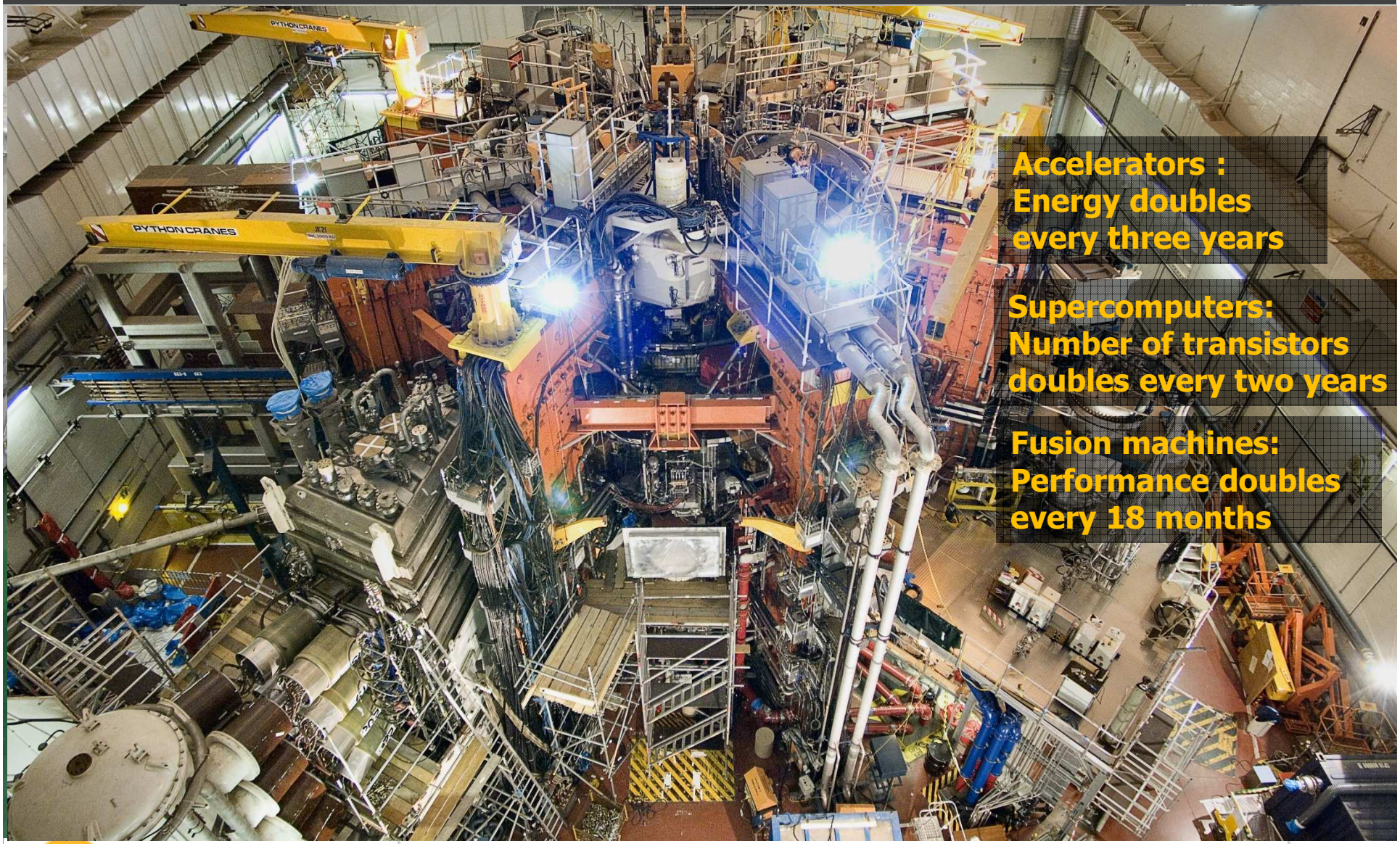
What will ITER do?

- ITER will demonstrate the availability and integration of science and technologies, and safety features for a fusion reactor
- The self-sustained D-T burning plasma in ITER generates 10 times more power than it receives
- Input 50 MW > Output 500 MW
- ITER is a power amplifier
- ITER is a necessary step on the way to commercial fusion reactor
- Schedule

Construction:	2010-2020
First Plasma:	2020
DT Operations:	2027



50 years of constant progress



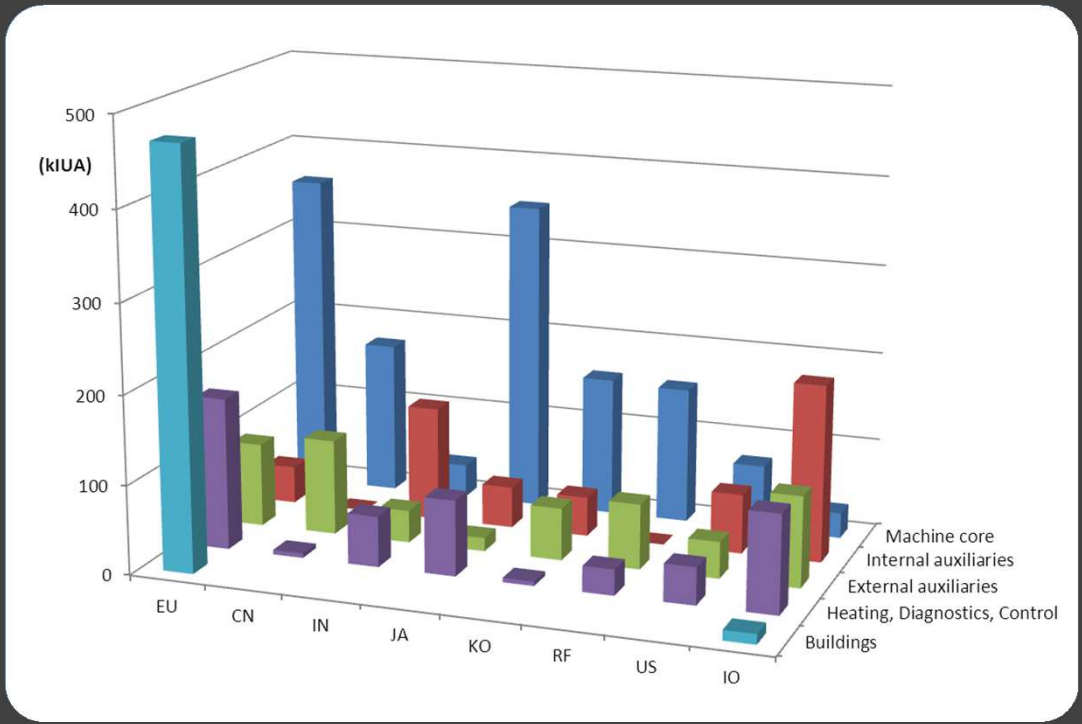
Accelerators :
Energy doubles every three years

Supercomputers:
Number of transistors doubles every two years

Fusion machines:
Performance doubles every 18 months

A unique formula

ITER is being built largely through in-kind contribution by the seven Members of the ITER Organization.

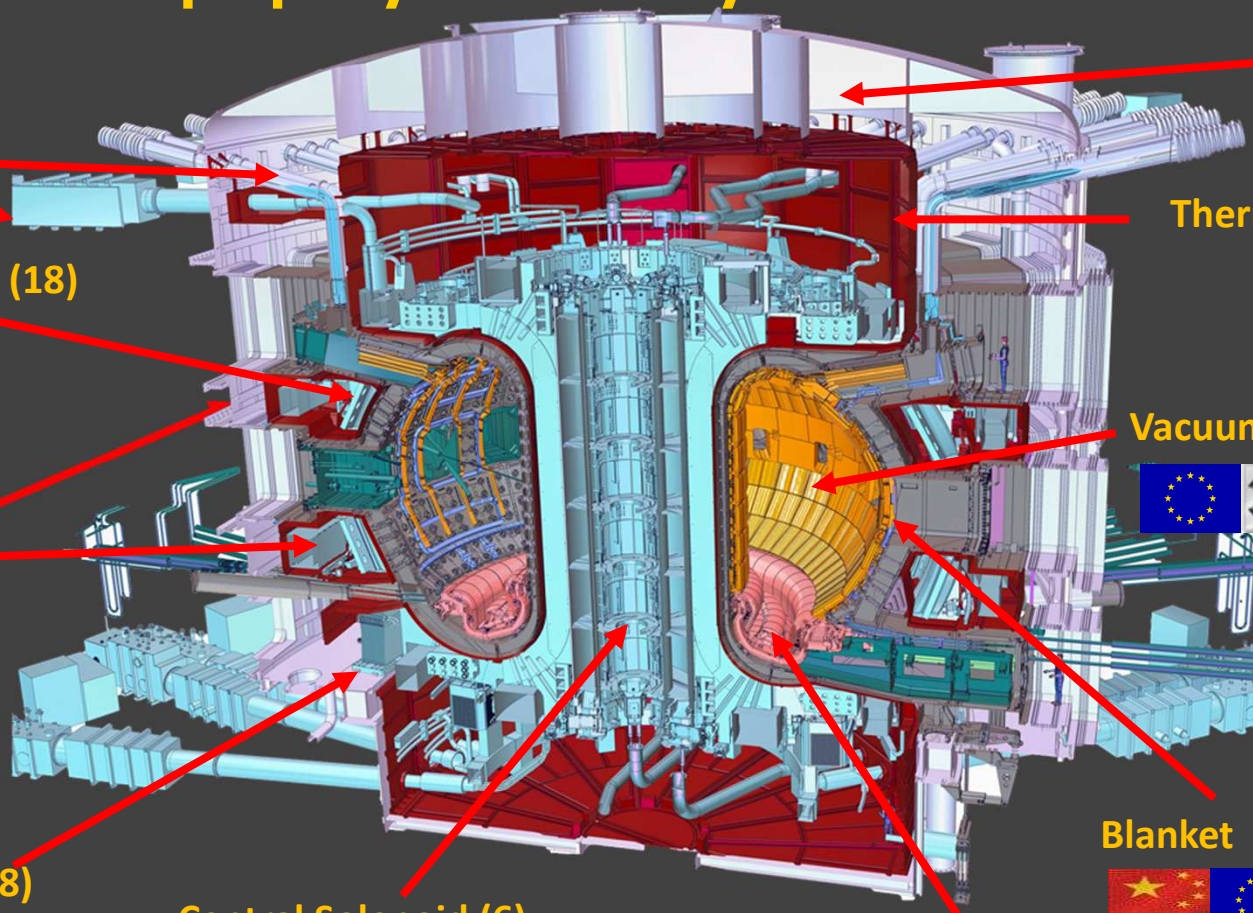


Procurement packages are shared between China, India, Japan, Korea, Russia and the United States (9%).

Europe's share, as Host Member, is 45%.

Who manufactures what?

All intellectual property is shared by the seven members



Feeders (31)

Cryostat

Thermal Shield

Toroidal Field Coils (18)

Vacuum Vessel

Poloidal Field Coils(6)

Blanket

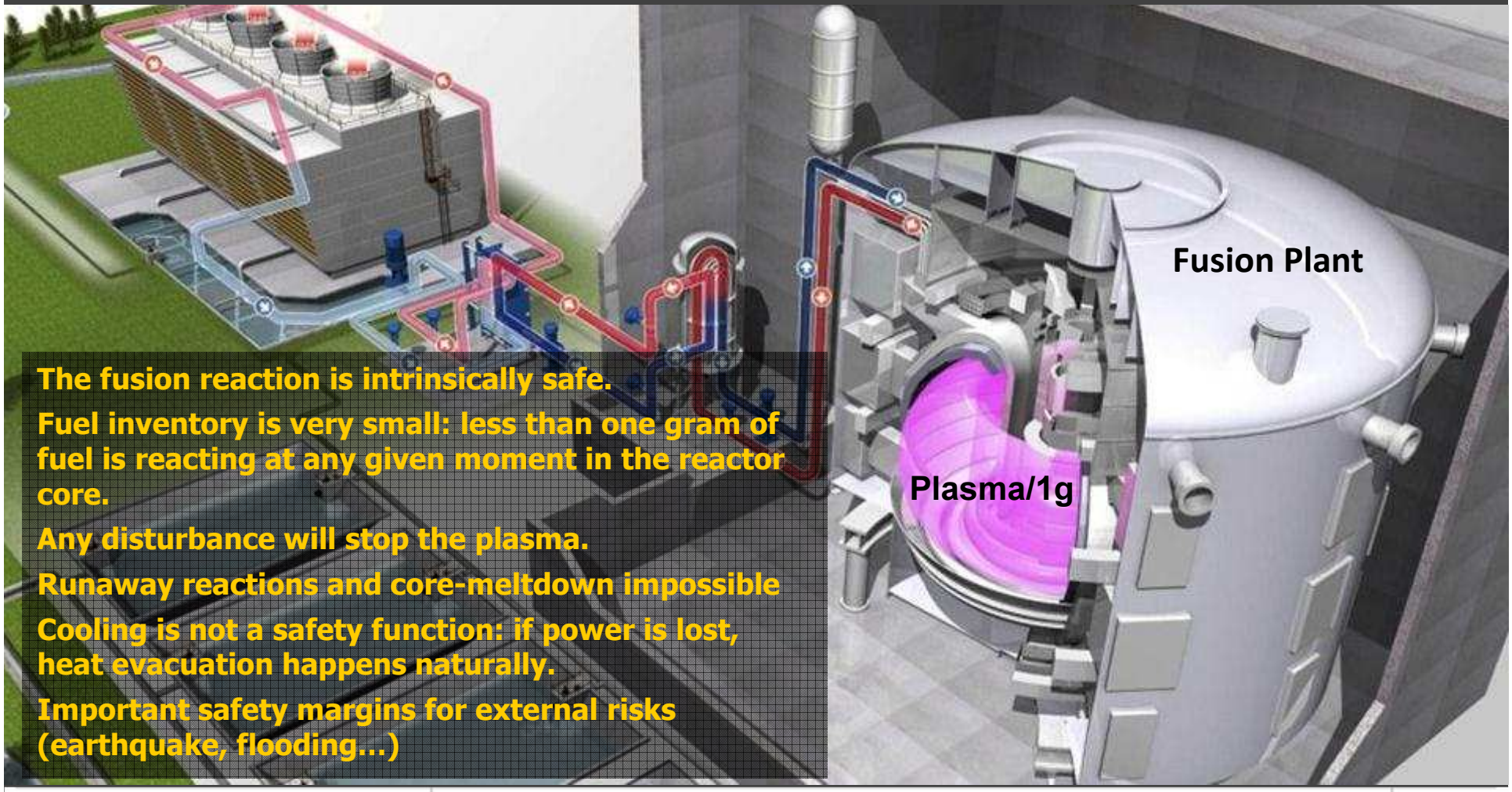
Correction Coils(18)

Central Solenoid (6)

Divertor

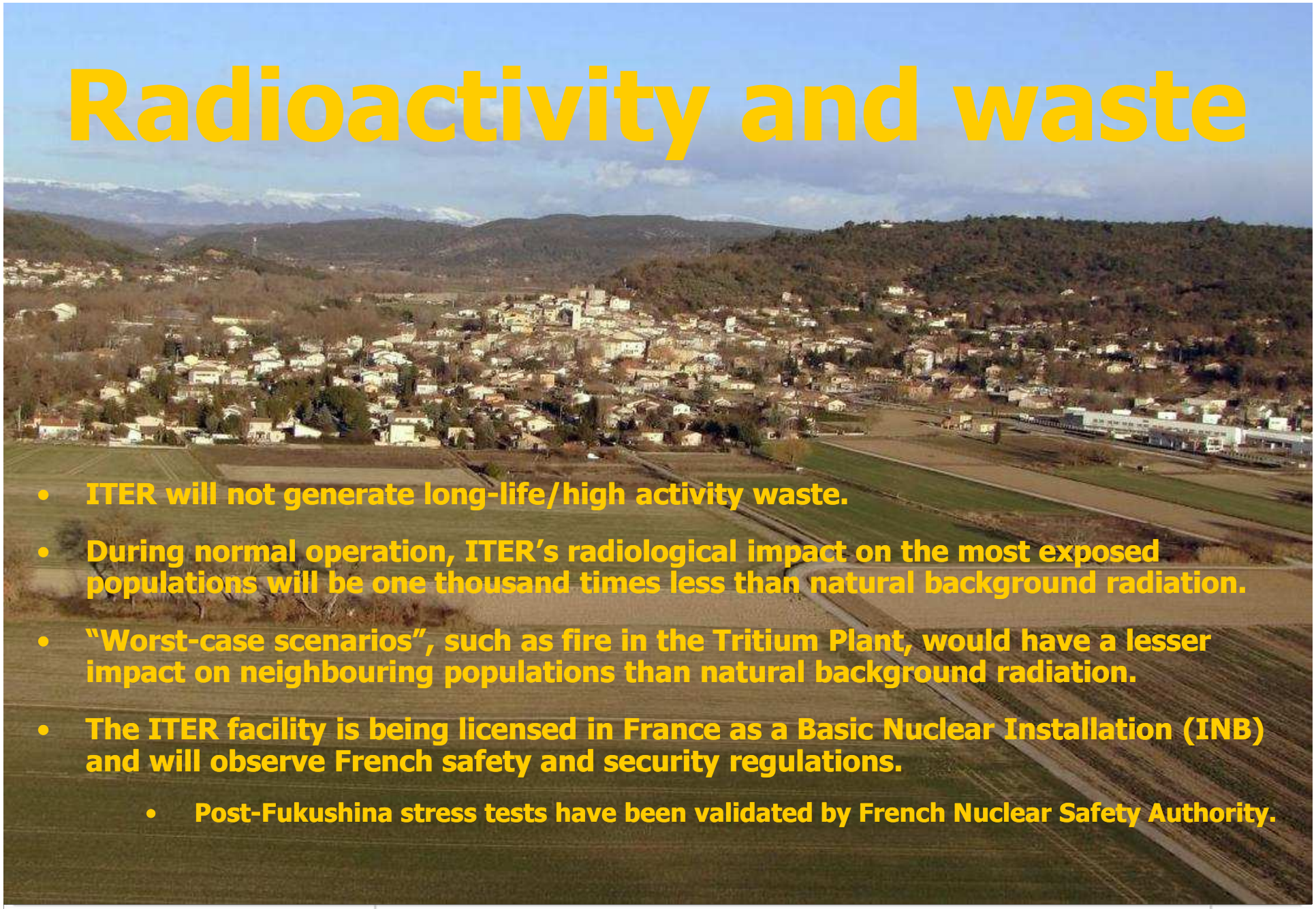
How safe is ITER?

A Fukushima-like accident is <u>impossible</u> in ITER
ITER is safe for workers, people and the environment



- The fusion reaction is intrinsically safe.
- Fuel inventory is very small: less than one gram of fuel is reacting at any given moment in the reactor core.
- Any disturbance will stop the plasma.
- Runaway reactions and core-meltdown impossible
- Cooling is not a safety function: if power is lost, heat evacuation happens naturally.
- Important safety margins for external risks (earthquake, flooding…)

Radioactivity and waste

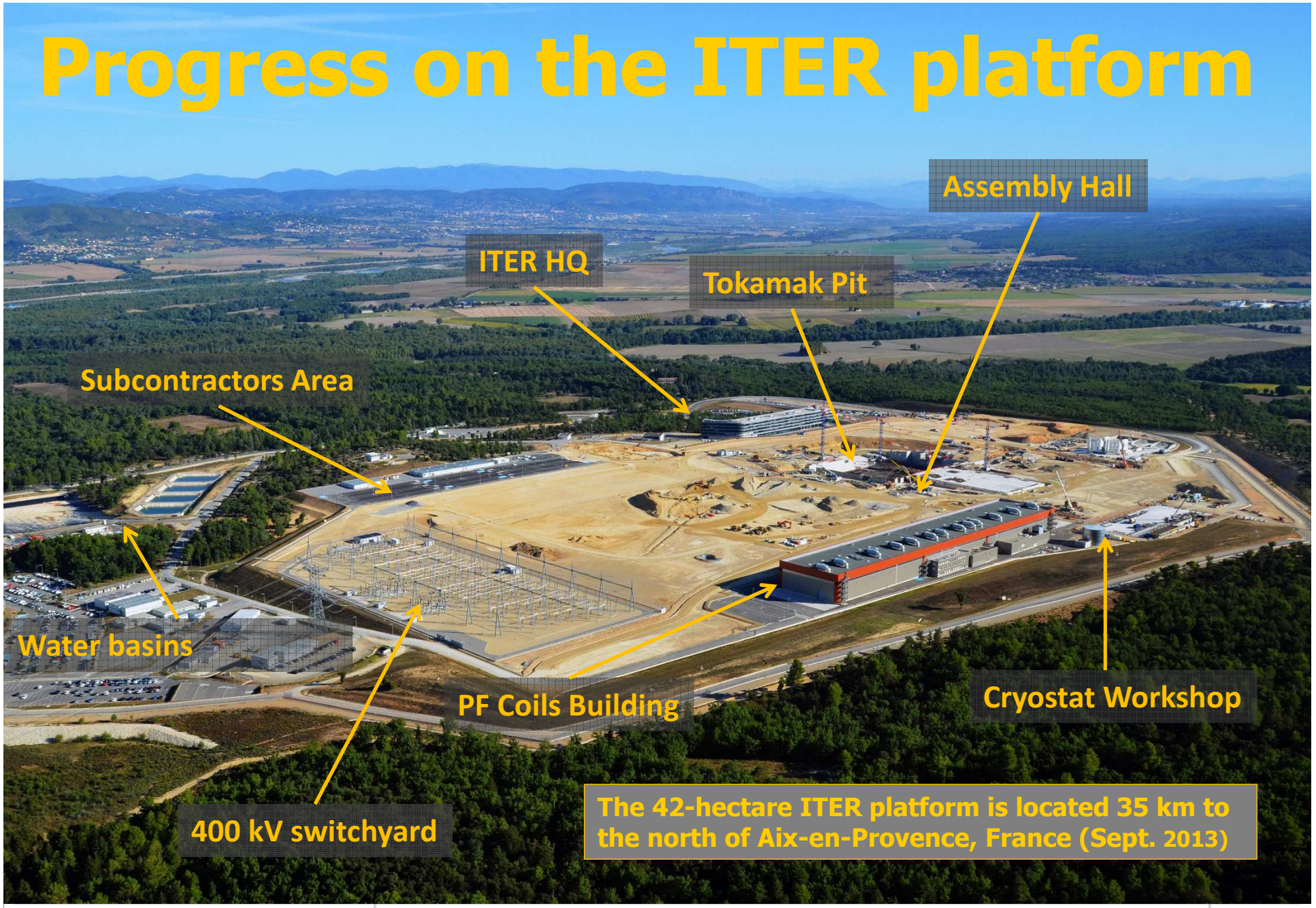


- ITER will not generate long-life/high activity waste.
- During normal operation, ITER's radiological impact on the most exposed populations will be one thousand times less than natural background radiation.
- "Worst-case scenarios", such as fire in the Tritium Plant, would have a lesser impact on neighbouring populations than natural background radiation.
- The ITER facility is being licensed in France as a Basic Nuclear Installation (INB) and will observe French safety and security regulations.
    - Post-Fukushina stress tests have been validated by French Nuclear Safety Authority.

A renewed commitment

At the initiative of European commissioner for Energy Günther H. Oettinger, the ministerial representatives of the seven ITER Members held a Council meeting at ITER on 6 September. In the presence of French minister of Higher Education and Research Geneviève Fioraso, they all reaffirmed their strong support for the ITER project.

Progress on the ITER platform



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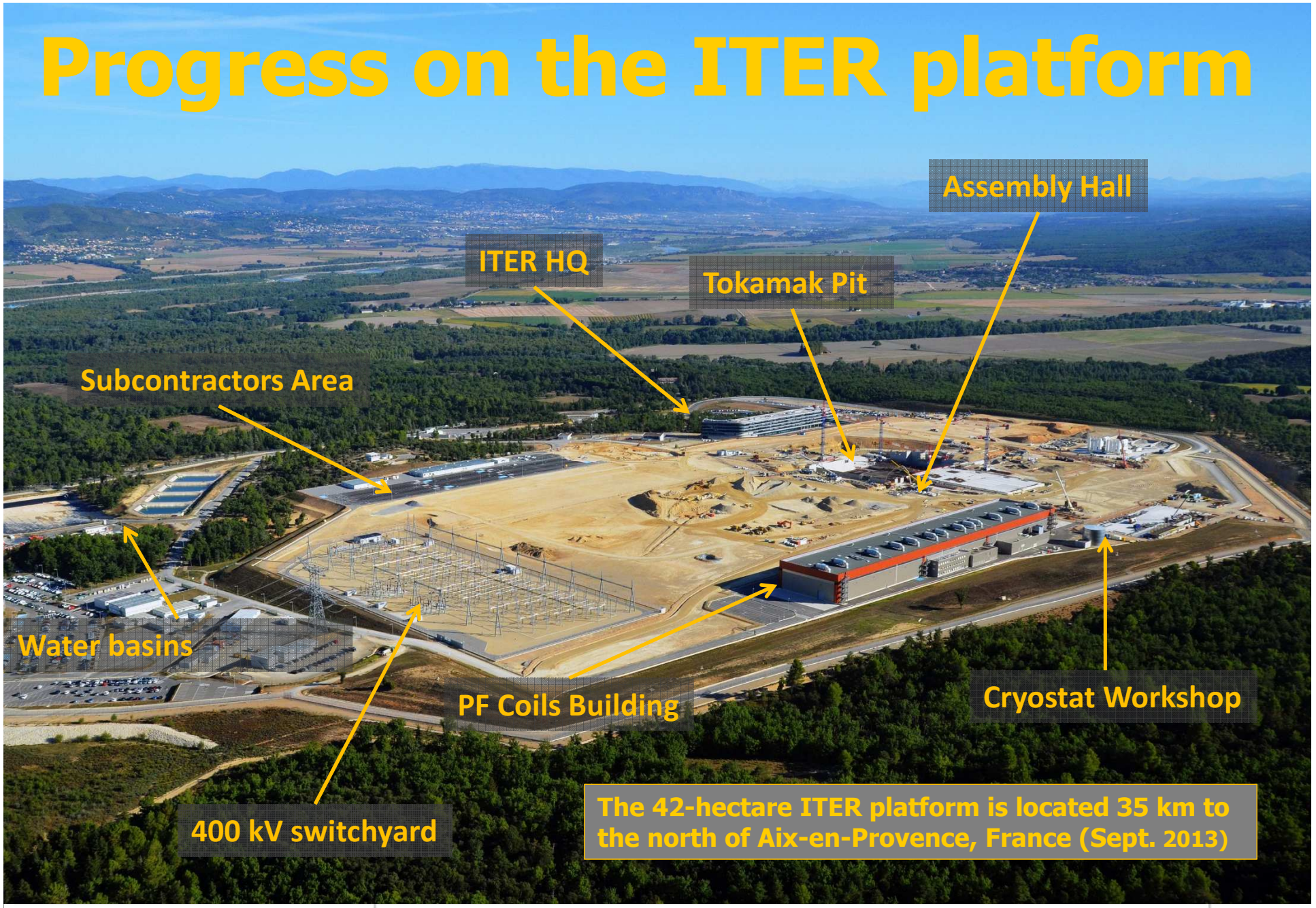
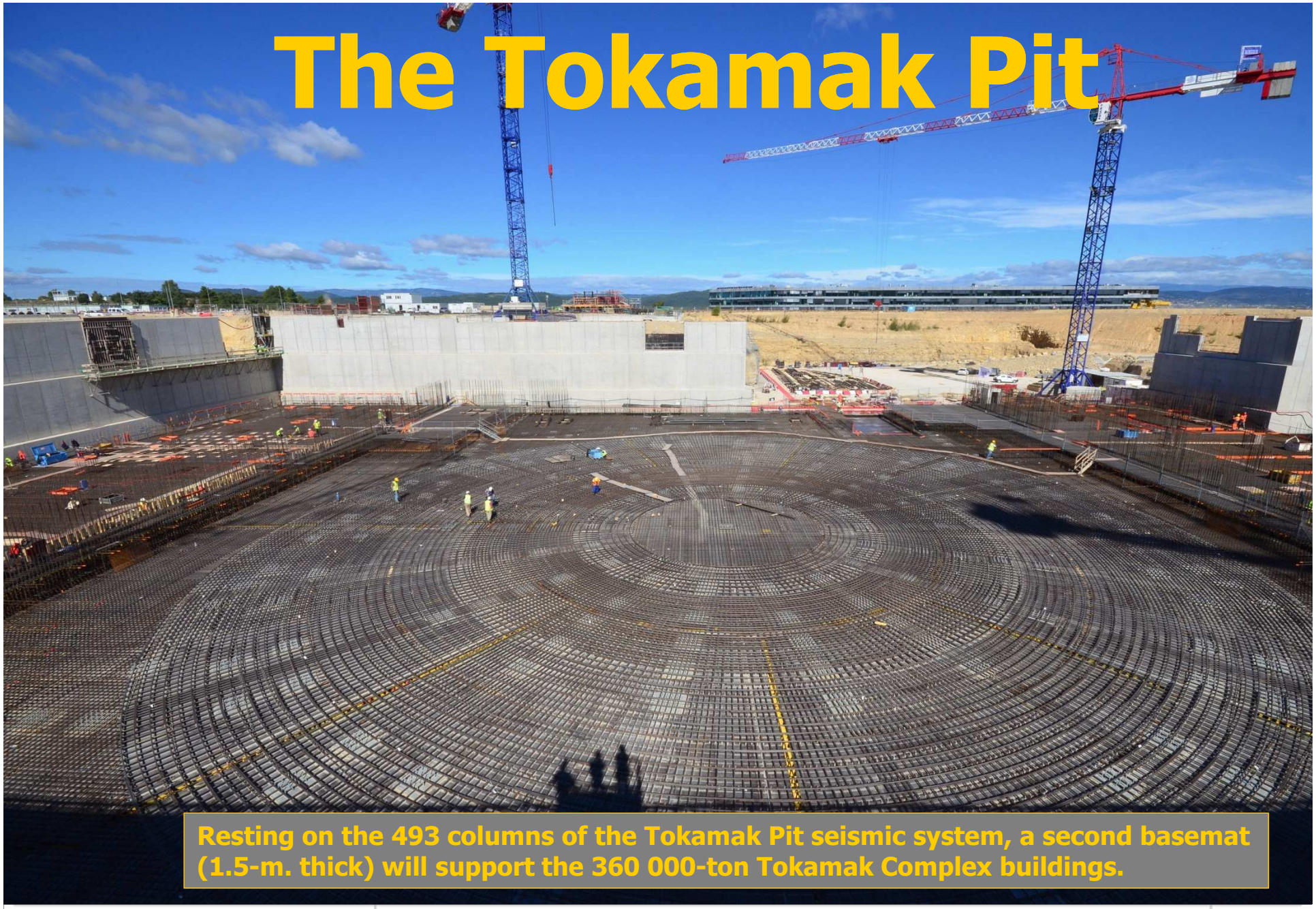
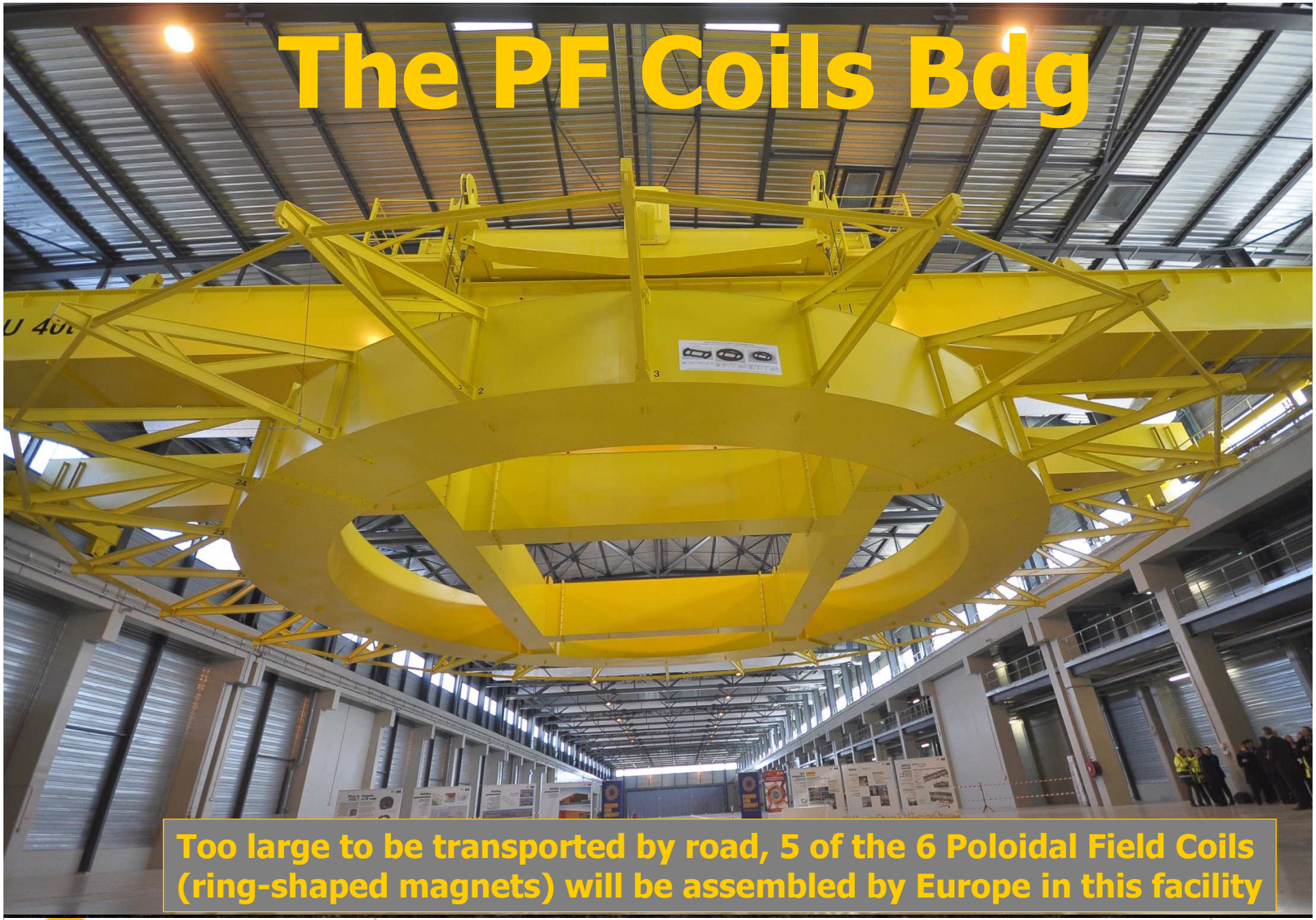


The Tokamak Pit



Resting on the 493 columns of the Tokamak Pit seismic system, a second basemat (1.5-m. thick) will support the 360 000-ton Tokamak Complex buildings.

The PF Coils Bdg



Too large to be transported by road, 5 of the 6 Poloidal Field Coils (ring-shaped magnets) will be assembled by Europe in this facility

The Cryostat Workshop

Construction of the Cryostat Workshop began on 6 June 2012. Procured by India, the giant refrigerator (30 m. x 30 m.) that encloses the ITER Tokamak will be assembled here.

Assembly Hall and Contractors Area

The pouring of the Assembly Hall basemat (6,000 square metres, 1.2 to 2.2-meter thick, 1,400 tons of steel reinforcement) began is now finalized. When delivered to the ITER site, the machine components will be pre-assembled here.

A 3 500 m² area is being prepared for contractors participating in the construction of the ITER installation. It includes modular office buildings, a cafeteria, an infirmary, parking space and storage areas.

Production is launched…

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Conductors destined to the ITER TF Coils are being produced and tested in Russia

At Korea's Hyundai Heavy Industries, fabrication of 2 vacuum vessel sectors is ongoing.

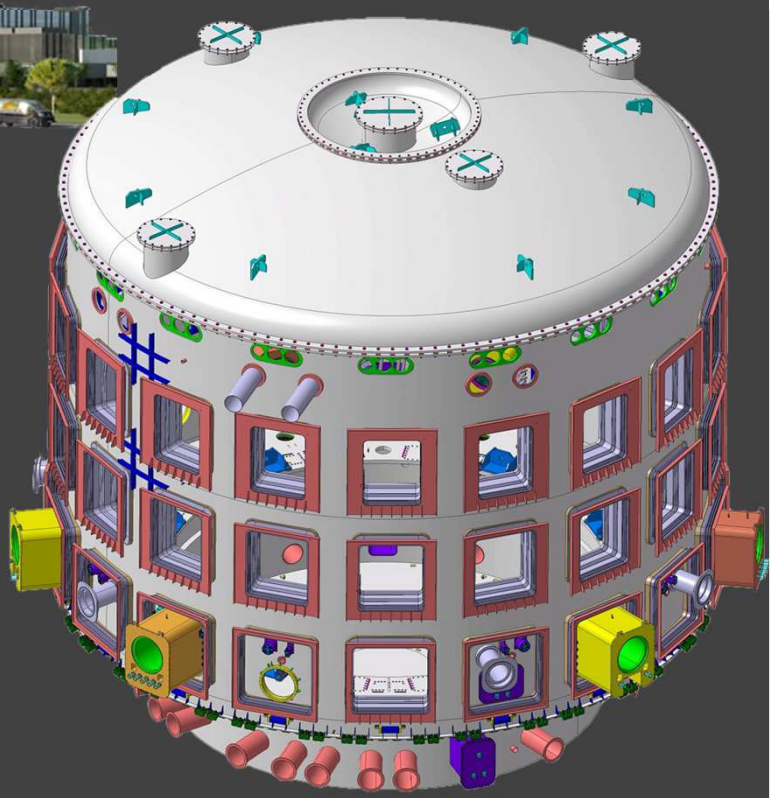
Dummy conductor fabrication at Nippon Steel in Japan.

...throughout the world

Some important contracts

Construction contract for the Tokamak Complex (295 million euros) was awarded to the French Spanish (Vinci, Razel, Ferrovial).

The Contract for the construction of the 29-meter high ITER Cryostat was awarded to the Indian company Larsen & Toubro Ltd.



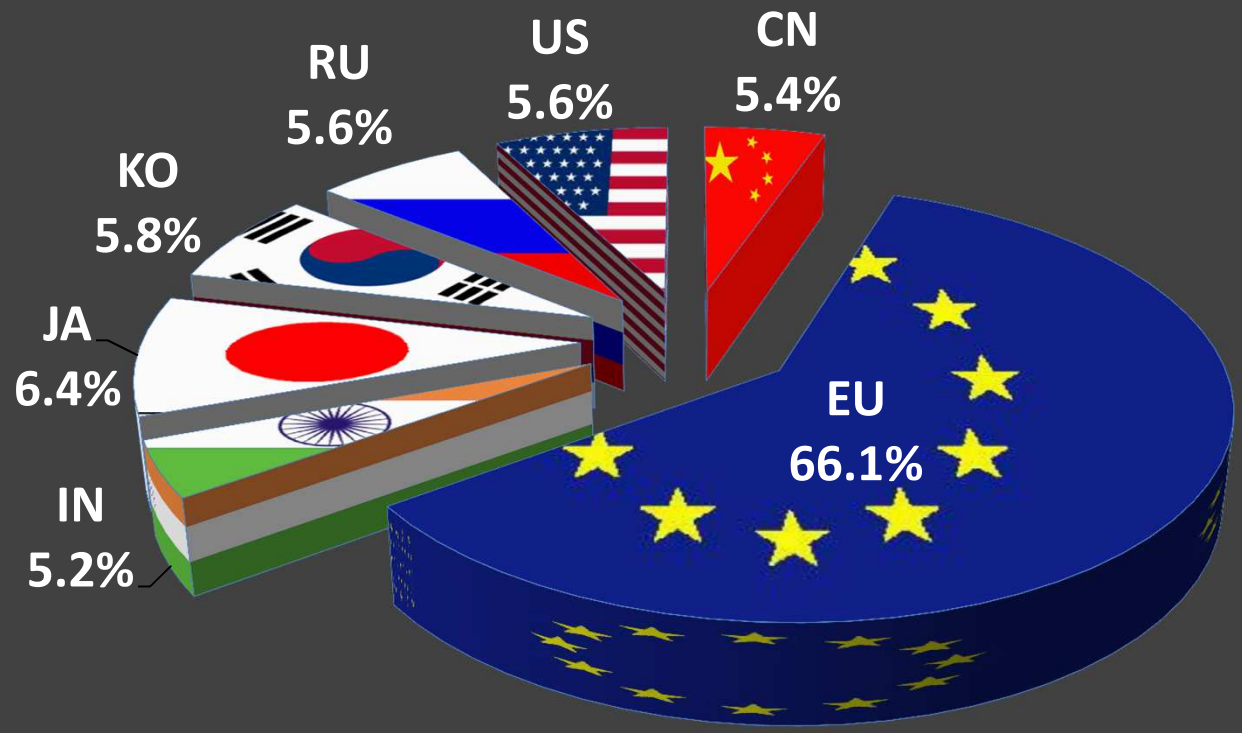
The European Domestic Agency has concluded a EUR 530 million euros contract for Tokamak Complex building services with a Franco-German consortium comprising Cofely Axima, Cofely Ineo and Cofely Endel (part of the GDF Suez Group) and the M +W Group GmbH.

In collaboration with the Italian SIMIC, French company CNIM will produce 70 TF Coils radial plates – a contract worth 160 million euros.

First test convoy successful
(16-20 Sept. 2013)

The ITER Itinerary test convoy, featuring an 800-metric-ton trailer replicating the weight and dimensions of ITER's most exceptional loads, has successfully completed its four-night journey, arriving at the ITER construction site at 4:45 a.m. on Friday 20 September.

Who works for ITER?



The IO has a total of 501 staff members; an equal number of contractors, experts and consultants directly work for the ITER Organization in Saint-Paul-lez-Durance, France.

On to DEMO

After ITER comes DEMO, the pre-industrial demonstrator that will lead fusion into its industrial era. The ITER Members have engaged the conceptual designs for different DEMO projects. By 2040-2050 feeding electricity to the grid could be demonstrated.

In less than 8 years


Thank you for your attention
More information at:
http://www.iter.org