ITER Current Status

Bernard BIGOT
Director-General ITER Organization

7 & 8 April 2021

Remote ITER Business Meeting

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Work scope towards First Plasma > 72% complete

According to the stringent metrics that measure project performance, > 72 % of the "total construction work scope from Design through First Plasma" is now complete.

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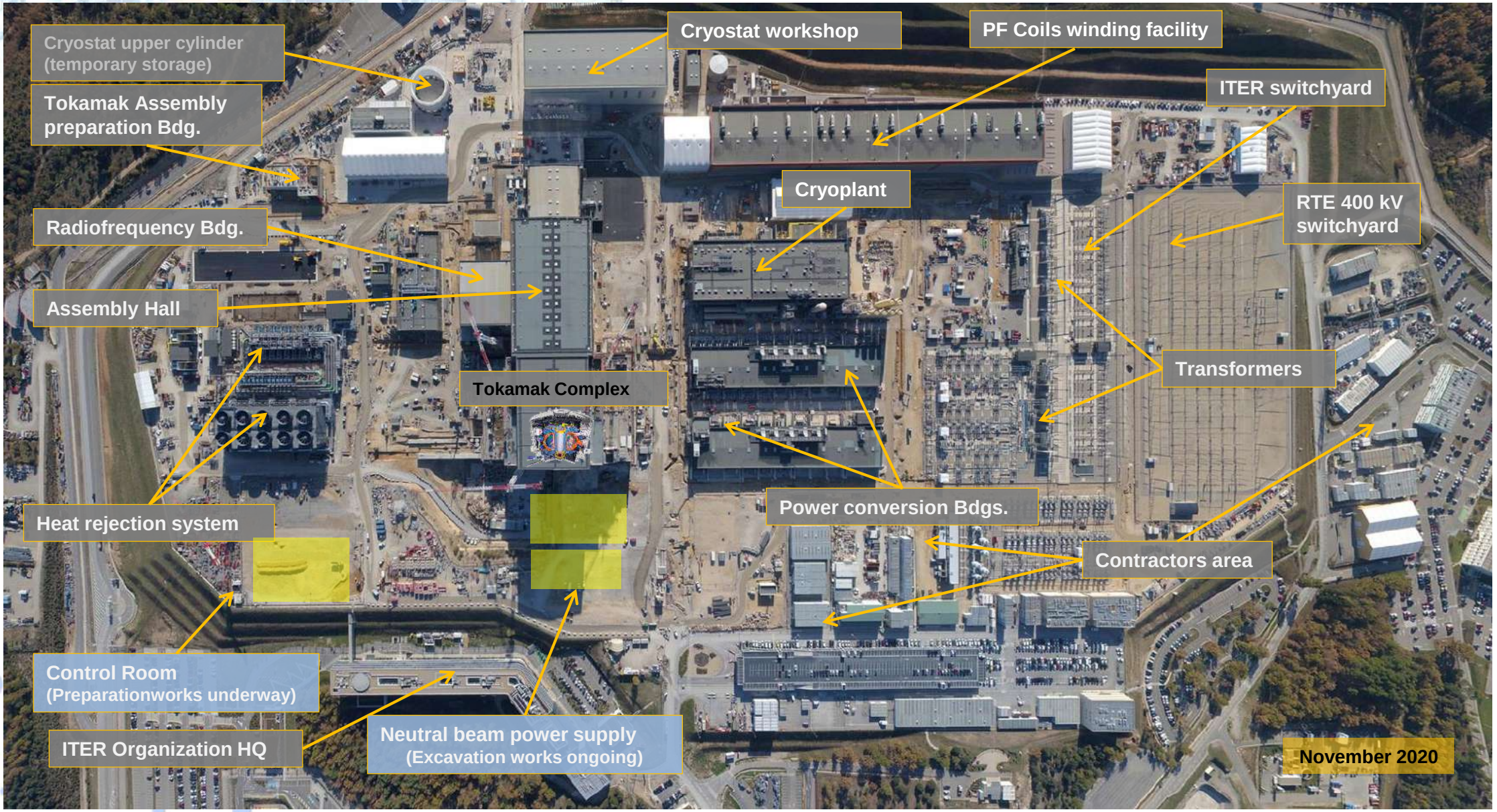
Worksite progress



Six years of steady progress

April 2014

November 2020

More than 78% of the installation's civil works are now completed.

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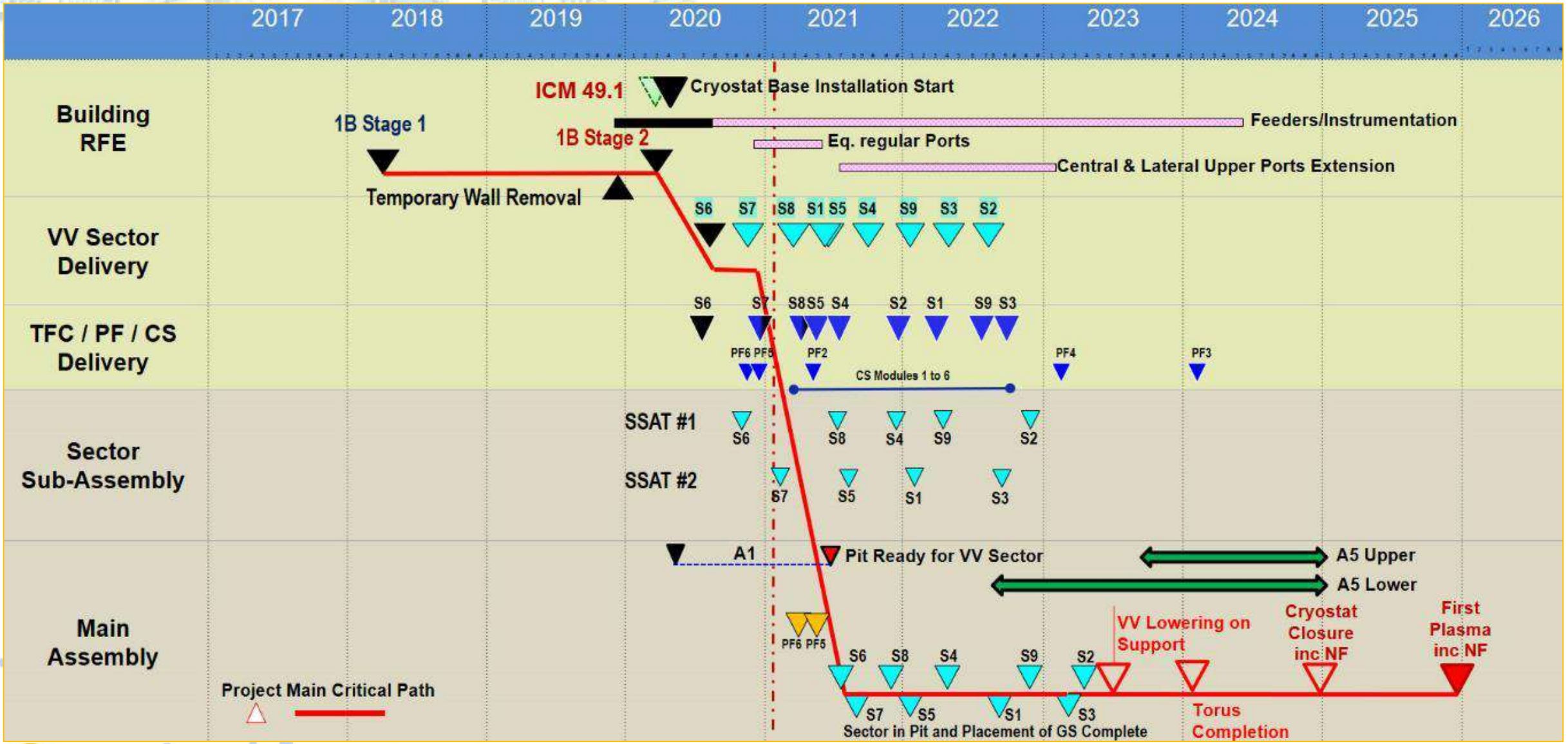
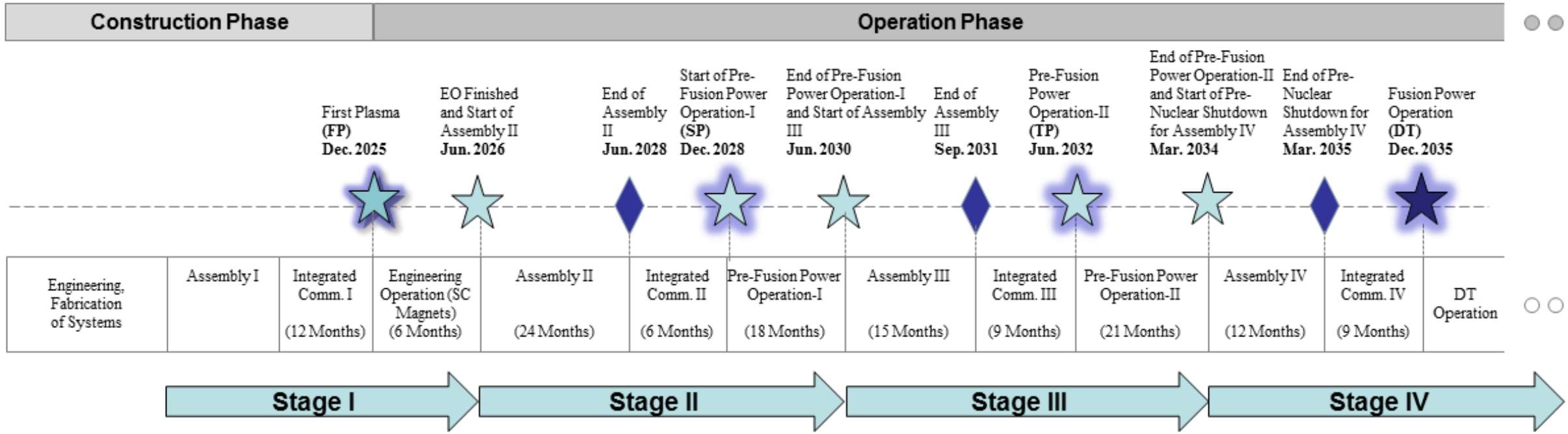
Details of Revised Construction Strategy



A staged approach to DT plasma

Extensive interactions among IO and DAs to finalize revised baseline schedule after COVID-19

- ✓ **Schedule and resource estimates through First Plasma (2025) consistent with Members' budget constraints**
- ✓ **Proposed use of 4-stage approach through Deuterium-Tritium (2035) consistent with Members' financial and technical constraints**



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Coping with COVID-19

Maintaining critical activities – ensuring personnel health and safety

- Anticipation (network tests, worksite reorganization as early as March, etc.)
- Strict observance of sanitary authorities recommendations;
- Teleworking
- Strong support from ITER Members and staff
- No productivity loss
- Establishing a « New Normal »:
  - Minimum 2 days onsite for non-worksite staff and contractors

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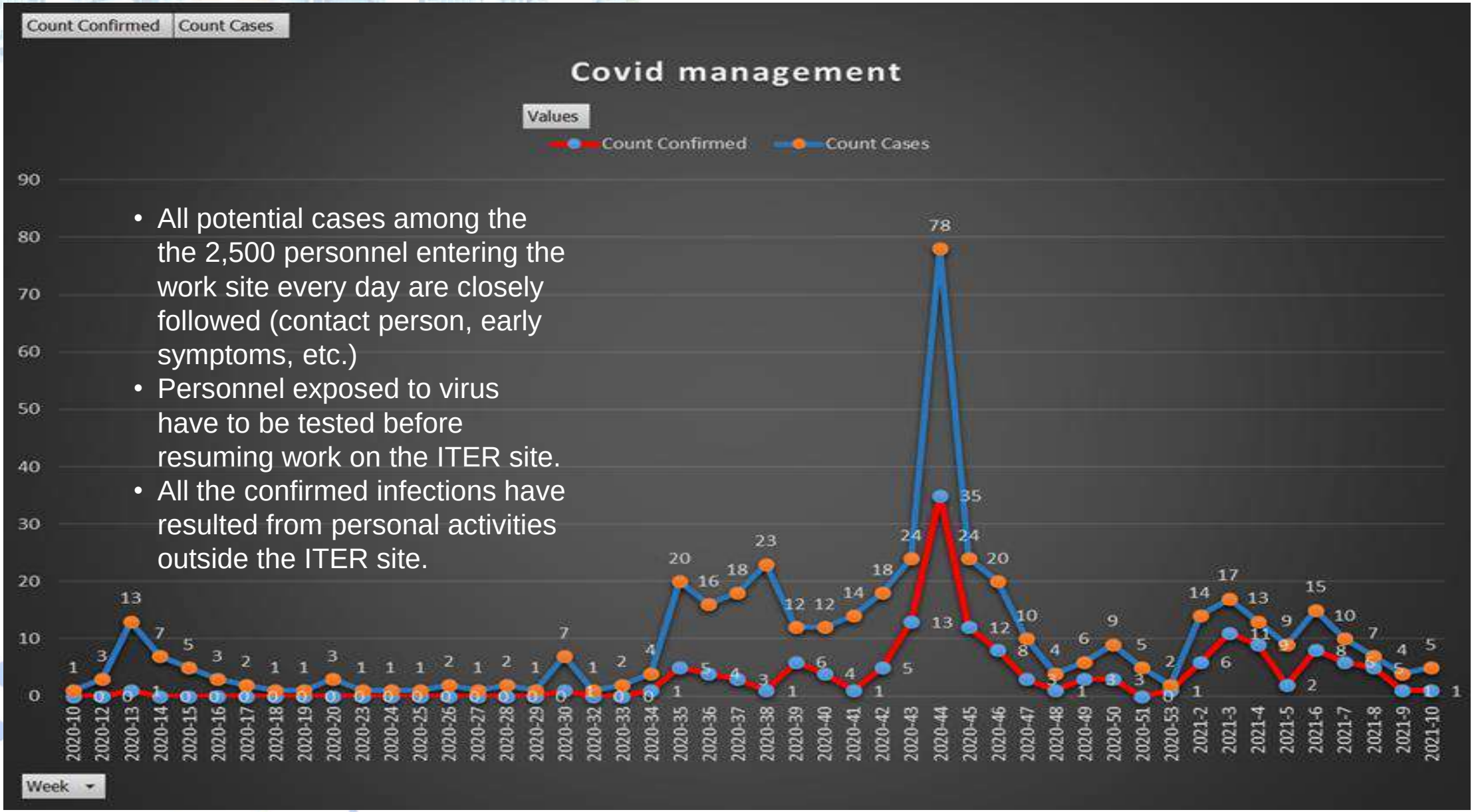
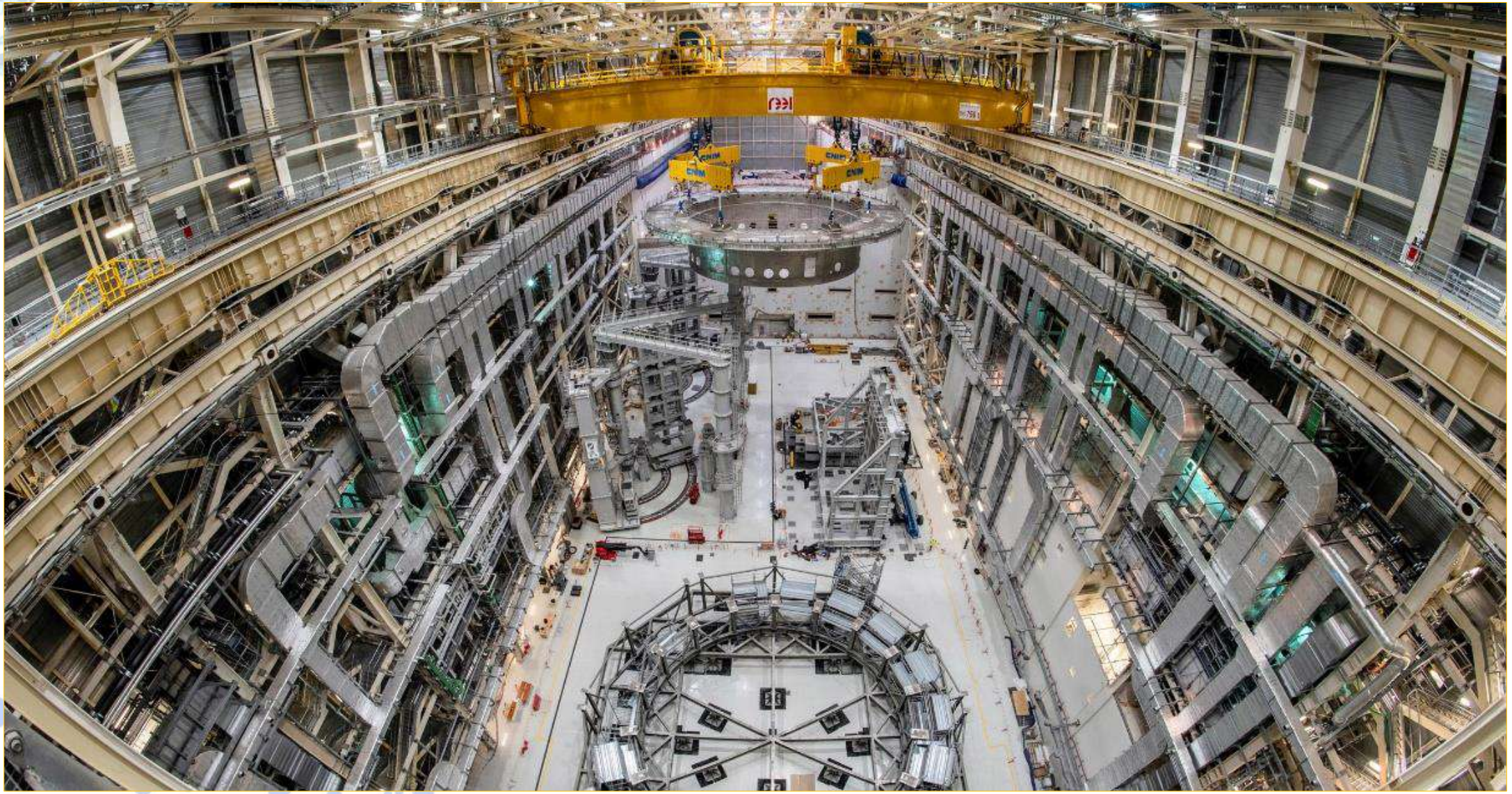
Coping with COVID-19



- All potential cases among the the 2,500 personnel entering the work site every day are closely followed (contact person, early symptoms, etc.)
- Personnel exposed to virus have to be tested before resuming work on the ITER site.
- All the confirmed infections have resulted from personal activities outside the ITER site.

Recent progress: A crucial milestone



On May 26-27 2020, the base of the Cryostat (1,250 t; procured by India) was successfully inserted into the Tokamak Assembly Pit.

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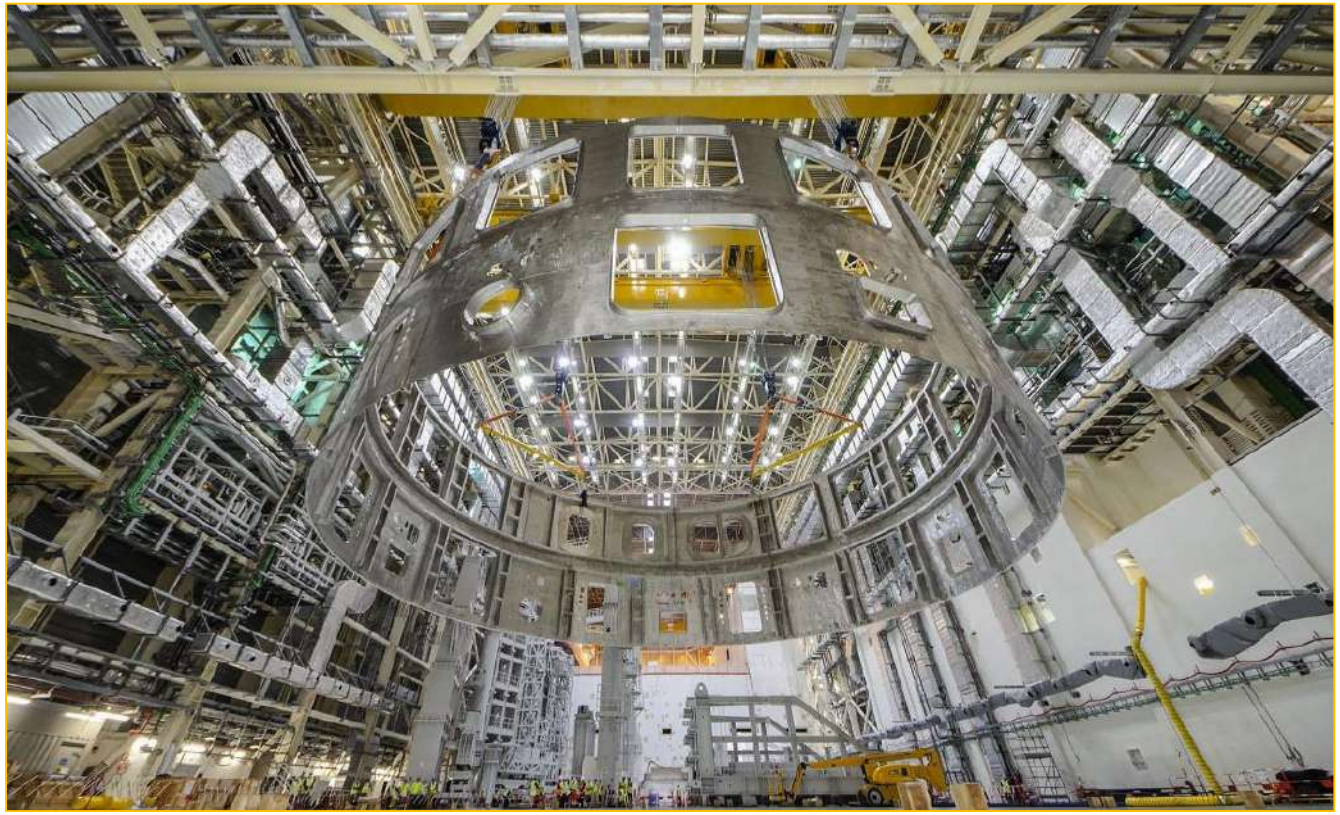
Recent progress:
Lower cylinder insertion



Cryostat Lower Cylinder lift

Inserting the Cryostat Lower Cylinder into the Tokamak Pit.
Perfect fit with the Base

31 August 2020

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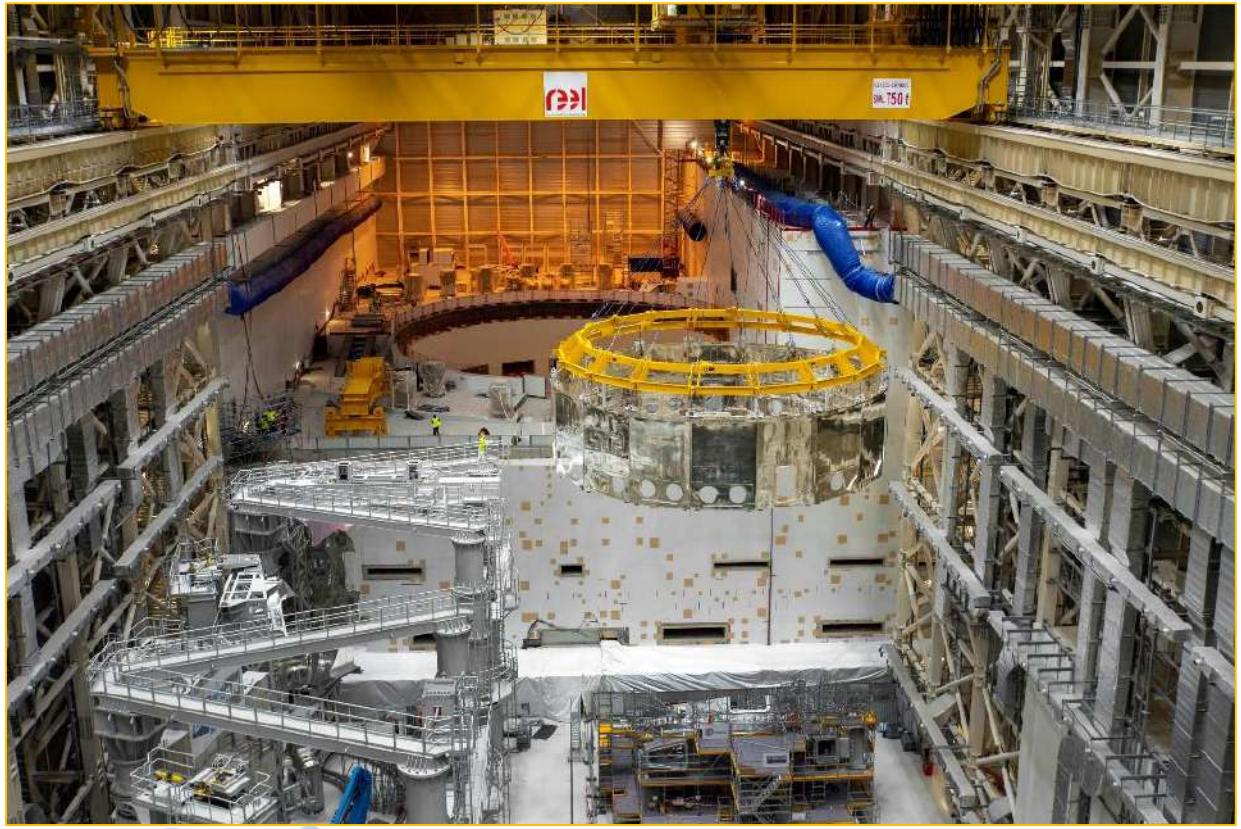
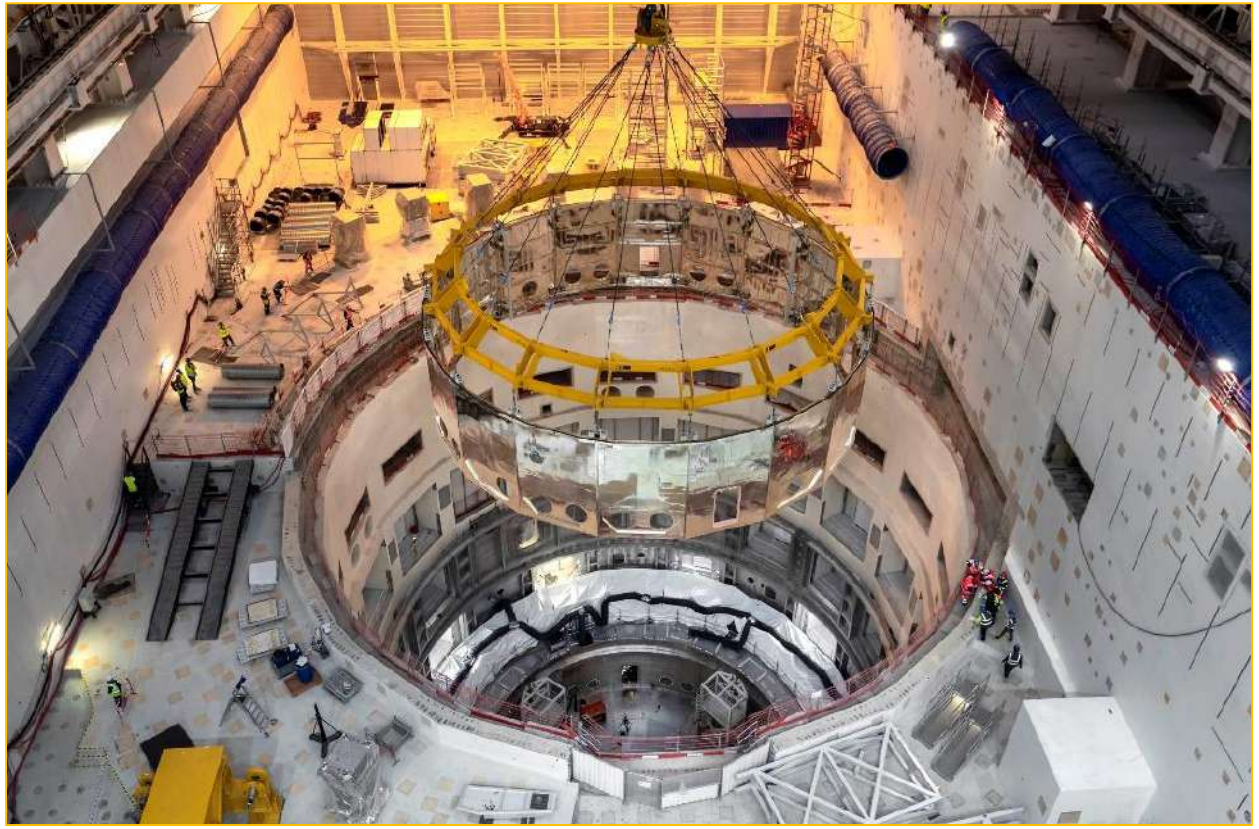
Recent progress:
Thermal shield insertion





The lower cylinder thermal shield (LCTS) was installed on 14 January 2021. A silver-plated component, the LCTS stands between the lower section of the Cryostat and the machine to act as an obstacle to thermal radiation.

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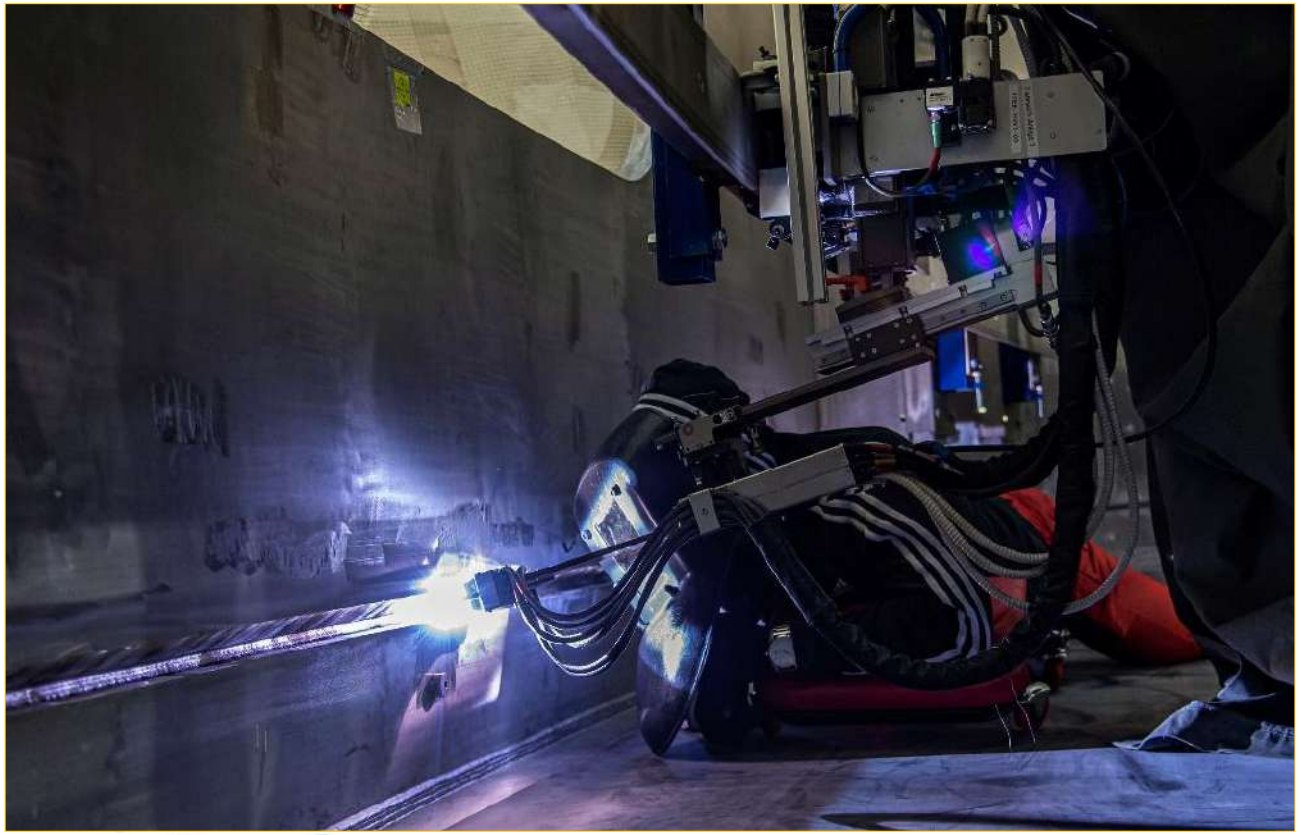
Recent progress:
Coil insertion preparation



Welding of the Cryostat lower cylinder to the base is finalized; temporary supports for PF #6 are in place; installation of “gravity supports” for toroidal field coils is progressing.

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Recent progress:
First pre-assembly preparation

Photos of VVS#6 upending and/or installed in SSAT

Components deliveries

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Components deliveries

TF 05 (Europe)
18 December 2020

TF 08 (Japan)
12 March 2021

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Major components expected in 2021-2022

TF08 (JA 04) - MHI	12/31/2020	VV Sector 5 (EU)	6/30/2021
TF03 (EU 04)	3/31/2021	VV Sector 8 (KO)	3/12/2021
PF 2 (EU)	3/15/2021	TF07 (JA 05) - TSB	9/25/2021
VV Sector 7 (KO)	11/11/2020	TF17 (EU 07)	1/9/2022
TF10 (JA 03) - TSB	4/14/2021	VV Sector 4 (EU)	9/30/2021
TF06 (EU 05)	6/25/2021	TF15 (JA 08) - TSB	11/19/2021
TF16 (JA 07) - TSB	5/24/2021	CS04 (US)	11/5/2021
TF02 (JA 06) - MHI	7/12/2021	VV Sector 1 (KO)	6/25/2021
CS01 (US)	1/21/2021	TF14 (EU 08)	4/1/2022
CS02 (US)	5/21/2021	VV Sector 9 (EU)	1/31/2022
TF04 (EU 06)	9/17/2021	TF01 (EU 09)	7/6/2022
CS03 (US)	6/30/2021	VV Sector 3 (EU)	4/29/2022

CS05 (US)	5/24/2022
TF18 (EU 10)	10/3/2022
CS06 (US)	8/24/2022
VV Sector 2 (EU)	7/29/2022
PF 4 (EU)	11/10/2022
PF 1 (RF)	11/29/2022

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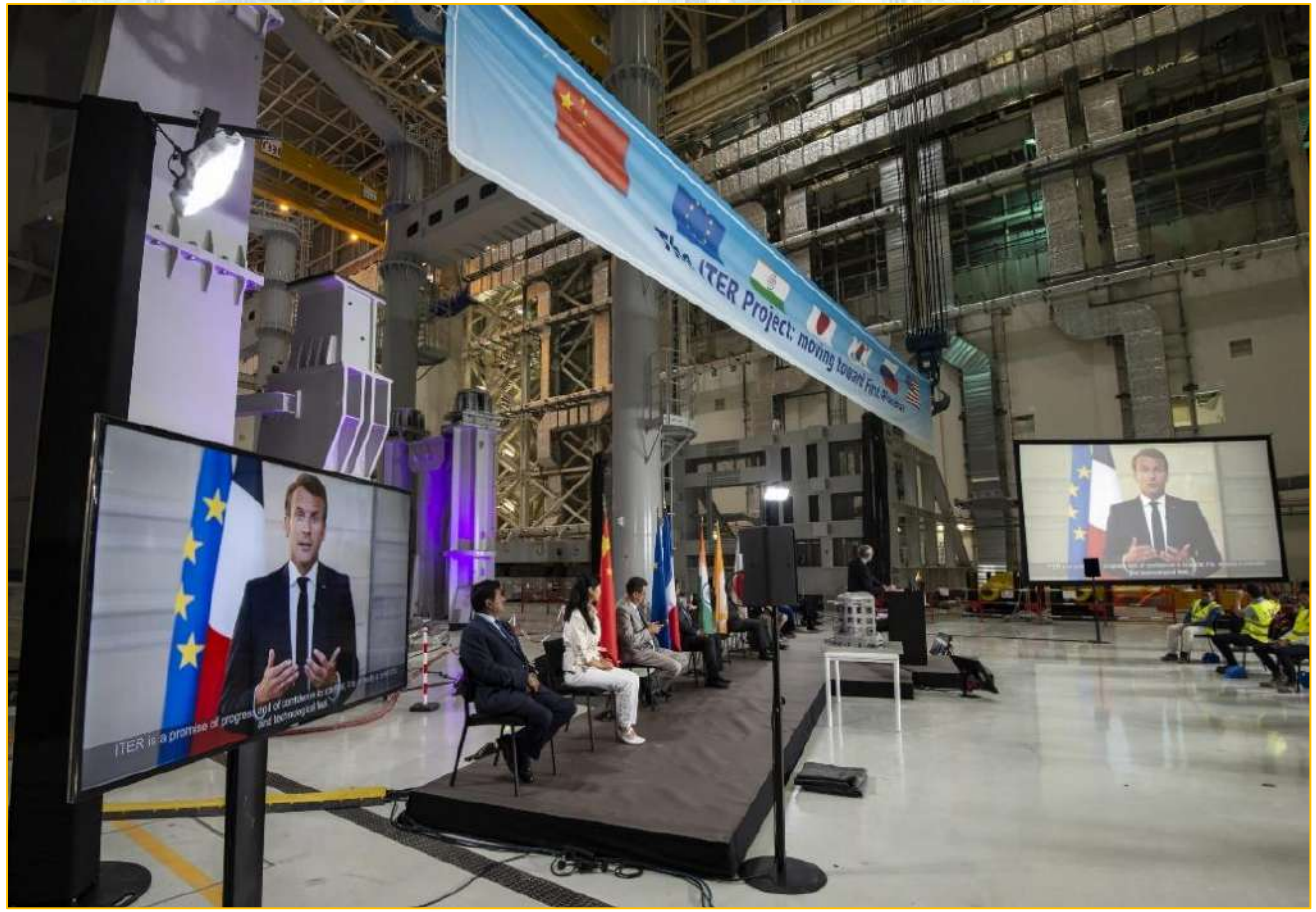
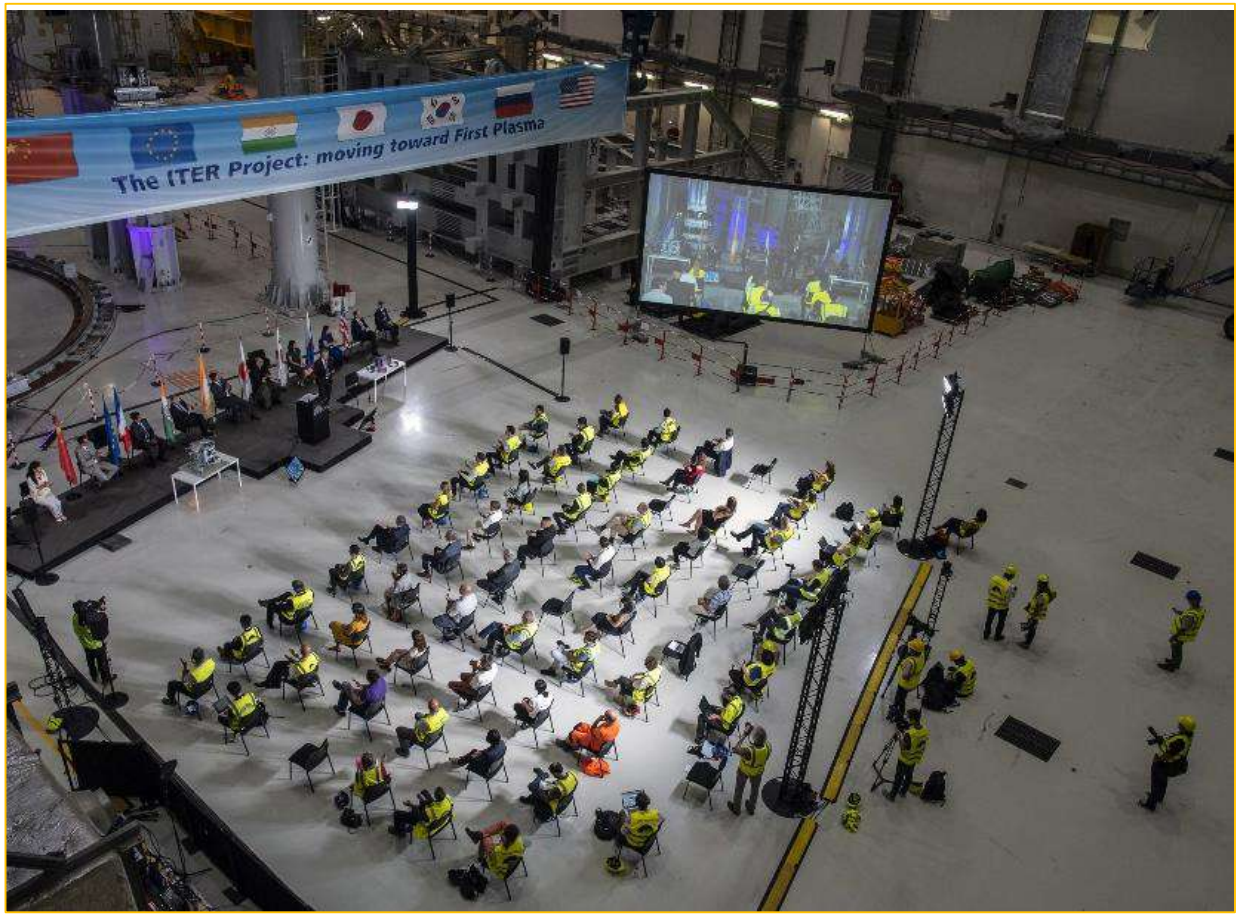
Celebrating Start of Machine Assembly





On 28 July, ITER celebrated the Start of Machine Assembly with a virtual ceremony hosted by French President Emmanuel Macron, with contributions from seven Heads of State and several ministers from ITER Members

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Balance of Plant Progress: Cryogenics

Installation of cryolines in the Tokamak Building (5.5 km)

Cold boxes and cryogenic termination cold box equipment

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Balance of Plant
Electrical networks

Connection to the French grid (400 kV network)
effective as of 26 Jan 2019

Reactive power compensation area (1 hectare of high-tech equipment)

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Balance of Plant
Electrical conversion

Electrical components from China, India, Korea and Russia are being progressively installed inside the Magnet Power Conversion Buildings, exterior bays and Tokamak Building.

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Balance of Plant
Heat rejection system

ITER cooling water systems will be capable of removing ~ 1.2 gigawatt of heat

Leak-tests were successfully performed on 27,000 m3 basins

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Drain tanks installation finalized

A set of massive water storage containers to support normal machine operation and protect the installation in case of incidental situations is now installed at the B2 level of the Tokamak Building. The tanks act as a confinement barrier and form one of the key safety systems for the ITER machine.

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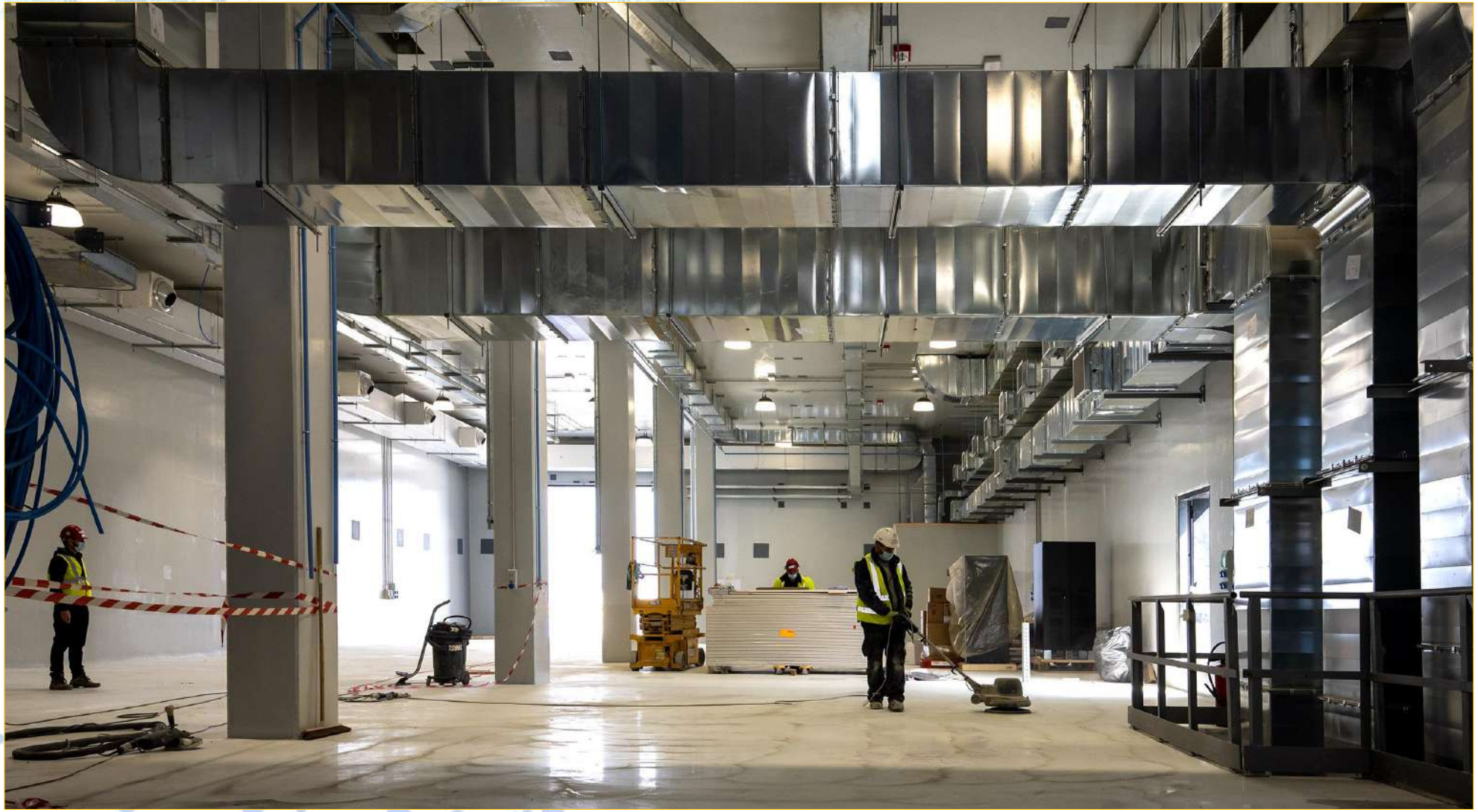
One building, two purposes



Tokamak Assembly Preparatory Building

Designed for the distinct storage and handling requirements of ITER's beryllium components beginning in 2024, this building will be used in the interim for Tokamak pre-assembly work.

Construction was completed in a record 9-month period.

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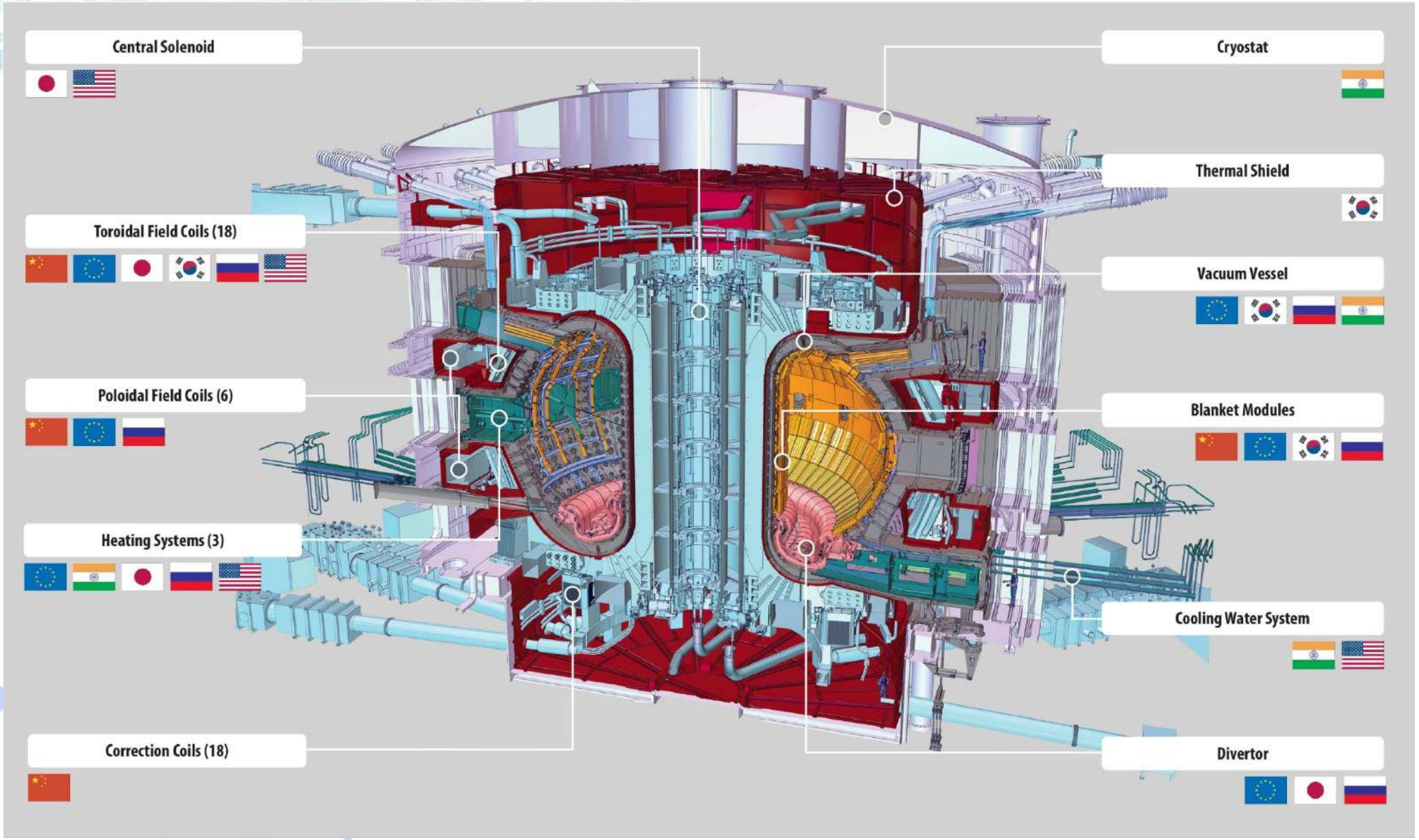
Who manufactures what?



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Manufacturing progress on-going globally

Five vacuum vessel sectors are under fabrication in Italy. Completion rates range from 66% to 89%.

Of the 10 toroidal field coils that Europe is procuring (out of a total 19, three were recently delivered to the ITER site, TF#9 in April; TF#11 in September and TF#5 in December.

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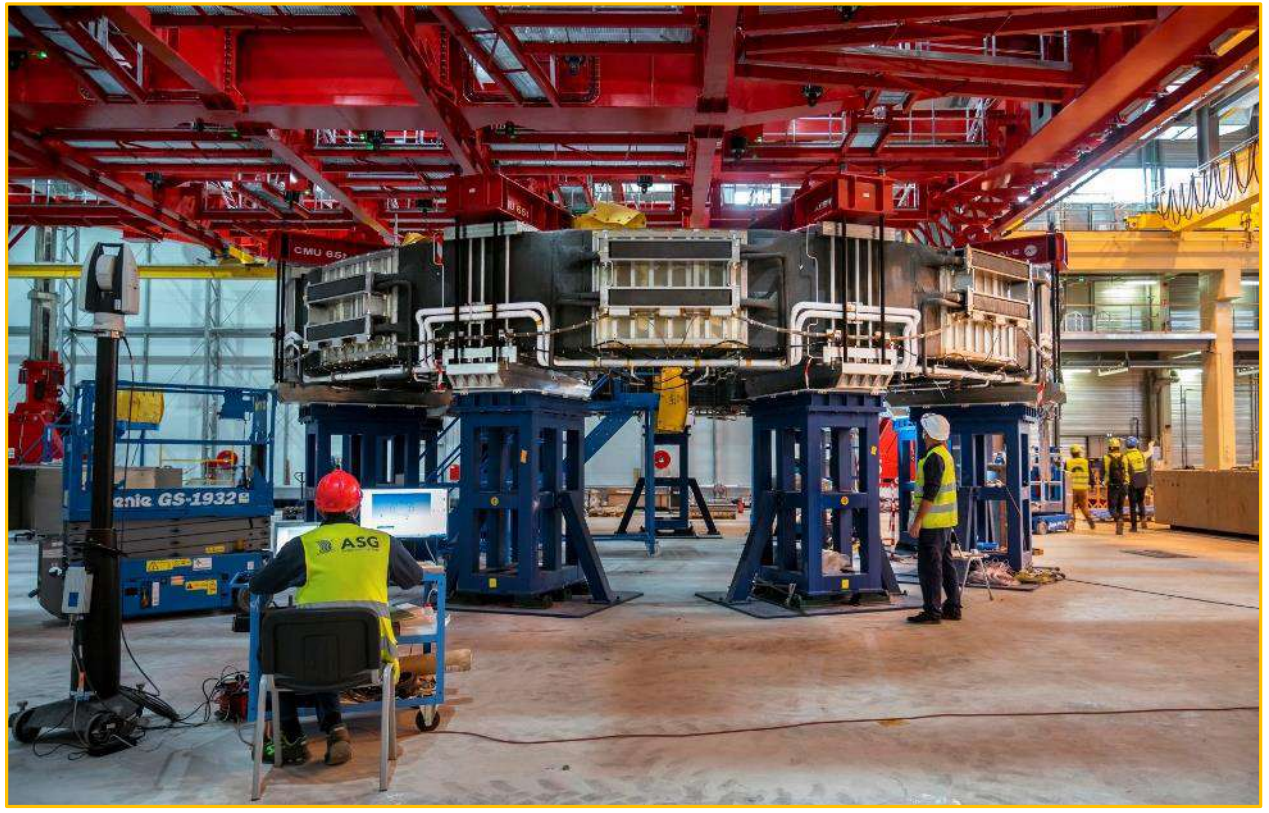
Manufacturing progress on-site fabrications

Due to their size (17 m – 24 m in diametre), 4 out of the 6 poloidal field coils required for the machine are manufactured on site by Europe; PF#5 has successfully passed cold testing; PF#2 is finalizes; PF#4 fabrication is progressing (Here PF#5 finalized and a double pancake for PF4).



Manufactured in China under a European contract, PF#6 has completed cold tests and is scheduled for installation in a few weeks

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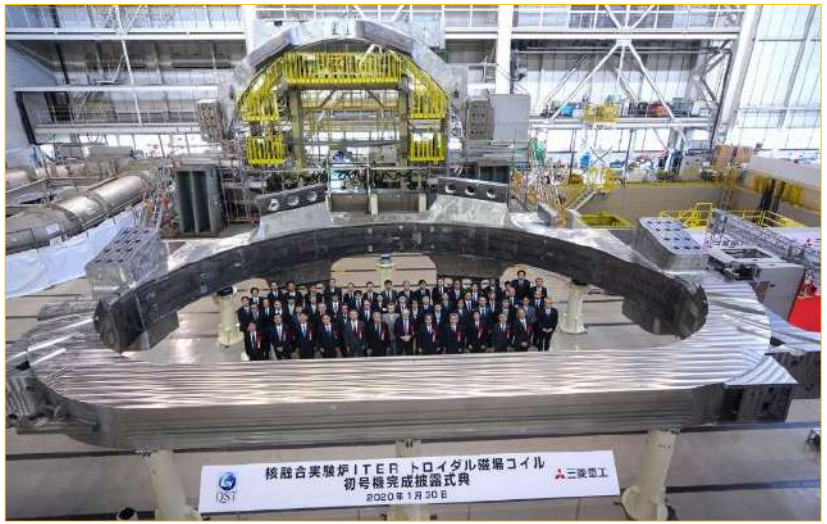
Manufacturing progress on-going globally

Delivery of more than 1,600 tonnes of equipment for the magnet feeders system is ongoing.

Assembly of the Cryostat Top Lid's elements is underway in onsite facility.



Japan has already delivered 3 toroidal field coils. Fabrication is ongoing for the remaining 6.

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Manufacturing progress on-going globally

3 more vacuum vessel sectors in fabrication, with completion rates from 86 % to 99%

Poloidal field coil #1 has successfully completed resin impregnation.

Six of the 7 central solenoid modules procured by the United States are in late stages of fabrication. First module successfully tested. Expected on site mid-2021.

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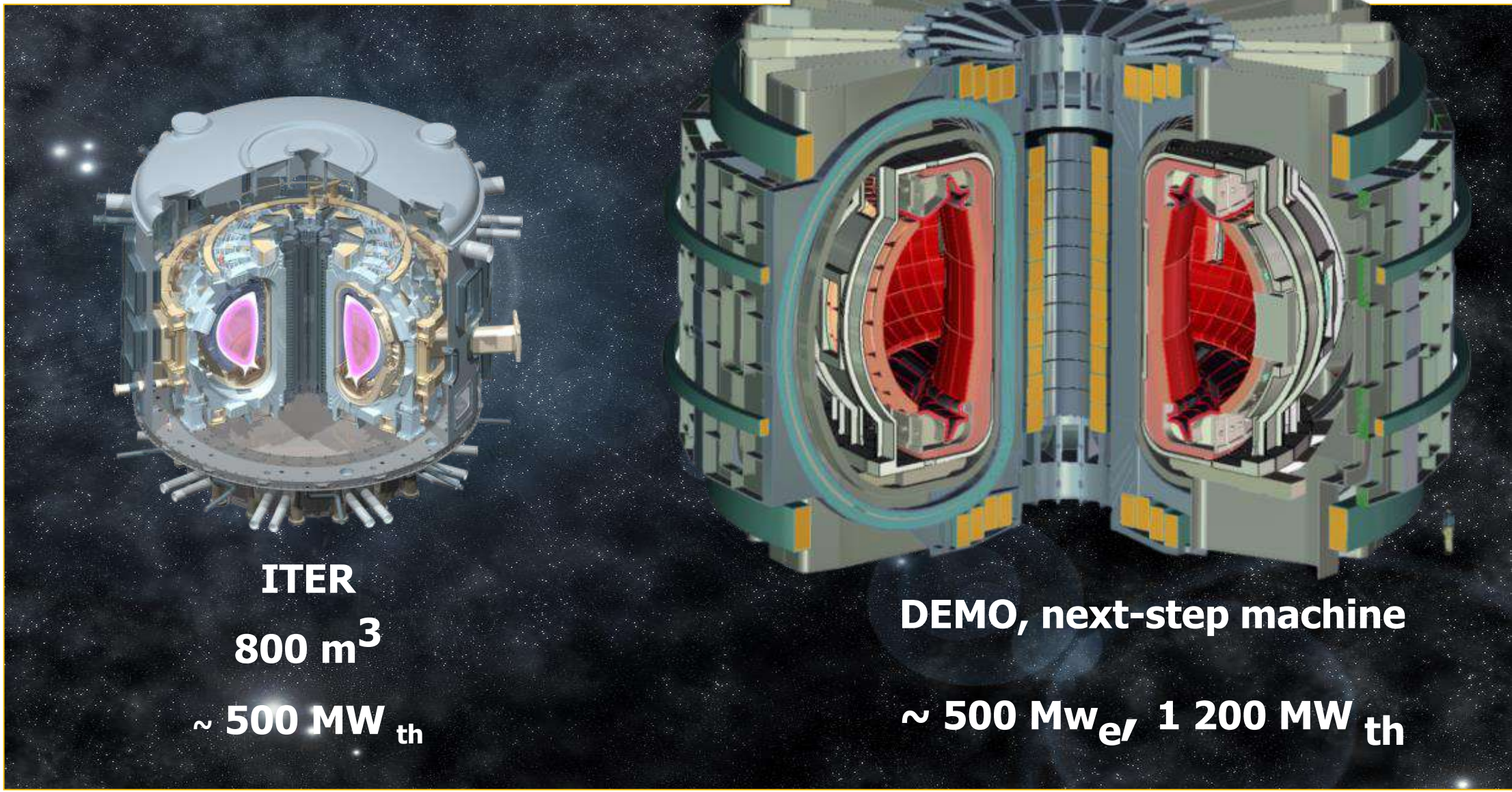
ITER and beyond

The ITER Members are developing conceptual designs for the « next-step » machine (DEMO).



Milestones to come

- Preparation, assembly and Installation of all the Tokamak Components deliveries
- Commissioning of Cryoplant (B51-B52-B53) from **September 2021**
- Hot Cell Complex conceptual design review by **November 2021**…
- Commissioning of twin Magnet Power Conversion Building (B32-B33) from **January 2022**
- Completion of the Emergency Power Supply and Low-Voltage Power Distribution buildings (B44-45-46-47). Civil Works and Services Installation by **June 2022**
- On-schedule Completion of the Control Building (B71N) Civil Works and Services Installation by **October 2022**
- Completion of the Tritium Building (B14) Civil Works and Services Installation by **November 2022**
- Completion of the NB High Voltage Power Supply building Civil Works and Services Installation by **March 2023**

Onward toward First Plasma - together!

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