

The ITER Project: *let the stars inspire us towards a sustainable world energy supply*



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ITER Mission

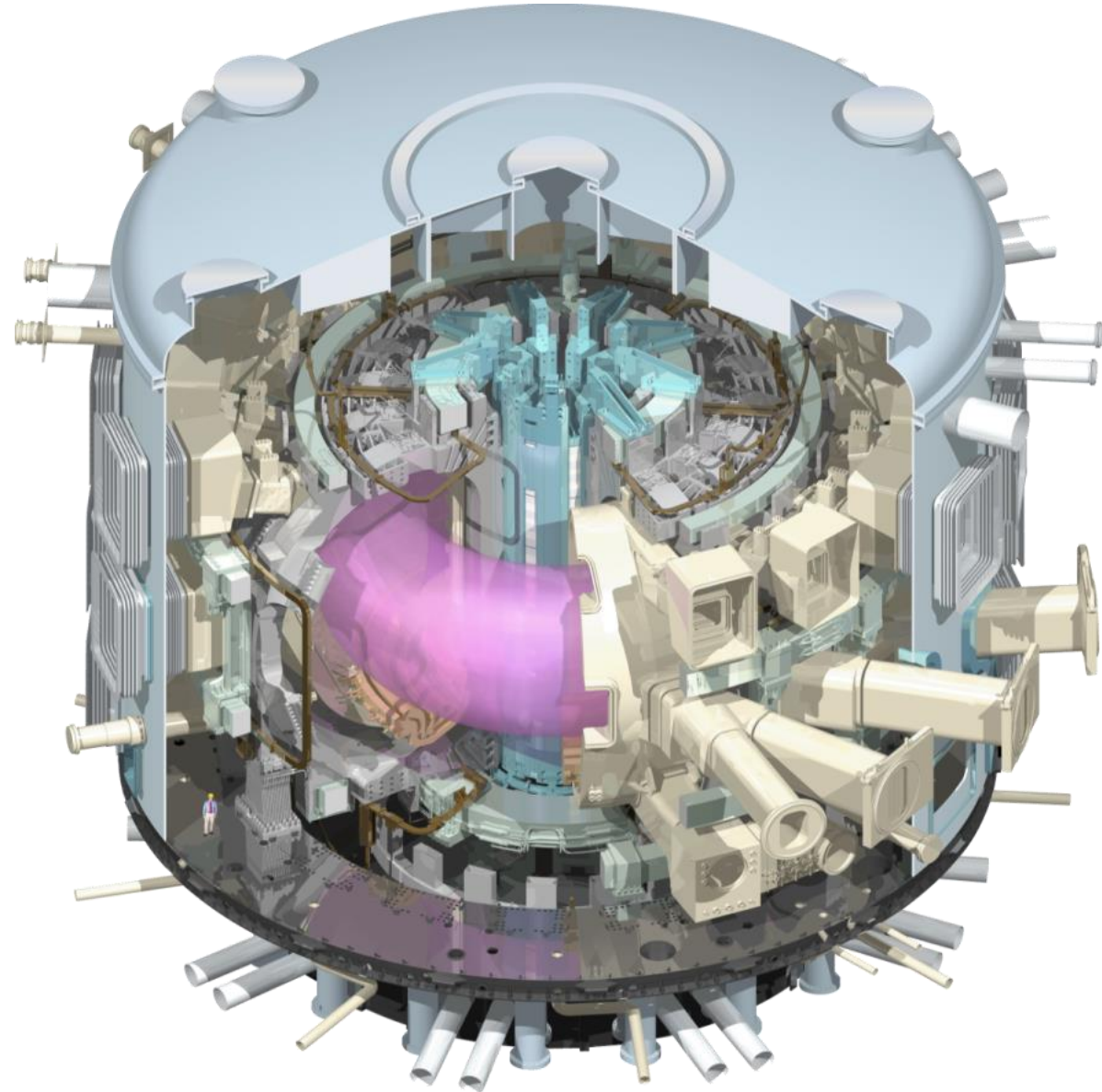
Demonstrate industrial-scale fusion

Study a “burning plasma”

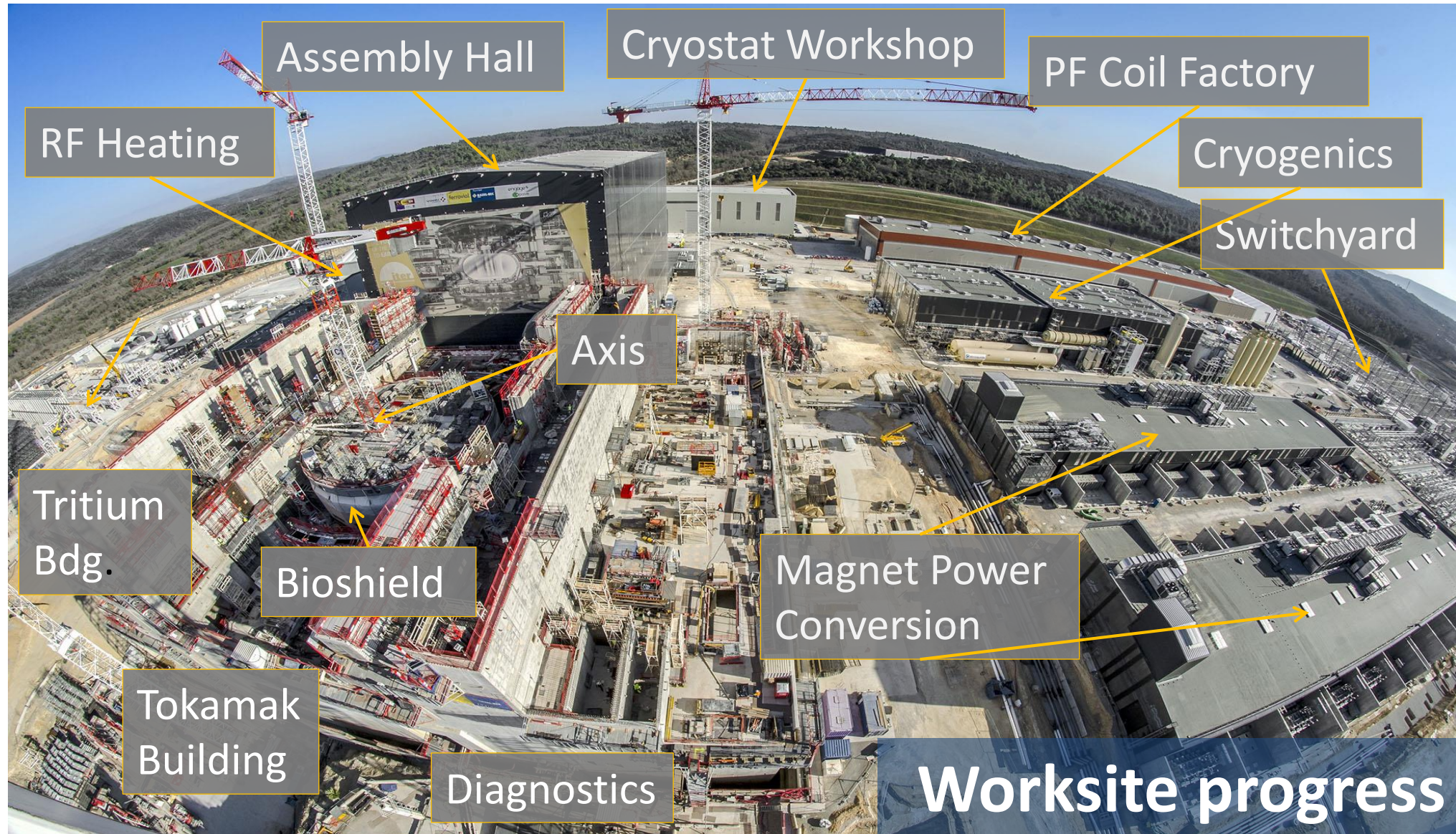
$Q \geq 10$

- 50 MW of heating input
- 500 MW of thermal output

*“Tokamak”: Russian acronym for
“Toroidal Chamber, Magnetic Coils”*



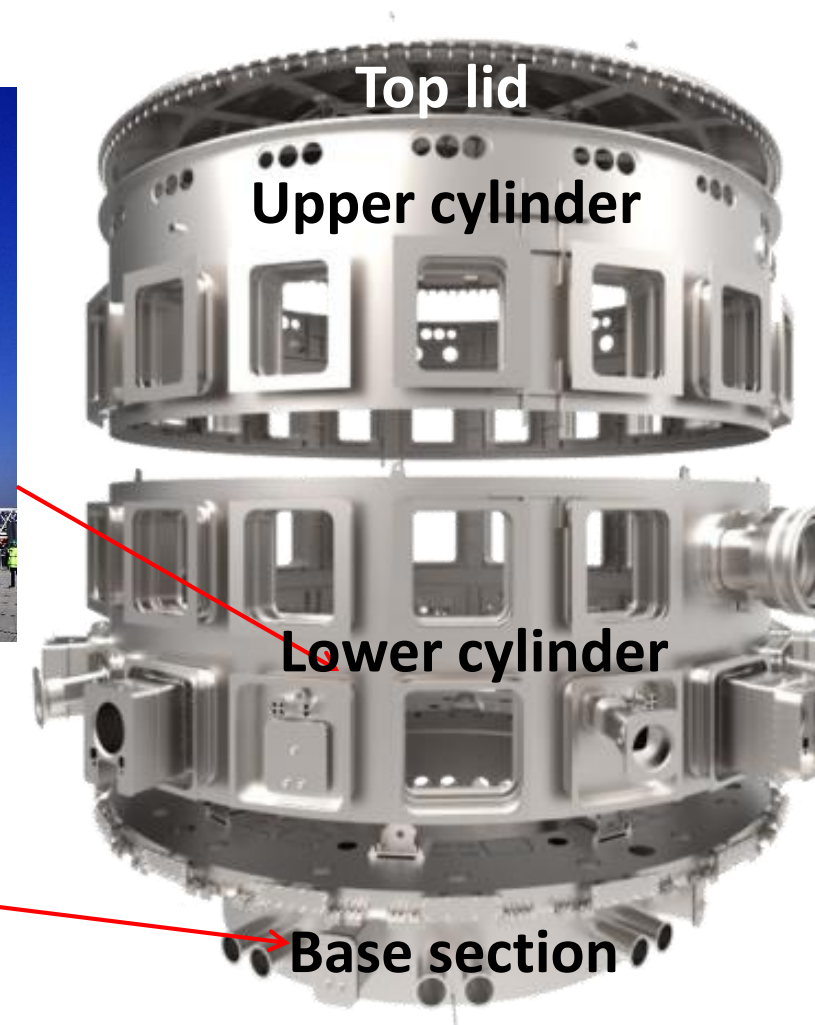
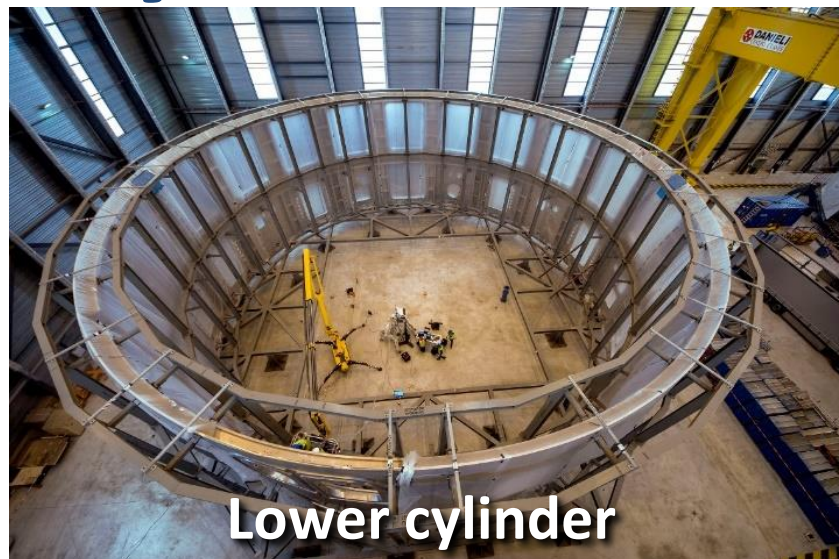
ITER Project Overview





Cryogenics Plant

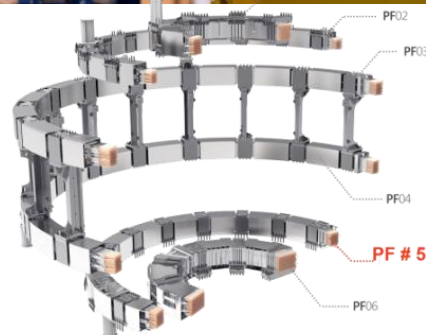
Cryostat Workshop



Manufactured in pieces in India, the 30 m x 30 m Cryostat is then welded together onsite



Poloidal Field Coil winding facility



Four of six ring-shaped magnets, 17 to 24 m in diameter, are being assembled on site.

Manufacturing Progress



Vacuum Vessel Sector Assembly



Cryoline production



Magnet clamp fabrication



Insertion in TF cases



High heat flux testing



CS supports



PF Coil #5

Vacuum Vessel

- Overall sector manufacturing progress as of March 2020

VV Sector 5:	75%
VV Sector 4:	68%
VV Sector 3:	60%
VV Sector 2:	60%
VV Sector 9:	58%



**Vacuum Vessel
Sector 5: PS2
Segment**



**PS4: welding of T-ribs
started
September 2019**

Vacuum Vessel (Sector 5)



**PS4: UT testing before IWS
installation
March 2020**

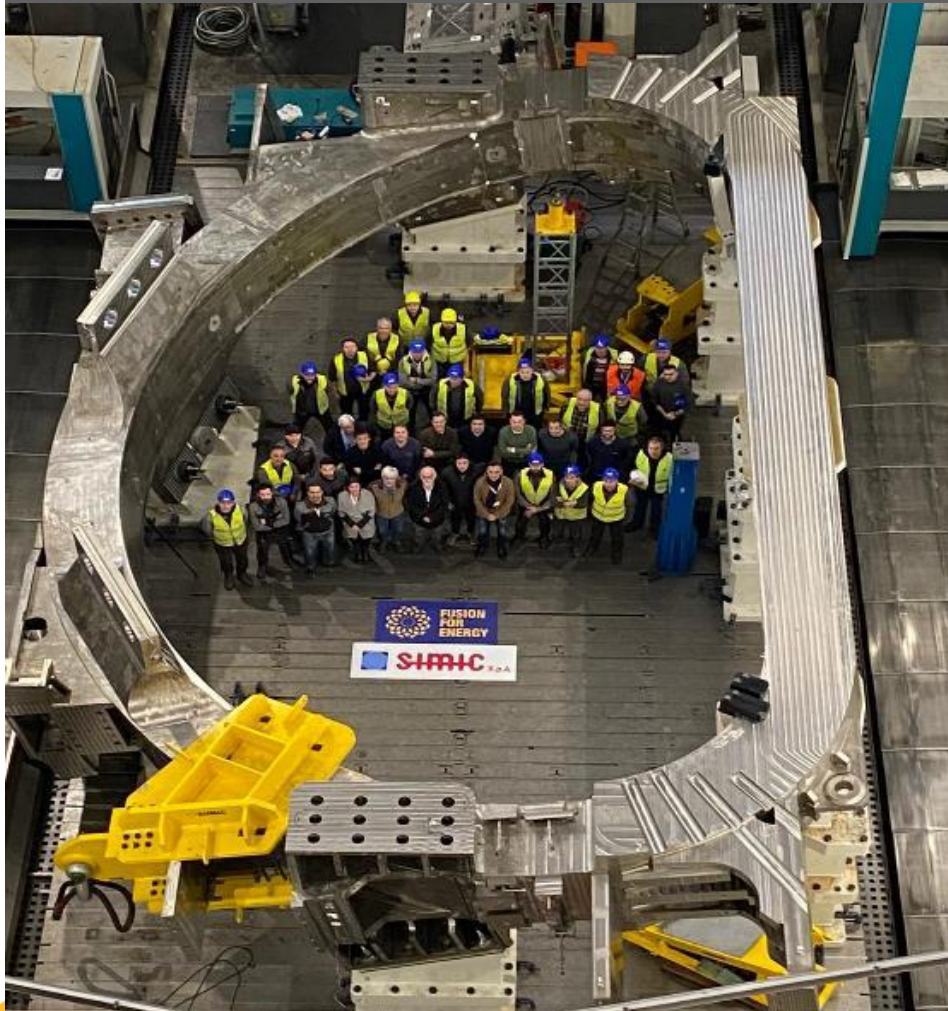
**Vacuum Vessel Sector 5:
PS3 main assemblies-
September 2019**

**Vacuum Vessel Sector 5:
PS3 Segment-
March 2020**

Magnets: Toroidal Field Coils

Insertion of WP into Coil Cases

Completion of the 1st TFC

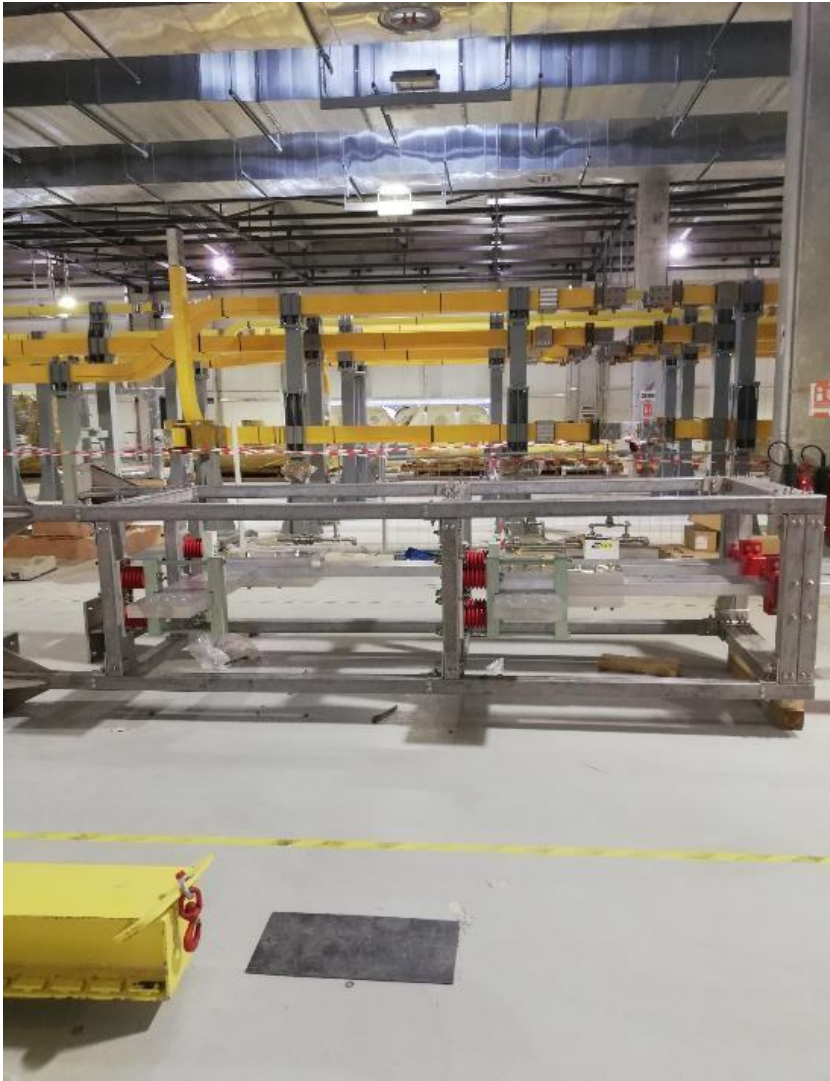


Delivery of the 1st TF coil on 17 April

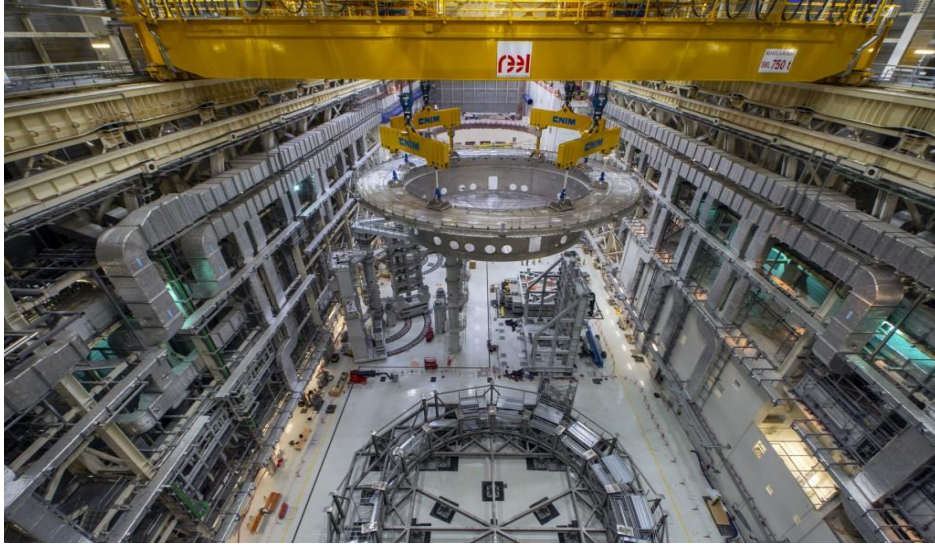


- 1st TF Coil delivery completed
- 2nd TF Coil machining ongoing
- 3rd TF Coil insertion completed, welding ongoing
- 4th TF Coil insertion ongoing
- 5th TF Coil Cold Test of Winding Pack ongoing

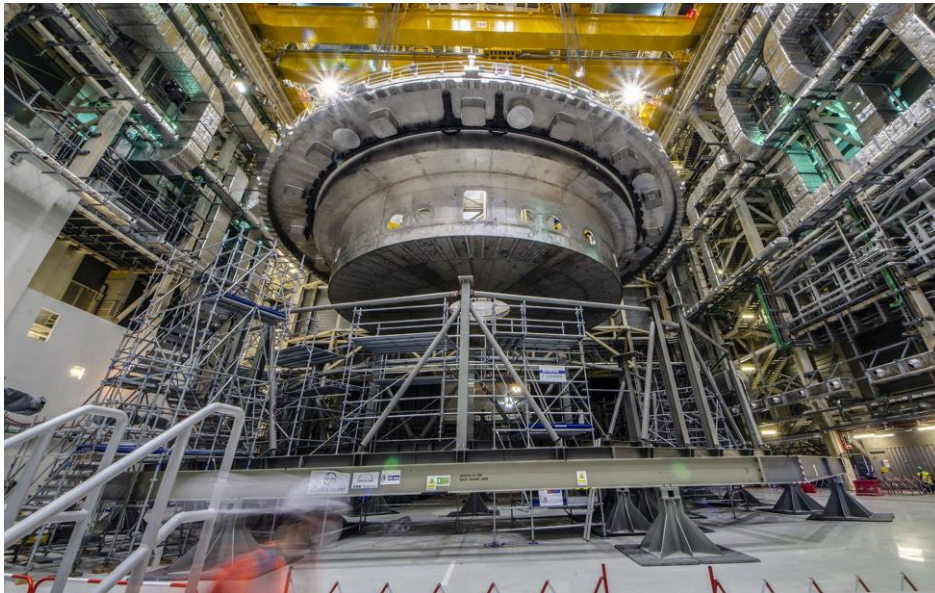
Progress on Busbars Installation in B32/33



Successful Cryostat Base Lifting & Installation on 26 May



On 26 May, the ITER cryostat base was gradually lifted from its frame, carried across the Assembly Hall to the Tokamak Building and eventually lowered into the Tokamak Assembly Pit.

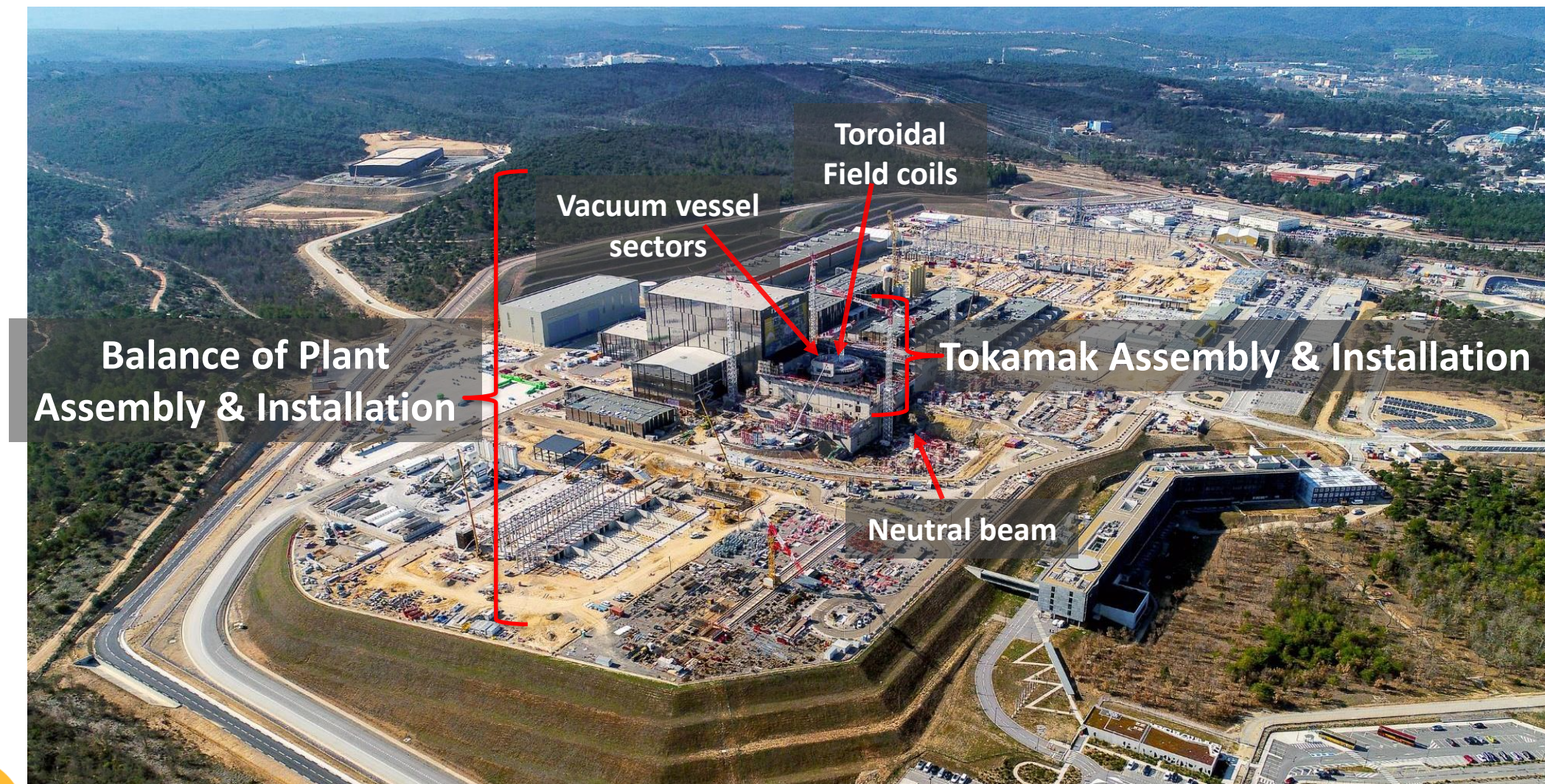


Transversal Contribution and Application out of ITER project

- **Superconductivity Technology**: Application in medical services and in diagnostic tools is already in progress assuring innovative applications and solutions – **Contribution of Politecnico di Torino is highly qualified** and represents a strategic contribution for ITER Project.
- **Vacuum technology**: Application in Aerospace as well as in air transportation is implementing all experiences and R&D produced in developing tools / instrumentation / technology for ITER largest vacuum system.
- **Cryogenic Technology**: Being the largest Cryogenic system never built all over the world, even using all proven and certified technology, it represents the best effort for transferring new consolidated technologies in aerospace, transportation and medical services. Also on this critical and top level subject the **Contribution of Politecnico di Torino is important and generating value.**
- **Static Magnetic Field qualification and design** : It was a black hole at ITER adventure starting. In Plant areas characterized by high static magnetic field there was no knowledge how to proceed in the design of rotating components or in supporting important static loads promoted by high magnetic field. Now the experience and the qualification process have produced a large extensive knowledge into the industrial system in producing qualified components according to Project necessities. **It is an arena with important challenging effort. Young generation has to be attracted by this special subject.**
- **Robotics and Artificial intelligence – Strategic for ITER , motivating for all the Young Generation** – This discipline is waiting for all the best brain to develop new challenging products to simplify the life in ITER and achieve the protection of Operational Staff during Operation and Maintenance / ISI.

We all are waiting for all of You and for your valuable exclusive unique Contribution

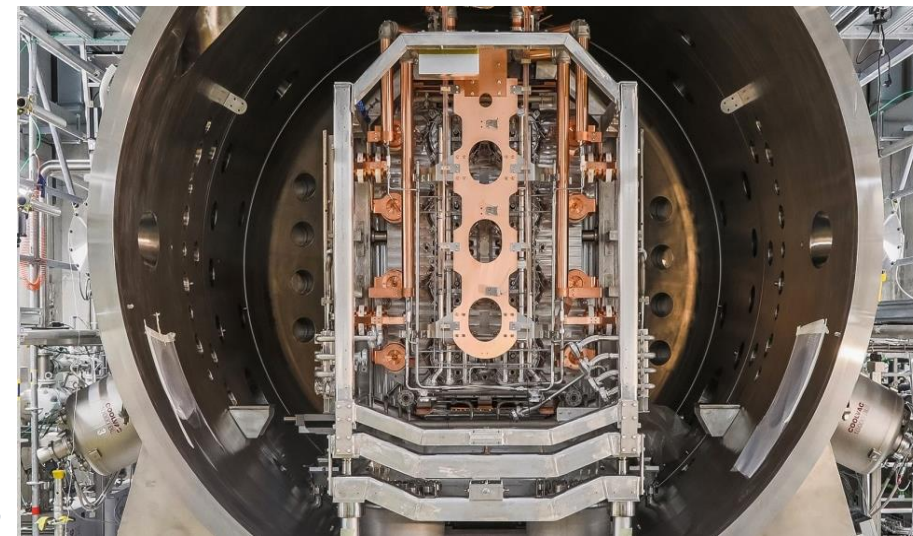
Italy's areas of contribution onsite



Italy's contribution: some examples



La Spezia: Toroidal Field Coil fabrication at ASG Superconductors SpA



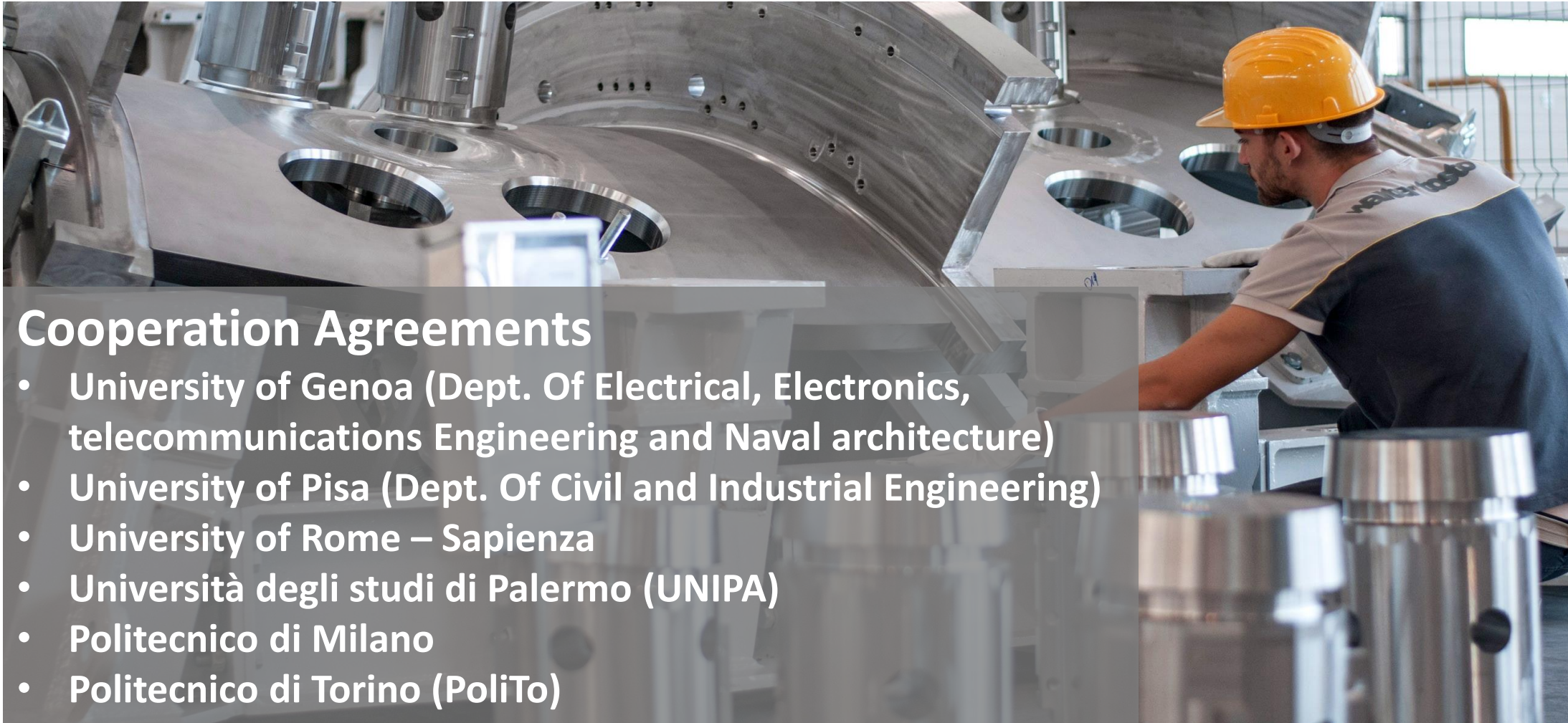
Padua: Neutral Beam test facility. First beam achieved in June 2018

Chieti: Vacuum vessel fabrication by AMW consortium (Ansaldo Nucleare S.p.A, Mangiarotti, Walter Tosto)



Marghera: Toroidal Field Coil cases fabrication at SIMIC

Partnership with Italy



Cooperation Agreements

- University of Genoa (Dept. Of Electrical, Electronics, telecommunications Engineering and Naval architecture)
- University of Pisa (Dept. Of Civil and Industrial Engineering)
- University of Rome – Sapienza
- Università degli studi di Palermo (UNIPA)
- Politecnico di Milano
- Politecnico di Torino (PoliTo)

Thank you for your attention!

www.iter.org