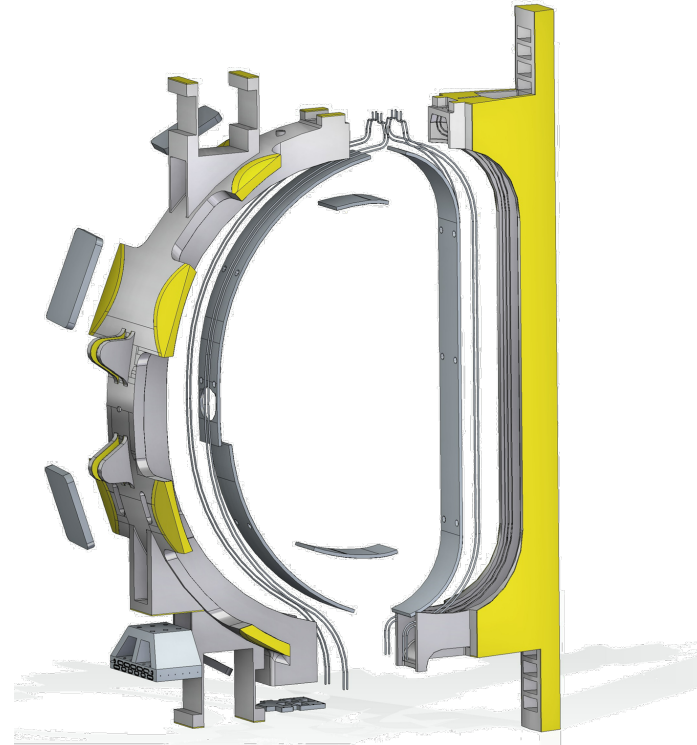


Info Day – Call for Tender for DTT TFC casing components: Project Status



Aldo Pizzuto

Chief Engineer
DTT S.c.a r.l. – Frascati – Italy

DTT Consortium (DTT S.C.a r.l. Via E. Fermi 45 I-00044 Frascati (Roma) Italy)

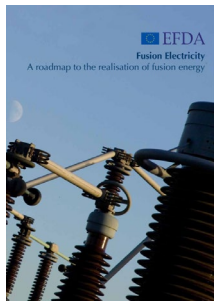




DTT Motivation

DTT is a fusion facility aimed at solving the issue of the plasma power exhaust, considered a key problem for the development of fusion energy as recognised by the European program:

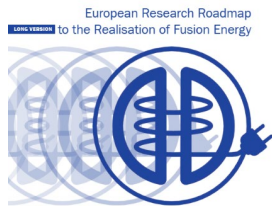
EFDA roadmap 2013:



A solution for the heat exhaust in the fusion power plant is needed.

[...] in parallel to the programme in support of the baseline strategy, an aggressive programme on alternative solutions for the divertor is necessary [...] a dedicated test on specifically upgraded existing facilities or on a dedicated Divertor Tokamak Test (DTT) facility will be necessary.

EUROfusion roadmap 2018:



[..] the extrapolation from proof-of-principle devices to DEMO based on modelling alone is considered too large. [...] a divertor optimised for the concept will be implemented in the Italian Divertor Test Tokamak (I-DTT) facility as a joint European collaboration.

https://www.euro-fusion.org/fileadmin/user_upload/EUROfusion/Documents/Roadmap.pdf

DTT Key Dates



- Jul 17** European workshop on DTT roles and objectives -> Eurofusion PEX-AHG
- Dec 17** Call for interest open to all Italian Regions to host DTT
- May 18** Interim project coordination team established by the HRU (A. Pizzuto)
- Jul 18** First Design review meeting to address the recommendations from the Eurofusion PEX-AHG
- Mar 19** European Investment Bank appraisal in CR ENEA Frascati (loan [approved](#) on April '19)
- Apr 19** DTT Interim Design Report ("[Green Book](#)")
- Apr 19** First call for tender for the procurement of the superconducting strands launched
- Sep 19** **The DTT consortium for the realization of the facility is established**

2029-2030 First Plasma

DTT S.c.a r.l. shareholders

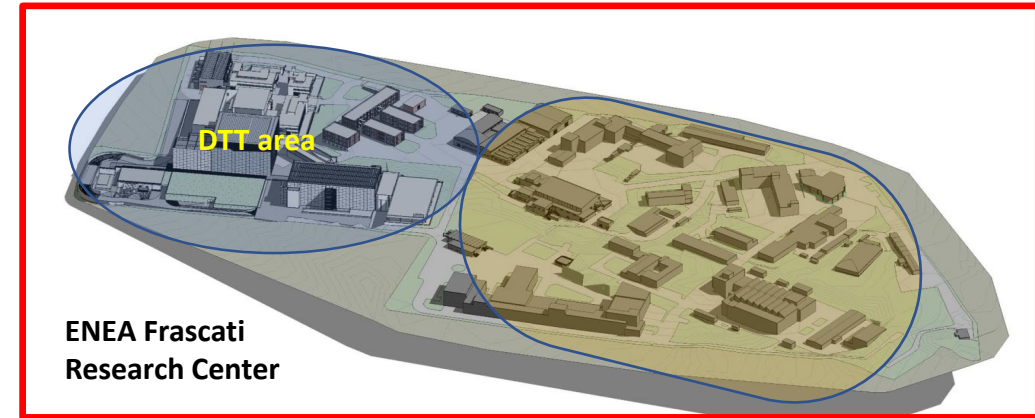


Site

On 10 Oct 2019 a consortium for the implementation of the project, named DTT S.c.a r.l., has been established, by **ENEA** and **CREATE**, subsequently the following partners joined DTT:

- **Eni**, by February 2020
- **CNR, Consortium RFX, INFN, PoliTo, Uni Bicocca, Uni Tor Vergata, Uni Tuscia**, by 2021
- **CETMA**, by 2023

Also **EUROfusion Consortium** is actively involved in the design and procurement of the divertor system.



DTT scope



DTT is aimed at providing a unique flexible integrated environment, relevant to ITER and DEMO, for Power Exhaust solutions

DTT will Explore various configurations:

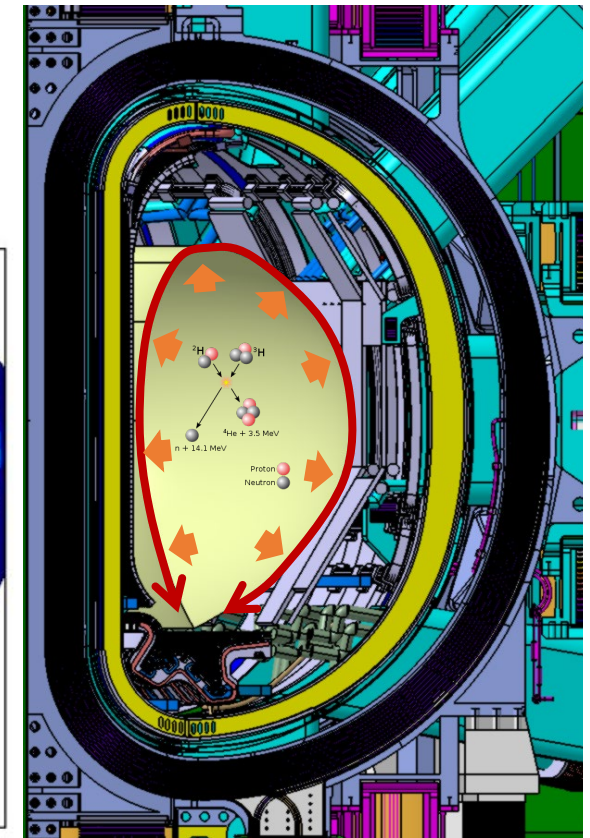
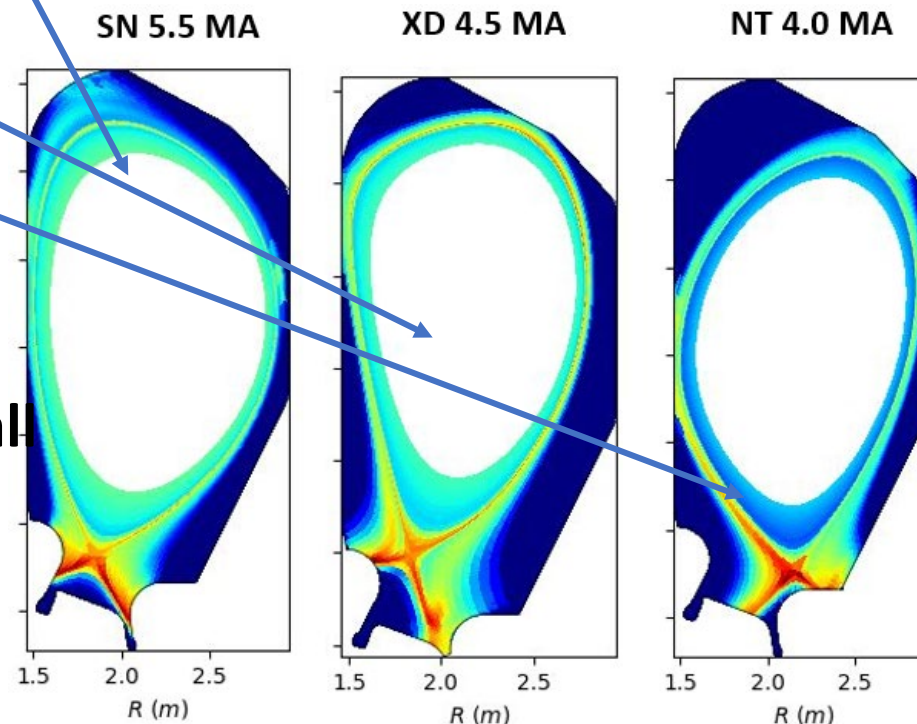
SN: Standard Single Null divertor

XD: X divertor

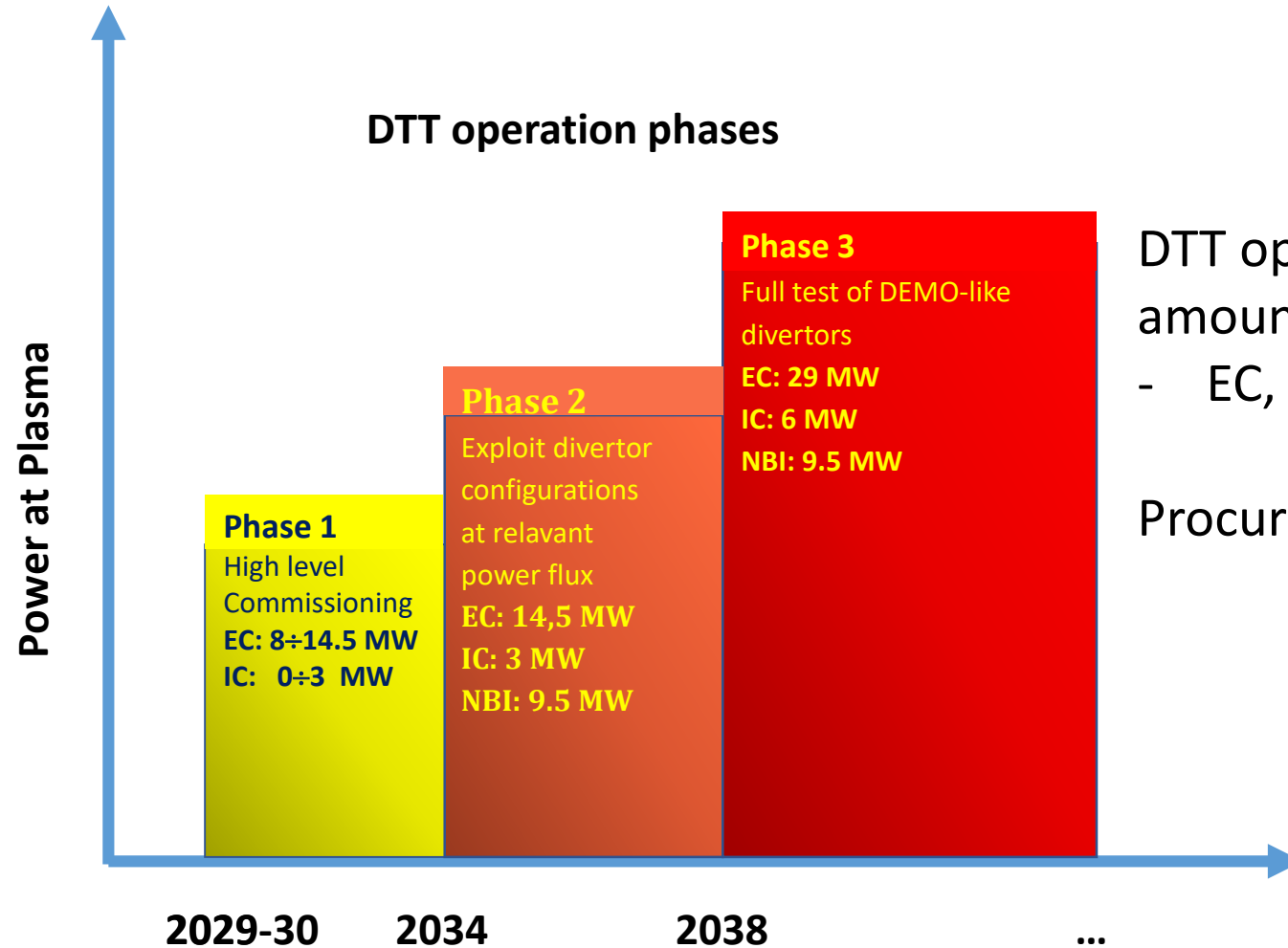
NT: Negative Triangularity

(Double null capability)

DTT has the same Adimensional Parameters and Heating Power of ITER and DEMO



DTT operation phases

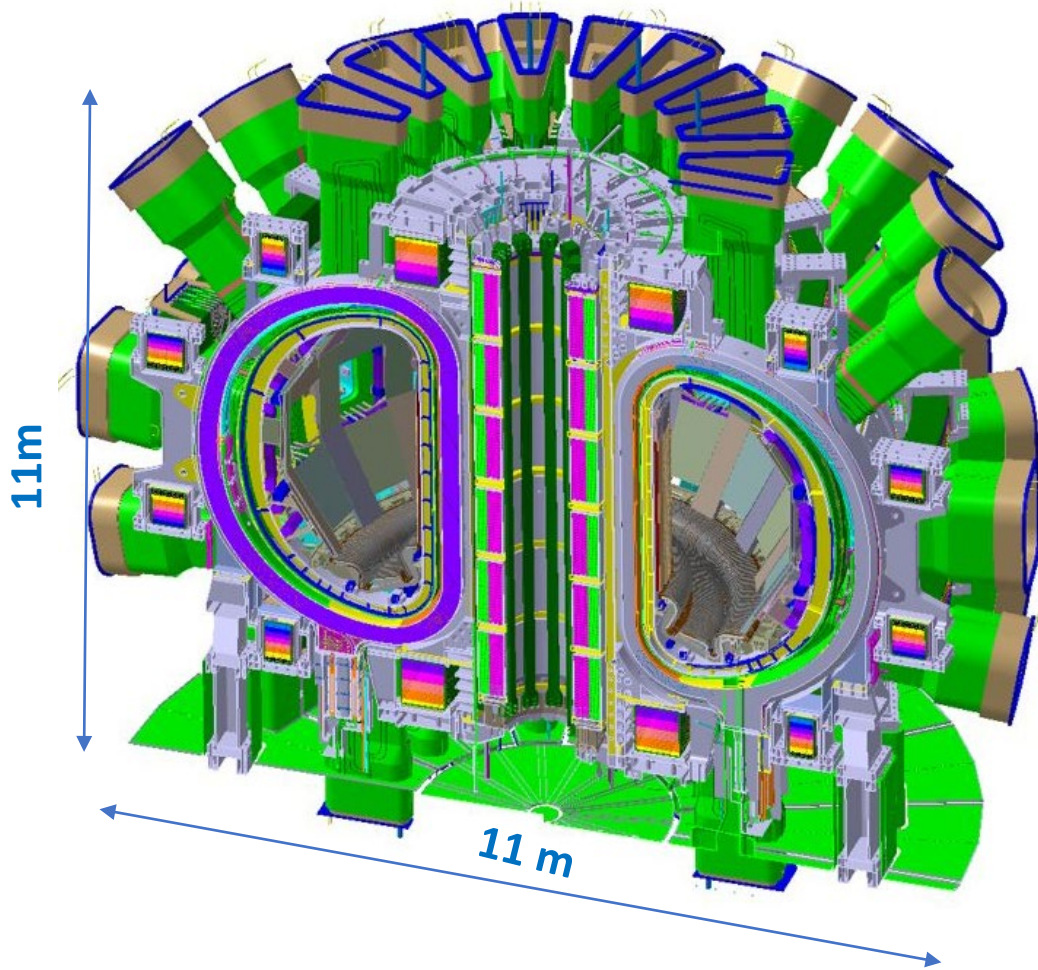


DTT operation is characterised by a substantial amount of additional heating mix made of:

- EC, IC and NNBI

Procurement will continue after first Plasma

DTT assembly



- Superconductive magnetic system:
 - 18 toroidal coils (Nb_3Sn)
 - 6 symmetric poloidal coils (2 in Nb_3Sn , 4 in NbTi)
 - 6 CS coils (Nb_3Sn)
- Vacuum Vessel
 - double wall structure
 - 82 ports (two inclined for NNBI tangential)
- In vessel components, actively cooled:
 - Divertor system (54 modules)
 - First Wall (inner, top and outer)
 - 27 non axisymmetric coils;
 - 5 axisymmetric (2 eq.; 3 in divertor region) coils
- Thermal Shield
- Cryostat
- In Vessel remote handling system

DTT Systems and Balance of Plant



Tokamak Systems:

Heating and Current Drive:

- Electron Cyclotron (32x1MW -170 GHz)
- Ion Cyclotron (8x1MW - 60 ÷90 MHz)
- Neutral Beam Injector (10 MW at 510 kV)

Power Supplies

- Toroidal Field Coils (± 100 V; 44 kA)
- Poloidal Field Coils (12 P.S. 2 ÷3 kV 30 kA)
- In vessel coils (32 P.S. 3 kV 2.5 kA)

Vacuum pumping systems

Machine Sensors

- quench detection
- magnetic sensors
- Strain gauges, Temperature

Cryoplant and cryolines

Remote Handling systems:

- Divertor
- First Wall
- ex vessel

BoP:

- 140.000 m³ new buildings
- 70.000 m³ existing buildings
- 150 kV sub station
- 5x20kV distribution substations
- Water cooling System
- 150 kV-300 MVA grid extension from Roma Est (TERNA)



DTT progress



Design:

-design of almost all the key components and system completed or very advanced:

- TFC magnets, done
- PFC magnets, done
- Vacuum vessel, done
- In vessel coils, done
- Divertor, advanced
- First Wall, advanced
- Central Solenoid, in progress
- Power Supply Systems, done
- Cryostat base, done
- Remote Handling Equipment for divertor and FW handling, done
- Cooling System, advanced
- Vacuum Pumping, advanced
- Buildings, done
- Site preparation, done
- Electric Distribution System, almost done
- High Voltage Substation, almost done
- Remote Handling Facility, done
- Cold Test Facility, done



WBS-1	WBS-2	Contract Scope	Contract Type	Status
THM	MAG	TF Modules	Supply	Awarded to ASG
THM	MAG	Nb3Sn (TF)	Supply	Completed by KAT
THM	MAG	Nickel-Chromium CU	Supply	Completed by LUVATA
THM	MAG	Nb-Ti (PF2 to PF5)	Supply	Completed by Furukawa
THM	MAG	Superconducting_Cables	Supply	Awarded to ICAS
THM	PSS	TF Transformers and AC/DC Converters	Supply	Awarded to JEMA
THM	PSS	TF FDU's Fast Discharge Units (including Prototype for CTF)	Supply	Awarded to OCEM
HCD	ECH	Gyrotrons (pre-series)	Supply	Awarded to THALES
HCD	ECH	Gyrotrons (15)	Supply	Awarded to THALES
HCD	ECH	RF Load	Supply	Awarded to "RTI" Curti Costruzioni Meccaniche Spa - LT Calcoli srl
HCD	ECH	Control System: HW procured in 2024 for ECH Test Bed (PNRR)	Supply	Awarded to Riemann Systems GmbH
HCD	ICH	ICH-Transmitter	Supply	Awarded to OCEM

**Total Value:
166 M€**

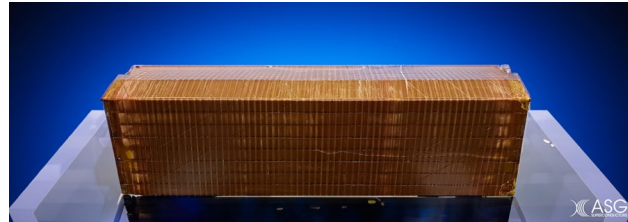
Construction Progress



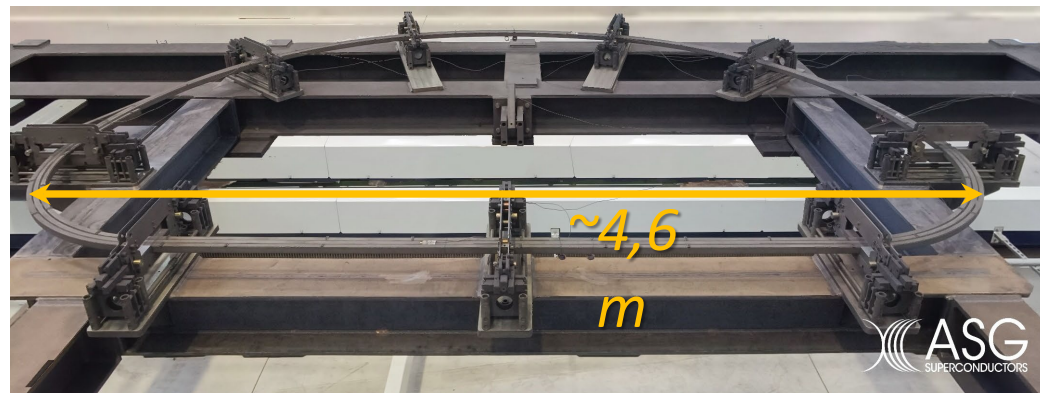
TF cable spools (ICAS)



TF helium inlet-outlet (ASG)



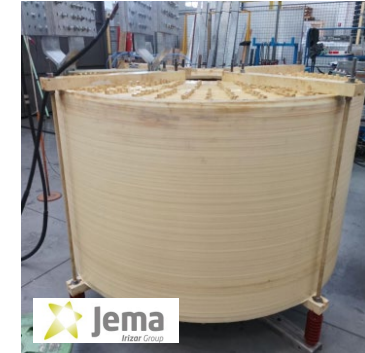
TF coil impregnation mockup (ASG)



TF winding trial



Pre-series Gyrotron (THALES)



TFC PS Dummy Load



TFC PS ML/LV Transformer



TFC PS Coupling Reactance



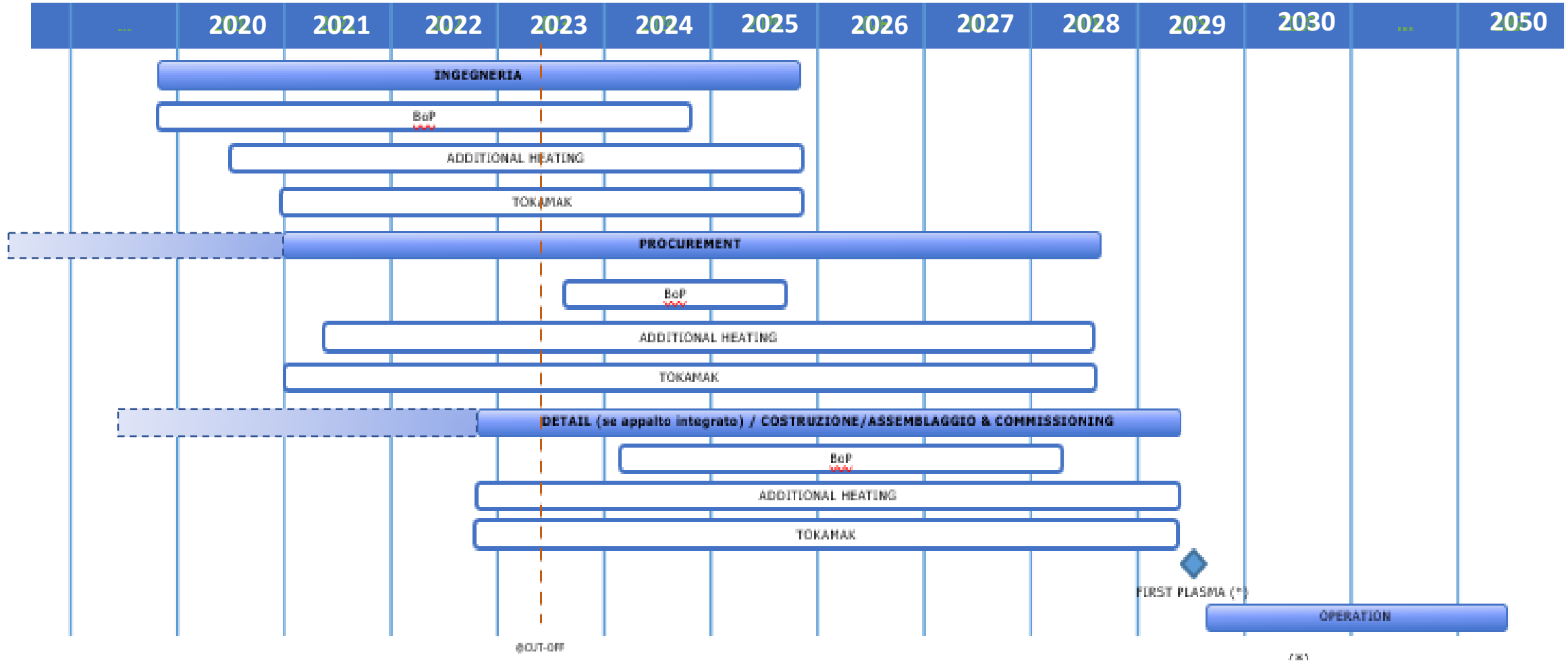
WBS-1	WBS-2	Contract Scope	Contract Type	Status
THM	MAG	Nb3Sn strands for the CS and PF conductors	Supply	Planned
THM	MAG	TF casings	Supply	Planned
THM	MAG	TF casings components and PF supports	Supply	Planned
THM	MAG	PF coils	Supply	Planned
THM	OVC	VVP Vacuum Vessel and Ports.	Supply	Planned
THM	MAG	In-vessel coil conductor	Supply	Planned
THM	PSS	PF power supply	Supply	Planned
THM	PSS	In-vessel coils power supply	Supply	Tender Ongoing
THM	PSS	In-vessel coils power supply	Supply	Tender Ongoing
THM	PSS	In-vessel coils power supply	Supply	Tender Ongoing
THM	PSS	Reactive power compensation system	Supply	Planned
THM	ASS	DTT assembly contract	Supply	Planned
THM	RHS	RH Boom (WP3 PNRR)	Supply	Tender Ongoing
THM	RHS	CMM (WP3 PNRR)	Supply	Tender Ongoing
THM	RHS	CMM (ENEA extra EPIC)	Supply	Tender Ongoing
THM	RHS	In-bore & out-bore (PNRR WP 3)	Supply	Tender Ongoing
THM	IVC	Divertor Prototype	Supply	Planned
THM	IVC	Divertor materials (mono-blocks tungsten)	Supply	Planned
THM	IVC	Manufacturing of FW prototypes	Supply	Planned
HCD	ECH	HVPS for gyrotrons	Supply	Planned
HCD	ECH	APS_Auxiliaries Power Supply	Supply	Planned
HCD	ICH	ICH Transmission line & matching	Supply	Tender Ongoing
HCD	ICH	ICH Transmission line & matching (PNRR funded)	Supply	Tender Ongoing
HCD	ICH	ICH Auxiliary units and structures	Supply	Planned
BOP	BUI	Tokamak Hall and New Buildings	Works	Planned
BOP	BUI	Construction site Gate (Site preparation)	Works	Planned
BOP	BUI	Demolitions Building 90 and ditch area	Works	Planned
BOP	BUI	Deconstruction Building 73 and tunnel	Works	Planned
BOP	AUX	Building 89 for ICH	Works	Planned

**Total Value 2024:
281.5 M€**

**Total value 2024-
2026:
514 M€**

**Total investment
value:
615 M€**

DTT Planning (under revision)





Thank you for attention

www.dtt-project.it