

The Divertor Tokamak Test project: progress towards the initial operation

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ABSTRACT

- The construction of the Divertor Tokamak Test facility is progressing with a number of machine components now under fabrication and the civil work starting.
- First plasma expected in July 2032.
- An overview of the status of the construction is presented.

BACKGROUND

- The Divertor Tokamak Test (DTT) facility is a research infrastructure under construction in Italy to investigate innovative solutions for the power exhaust in conditions similar to those of ITER and DEMO.
- ITER and DEMO relevant heat loads achieved through a combination of additional heating (45MW at the plasma: 29MW ECH, 7MW ICH, 9MW NNBI) and compact dimensions ($R=2.19\text{m}$, $a=0.70\text{m}$, $B=5.85\text{T}$, $I_p=5.5\text{MA}$)
- DTT is a breakeven-class, long-pulse (100s) superconducting tokamak, equipped with full-tungsten, actively cooled plasma-facing components.
- Core-edge integration crucial part of the research program (investigation of high-confinement, high radiation regimes via impurity seeding).
- First version of the DTT Research Plan released in 2024 and elaborated with the active involvement of several scientists from the Eurofusion laboratories (for more details see P. Martin OV).
- About 38% of the budget is committed in running contracts, 22% in ongoing or adjudicated tenders, 28% in call for tender to be launched by the beginning of 2026.

HEATING AND CURRENT DRIVE SYSTEMS

First half of the 32 MW/170GHz DTT ECH system under procurement. The pre-series gyrotron successfully tested. First load successfully tested in April 2025. HVPS call for tender early 2026.

First 2MW of ICH system delivery in 2026. Prototype solid state transmitter tested in 2025. First batch of transmission line components completed.

Negative beam system: R&D ongoing.

(for more details see G. Granucci poster)



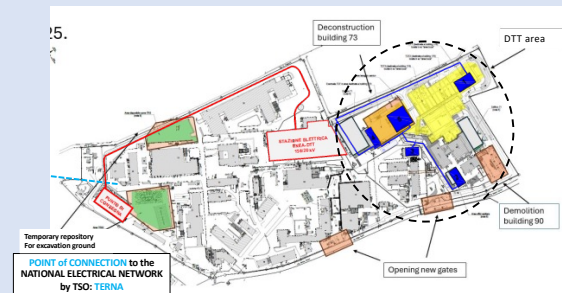
Left: pre-series gyrotron; middle: RF load; right: ICH solid state module.

BALANCE OF PLANT

Call for tender for the new buildings launched in May 2025. Presently under evaluation.

Design and verification of the new 150kV/20kV substation and electrical distribution system completed. Work to connect the 150kV line started.

Demolition of Bld. 90 and 73 and opening of new gates starting.

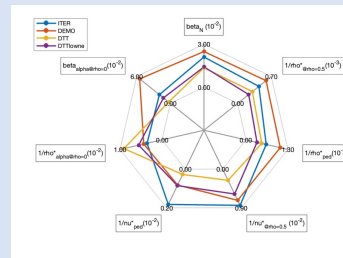
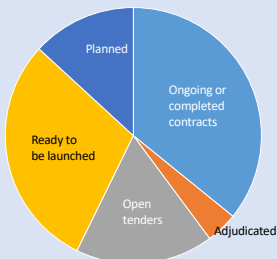


CONCLUSION

- DTT construction is progressing rapidly. By the first half of 2026 88% of the available budget expected to be committed.
- Strong support both at national and regional level.
- The work on the building and electrical distribution system is starting.
- First plasma scheduled in 2032 with full in-vessel configuration of the machine.



Left: TF magnet first winding pack. Right: TF power supply installed in the cold coil test facility in Frascati where all the Nb3Sn coils will be tested.



Left: share of the budget committed in running contracts an open/adjudicated or ready to be launched tenders. Right: DTT dimensionless parameters.

MACHINE CONSTRUCTION

Toroidal magnet: 4 winding pack ready, other 6 under preparation, casing production to be started in 2026.

Poloidal coils: strand for PF2-PF6 procured and conductor successfully qualified, strand for PF1 and CS under procurement. Call for tender for the PF coils fabrication ongoing.

Central solenoid: design solution frozen with a conventional LTS pancake wound plus a HTS superconducting insert.

Power supplies: TF power supply and 1st Fast Discharge Unit delivered, Power supply for internal coils under construction (delivery in 2026)

Vacuum vessel and ports: tender adjudicated

Divertor: small scale sample qualification completed, full scale mock-up under preparation, prototype oven for HRP delivered.

Cryoplant: tender documentation ready

Remote Handling: articulated boom (HYRMAN) and cassette mover under construction. Delivery in 2026 to the DTT RH facility near Naples.

(for more details see Gianmario Polli presentation)