## MERIL EU Core Data

### Identification

### Hosting Legal Entity

**ENEA Research Center, Frascati (Rome), Italy (but it is planned the foundation of a DTT Consortium)**

### Location

**ENEA Research Center, Via Enrico Fermi, 45, 00044 Frascati (Rome), Italy**

### Structure

**Type Of RI**

*Facility. Single-sited*

**Coordinating Country**

*Italy*

### Status

**Current Status:** Proposed in 2015, Interim Design Report to be delivered in 2018. Commissioning planned in 2025

### Scientific Description

*The role of DTT project in the frame of European fusion research*
The development of a reliable solution for the power and particle exhaust in a fusion reactor is recognized as one of the major challenges towards the realization of a fusion power plant (EFDA, Fusion Electricity: A roadmap to the realisation of fusion energy, November 2012, [https://www.euro-fusion.org/wpcms/wp-content/uploads/2013/01/JG12.356-web.pdf]).

The solution to adopt a conventional divertor (which will be tested in ITER) could not be suitable to be extrapolated to DEMO. In order to mitigate the risk, alternative solutions must be developed.

While several alternatives, such as the cooled liquid Li limiter in FTU (Mazzitelli G. et al., Nucl. Fusion, 51, 073006, 2011), the Super-X divertor in MAST-U (http://www.cceu.ac.uk/mast_upgrade_project.aspx) or the Snowflake divertor in TCV (Reimerdes H., et al., Plasma Phys. Control. Fusion, 55, 124027, 2013) are being investigated in presently operating tokamaks, the extrapolation from present devices to DEMO is considered not reliable (EFDA, Fusion Electricity: A roadmap to the realisation of fusion energy, November 2012, [https://www.euro-fusion.org/wpcms/wp-content/uploads/2013/01/JG12.356-web.pdf]).

DTT project is part of the general European programme in fusion research, which, actually, includes many other R&D issues (plasma experiments, modeling tools, technological developments for liquid divertors, etc...).

The specific role of the DTT facility is to bridge the gap between today's proof-of-principle experiments and the DEMO reactor. DTT should, in particular, have the capability to bring such solutions to a sufficient level of maturity and integration from both physics and technology points of view.

The main objectives of the project DTT

The DTT facility will be able to test the physical and technological feasibility of various alternative divertor concepts that can confidently be extrapolated to DEMO. In this way, it will possible to integrate the knowledge about the concepts of a number of divertor presently in testing operation on existing machines, with the implementation requirements of DEMO.

The main objectives of DTT, as reported in a number of official European documents (EFDA, Fusion Electricity: A roadmap to the realisation of fusion energy, November 2012, [https://www.euro-fusion.org/wpcms/wp-content/uploads/2013/01/JG12.356-web.pdf], Report of the STAC Ad Hoc Group on 'A strategy to address exhaust issues in the EU Fusion programme Phase I', Final version, 10.7.201), can be summarized as follows:

- demonstrate that the heat exhaust system proposed for DEMO is able to withstand the strong thermal load acting if the fraction of radiated power turns out to be lower than expected;
- improve the experimental knowledge in the heat exhaust scientific area that cannot be addressed by present devices;
- demonstrate that the possible (alternative or complementary) divertor solutions (e.g., advanced divertor configurations or liquid metals) can be integrated in the DEMO device.

In particular, it will be possible to assess whether:

- the alternative divertor magnetic configurations are viable in terms of the exhaust problems as well as of the plasma bulk performances;
- the alternative divertor magnetic configurations are viable in terms of poloidal coils constraint (i.e., currents, forces, ...);
- the various possible divertor concepts are compatible with the technological constraints of DEMO;
- the divertors based on the use of liquid metals are compatible with the characteristics of the edge of a thermonuclear plasma;
- liquid metals are applicable to DEMO.

RI Keywords

*Magnetic confinement, Tokamak, Plasma physics, Thermonuclear fusion*

Classifications

RI Category

*Nuclear Research Facilities*

Scientific Domain

*Physics, Astronomy. Other technical sciences*

ESFRI Domain

*Physical Sciences and Engineering*

Services

Research Services

*Testing of various possible divertor concepts, including liquid metals; experimental campaigns on possible alternative divertor magnetic configurations*

Equipment

**DTT: Tokamak facility for divertor assessing and power exhaust analysis.** Main parameters: \(I_p = 1.6 \text{MA}, B_t = 3.1 \text{T}, R = 2.10 \text{m}, a = 0.65 \text{m}, B_t = 6.0 \text{T}, V = 29 \text{m}^3, \) pulse duration (90 @). The device includes three heating systems (up to 45 MW and and a full set of plasma diagnostics.

Main subsystems: Magnets (including Toroidal field coil system, Central solenoid and poloidal field coil system); Vacuum vessel; First wall; Divertor; Shielding and Neutronics systems; Remote handling; Heating and current drive systems (including ICRH, ECRH and NBI heating); Fueling and pumping systems; Cryostat; Cooling system; Power supply; Electrical distribution system; Diagnostics and control system.

Additional Data

Collaborations

**EUROfusion; F4E**

*Scientists from EUROfusion Partners from China and from all international fusion labs are invited to meet the DTT and to propose new experiments campaigns.*