An Italian enterprise for Europe

DTT will be a key facility in the EURATOM fusion program.

DTT is under construction at the ENEA Research Centre in Frascati by the consortium DTT S.c.a r.l. The company includes the main Italian public scientific research institutions, research consortia engaged in fusion, some prestigious universities, and the most important Italian energy company.

First meeting to discuss the DTT research program with EUROfusion laboratories – July 8, 2022, ENEA Frascati"

DTT has an investment cost of approximately 614 million euros entirely provided by ENEA with contributions from MUR, MASE, PNRR, and the Lazio Region. Operating costs for system design amount to 130 million euros, divided pro rata among the members.

DTT is an Italian enterprise with significant involvement of the European community in fusion through the EUROfusion Consortium, which finances the divertor construction for approximately 60 million euros. EUROfusion member laboratories are also actively collaborating in defining the scientific program.

DTT is an essential element of the European roadmap to fusion electricity.

A powerful team

The **DTT project** is based on decades of experience in fusion research from Italian laboratories and universities and in the realization of large industrial plants by ENI.

DTT offers an opportunity for cooperation between research, universities and industry for the realization of fusion energy.

ENEA
Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile

CETMA

Consiglio Nazionale delle Ricerche

create

CONSORZIO RFX
Ricerca Formazione Innovazione

eni

INFN
Istituto Nazionale di Fisica Nucleare

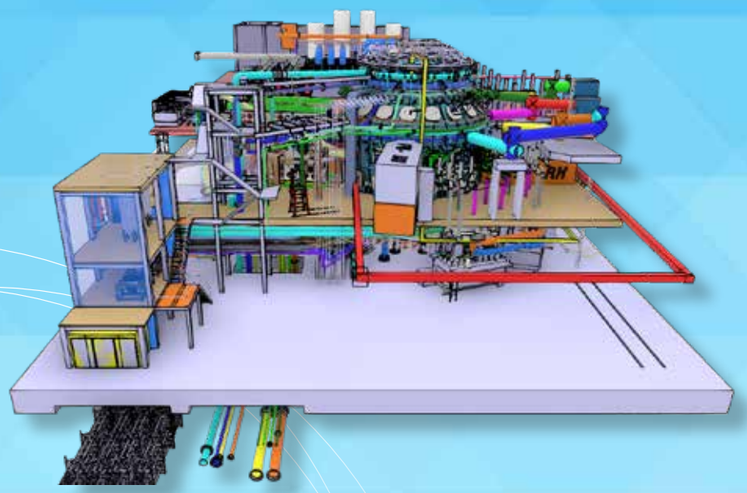
UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA

Politecnico di Torino

TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

UNIVERSITÀ DEGLI STUDI DELLA TUSCIA

DTT
DIVERTOR TOKAMAK TEST



design&stampa: Tipografia Giammarioli, Via Enrico Fermi 8/10 - Frascati (Roma) - www.tipografiagiammarioli.com

www.dtt-project.it

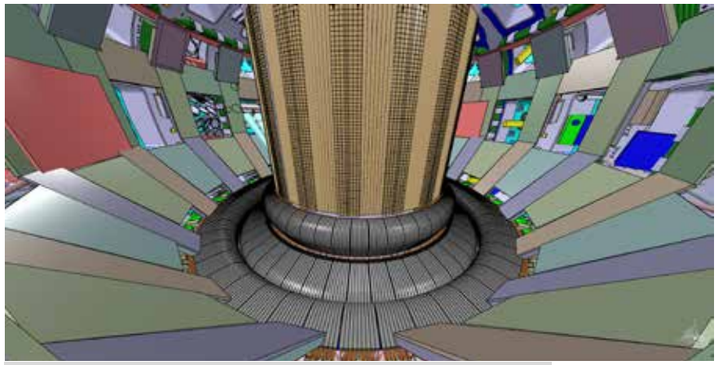
DTT S.c. a r.l.
Via Enrico Fermi 45 - 00044 Frascati, Italia

DTT: the goal

Fusion is a sustainable energy source because it utilizes a practically limitless fuel, does not produce greenhouse gases, maintains high safety standards, and has a limited environmental impact.

Fusion is achieved by heating a gas of hydrogen isotopes to temperatures exceeding 100 million degrees, ten times the temperature at the center of the Sun.

In these conditions, electrons are not bound to the nuclei, and matter is in the 'plasma' state. Plasmas are confined by intense magnetic fields (one hundred thousand times larger than the average Earth's magnetic field) in a toroidal configuration called **tokamak**, where a current of several million ampères is passed through.

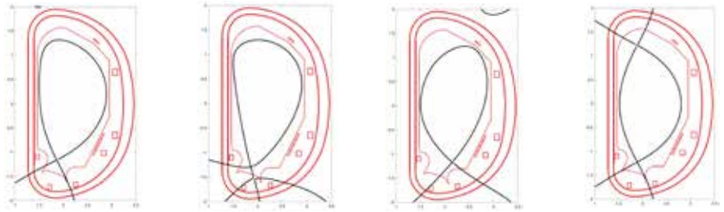


The interior of the DTT tokamak with the divertor at the bottom. The major radius of DTT is 2.2 m, and the minor radius is 0.7 m. A current of 5.5 million Ampères will flow through the plasma of DTT.

A portion of the power released by fusion reactions is transported to a component – **the divertor** – from which it is extracted. Due to the high heat flux, the divertor is one of the most critical components of a fusion plant. A solution for the ITER divertor (the first experimental reactor built to generate 500 megawatts of fusion power) has already been developed. However, the heat flux released in a power plant will be much greater than that in ITER and similar to that on the surface of the Sun. The solution used for ITER may not be adequate.

The goal of DTT is to study innovative solutions for the extraction, through the divertor, of the power generated by fusion at heat fluxes comparable to those of a power plant.

DTT: the project



Single Null | **X-divertor** | **Negative Triangularity** | **Double Null**

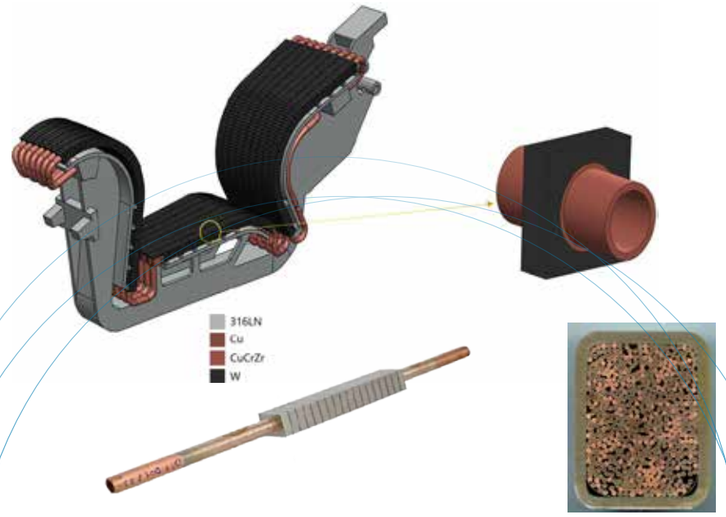
Flexibility as the main design requirement: various plasma configurations (black lines) that can be explored by DTT

DTT is a flexible experiment with the goal of developing the best solution for the DEMO divertor (the first power plant to feed fusion-generated electricity into the grid).

DTT will integrate all the most advanced technologies, such as superconducting magnets and high power flux components for the divertor.

DTT will produce DEMO plasma conditions in pulses lasting about 100 seconds to study a variety of different divertor configurations and innovative materials such as liquid metals.

To replicate the high heat flux required on the divertor, DTT will use heating systems that will inject up to 45 megawatts of power into the plasma



The divertor will consist of tungsten monoblocks as shown in the figure. Monoblock technology has been developed by ENEA.

Section of superconducting Nb_3Sn cable from DTT coils to produce the toroidal magnetic field of 6 Tesla. The 'cables in-conduit conductors (CICC)' technology is developed in ENEA laboratories.

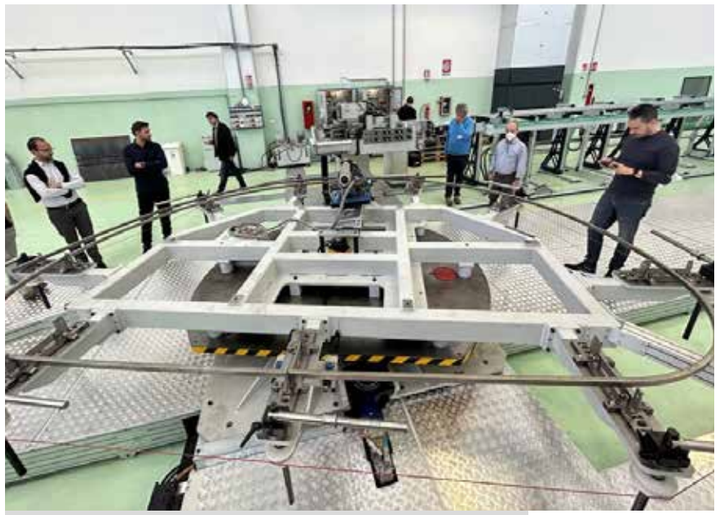
DTT: the industry

Over 500 Italian companies, including Ansaldo Nucleare, ASG Superconductors, SIMIC, Mangiarotti, Walter Tosto, Delta TI, OCEM Energy Technology, Angelantoni Test Technologies, Zanon, CECOM, and the ICAS Consortium (ENEA, Criotec, and Tratos), are successfully participating in the construction of ITER.

Thanks to Italian fusion research and traditional collaboration with the industry, Italian industries have won supply contracts worth more than 2 billion euros, making our country's system one of the leading players in the construction of ITER.

DTT allows the expansion of the significant experience gained in ITER, in terms of technological know-how, complex project management, and quality control.

The list of companies involved in the construction of plant components and in the R&D activities of DTT includes more than twenty entities and is constantly expanding.



Prototype of the toroidal magnet coil of DTT under construction at ASG.