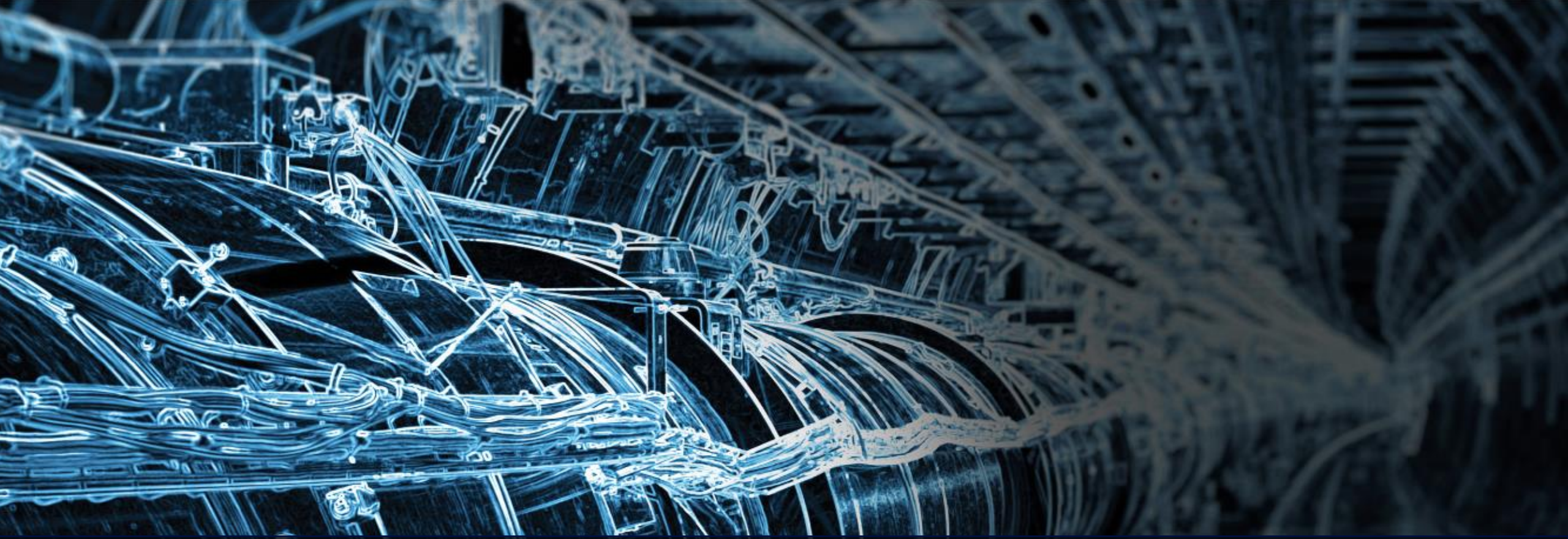
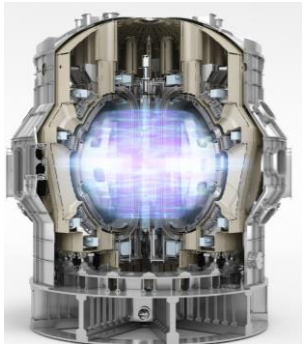


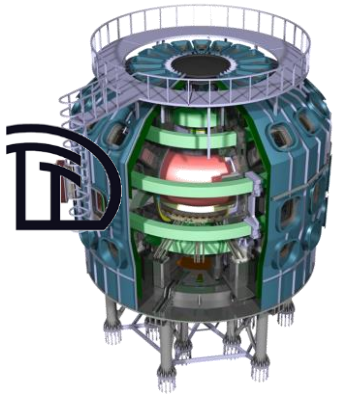
CERN Fusion Technology Coordination Unit

Michele BATTISTIN, Bernardo BORDINI, Luca BOTTURA, Enrico CHESTA, Roberto LOSITO, Luigi SCIBILE, Jean-Philippe TOCK, Ray VENESS.

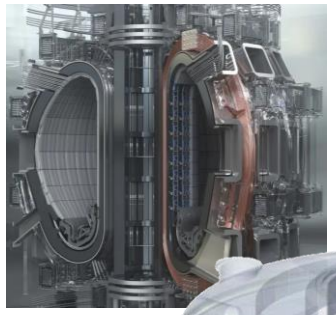
28 October 2025

Fusion

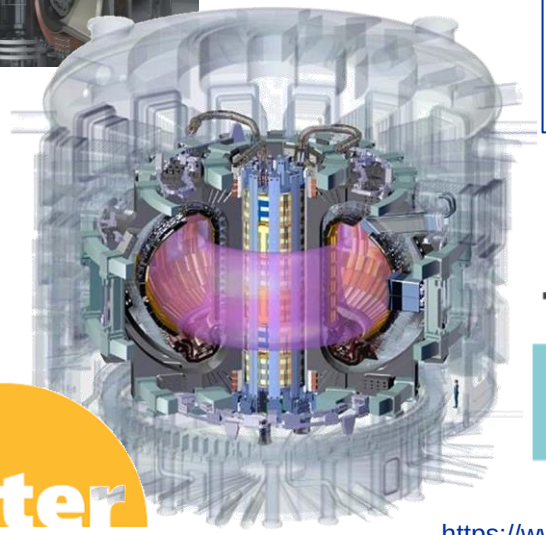




JT-60SA
Advanced Superconducting Tokamak
BA-Satellite Tokamak Program



BEST

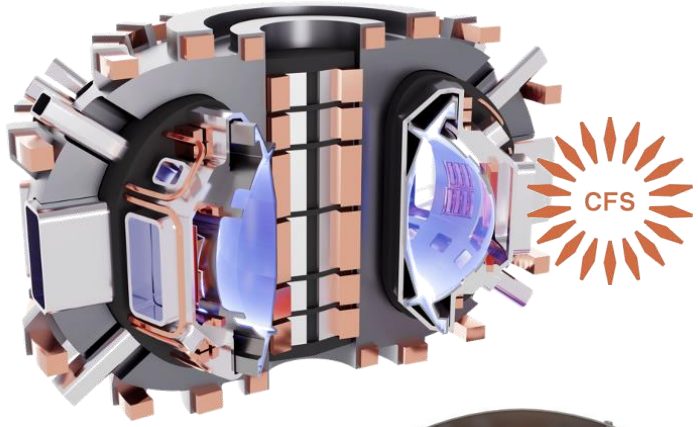


iter

4. Companies with $200M investment or more

FUSION INDUSTRY ASSOCIATION

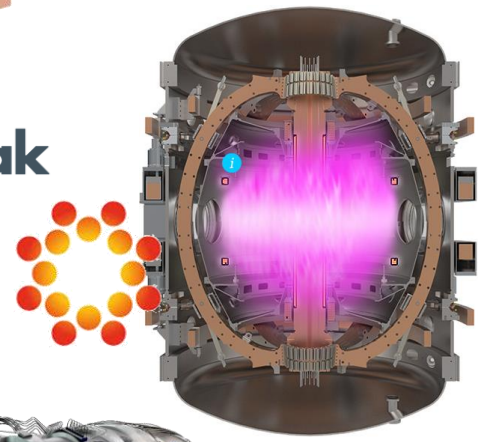
- TAE Technologies ($1bn+)
- General Fusion
- Tokamak Energy
- Zap Energy
- Commonwealth Fusion Systems ($2bn+)
- ENN
- Helion Energy
- SHINE Technologies

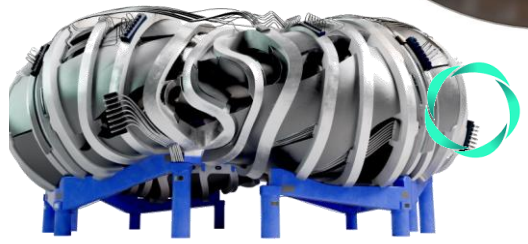


- The field of thermonuclear fusion is undergoing a **true revolution**
- This is causing remarkable side effects, notably on **HTS magnet technology**

5. Location

Tokamak Energy





Proxima Fusion

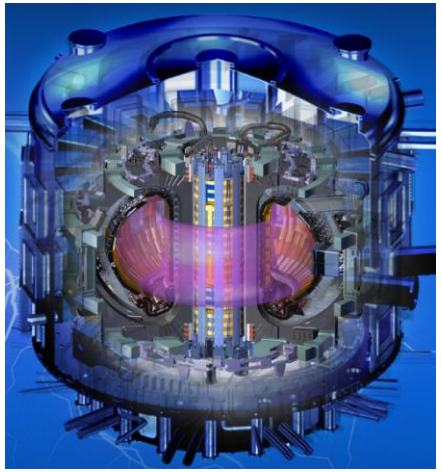
1. Total funding

~$7,122,435,000 (7.1bn)

GAUSS FUSION

https://www.fusionindustryassociation.org/wp-content/uploads/2024/07/2024-annual-global-fusion-industry-report.pdf

Why a CERN involvement in Fusion?



- Technologies developed to reach our goals may be used in other fields. CERN's mission includes **transferring these technologies** and **engaging in collaborations** where CERN's core mission and other fields align (mutual interest).
- CERN has a **long tradition** of knowledge & technology transfer and collaboration with public institutions and private companies involved in fusion.
- This aligns with CERN commitment to advancing scientific innovation and sustainable development while exploring the application of particle accelerator technologies to help address one of society's most pressing challenges: **Renewable and Low-Carbon Energy Production** (the first pillar of the **CIPEA** strategy).

CIPEA
CERN Innovation Programme on Environmental Applications

The participation is setup via formal cooperation or collaboration agreements, consultancy contracts and industrial partnerships. **The key discriminator for the participation is the "mutual interest"**.

How is the CERN involvement organised?

- ATS setup in 2023 a **Fusion Technology Coordination Unit (FTCU):**
  - **To identify the areas** where the needs of the Fusion Community and of the CERN community require the development of common technologies.
  - **To identify the opportunities** and **coordinate the establishment** of collaboration/cooperation/consultancy agreements to provide expertise, technical support and technical coordination for research and development activities in physics and engineering towards magnetically confined fusion.
- The full M+P engaged in the activity are **compensated by the external contribution** of the fusion partner.
- The FTCU **does not replace CERN's organisational structure**; rather, it coordinates activities across departments to ensure alignment and efficiency.

Mandate at EDMS 2932579: https://edms.cern.ch/document/2932579/1

The ATS-FTCU

Michele Battistin (EN-ACE)

Luca Bottura (ATS-DO)

Roberto Losito (ATS-DO)

Jean-Philippe Tock (EN-ACE)

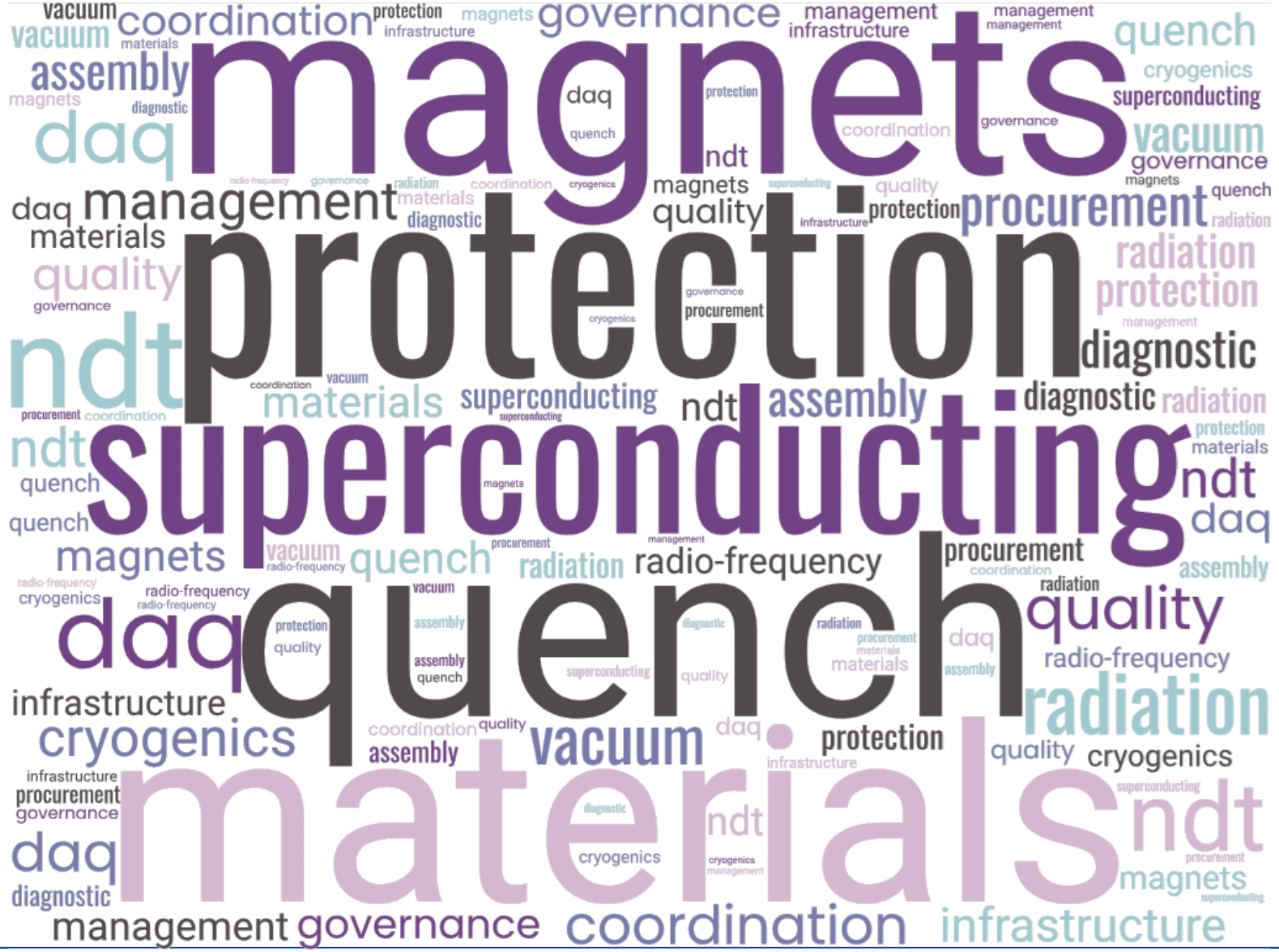
Bernardo Bordini (TE-MPE)

Enrico Chesta (IPT-KT)

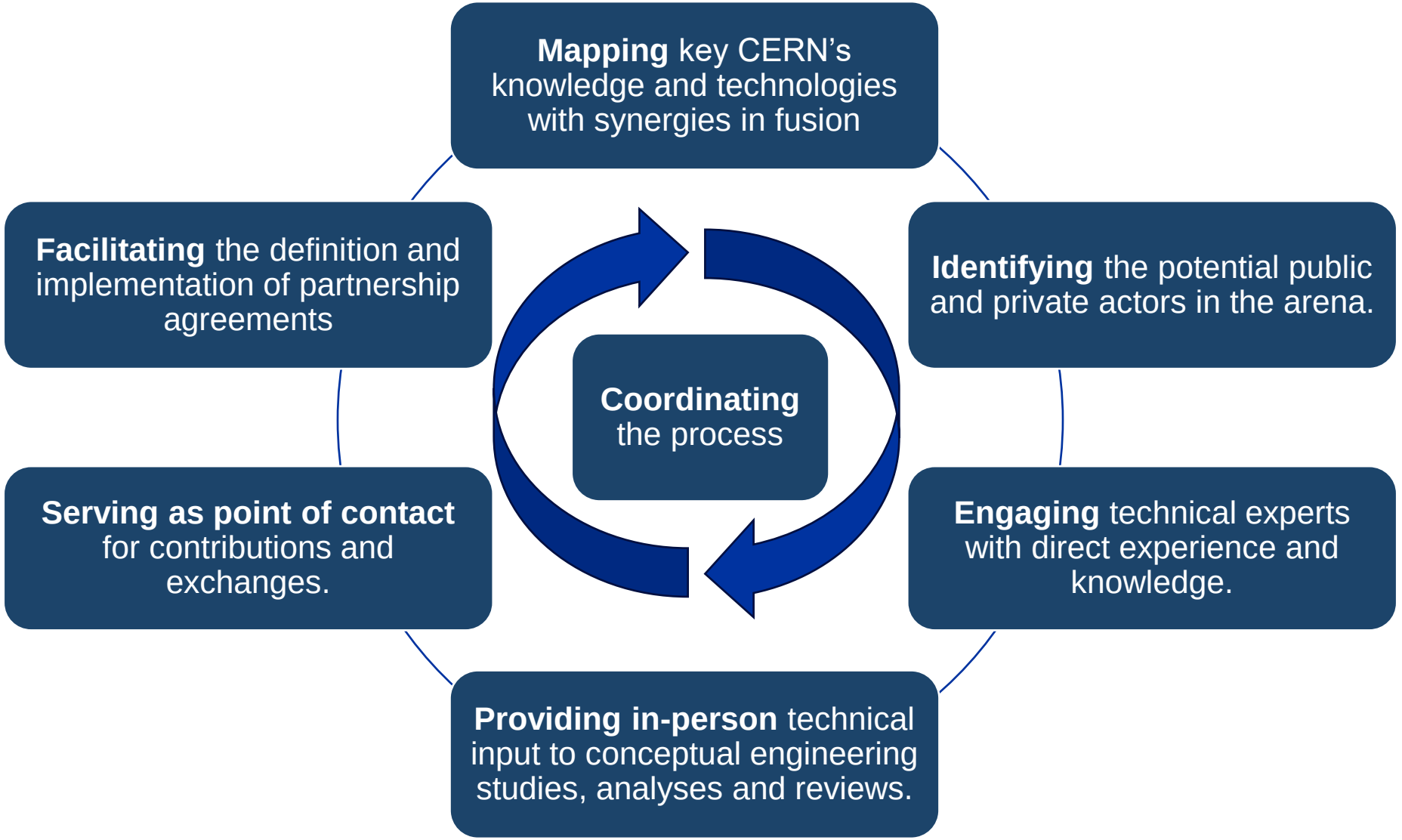
Luigi Scibile (TE-HDO)

Raymond Venness (SY-BI)

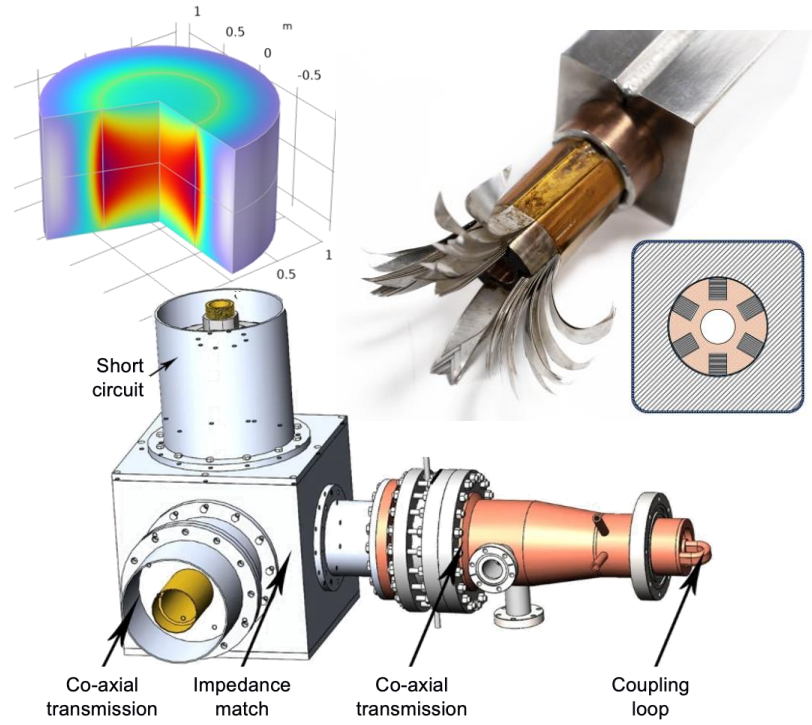
Key technologies, and beyond

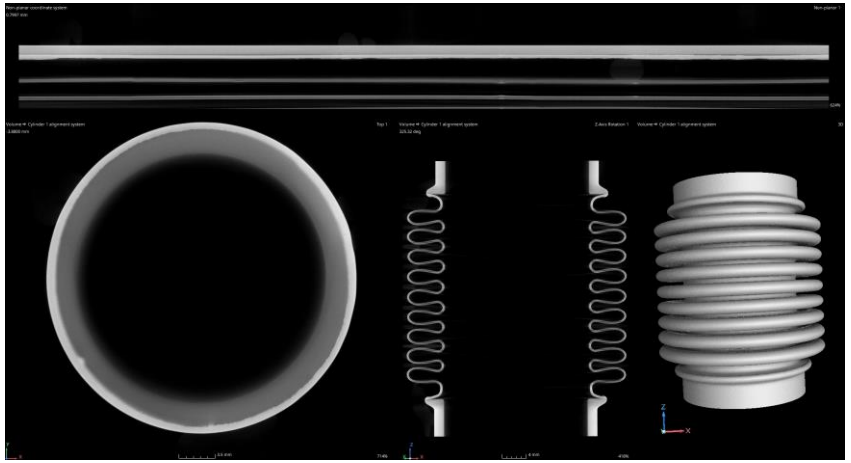


How does the ATS FTCU operate?



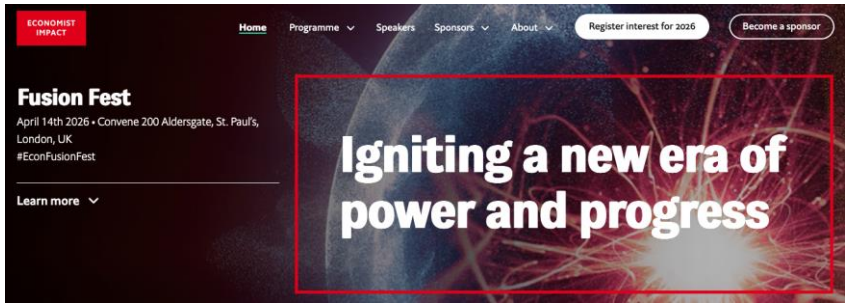
Collaboration activities





- CERN-ENI 20T@20K HTS solenoid magnet (KN6199) – Completed feasibility study.
- CERN-F4E (KN6610) – started (+ RF power couplers for IFMIF (KR6375) – in production).
- CERN-GaussFusion (KR5735) – Completing quench protection analysis of GIGA coils.
- CERN-EuroFusion (KN5888) – Completed scoping study of HTS magnets for HEP (MC) and fusion (VNS).
- CERN-Rolf Kind (KR5777) – On-going structural material testing at cryogenic temperature.
- CERN-ITER cooperation (KN1449).
- CERN-KEF cooperation (KN6458).

Representation



- Panelist at the Economist “Fusion Fest”, London, 14 April 2025
- Participant at the EUROFusion “Knowledge Management Workshop”, 12-14 November 2024
- Participant at meeting on “Role of Swiss Industry in Fusion Energy”, 2 December 2024
- Panelist at the “F4E Roundtable” - Investing in fusion technologies and skills, June12-13 2025

10 September 2025 – signature of framework agreement KN6607 with Fusion for Energy

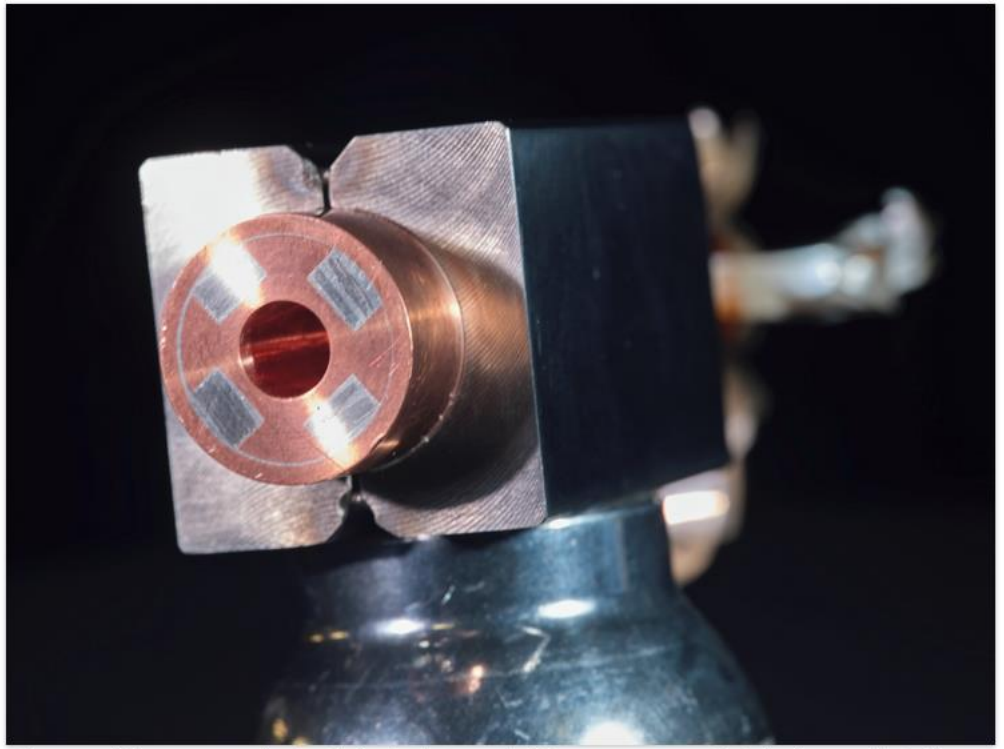
F4E and CERN join forces in fusion energy and particle physics

Marc Lachaise, Director of Fusion for Energy (F4E), together with Mike Lamont CERN Director for Accelerators and Technology, signing the cooperation agreement between the two organisations, September 2025. ©CERN

CERN and fusion energy, advancing together

CERN and Fusion for Energy (F4E) sign a major framework collaboration agreement to advance scientific research and technological development in areas of common interest, including high-temperature superconducting magnets and fusion energy

16 SEPTEMBER, 2025 | By Anaïs Schaeffer



A demonstrator high-current superconducting cable developed at CERN, using high-temperature superconducting (HTS) tapes, and inspired by developments for advanced nuclear fusion reactors. The cable consists of a hollow copper profile hosting HTS tapes in twisted grooves. When cooled to 20 K, a cable of this class can carry currents up to 60 kA in fields up to 20 T. (Image: CERN)

Upcoming

- **ENI**
  - Negotiating **Project 2 –** HTS conductor design and development.
- **F4E**
  - Co-organizing **EU magnet landscape mapping –** Build a post-ITER strategy with investment/spending plan, with potential participation in demonstrator projects (e.g. 20T@20K HTS magnet). On-line workshop, 17 September 2025, in-person workshop at **CERN, 26-27 November 2025**.
  - **Kick-off Addendum I –** HTS magnet conceptual and engineering design (solenoids).
- **EuroFusion**
  - Negotiating **Addendum II –** Participation in the 20T@20K HTS magnet design
- **UKAEA**
  - Defining a **Framework Collaboration Agreement –** Supporting STEP (Spherical Tokamak for Energy Production) Project – Meeting on UKAEA Culham Campus in November 2025.
- **ITER**
  - Cooperation Steering Committee @ end of the year.

A balance and summary

The ATS-FTCU is now acting as a **central point of coordination (**as originally planned)

In the past two years, the ATS-FTCU has provided some **practical return** in several ways, e.g.

- Facilitating strategic collaborations (e.g. CERN-EUROFusion, CERN-F4E)
- Screening requests from the private and public sector (e.g. case of the *fusion diesel engine*)
- Promoting development of technologies of interest to CERN (e.g. design and protection of HTS magnets with large stored energy)
- Represent CERN at high level at fusion events (e.g. Fusion Fest)

We propose to continue in this **productive and mission-driven** ”cruise” mode, **open to adjustment** as new opportunities emerge, and noting that the ATS-FTCU is **effectively acting CERN-wide**.


能量奇点
ENERGY SINGULARITY