



EURATOM

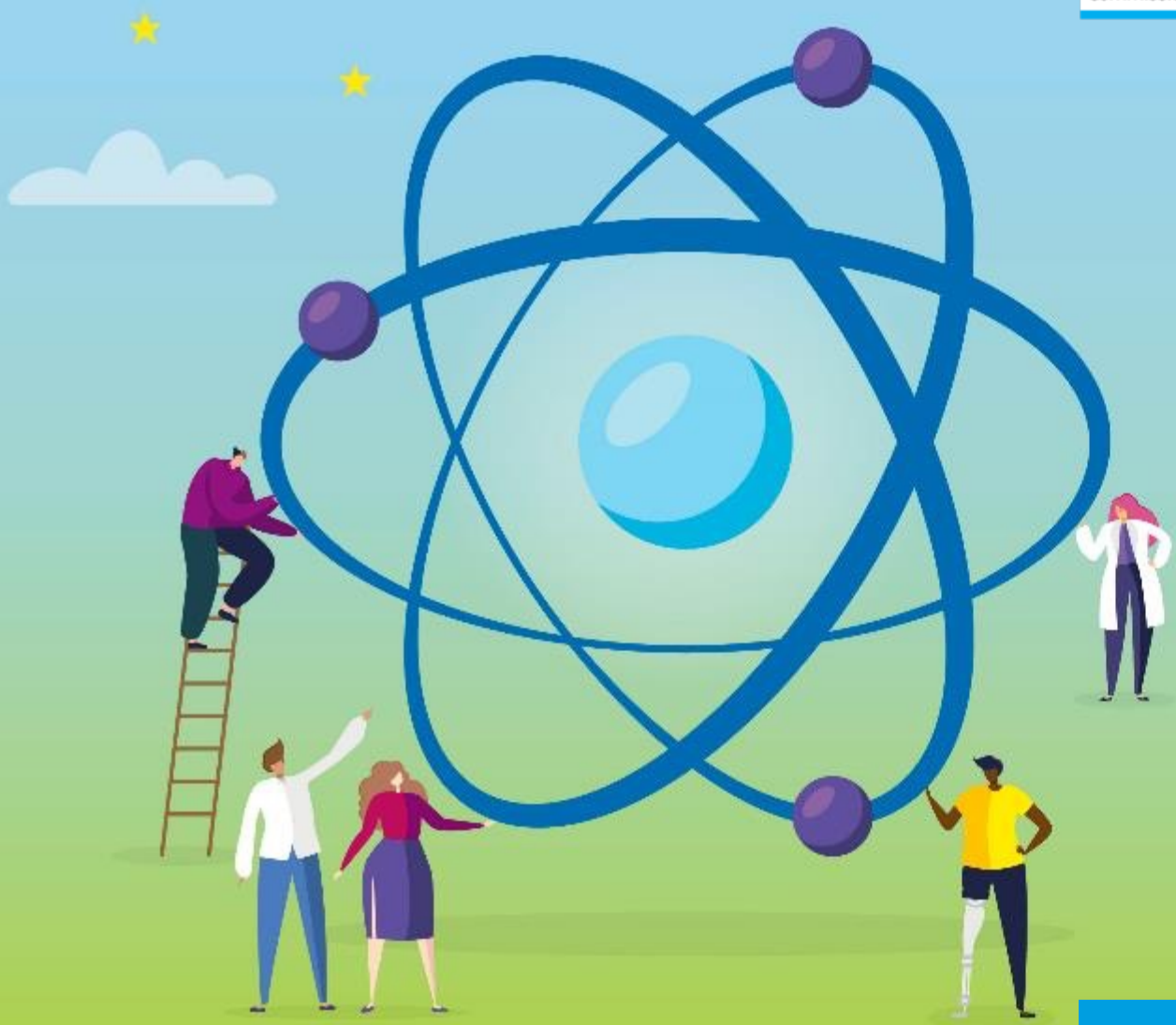
Research and Training Programme & European Fusion Policy

ELI Laser-Induced Fusion Kick-off Meeting
28 November 2023

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*Head of the Fusion Sector
European Commission, DG RTD
Euratom Research Unit*

Research and
Innovation



Outline

- The Euratom Research and Training Programme
- The fusion research programme under Euratom
- EUROfusion in a nutshell
- Future outlook of the EU fusion research programme: The Fusion Strategy

Horizon Europe & the Euratom programme

HORIZON EUROPE

EURATOM

SPECIFIC PROGRAMME: EUROPEAN DEFENCE FUND

*Exclusive focus on
defence research
& development*

Research
actions

Development
actions

SPECIFIC PROGRAMME IMPLEMENTING HORIZON EUROPE & EIT*

Exclusive focus on civil applications



**Pillar I
EXCELLENT SCIENCE**

European Research Council

Marie Skłodowska-Curie

Research Infrastructures



**Pillar II
GLOBAL CHALLENGES &
EUROPEAN INDUSTRIAL
COMPETITIVENESS**

Clusters

- Health
- Culture, Creativity & Inclusive Society
- Civil Security for Society
- Digital, Industry & Space
- Climate, Energy & Mobility
- Food, Bioeconomy, Natural Resources, Agriculture & Environment

Joint Research Centre



**Pillar III
INNOVATIVE EUROPE**

European Innovation
Council

European innovation
ecosystems

European Institute of
Innovation & Technology*

WIDENING PARTICIPATION AND STRENGTHENING THE EUROPEAN RESEARCH AREA

Widening participation & spreading excellence

Reforming & Enhancing the European R&I system

Fusion

Fission

Joint
Research
Center

EURATOM research and training programme 2021-2025

Objectives

- Research and training activities to reduce risks in nuclear safety and security, development of safe nuclear technologies and optimal radiation protection.
- Foster the development of fusion energy and contribute to the implementation of the fusion roadmap

Key novelties

- Increased focus on non-power applications of radiation (medical, industrial, space)
- Opening mobility opportunities for nuclear researchers through inclusion in Marie Skłodowska-Curie Actions

Euratom budget (2021-2025)

Euratom Research and Training Programme adopted on 12 May 2021

Budget of €1.38 billion for 5 years



€583 M for indirect actions in **fusion research** and development

€266 M for indirect actions in **nuclear fission**, safety and radiation protection

€532 M for **direct actions** undertaken by the JRC

The fusion research programme and the EUROfusion Partnership



The European Fusion Landscape

The European Commission

MST & Linear devices



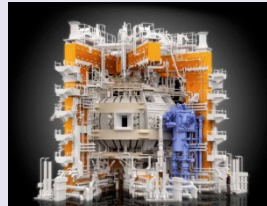
29 Labs



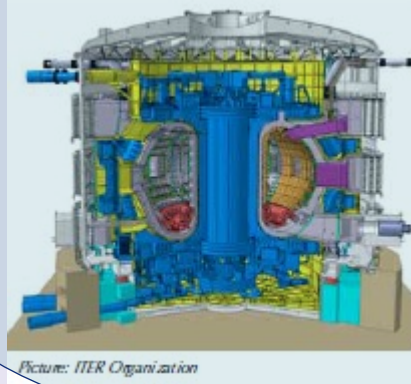
Work inside the plasma chamber of Wendelstein 7-X. Picture: IFF

W7-X

JET



F4E



Picture: ITER Organization

International

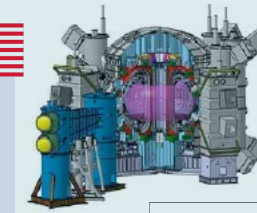


Image: JT-60SA

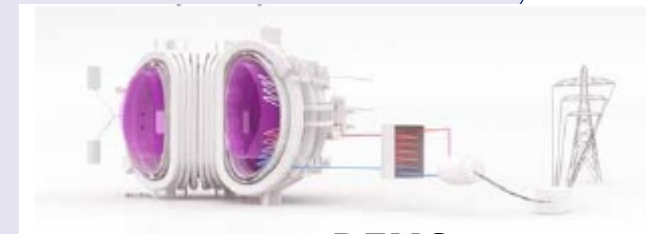


roadmap for Electricity from Fusion Energy

2050 and beyond



EU Fusion Programme



DEMO

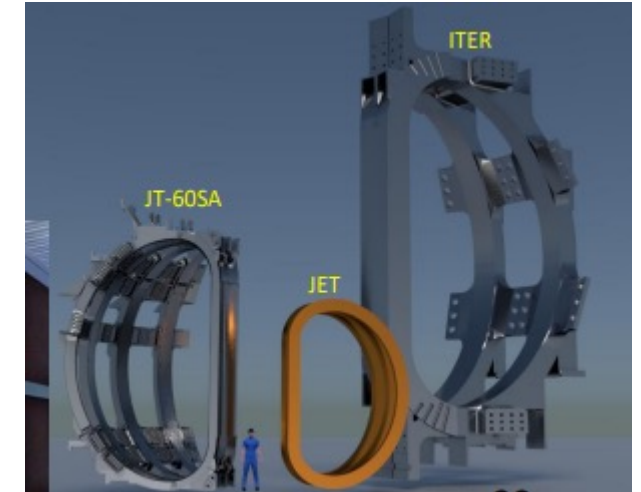
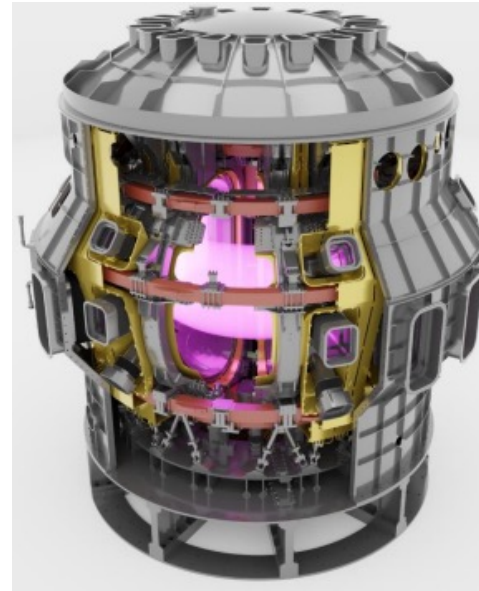


European Commission

EU-Japan collaboration: the Broader Approach

JT-60SA - The Satellite Tokamak Programme (STP)

- The largest, most advanced tokamak in the world



IFMIF/EVEDA - International Fusion Materials

Irradiation Facility - Engineering Validation and Engineering Design Activities

- Prototyping essential materials research and validation



IFERC - International Fusion Energy Research Centre

- Ultra-fast supercomputing in fusion research
- Researching remote fusion experiments
- DEMO Design and R&D Coordination Centre



European Research Roadmap to the Realisation of Fusion Energy

Roadmap issued by **EUROfusion** in 2012, updated in 2018

Scope

To align the priorities in fusion R&D towards the ultimate goal of achieving electricity from fusion.

Three main pillars

ITER, IFMIF-DONES, and DEMO, supported by a strong Research and Innovation Programme.

Three periods, eight missions

- Start ITER operation(<2030);
- Burning plasma on ITER and DEMO engineering design (2030-2040);
- Plasma and technology optimization on ITER, construction of DEMO (>2040).

Acceleration is needed!

**Roadmap's timeline (addendum) under revision by EUROfusion
Independent scrutiny by the EC**

EUROfusion in a nutshell



31 member organisations
164 associated entities
+/- 5000 researchers, students & staff



EUrofusion is 100% publicly funded

- » The EU contribution reached EUR 549 million (54,5% of the budget in 2021-2025)
- » 20% used for the design of the European fusion DEMOnstration power plant

EUROfusion & the European Commission

DG Research & Innovation
Eurofusion Research Unit

DG Energy

EUROfusion contributes to
EUROfusion policies

European Research Roadmap to
the Realisation of Fusion Energy

EUROfusion results



Scientific & technological knowledge to achieve fusion energy through magnetic confinement



Contribution to JET & the exploitation of ITER



Pre-conceptual & conceptual design of DEMO

EUROfusion Results



Agreement with the development
of an **international
facility to test fusion
materials by neutron
irradiation**

IFMIF-DONES



**Technology transfer to
non-fusion applications**
with commercial and societal
potential

FUTARA III



Contribution to the
**broader approach
agreement with Japan**

*JT60SA construction and
commission*

EUROfusion Results



Communication actions on fusion



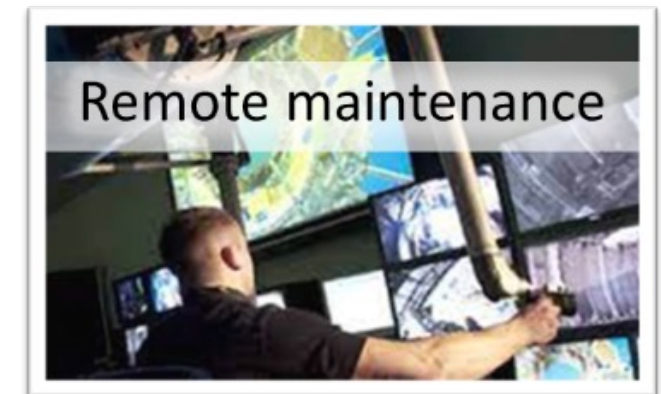
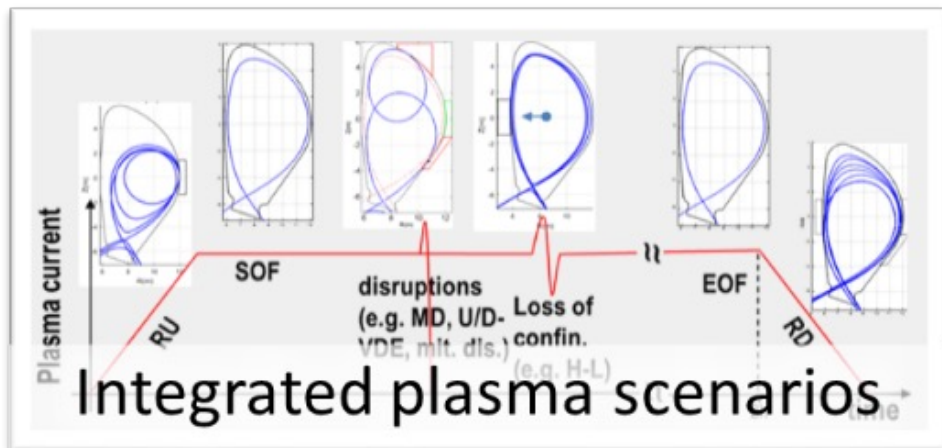
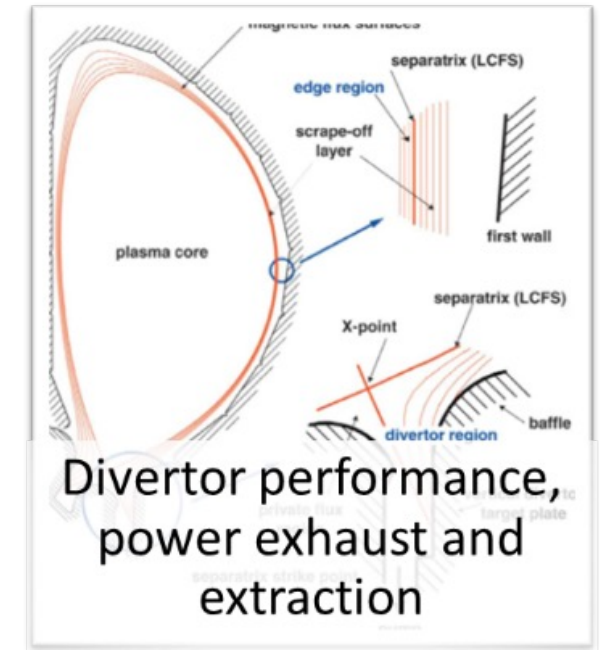
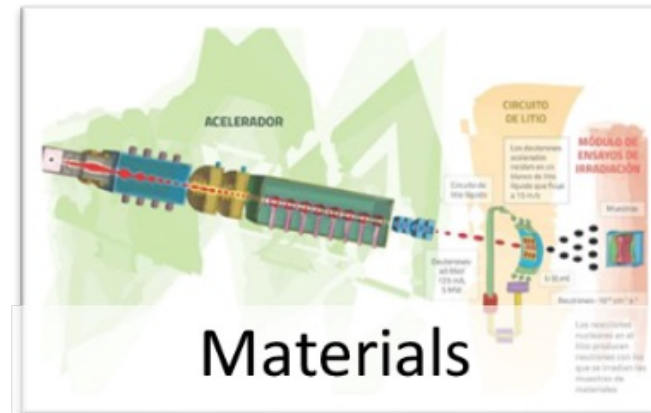
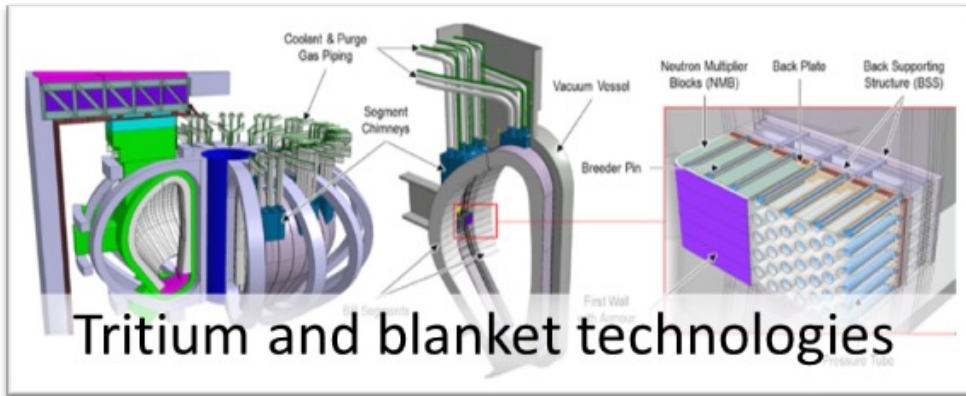
Training and education activities

42 Researcher Grants

40 Engineering Grants

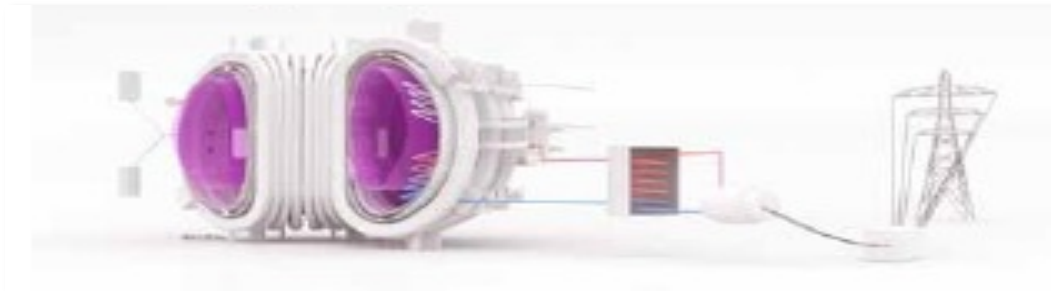
financed under the Framework Programme 9

Gaps to be addressed



EUROfusion priorities for the future

- » Parallelization of activities to reduce the sequential coupling of ITER milestones and DEMO decision points
- » Strengthening R&D in the identified gap areas
- » Increased effort in simulations for plasma & engineering
- » Mutually beneficial new international collaborations
- » Development & maintenance of adequate workforce



EUROfusion priorities for the future

The future outlook of the EU fusion research programme



Towards a European Fusion Strategy

Main Goals

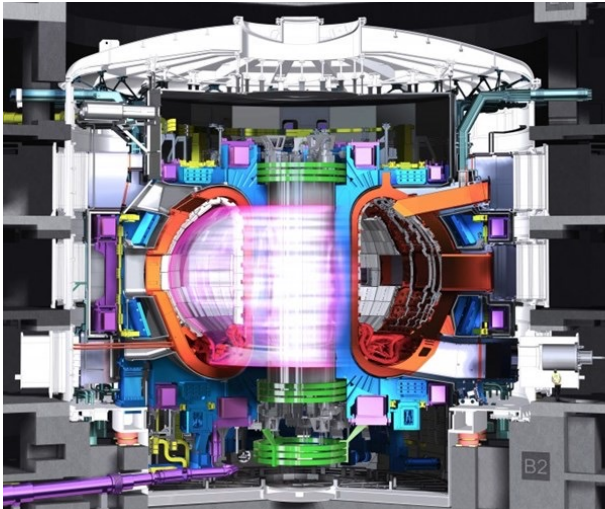
- Provide a clear European vision and a roadmap for the development of fusion energy in the EU
- Accelerate the demonstration of fusion energy in the EU
- Harness the European fusion expertise and experience
- Face the growing international competition
- Attract private and public investments while engaging the EU industry and suitable international partners



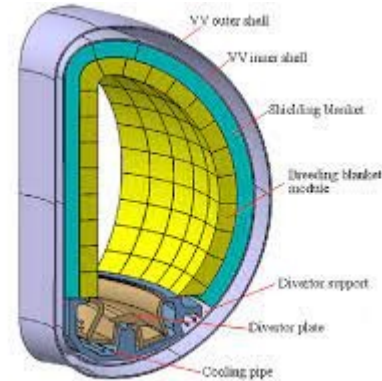
Main Actions

- Independent review of the EUROfusion roadmap and its outcomes
- Possible Public-Private Partnership with the fusion Industry
- Possible *Innovation Pillar* in the Euratom Programme (emerging approaches)
- Governance review and its results, eg **Fusion Expert Group**
- Investigation of regulatory options for fusion facilities

ITER rebaselining influencing DEMO timeline



Technological Bottlenecks hindering the path to fusion energy production

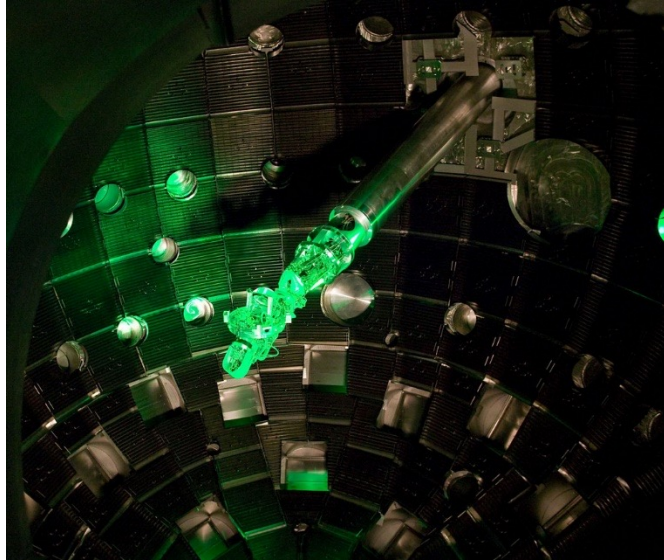


Changing Fusion Landscape: Flourishing Start-ups



Independent revision of the EUROfusion Roadmap

Encouraging scientific developments



Emergence of private investors willing to enter the field



Increasing technological maturity, need for industry pragmatism



Exploring Alternative Financing Options: PPP, Innovation “Pillar”

Investigation of regulatory options for fusion facilities

Grants:

- EUROfusion Working Group on Licensing for Fusion; Paper to be published as: *Recommendations for the Future Regulation of Fusion Power Plants* (EUROfusion grant agreement general info: <https://cordis.europa.eu/project/id/101052200>)
- HORIZON-EURATOM-2021-NRT-01-06: Harmonisation of licensing procedures, codes and standards for future fission and fusion plants (<https://cordis.europa.eu/project/id/101061643>).

International Cooperation:

- IAEA Tecdoc, 'International Experience in the Regulation of Fusion Facilities'
- IAEA Tecdoc, 'Experiences on Design Safety and Safety Assessment for Fusion Facilities'



Thank you for your attention!

HorizonEU
Euratom

<http://ec.europa.eu/horizon-europe>

