FUSION FOR ENERGY

Technology Development Program (TDP) / Technology Roadmapping

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Fusion Technologies and Engineering Department

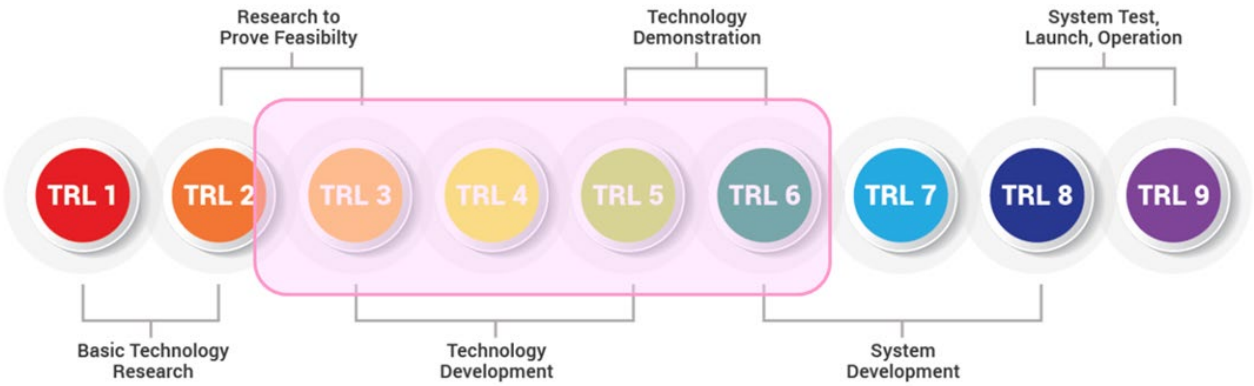
6th February 2024

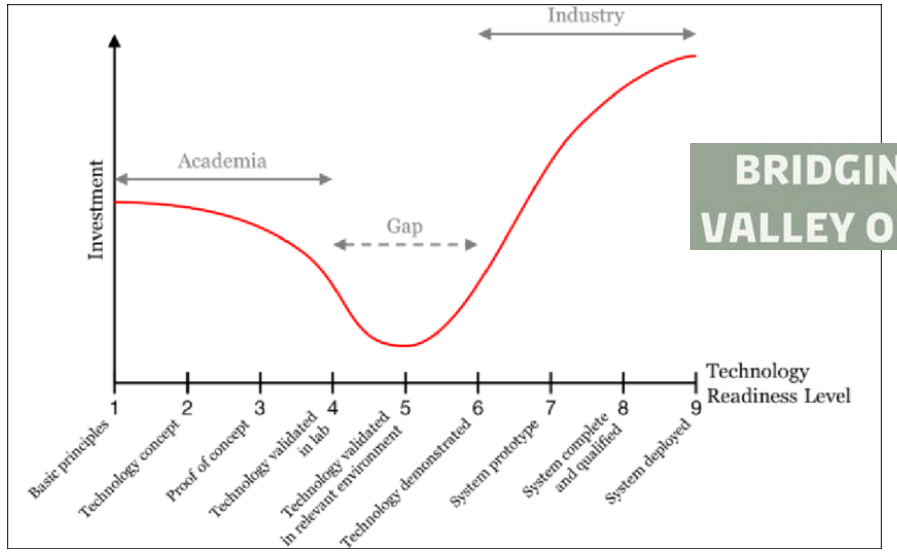
CONTENT

TECHNOLOGY DEVELOPMENT PROGRAMME

FUSION FOR ENERGY

- Support R&D activities on advanced technological capabilities.
- Explore the feasibility and suitability of cutting-edge technologies.
- Ease availability of fusion key enabling technologies (right technologies at the right time!) for commercial fusion.
- Promote strategical technology actions for future-proofing the competitiveness of European Fusion Supply Chain.
- Address critical technologies gaps for European fusion technology non-dependence.





TDP Pilots 2024

TDP Pilot Action 1 (F4E-OPE-1776):

Subject: R&D Feasibility Study to Manufacture Tungsten To CuCrZr Gradient Joints
Contract signature forecast: March 2025
Scope: R&D effort to specify, manufacture and test a series of Tungsten gradient joints samples for a systematic material properties characterization.
Duration: 15 months

TDP Pilot Action 2 (F4E-OPE-1775):

Subject: R&D for a Personal Monitor For Tritiated Vapor In Air
Contract signature forecast: April 2025
Scope: R&D effort to develop the design of a real time personal monitor for Tritium vapor. Prototyping and testing of such a design. Redesign and further prototyping and testing as needed.
Duration: 24 months

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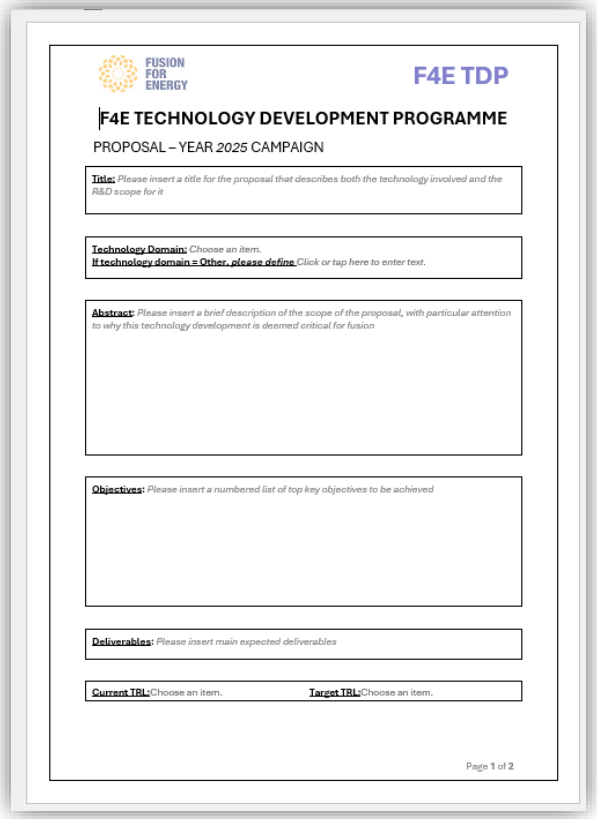
Identify Fusion **Key Enabling** (Critical) Technologies

Call for Technology Abstracts



FUSION FOR ENERGY F4E TDP

F4E TECHNOLOGY DEVELOPMENT PROGRAMME

PROPOSAL – YEAR 2025 CAMPAIGN

Title: *Please insert a title for the proposal that describes both the technology involved and the R&D scope for it*

Technology Domain: Choose an item.
If technology domain = Other, please define Click or tap here to enter text.

Abstract: *Please insert a brief description of the scope of the proposal, with particular attention to why this technology development is deemed critical for fusion*

Objectives: *Please insert a numbered list of top key objectives to be achieved*

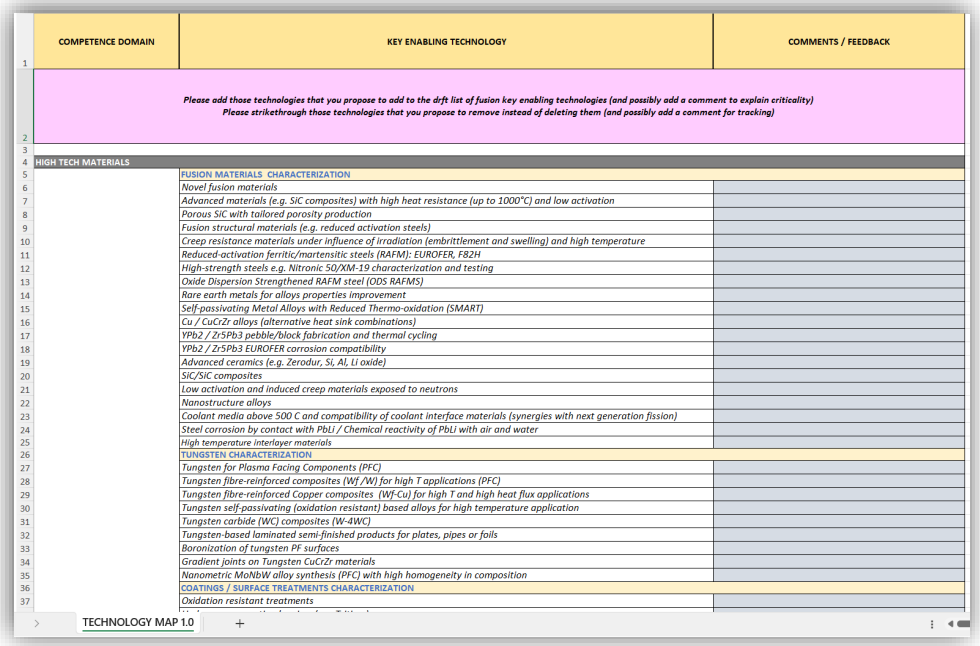
Deliverables: *Please insert main expected deliverables*

Current TRL: Choose an item. **Target TRL:** Choose an item.

Page 1 of 2

TECHNOLOGY DEVELOPMENT PROGRAM - Call For Abstracts

https://industryportal.f4e.europa.eu/categories/forthcoming/



	COMPETENCE DOMAIN	KEY ENABLING TECHNOLOGY	COMMENTS / FEEDBACK
1			
		Please add those technologies that you propose to add to the drft list of fusion key enabling technologies (and possibly add a comment to explain criticality) *Please strikethrough those technologies that you propose to remove instead of deleting them (and possibly add a comment for tracking)*	
2			
3			
4	HIGH TECH MATERIALS		
5		FUSION MATERIALS CHARACTERIZATION	
6		*Novel fusion materials*	
7		*Advanced materials (e.g. SiC composites) with high heat resistance (up to 1000°C) and low activation*	
8		*Porous SiC with tailored porosity production*	
9		*Fusion structural materials (e.g. reduced activation steels)*	
10		*Creep resistance materials under influence of irradiation (embrittlement and swelling) and high temperature*	
11		*Reduced-activation ferritic/martensitic steels (RAFM): EUROFER, F82H*	
12		*High-strength steels e.g. Nitronic 50/XM-19 characterization and testing*	
13		*Oxide Dispersion Strengthened RAFM steel (ODS RAFMS)*	
14		*Rare earth metals for alloys properties improvement*	
15		*Self-passivating Metal Alloys with Reduced Thermo-oxidation (SMART)*	
16		*Cu / CuCrZr alloys (alternative heat sink combinations)*	
17		*YPb2 / Zr5Pb3 pebble/block fabrication and thermal cycling*	
18		*YPb2 / Zr5Pb3 EUROFER corrosion compatibility*	
19		*Advanced ceramics (e.g. Zerodur, Si, Al, Li oxide)*	
20		*SiC/SiC composites*	
21		*Low activation and induced creep materials exposed to neutrons*	
22		*Nanostructure alloys*	
23		*Coolant media above 500 C and compatibility of coolant interface materials (synergies with next generation fission)*	
24		*Steel corrosion by contact with PbLi / Chemical reactivity of PbLi with air and water*	
25		*High temperature interlayer materials*	
26		TUNGSTEN CHARACTERIZATION	
27		*Tungsten for Plasma Facing Components (PFC)*	
28		*Tungsten fibre-reinforced composites (Wf /W) for high T applications (PFC)*	
29		*Tungsten fibre-reinforced Copper composites (Wf-Cu) for high T and high heat flux applications*	
30		*Tungsten self-passivating (oxidation resistant) based alloys for high temperature application*	
31		*Tungsten carbide (WC) composites (W-4WC)*	
32		*Tungsten-based laminated semi-finished products for plates, pipes or foils*	
33		*Boronization of tungsten PF surfaces*	
34		*Gradient joints on Tungsten CuCrZr materials*	
35		*Nanometric MoNbW alloy synthesis (PFC) with high homogeneity in composition*	
36		COATINGS / SURFACE TREATMENTS CHARACTERIZATION	
37		*Oxidation resistant treatments*	

TECHNOLOGY MAP 1.0

Draft List of fusion critical technologies

Identify Fusion **Key Enabling** (Critical) Technologies

🛠 **Technology Mapping and Roadmapping Workshops**

📌 Identify fusion critical technology needs and gaps that can inform R&D actions

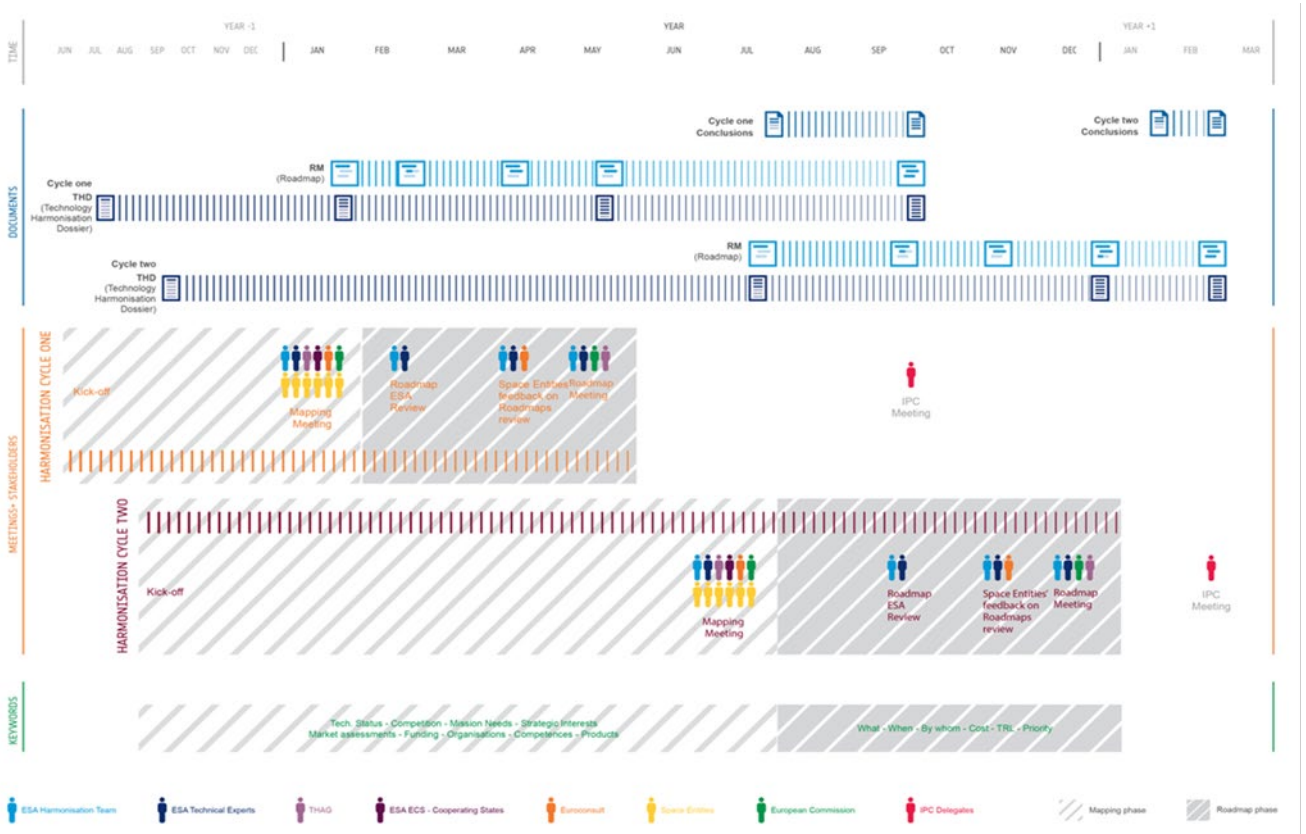
📌 Provide guidance to all stakeholders on the what & when (short to long term needs & priorities AND opportunities)

📌 Reinforce the EU fusion community, give voice to all players and create new networks and partnerships

COLLABORATIVE

Identify Fusion **Key Enabling** (Critical) Technologies

🛠 Technology Mapping and Roadmapping Workshops

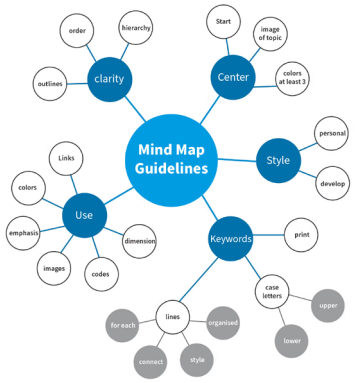


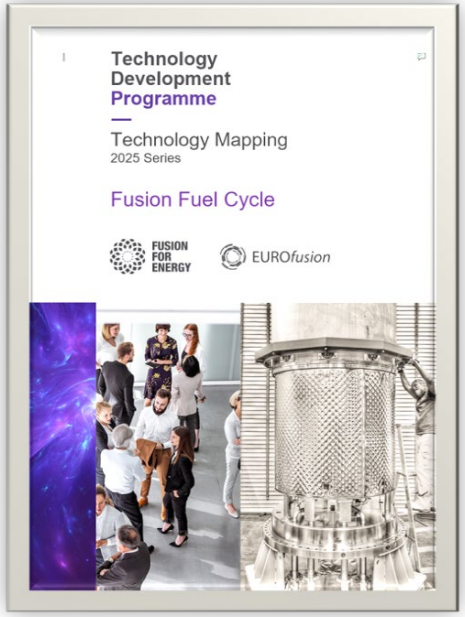
COLLABORATIVE

TECHNOLOGY MAPPING PROCESS

BREAKDOWN OF RELEVANT DOMAIN TECHNOLOGIES & FUNCTIONAL GROUPING

ONLINE





Online Discussion

EXHAUSTIVE LIST OF RELEVANT TECHNOLOGIES FOR MAPPING

TECHNOLOGY MAPPING PROCESS

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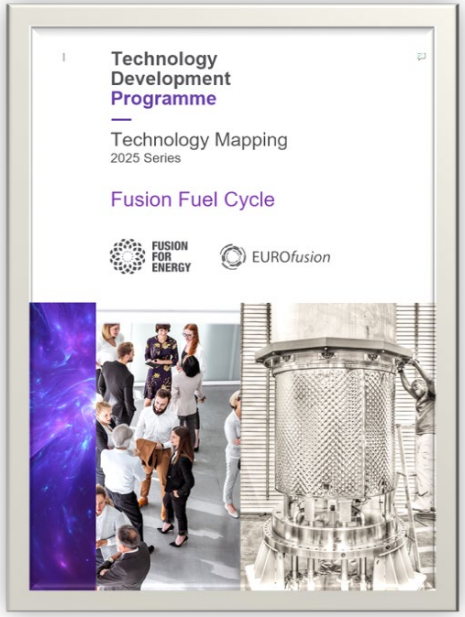
BREAKDOWN OF RELEVANT DOMAIN TECHNOLOGIES & FUNCTIONAL GROUPING



Online Discussion

EXHAUSTIVE LIST OF RELEVANT TECHNOLOGIES FOR MAPPING

TECHNOLOGY MAPPING PROCESS

1. **Technology Need / Strategic Interest**
2. **Innovation/ Market Potential / Scalability and Commercialization Potential**
3. **Technical Feasibility and Maturity / Risk Assessment**
4. **Timing – Cost - Implementation Frame**
5. **Broader impact – Sustainability**

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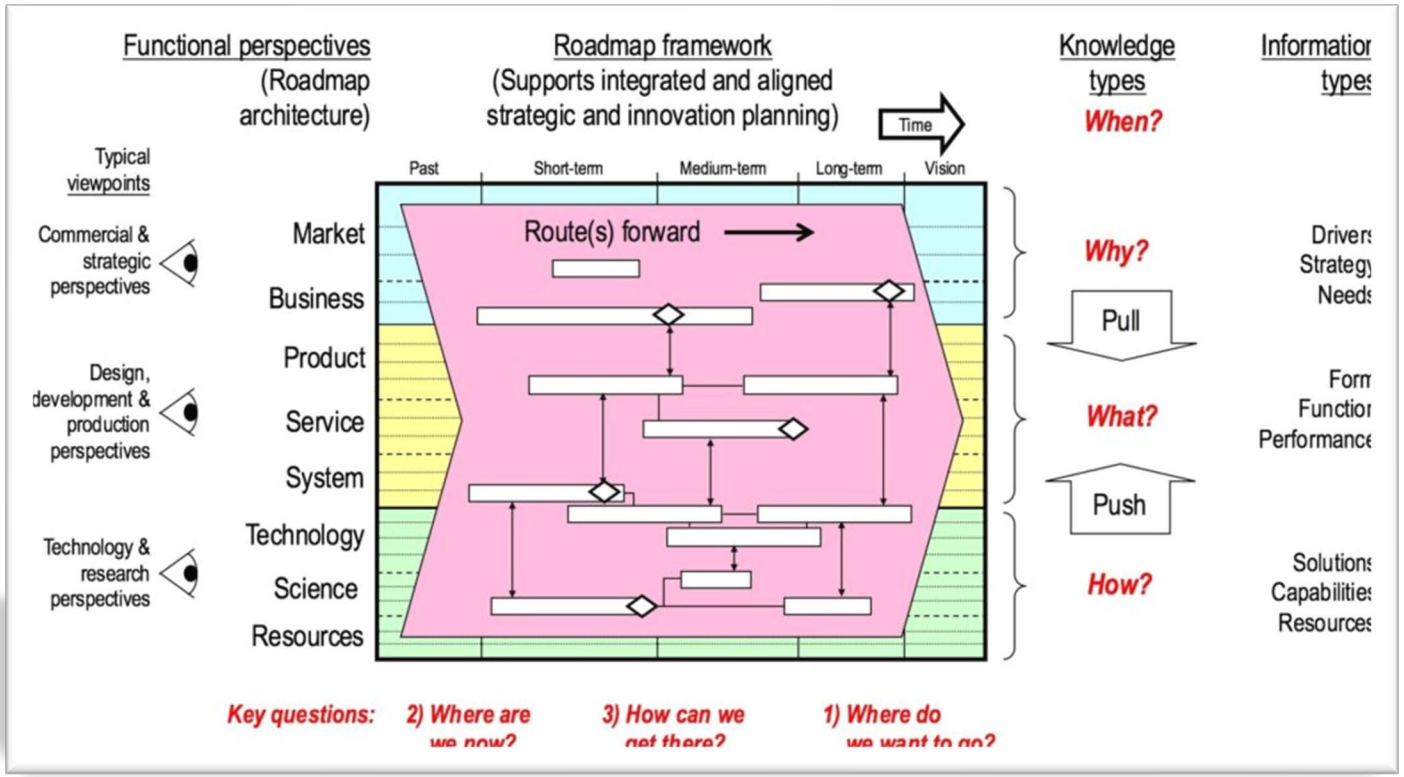
ROADMAPPING

IN-PERSON

PRIORITY



MAPPING & ROADMAPPING OF RELEVANT TECHNOLOGIES

FUSION FOR ENERGY

Thank you for your attention

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