Workforce Development

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Workforce Development Session

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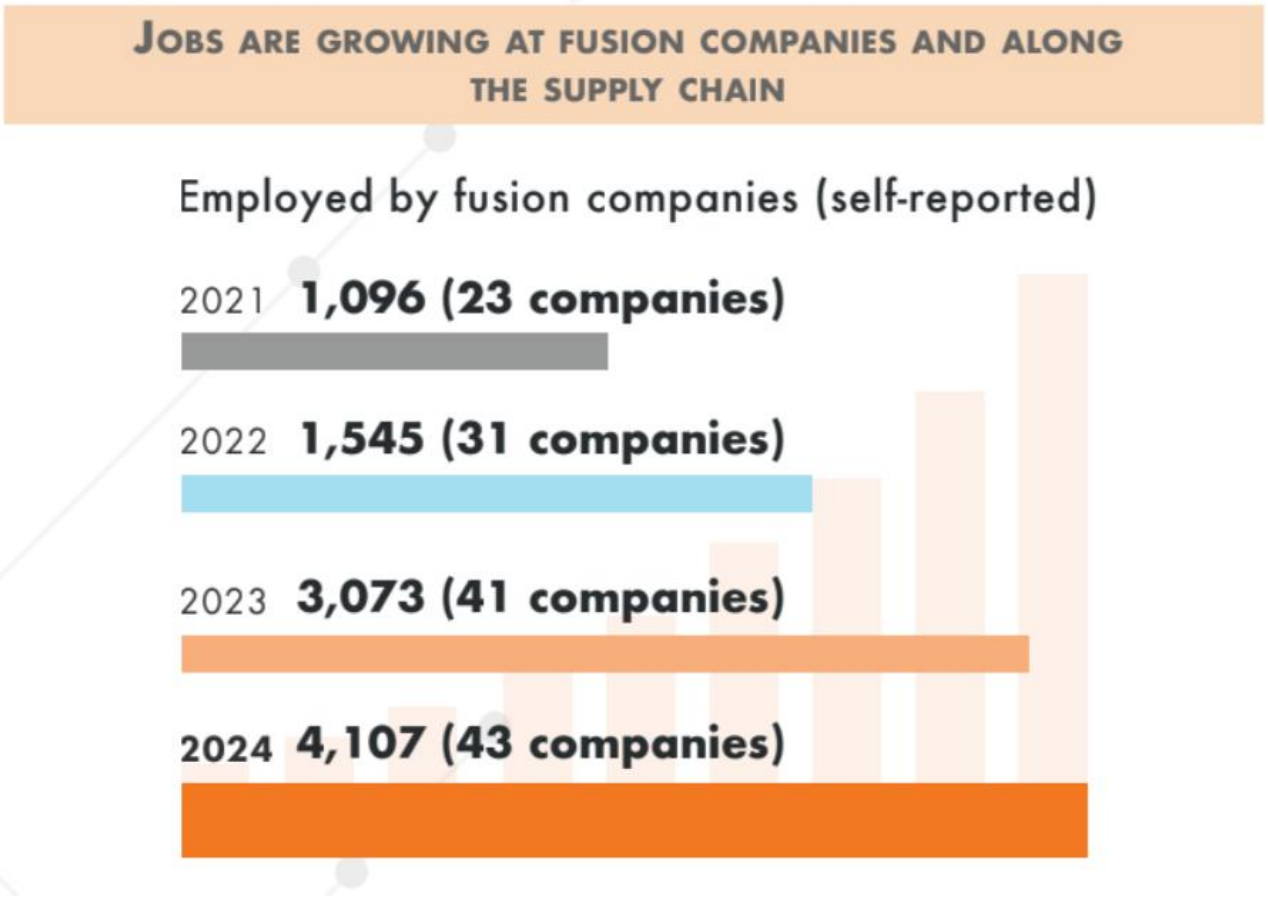
- Group challenge!

Fusion Industry Association (FIA)

The Fusion Workforce 2024



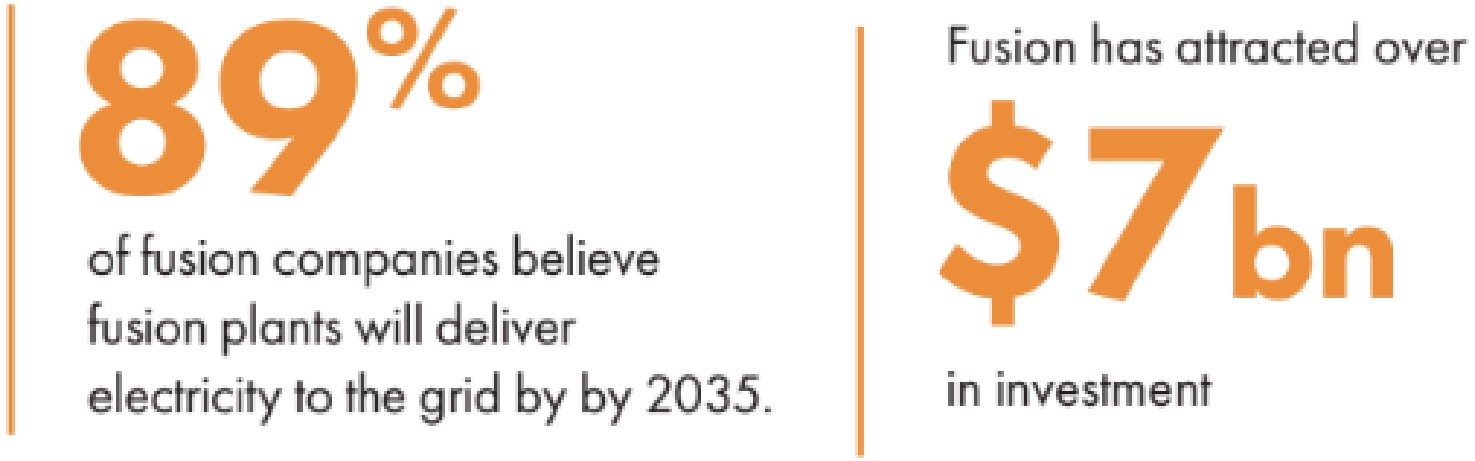
Fusion Industry Association (FIA)

Fusion Industry Report 2024: Location

- Over 40 fusion companies are members
- Over 80 affiliate member companies.

Fusion Industry Association (FIA)

The Fusion Workforce 2024



FIA Outlines Fusion Workforce Opportunities and Projections in Skills Report - Fusion Industry Association

Fusion Industry Association (FIA)

The Fusion Workforce 2024

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Fusion Industry Association (FIA)

The Fusion Workforce 2024

The skills needed by the fusion industry and its supply chain

- Skills to develop specialized components such as for heat management, plasma-facing first wall, and vacuum pumps
- Precision engineering skills at the cutting edge
- Skills for large scale production of power electronics
- Scientists, including plasma physicists
- Nuclear and plant process engineers
- Engineers to design and assemble fusion machines and power plants
- Machine learning and digital engineering
- Those experienced in navigating new regulatory frameworks

Potential solutions

- Strategic workforce development initiatives at the national and company levels
- Regulatory frameworks and incentives to derisk long term investments by fusion and its supply chain
- Public-private partnerships to effectively collaborate and build skills
- Online resource center and skills guidelines
- Support for research and technology development programs
- International collaboration, standards setting, and forums
- Targeted support for diverse and displaced workers

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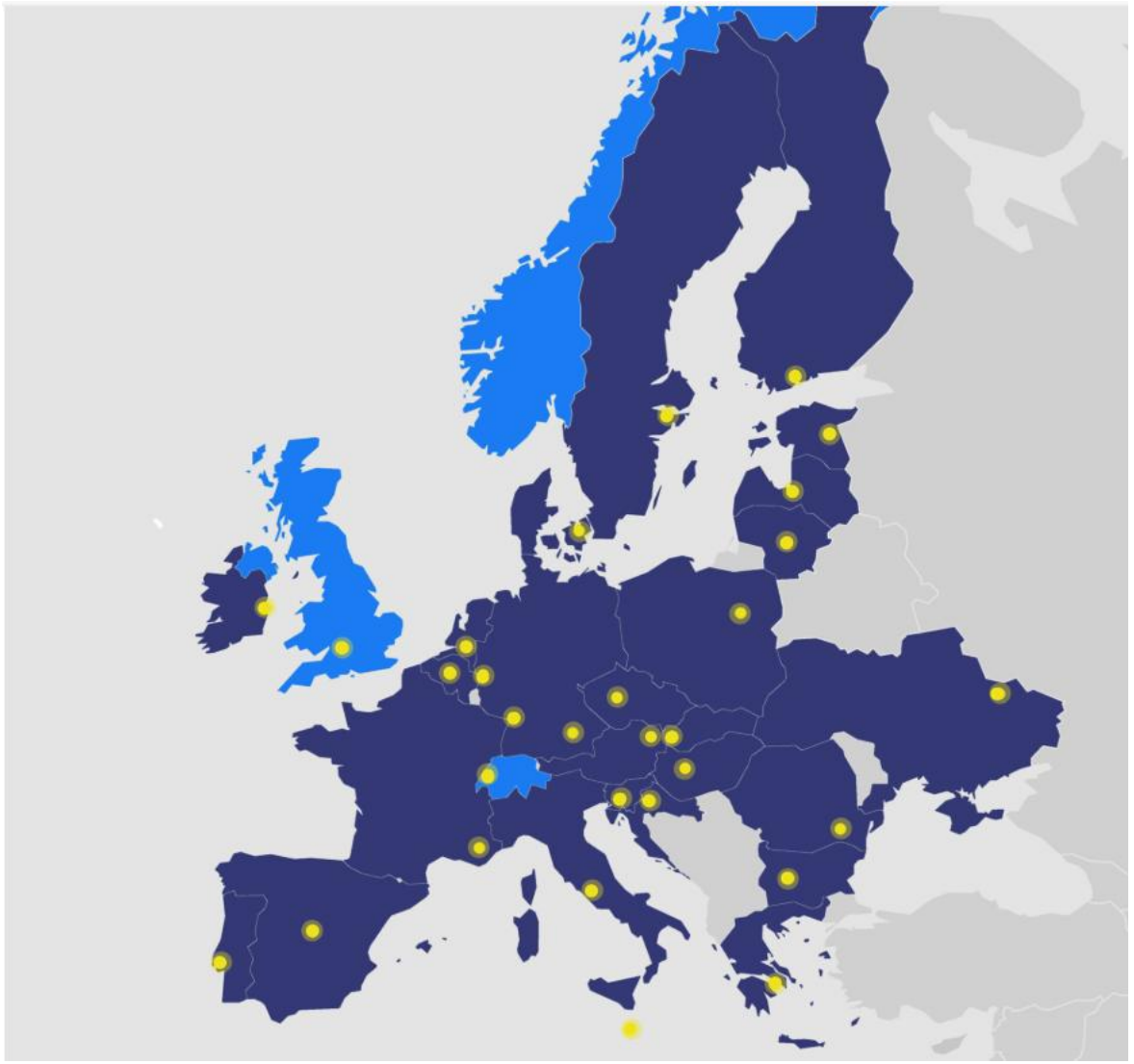
EUROfusion

Public sector

- Consortium of 28 member institutes across Europe, with over 4800 researchers and 162 affiliated entities.
- Aim: Deliver on the European Roadmap for Fusion
- Publicly funded by the Euroatom programme from the EU.



EUROfusion

Human Resources Survey 2023

Key findings:

- Hard to retain talent in the public sector due to strong market competition. It is key to attract more people from diverse backgrounds into fusion.
- Knowledge loss due to retirement of experienced staff.
- Access to fusion courses is not uniform across Europe (country bias)
- As ITER is being commissioned it is important to attract more talent: operators, training, design etc.
- Maintenance of knowledge management as JET is decommissioned.

EUROfusion

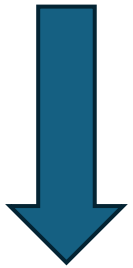
Human Resources Survey 2023

Recommendations:

- Support European staff to contribute to ITER programme
- Develop long-term staffing policy to attract physicists and engineers
- Strengthen training programme: Fellowships, Early Career support
- Raise awareness of fusion at high school and university level
- Establish a roadmap for scientific and technical development.

Private vs Public

- Limited pool of skilled physicists and engineers
- Many will train in the public sector and move into private sector (increased salaries).



Problem: Private companies do not have al the capabilities to solve every fusion challenge, support from the public sector e.g. testing facilities, remote maintenance will require public sector support.

Accelerating Fusion Workforce

US position paper

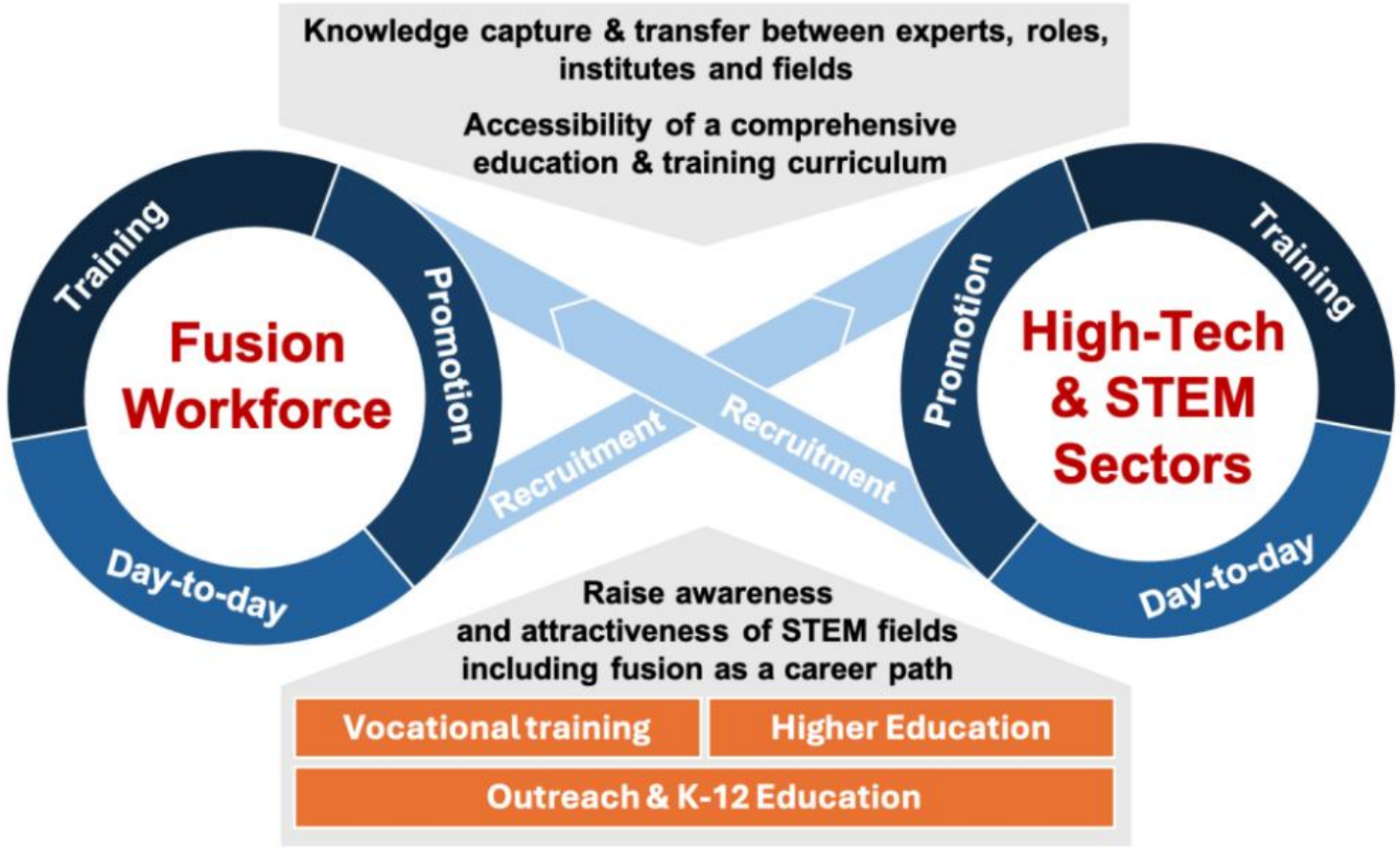
Some technical elements are unique to a specific fusion concept, some are unique to all fusion concepts, and others are broadly applicable. Technologies that are specific to fusion are:

- plasma-facing components;
- tritium breeder blanket technologies (including neutronics, structural mechanics, and thermal mechanics);
- tritium fuel cycle management (fuel injection, exhaust processing);
- fuel/material injection (cryogenic pellets);
- plasma measurement systems.

Accelerating fusion workforce

Accelerating Fusion Workforce

US position paper



Areas which overlap with other clean technology sectors:

- Power conversion (Rankine cycles, Brayton cycles, and advanced Brayton cycles)
- Cryogenic engineering (cooling of the magnets, design of the thermal shield systems)
- Vacuum engineering (exhaust pumping systems, cryogenic vacuum pumping systems)
- Remote handling (Robotics and handling systems for extreme environments)
- Superconducting magnets (for fusion, medical applications, accelerator applications)
- Precision manufacturing (high volume, quality assurance, non-destructive testing)

Accelerating fusion workforce

Accelerating Fusion Workforce

International Collaboration

- Engagement with IAEA on knowledge management and workforce development: The IAEA have 180 member states and it is important to facilitate awareness of fusion energy developments to all member states e.g. ICTP school!
- Global South: Number of groups in fusion and plasma research in Latin America, North Africa, Middle East and Asia. Support platforms for exchange of information and promote partnerships. Partnerships should focus on the reduction of economic barriers to process. Building awareness and trust of fusion energy in the global south.
- Engage with EUROfusion and countries which have defined fusion roadmaps e.g. UK, Japan, Republic of Korea.

Skills Development

Fusion Cluster Report, UK

A focus on skills removes the requirement for a fusion background. An increase in STEM courses and training (not specifically fusion related) will train many of the staff required for the fusion industry.

Skills	Total volume	%
Engineering	638	47.4%
MATLAB	327	24.3%
Mechanical Engineering	295	21.9%
Python	261	19.4%
Data Analysis	261	19.4%
Manufacturing	253	18.8%
Physics	238	17.7%
Research and Development (R&D)	211	15.7%
C++	180	13.4%
Computer-Aided Design (CAD)	171	12.7%
Simulations	160	11.9%
SOLIDWORKS	149	11.1%
Commissioning	149	11.1%
Nuclear	142	10.5%

IAEA: Workforce Development Meeting

April 27-30th 2026

Key Categories included:

- National Roadmaps
- Organisational Roadmaps
- Education and Training
- Knowledge Management
- Adjacent Sectors and Industries

Series of Panels including: Setting up degree programmes, schools with practical components, collaboration between schools/industry, student career panel and outreach.

Challenge

“Powering the Future: Designing a National Workforce Plan for Fusion Energy"

- Split into groups
- You have a new country: Fusion Island
- Fusion Island (pop. ~5 million) has decided to pursue fusion energy as a cornerstone of its energy and science policy. While you have a strong general STEM education system, your country has no existing fusion industry and only limited experience in nuclear technologies. You will have 20 minutes to develop some key points for a **10–20 year national workforce development plan** that will support the creation, growth, and sustainability of a fusion energy sector.
- At the end your group will do a short (max 5 minute) presentation on the key points for your plan.

Challenge

“Powering the Future: Designing a National Workforce Plan for Fusion Energy"

A potential outline for each team could be:

1. **Assess** the fusion landscape and identify the roles and skills needed.
2. **Map out** a timeline for workforce development.
3. **Design pathways** for talent development (education, training, immigration, etc.).
4. **Propose partnerships** (international, academic, industry).
5. **Plan for inclusivity, diversity**, and future adaptability.

Do not worry about numbers, but do make some assumptions e.g. number of universities on Fusion Island, previous experience in STEM of Fusion Island

Challenge

Other points to consider…

- Addresses all R&D gaps in fusion, skills gaps: engineering, materials, data science (modelling)
- Training and education opportunities for further education
- Mentorship
- Knowledge management strategy
- Diversity and Inclusion – culture of an organisation
- Industry Requirements

Congratulations!

Fusion Island is a global leader in Fusion Energy!

Summer Schools

ITER list of summer schools: Join the Quest for Fusion Energy

- Some examples of summer schools are:
- Carolus Magnus Summer School (Belgium, Netherlands and Germany)
- Culham Summer School (United Kingdom)
- Festival de Theorie (France)
- Plasmasurf (Portugal)
- IPP Summer University (Germany)
- SUMTRAIC Summer Training Course in Prague (Czechia)
- ITER International School, 2025 ITER International School on Integrated Modelling
- JIFS JT-60SA International Fusion School (European-Japanese collaboration)
- Karlsruhe International School on Fusion Technologies (Germany)
- Kudowa Summer School (Poland)

Internship Opportunities

1. **International Atomic Energy Agency (IAEA)**

- **Job Portal:** IAEA Career Opportunities

- Marie Skłodowska-Curie Fellowship Programme

- Lise Meitner Programme

2. **ITER Organization**

- **Internships:** ITER Internships

3. **Fusion for Energy (F4E)**

- **Traineeships:** Fusion for Energy Traineeships

4. **Fusenet**

- **Matchmaking for Internships and Theses:** Fusenet Matchmaking

5. **Euraxess**
- **Research Jobs and Fellowships:** Euraxess Job Search

6. **Erasmus Intern**
- **Traineeships across Europe:** Erasmus Intern Traineeships

7. **Italian National Research Council (CNR)**
- **Internship Opportunities:** CNR IGI Education and Theses

Max Planck Institute for Plasma Physics (IPP)
- **Student Assistant Positions:** IPP Werkstudent

9. **Karlsruhe Institute of Technology (KIT)**
- **International Students and Internships:** KIT Internships