White Paper

Updated Reflections on The European Hydrogen Skills Strategy

Short Version

GreenSkillsforH2 project

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1. Introduction

The European hydrogen sector is in constant movement and development, which requires close documentation and analysis of the evolution of skills demand in line with market dynamics. In 2023, Green Skills for Hydrogen (GreenSkills4H2) published the European Hydrogen Skills Strategy, based on stakeholder interviews conducted between November 2022 and March 2023 across 23 countries. In early 2025, the GreenSkills4H2 consortium conducted an additional interview campaign with hydrogen stakeholders across the European Union (EU) and a literature review of newly published skills strategies and reports across the EU. This work is intended to capture changes in skills demand and to document trends and new needs in the market.

2. Current landscape

The hydrogen market in 2024/2025 is at its lowest point, marked by the cancellation of many projects that had not been feasibly planned. This slowdown in activities has cascaded across the entire hydrogen value chain and stakeholder operations. However, some projects are advancing from announcements to feasibility and engineering studies, as well as project realisation. As such, skills demand is currently lower and has shifted toward practical experience. The most critical competences required concern how to transfer blueprints and designs from the drawing boards to construction sites and ensure facilities' safe and reliable operation. Given the short lifespan of the green hydrogen sector, this proves to be a very difficult undertaking.

The demand for R&D skills is retreating as the market moves toward technology commercialisation and project construction. Operation and maintenance skills demand is growing as a result of the increasing deployment of H_2 facilities and infrastructure across all industries and sectors. This demand is expected to continue growing as the industry evolves. Project execution and construction remain among the most delicate skill areas, as companies are seeking experienced professionals with reliable expertise to fill these critical roles. Project permitting, authorisation, risk, and safety are still strongly demanded in the market, though no major bottlenecks appear so far.

The development of the H_2 value chain involves its integration into existing infrastructures and energy systems. This requires experts who understand how various systems function: Carbon Capture, Utilisation and Storage (CCUS), renewable energies, alternative fuels, refineries, mobility, etc. Consequently, there is a strong need for cross-cutting expertise and skills encompassing these systems. The market is looking for those experts—solution architects—who can manage the transitional adoption of hydrogen in various industries while addressing technical and economic aspects.

Process engineering, material science, gas and liquid conversion, as well as industrial, mechanical, and electrical engineering, form the backbone of the profiles required by various H_2 value chain actors. There is no specific challenge in securing these specialists; however, competition exists between hydrogen and other renewable energy sectors seeking the same profiles. Several actors have expressed difficulty in attracting IT engineers,

who are in high demand. Project feasibility, finance, and economics are identified as crucial yet missing competencies.

The representation of women in the hydrogen industry is weak, as confirmed by interviewees across most European countries. Hydrogen actors have implemented several mechanisms to attract women into their workforce; however, they struggle to find a sufficient pool of candidates. This phenomenon is largely linked to the general perception of engineering jobs as less attractive to women. The low supply of female candidates is associated with the significantly lower number of women than men in technical and engineering schools.

3. Dynamics of the current demand for professionals

Job demand is shifting from oil and gas to renewables, thus offering a supply of experienced and trained personnel who need to be upskilled. Internal training is aimed at equipping new staff with knowledge and skills specific to hydrogen, while basic domain knowledge remains the same. As the hydrogen sector matures—and as project delivery advances more steadily than previously expected—there is currently no critical quantitative shortage of professionals. Additionally, recent market restructuring has increased the availability of experienced hydrogen talent, helping to strengthen the wider ecosystem and support capacity building across companies.

In a few years, the demand for operation and maintenance profiles is expected to grow as more hydrogen projects become operational.

4. Critical needs

5. Recommendations

- **Focus on cross-cutting skills and competencies** that are transferable across multiple technologies, ensuring adaptability in a rapidly evolving energy sector.
- **Develop dedicated upskilling programmes** tailored to oil, gas, and electricity professionals, leveraging their existing technical knowledge and experience to fast-track hydrogen proficiency.
- **Integrate hydrogen-related knowledge** into academic and professional training programmes, ensuring curricula reflect the latest industry advancements and demands.
- **Design transitional upskilling pathways** for technical professionals and experts, building on their domain expertise to facilitate a smooth shift into hydrogen-related roles.
- **Strengthen industry collaboration** in training programme development to ensure alignment with real-world needs and enhance workforce readiness.
- **Prioritise competencies** in commissioning, operation, and maintenance, as these are critical and highly sought-after skills in the hydrogen sector.
- **Equip H_2 professionals with holistic knowledge of energy systems**, enabling them to understand interdependencies and seamlessly integrate hydrogen into existing infrastructure.
- **Incorporate synergies** with renewables, synthetic fuels, and carbon capture, utilisation and storage (CCUS) into training curricula to prepare future professionals for a multi-technology energy landscape.

6. Recommendations for the European Hydrogen Skills Strategy

1. **Expand modular training to related technologies**

Broaden the scope of modular training programmes to encompass technologies that have significant synergies with hydrogen, ensuring a holistic approach to workforce development.

2. **Emphasise practical outcomes in hydrogen training standards**

Design hydrogen training standards with a strong emphasis on real-world application and the practical implementation of acquired skills and knowledge.

3. **Prioritise continuing education for professionals**

Make access to continuing education a top priority, particularly for professionals transitioning from other sectors who possess relevant and transferable expertise.

4. **Strengthen the hydrogen online community as a central resource**

Further develop the hydrogen online community to serve as the primary platform for accessing both past and current hydrogen training resources and programmes, with a special focus on EU-funded initiatives.

5. **Enhance and promote mobility programmes**

Expand and promote mobility programs to ensure sufficient student enrolment in hydrogen-related courses and co-developed educational programs.

6. **Promote the sector's attractiveness to diverse talent pools**

Increase efforts to highlight the appeal of the hydrogen sector, targeting both transitioning professionals and young students. Promotional activities should communicate hydrogen's pivotal role as a long-term transitional energy vector, not just a short-term solution.

About the European Hydrogen Skills Alliance

Hydrogen is a key pillar of the EU's strategy to achieve its 2050 decarbonisation goals. The rapid development of the European hydrogen value chain over the coming years is expected to generate approximately 1 million highly skilled jobs by 2030, and up to 5.4 million by 2050[1]. This growth presents a significant economic and environmental opportunity for Europe, but it also creates considerable labour market challenges.

Green Skills for Hydrogen (GreenSkills4H2) is a four-year project, started in July 2022, bringing together partners from 15 European countries and co-funded under the EU's Erasmus+ Programme. Its primary objective has been to design and implement a highly innovative, effective, and sustainable Hydrogen Skills Strategy for Europe to ensure the skills needs of the rapidly expanding and evolving hydrogen value chain can be met over the short, medium and long term. It has also generated a blueprint to address the skills needs of workers in declining sectors and transition regions, offering them upskilling and reskilling pathways into hydrogen-related roles.

To date, the project has delivered three core training programmes aligned with EU qualification standards, implemented more than 41 training sessions reaching over 2,000 learners, and participated in more than 12 major dissemination events engaging key hydrogen stakeholders. It has also established the European Hydrogen Skills Community, a network of 5,000 professionals and students.

Building on these achievements, GreenSkills4H2 has helped establish a long-term partnership between industry and education: the **European Hydrogen Skills Alliance**, created to scale and adapt the training programmes across Europe.

Members of the European Hydrogen Skills Alliance

European Hydrogen Skills Alliance is led by Karlsruher Institut für Technologie (KIT) and Hydrogen Europe Research, bringing together key Industry and Education stakeholders from across the hydrogen sector. Its members are presented in the following tables.

Partners	Acronym
Adecco Formazione / Mylia	**Mylia**
Advent Technologies	**Advent**
Austrian Institute of Technology	**AIT**
Cluster of Bioeconomy and Environment of Western Macedonia	**CluBE**
CP Europe	**CP**
Danmarks Tekniske Universitet	**DTU**
Foundation for the Development of New Hydrogen Technologies in Aragon	**FHA**

[1] Source: Hydrogen Roadmap Europe, FCH-JU, 2019

Partners	Acronym
Hydrogen Europe Research	**HER**
Enerdata	**Enerdata**
Institute of Electrochemistry and Energy Systems	**IEES**
Karlsruher Institut für Technologie	**KIT**
National Research and Development Institute for Cryogenics and Isotopic Technologies ICSI Rm. Valcea	**ICSI**
National University of Ireland Galway	**NUIG**
NHL Stenden University of Applied Sciences	**Stenden**
Nuovo Pignone Tecnologie / Baker Hughes	**Baker Hughes**
Politecnico di Torino	**Polito**
Region Auvergne Rhone Alpes	**AURA**
The Danish Institute of Fire and Security Technology	**DBI**
Regional Pomeranian Chamber of Commerce	**RIGP**
ROC Drenthe College	**Drenthe**
Skillnet Ireland	**Skillnet**
SNAM	**SNAM**
Tallinn University of Technology / EMERA	**TalTech**
Tartu Vocational Education Centre	**Tartu VEC**
University of Perugia	**Uni Perugia**
Associated partners	
Association Française pour l'Hydrogène et les Piles à Combustible	**France Hydrogène**
Epia Solarpower Europe	**EPIA**
Industriall	**Industriall**
Tartu Regional Energy Agency	**TREA**
Trakiyski Universitet / Institute for Sustainable Transition and Development	**ISTD**
WindEurope	**WindEurope**
Subcontractors	
University Politehnica of Bucharest	**UPB**
Green Tech Skillnet (Green Tech)	**Green Tech Skillnet**
Schuman Associates	**SA**

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