



Forum on Vocational Excellence 2025

Workshop:

CoVEs as Catalysts for the Hydrogen Economy

Kolding, Danemark
9th September 2025



Co-funded by
the European Union

SPEAKERS & TOPICS

- ***Karna Dahal*** – *H2Excellence project overview and skills gaps analysis*
- ***Angela Pulvirenti*** – *Driving Stakeholders Engagement in the H2Excellence Network: Expansion and collaboration Opportunities*
- ***Vangelis Makris*** – *Microcredentials and flexible learning pathways*
- ***Margarida Segard*** – *Skilled workforce and cross-sector collaboration in the hydrogen economy*

SPEAKERS & TOPICS

- ***Karna Dahal*** – *H2Excellence project overview and skills gaps analysis*



Dr. Karna Dahal is an EU project manager and lecturer in renewable energy at Vaasa University of Applied Sciences (VAMK), Finland. He currently coordinates the H2Excellence project which focuses on fuel cell and green hydrogen technologies and teaches renewable energy at VAMK. He received his PhD in Energy Transition and Carbon Neutrality from the University of Helsinki (2015–2018). He has held postdoctoral research positions at the University of Eastern Finland (UEF) (2021–2023) where he worked on fine particles and small-scale solid fuel combustion technologies and at Chalmers University of Technology in Sweden (2019–2021) where he focused on alternative fuels and propulsion systems. With a multidisciplinary background, Dr. Dahal has authored about 20 scientific publications and contributed to innovative solutions including the development of a UV/TiO₂-based kitchen grease filtration system. His work bridges academic research and practical applications in the fields of clean energy, environmental technology, and sustainable development.

SPEAKERS & TOPICS

- **Angela Pulvirenti** – *Driving Stakeholders Engagement in the H2Excellence Network: Expansion and collaboration Opportunities*



Head of the Innovation area within the Federation of Scientific and Technical Associations, Angela has more than 25 years experience as manager of different EU projects mainly in the field of innovation support and sustainability. She has gained significant knowledge of training schemes aimed at enhancing skills and capacities of SMEs.

SPEAKERS & TOPICS

- **Vangelis Makris** – *Microcredentials and flexible learning pathways*



Evangelos Makris is Team Leader at AKMI International, where he manages EU-funded projects and coordinates international partnerships (ERASMUS+, CERV, etc). With a strong background in sociology, project management, proposal writing, and applied research, he has extensive experience in Erasmus+ and other EU funded initiatives. He represents EEO Group in H2Excellence.

SPEAKERS & TOPICS

- ***Margarida Segard*** – *Skilled workforce and cross-sector collaboration in the hydrogen economy*



Maria Margarida Segard is Director of ISQ Academy; Vice President of the European Association of Training Centers - EVBB; Advisor at the European Commission and UNESCO - DG Employment, DG Mare, in several high-level working groups, including 4.0, Green Skills, Adult Learning, Excellence in VET Training; Coordinator of major national, international and European projects and studies (in more than 40 countries); Founder, former President of the National Network for Social Responsibility RSO PT. Graduated in Law with post-graduate studies in Legal and Public Sciences, Portuguese Catholic University and an AESE MBA; Worked at the Ministry of Economy PEDIP I and the Ministry of Labor IEFEP, as coordinator of the National Professional Certification System, technician and lawyer and responsible for audits of ESF (European Social Fund) Training Programs; responsible for the national team of audits of training projects financed by the ESF.



Forum on Vocational Excellence 2025

H2Excellence Workshop:

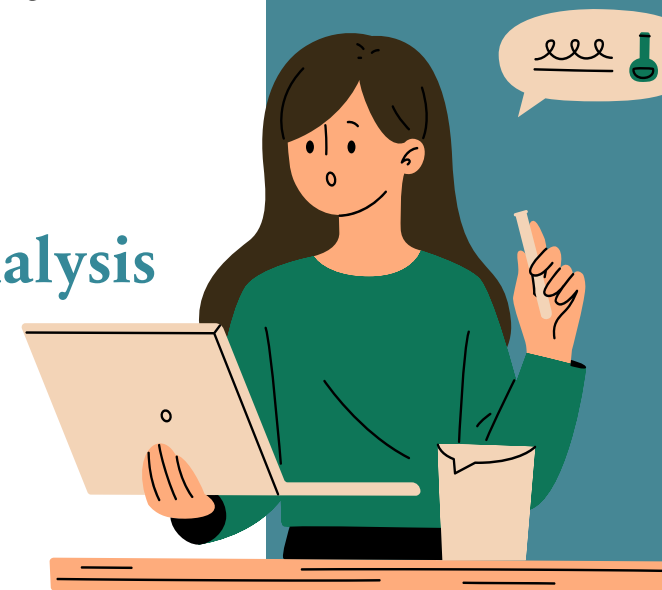
CoVEs as Catalysts for the Hydrogen Economy

Kolding, Denmark
9th September 2025

H2Excellence Project Overview and Skills Gaps Analysis

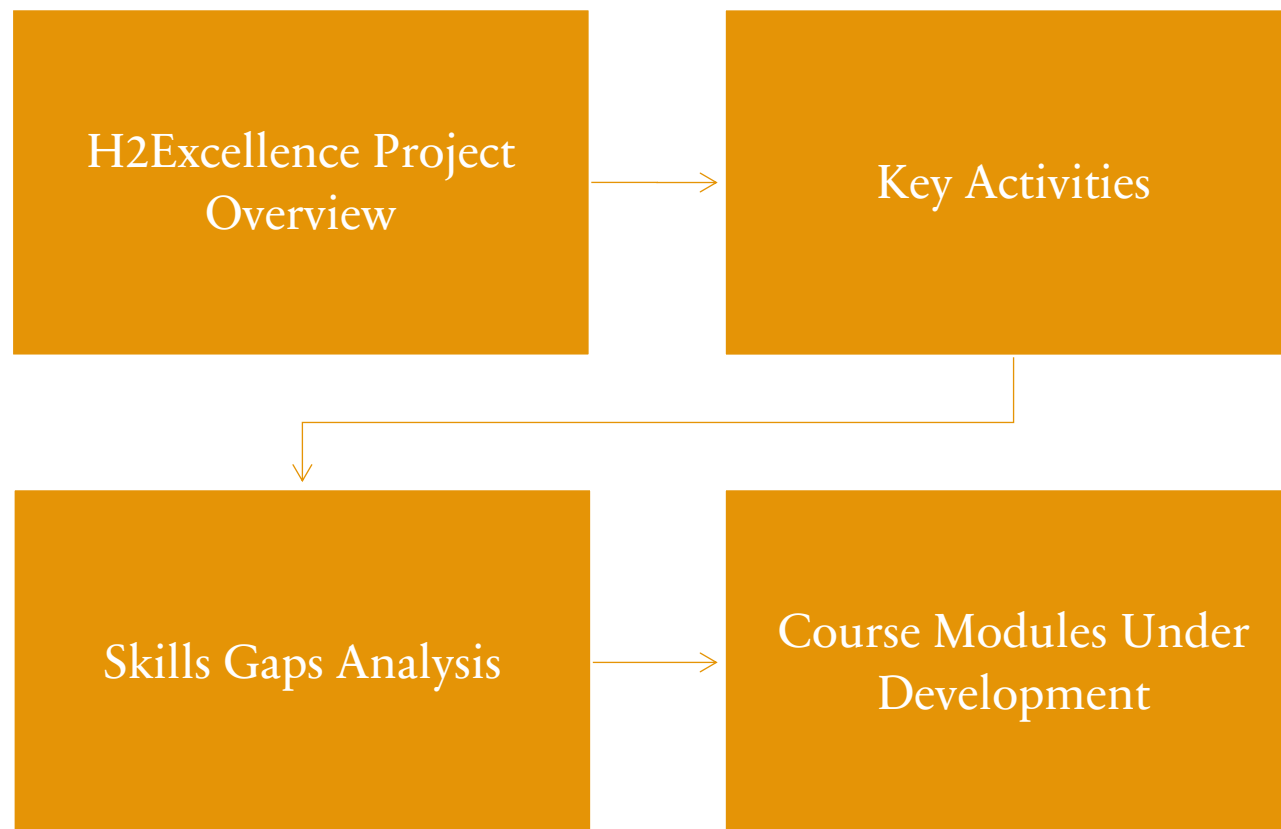
Dr. Karna Dahal

Project Coordinator, H2Excellence Project
Vaasa University of Applied Sciences (VAMK)



Co-funded by
the European Union

PRESENTATION CONTENTS



WHAT IS H2EXCELLENCE?

H₂EXCELLENCE: FUEL CELLS AND GREEN HYDROGEN CENTERS OF VOCATIONAL EXCELLENCE TOWARDS AFFORDABLE, SECURE, AND SUSTAINABLE ENERGY FOR EUROPE

[15.06.2023 – 14.06.2027]

Erasmus plus-funded project to establish Centres of Vocational Excellence (CoVEs)

Focus on fuel cells and green hydrogen technologies

Bridges education, research, and industry

Supports regional innovation and workforce development

24 partners from 9 different Erasmus+ EU countries (+1 international partner)
(Finland, Portugal, France, Greece, Germany, Poland, Italy, Spain, and Romania + Canada)

Project Coordinator: Vaasa University of Applied Sciences (VAMK), Vaasa, Finland

MAIN OBJECTIVES OF THE H2EXCELLENCE PROJECT



To create Centre of Vocational Excellences (CoVEs) dedicated to fuel cells and green hydrogen technologies

To connect and build 6 national CoVEs/sub-COVEs in 6 Erasmus+ countries

COVES: Italy, Spain, Finland, and Portugal

Sub COVES: Poland and France

To design, pilot, and implement several trainings for students at different levels in vocational education training (VET) and higher education institutes

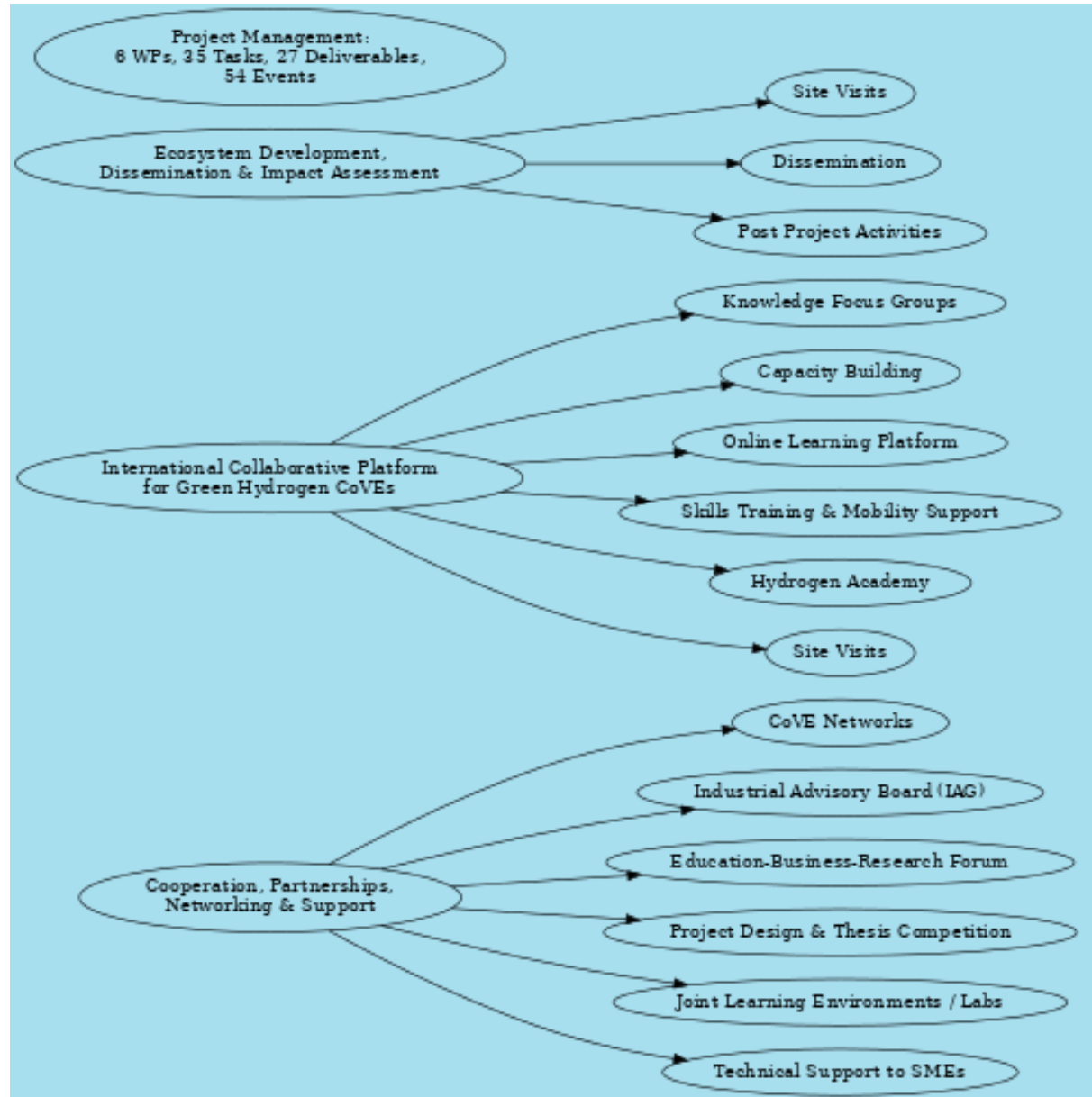
To offer teacher upskilling training: train the trainers and exchanges

To foster collaboration between academia and industry

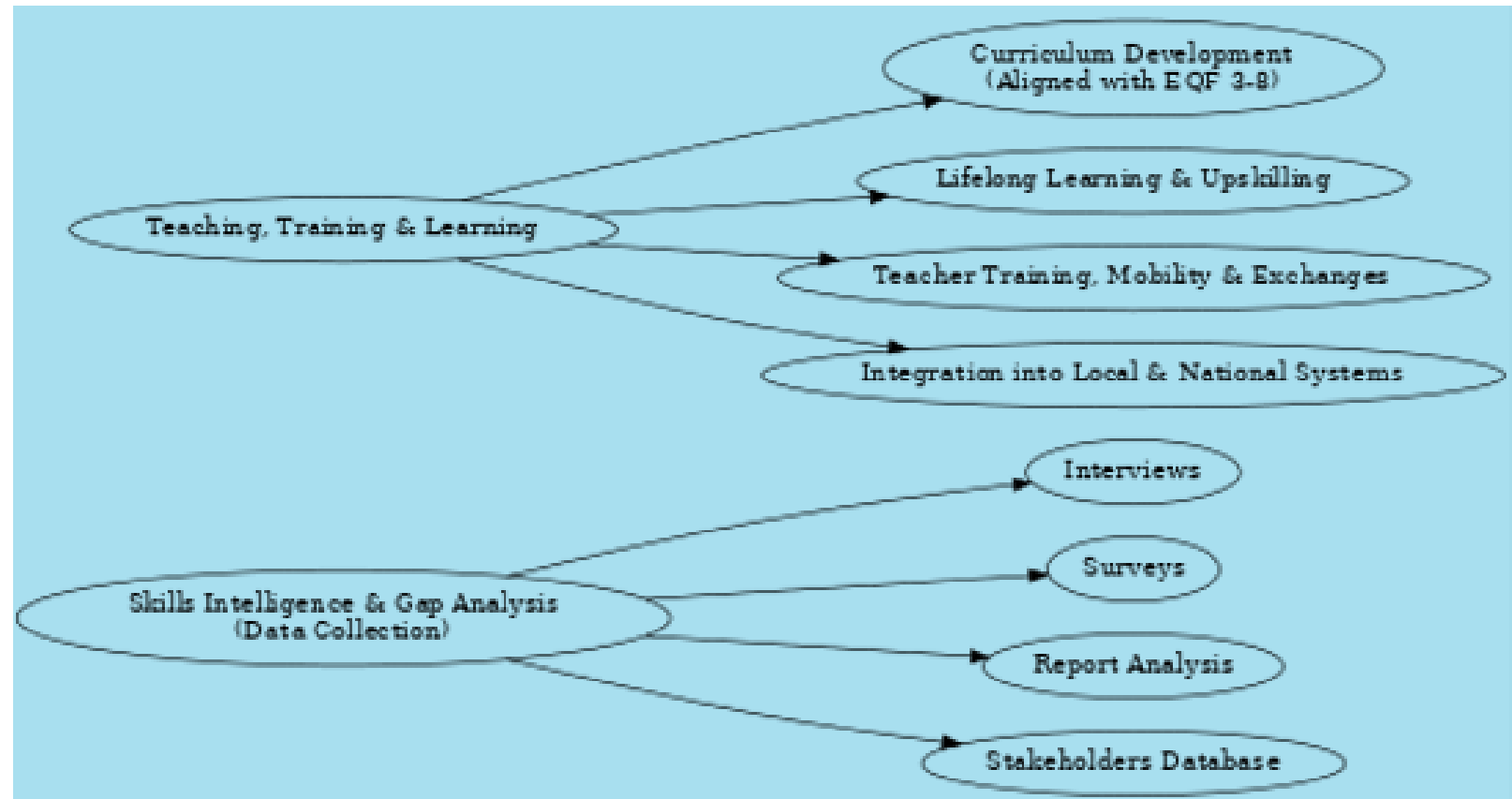
To support SMEs and regional innovation ecosystems

To promote internationalization and sustainability: EU wide geographical representation and development of sustainable business models and long-term sustainability plan for CoVEs

H2EXCELLENCE KEY ACTIVITIES



H2EXCELLENCE KEY ACTIVITIES



COLLABORATIVE PATHWAYS VIA H2EXCELLENCE PROJECT



❖ Why to Collaborate ?

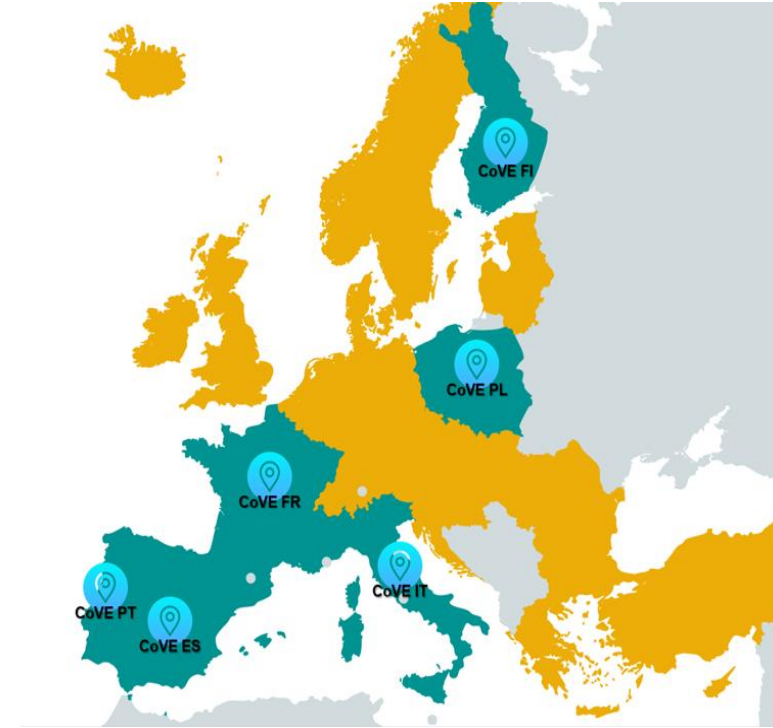
- Knowledge exchange
- Support for regional and international green hydrogen sector players

❖ Cooperation, partnerships, networking through

- Local CoVEs
- Industrial Advisory Group (IAG)
- Knowledge Focus Group (KFGs)
- Local Stakeholder groups
- Community of Practice for Micro-Credentials (CopM)
- VET internationalization plan

❖ Future directions

- Potential new R&D projects and post project collaborations under the H2Excellence consortium and H2Excellence CoVEs



HOW ARE WE PROGRESSING?

The project has progressed well without obstacles till now

All WPs have started and WP2 is already completed

Current focus on the finalization and piloting of training programme, Deployment of Online learning platform and COVE expansion & activities

Exciting involvement of the partners

Next Steps

- Training modules and pilot programmes developed (almost finished)
- Scaling up training and innovation activities
- Expansion of CoVEs and international collaboration - Strong partnerships across Europe: with industries and EU projects
- Knowledge-sharing events and workshops
- Contribution to regional hydrogen strategies

QUALITY ASSESSMENT: GLOBAL 3P RESULTS

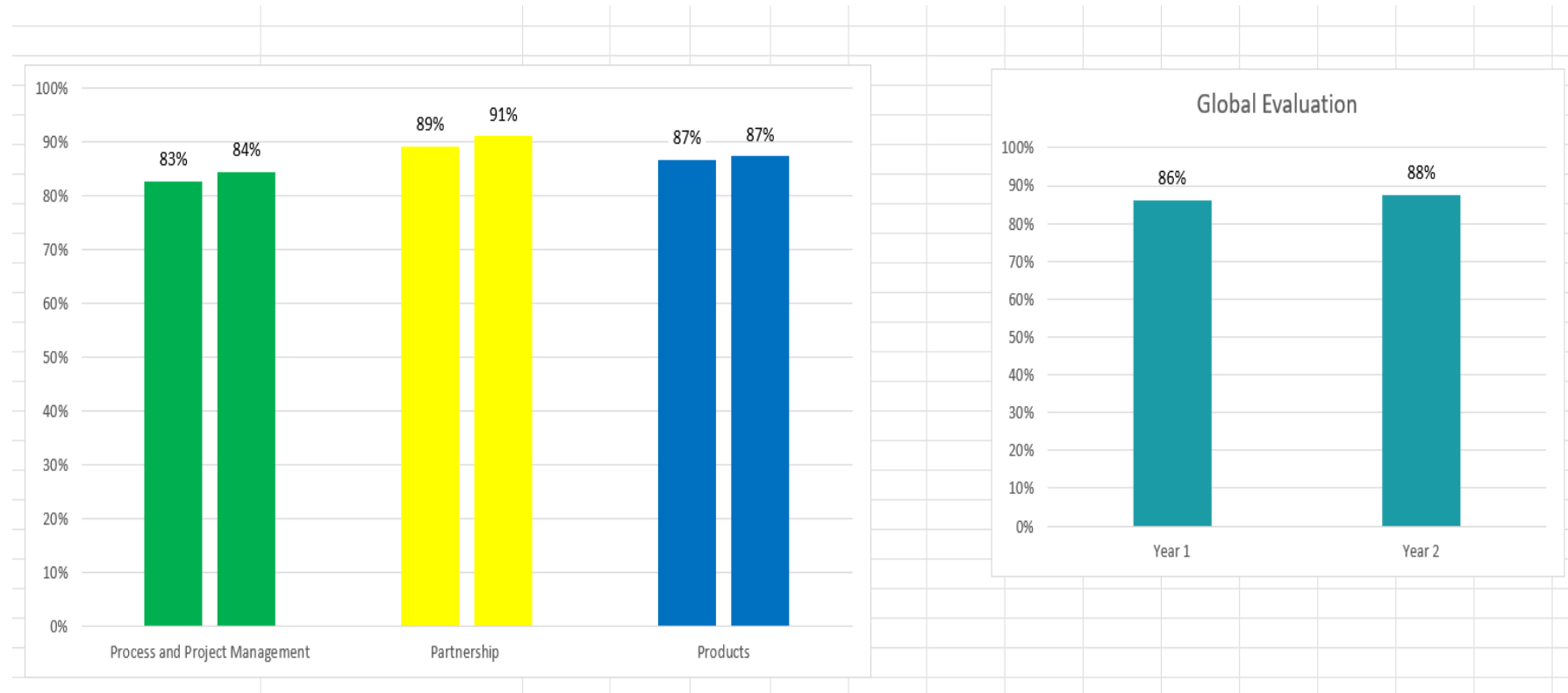


Figure: Global 3P results (Based on the quality assessment performed in June 2024 and June 2025)

H2EXCELLENCE WEBSITE

[News](#)[Events](#)[CoVEs](#)[Pilots](#)[Documents](#)[Project](#)[Consortium](#)[Contact](#)[Sign up to our Newsletter](#)

Green skills for future workforce in fuel cells and green hydrogen sector

Course modules, training programmes, and online
learning platform development for lifelong learning
opportunities in fuel cells and green hydrogen sector

[Learn More](#)

<https://h2excellence.eu/>

H2EXCELLENCE SOCIAL MEDIA



LinkedIn Page: <https://fi.linkedin.com/company/h2excellence-erasmus-project>

Survey Context

- The vast majority of respondents (94%) were based in Europe, with significant participation from Portugal (28%), Italy (25%), and Spain (14%).
- Most were industry representatives (59%) and public institutions, predominantly universities. Industry stakeholders were largely linked to the services sector (30%) and the energy and fuel industries (13%).

Training Offers in Hydrogen

Table 3

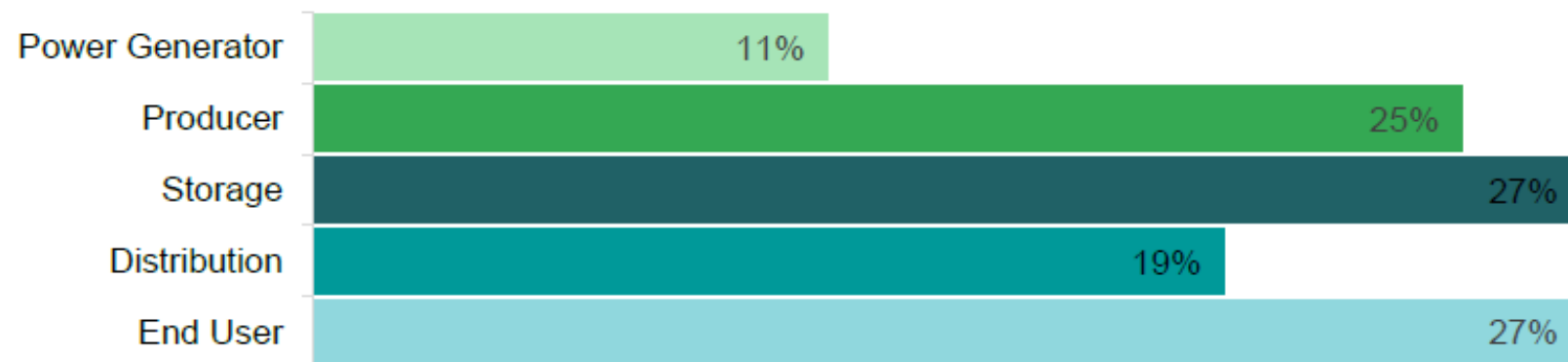
Type and level of training offered

Type of hydrogen-related training offer	Percentage (N=114)
Academic	21%
Professional	27%
Lifelong Learning	6%
N/A	0.8%
Level of hydrogen-related training offer	Percentage (N=107)
EQF 3-5	7%
EQF 6-8	7%
Lifelong learning	22%
Professional training	4%
N/A	12%

Source: Stakeholders Mapping H2Excellence, 2024.

Note: Respondents were provided with multiple response options.

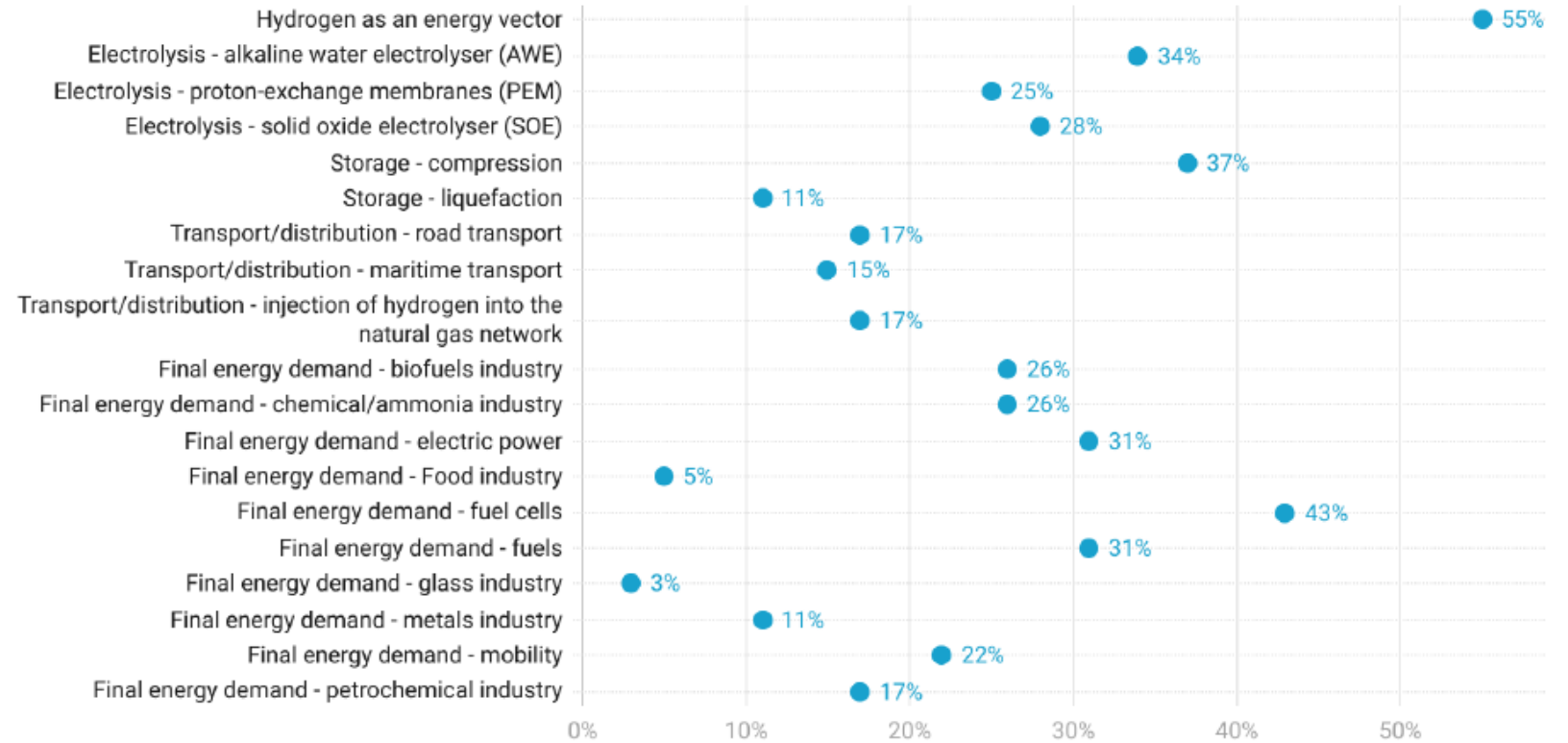
Position of Stakeholders in the Green Hydrogen Value Chain



Source: H2Excellence Stakeholders Questionnaire, 2024.

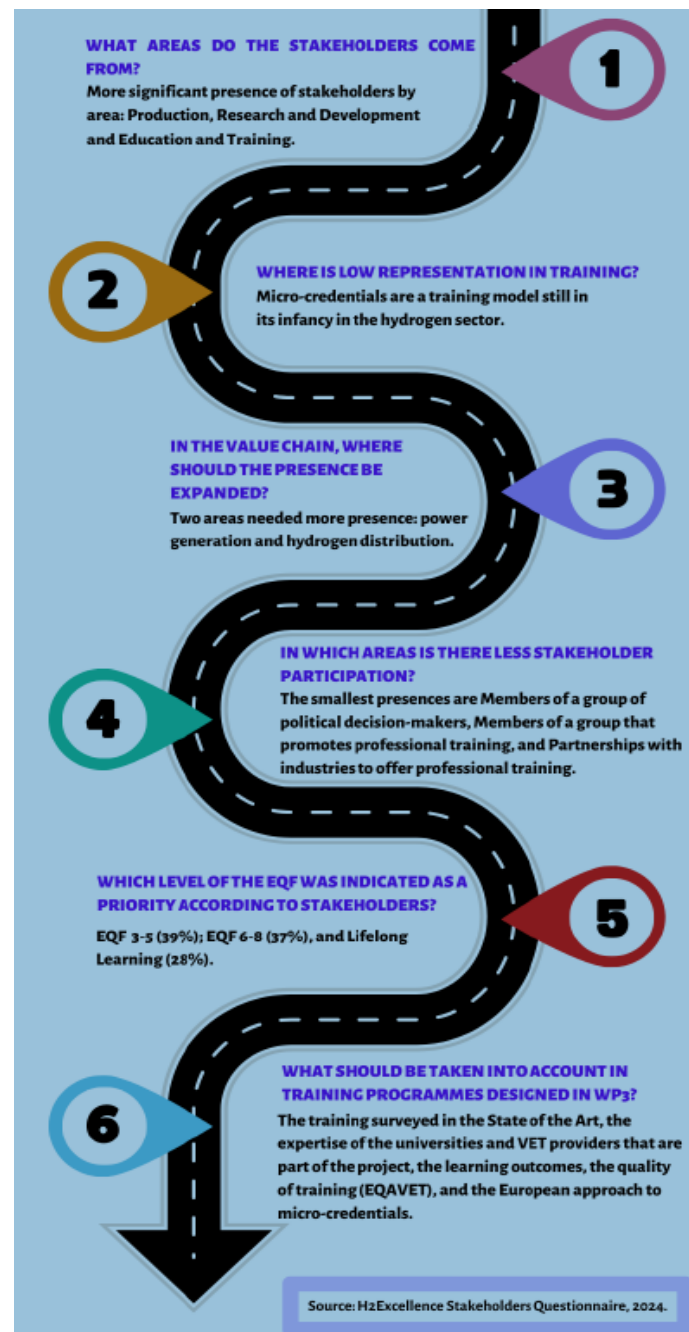
Note: Respondents were allowed to select multiple answer options (N=118).

Knowledge Within the Hydrogen Value Chain



Source: H2Excellence Stakeholders Questionnaire, 2024.

Note: Respondents were allowed to select multiple answer options (N=118).



Presences and absences in the hydrogen sector

EQF 6-8 professional profiles elected by stakeholders

Occupation/Profession (EQF 6-8)	Absolute Value	Percentage (n= 118)
Hydrogen energy engineer	65	55,08%
Hydrogen systems safety researcher and analyst	65	55,08%
Hydrogen energy system operations engineer	62	52,54%
Installation, operations, engineering, and management manager hydrogen power plant	60	50,85%
Hydrogen systems program manager	54	45,76%
Automation technology electronics technician - Industry and trade	51	43,22%
Plant Manager - electrolysis	46	38,98%
Automation Engineer	46	38,98%
R&D researchers/engineers	46	38,98%
Fluid engineer	45	38,14%
Engineer modelling hazardous phenomena	44	37,29%
Chemical engineer	43	36,44%
Electromechanical engineer	40	33,90%
Electrochemical engineer/electrochemist	40	33,90%
Storage and renewable energy planner/project manager	40	33,90%
Process Safety Engineer	39	33,05%
Materials Specialist	39	33,05%
Innovation Manager	38	32,20%
Renewable interconnections specialist/ Systems integration specialist	38	32,20%
Maintenance planner (EQF 6-8)	37	31,36%
Designer and project engineer hydrogen fuel station	35	29,66%
Occupational specialist in the field of distribution network technology	35	29,66%
Chief Technical Officer	35	29,66%
Pipeline Engineer	35	29,66%
Engineer for automotive power electronics with fuel cells	34	28,81%

Source: H2Excellence Stakeholders Questionnaire, 2024.

Note: Questionnaire respondents were allowed to select more than one professional profile.

EQF 3-5 professional profiles elected by stakeholders



Occupation/Profession (EQF 3-5)	Absolute Value	Percentage (n= 118)
Electrical and process technician	65	55,08%
Hydrogen energy technician	62	52,54%
Electrolyzer Technicians	60	50,85%
Maintenance professionals: electrical, electromechanical, instrumentation & control, mechanical engineering	57	48,31%
Hydrogen energy system installer	52	44,07%
Hydrogen Process Operator Specialist	51	43,22%
Plant builder - electrolysis	48	40,68%
Production and assembly of electrolyzers, fuel cells and components	48	40,68%
Hydrogen pipeline construction worker	48	40,68%
Commissioning Technician	48	40,68%
Maintenance/operational technician	48	40,68%
Hydrogen Process Operator Specialist, including Supervisory Control and Data Acquisition - SCADA	47	39,83%
Maintenance Technician: Compression	46	38,98%
Fuel cell manufacturing technician	45	38,14%
Fuel cell technicians	45	38,14%
Industrial maintenance technician	43	36,44%
Fuel cell power systems operator and instructor	42	35,59%
Certifiers of equipment	42	35,59%
Technical occupations, including pressure vessels, etc.	38	32,20%
Non-destructive (NDE) inspector and technician	37	31,36%
Fuel cell retrofit installer	36	30,51%
Explosive atmospheres (ATEX) equipment repairman	36	30,51%
Hydrogen fuel transporter - driver	36	30,51%
Process technician	36	30,51%
Installation technician - Industry and trade	36	30,51%

Source: H2Excellence Stakeholders Questionnaire, 2024.

Note: Questionnaire respondents were allowed to select more than one professional profile.

EQF 3-5 and 6-8 professional profiles elected by stakeholders (Lifelong Learning)

Occupation/Profession (EQF 6-8 and 3-5)	Absolute Value	Percentage (n=118)
Designer and project engineer hydrogen fuel station (EQF 6-8)	35	29,66%
Electrician hydrogen vehicle (EQF 3-5)	35	29,66%
Occupational specialist in the field of distribution network technology (EQF 6-8)	35	29,66%
Chief Technical Officer (EQF 6-8)	35	29,66%
Pipeline Engineer (EQF 6-8)	35	29,66%
Gas Technician (EQF 3-5)	35	29,66%
Safety Managers (EQF 3-5)	35	29,66%
Engineer for automotive power electronics with fuel cells (EQF 6-8)	34	28,81%
Hydrogen fuel station manager (EQF 6-8)	34	28,81%
Power plant operators (EQF 3-5)	34	28,81%
Material engineer (EQF 6-8)	34	28,81%
Installation builder/network builder - electricity and gas (EQF 3-5)	34	28,81%
Production line operator/technician (EQF 3-5)	34	28,81%
Fuel cell designer (EQF 6-8)	33	27,97%
Operations engineer - site manager (EQF 6-8)	33	27,97%
Installation technician for piping systems (EQF 3-5)	33	27,97%
Process Operator (EQF 3-5)	33	27,97%
Fuel cell testing technician (EQF 3-5)	32	27,12%
Technician backup energy system with fuel cell (EQF 3-5)	32	27,12%
Compression Specialist (EQF 6-8)	32	27,12%
Operational safety/risk/Quality, Health, Safety and Environment engineer (EQF 6-8)	32	27,12%
Service Technician (EQF 3-5)	32	27,12%
Fuel cell vehicle development engineer (EQF 6-8)	31	26,27%
Laboratory Technician (EQF 3-5)	31	26,27%
Incident Commander Fire Department (EQF 3-5)	30	25,42%

Source: H2Excellence Stakeholders Questionnaire, 2024.

Note: Questionnaire respondents were allowed to select more than one professional profile.

Selected Modules EQF 3-5 (Vocational Education)

Partner	Module
VAMIA	Hydrogen Basics
ECOLE	Hydrogen Safety, Risks, Standards & Regulations
CESUR	Hydrogen High-Pressure Fittings & Connections
VAMIA	Hydrogen Storage
CIEMAT	Operation and Maintenance of Electrolysers & Fuel Cells
VAMIA	Hydrogen Transportation & Delivery
VAMIA	Hydrogen Combustion
VAMIA	Hydrogen Sensors, Detectors & Monitoring
CESUR	Soft Skills applied into Hydrogen sector
CESUR	T-shaped Skills applied into Hydrogen sector

Selected Modules EQF 6-8 (Higher Education)



#	PARTNER	Title
1	UNIPG	High temperature electrolysis
2	UNIPG	Fuel cells modelling
3	MGEP	Fuel cell for mobility application
4	MGEP	H2 production from renewable energy (green H2)
5	UMA	Process of H2 production: thermochemical, electrolytic, biological and renewable energy based. Integrated systems (photo-water splitting).
6	UMA	Functional nanomaterials for H2 technologies. Synthesis and surface characterization.
7	ATENA	Fuel cells modelling and testing
8	ATENA	Metal Hydrides Storage System modelling and testing
9	CIEMAT	Catalytic production and uses of H2 from biogas
10	VAMK	Hydrogen storage system
11	VAMK	Hydrogen re-fuelling station

Selected Modules LIFELONG LEARNING

MODULE NUMBER	PARTNER	MODULE TITLE
1	IPP	Hydrogen systems engineering
2	IPP	Electrochemical technologies: production & end-uses of renewable hydrogen
3	ISQ	Green Hydrogen Update for Gas Technician
4	PVF	Hydrogen Storage, Transportation and Distribution Systems
5	ECOLE	Safety in hydrogen facilities and applications (focusing on design phase)
6	FAST	Hydrogen vehicles and refuelling stations
7	UMA	Hydrogen end uses and applications
8	UMA	Hydrogen production: technologies and materials
9	RPCC	Integration, Certification and Permits for HRS and H2 installation
10	RPCC	Optimizing the use of local water resources - studies, forecasts, treatment systems

H2EXCELLENCE ONLINE LEARNING PLATFORM

[Homepage](#)[CoVEs](#)[E-learning](#)[Events](#)[Labs & Reskilling](#)[Mobility](#)[Capacity building](#)[Login](#)[EN](#)

About the project

The H2Excellence project, co-financed by the European Commission under the ERASMUS PLUS Programme, aims to establish a platform of centres of vocational excellence (CoVEs) in the field of fuel cells and green hydrogen technologies. The project is focused on developing a collaborative educational, training, and development program aimed at bridging the current skills gaps within the industry.

Find more about H2Excellence project



H2Excellence Project Erasmus+ Interview



Watch Later



Share

TRAINING OPPORTUNITIES VIA H2EXCELLENCE PLATFORM


[Homepage](#)
[CoVEs](#)
[E-learning](#)
[Events](#)
[Labs & Reskilling](#)
[Mobility](#)
[Capacity building](#)

Training opportunities

[Language](#)

[EQF Level](#)

[Audience](#)




Hydrogen Refuelling Station (HRS): Design and Operation

Starts on: January 12

This module offers participants a wide-ranging understanding of hydrogen refueling stations, their operational dynamics, maintenance requirements, and safety protocols, along with an exploration of their integration into diverse applications such as marine vessels and automotive retrofitting. The scope of training encompasses the following modules and activities: procedure, components and infrastructures of hydrogen refueling stations; operations, maintenance, and safety protocol as well as integration of hydrogen refueling in other applications such as marine.

[Register now →](#)


Hydrogen Storage Technologies

Starts on: January 12

This module introduces compressed, liquid, and solid-state hydrogen storage along with facility construction, automation, safety protocols, and integration with fuel cells and marine engines. Students will gain a solid understanding of storage principles, system design, and operational practices. The course will explore the real-world applications with a focus on safety, efficiency, environmental impact, and regulatory compliance.

[Register now →](#)


Operation and maintenance of electrolyser & fuel cells

Starts on: October 1

This module will provide basic and practical knowledge about the operation of electrolysers and fuel cells. It will analyse the protocols and procedures commonly used for operation, diagnostic tests, and basic maintenance of the systems from a practical standpoint.

[Register now →](#)

TRAINING OPPORTUNITIES VIA H2EXCELLENCE PLATFORM

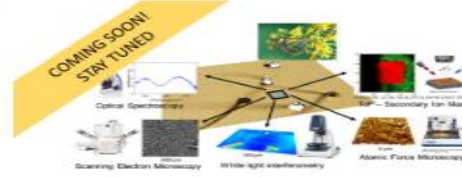


Hydrogen production: technologies and materials

Starts on: October 1

This module will provide a practical introduction to the importance of green hydrogen in the global economy, focusing on the materials involved in its current production and future integrated technologies. It will analyse the characterisation procedures commonly used from a practical point of view.

Register now →



Functional nanomaterials for H2 technologies. Synthesis and surface characterization.

Starts on: October 1

This module will provide a practical introduction to the importance of green hydrogen in the global economy. It will highlight the materials involved in current generation and storage processes, focusing particularly on their chemical, physical, and electrochemical characteristics. The module will analyse the most commonly used procedures for characterising green hydrogen from a practical standpoint.

Register now →



Hydrogen end uses and applications

Starts on: October 1

This module will provide a practical introduction to the importance of hydrogen in our energy ecosystem and the materials used for its production, transport and storage. It will analyse the characterization procedures commonly used from a practical point of view.

Register now →



Hydrogen vehicles and refuelling station

Starts on: October 1

The module provides technical knowledge on the design and layout of hydrogen powered vehicles as well as on their main components and structure. The infrastructure for hydrogen delivery will also be described with a focus on refuelling stations and their integration with electrolyzers. Trainees will acquire the skills to analyse the integration between vehicles, refuelling stations and the overall system, and to identify the challenges for the development of the hydrogen-fuelled mobility sector.

Register now →



Operation and maintenance of electrolyser & fuel cells

Starts on: October 1

This module will provide basic and practical knowledge about the operation of electrolyzers and fuel cells. It will analyse the protocols and procedures commonly used for operation, diagnostic tests, and basic maintenance of the systems from a practical standpoint.

Register now →



Hydrogen production processes and PV fundamentals for green H2

Starts on: October 1

This module will provide a practical introduction to the importance of green hydrogen in the global economy. It will highlight the materials involved in current generation processes, such as photovoltaics and electrolyzers, as well as those that may be developed in the future. The module will analyse the procedures commonly used for characterising green hydrogen from a practical point of view.

Register now →

CONCLUSION

- H2Excellence is Progressing well until its mid-term
- Key Success in collaboration, partnership and networking
- Training programmes under development will have great impact

**We are open
for close
cooperation!**



FOLLOW US ON

OUR SOCIAL CHANNELS



OUR WEBSITE



AND ON OUR KNOWLEDGE PLATFORM





Forum on Vocational Excellence 2025

Workshop:

CoVEs as Catalysts for the Hydrogen Economy

Driving Stakeholders Engagement in the H2Excellence Network:
Expansion and Collaboration Opportunities

Angela Pulvirenti
FAST

Kolding, Denmark
9th September 2025



Project n. 101104447. Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



Co-funded by
the European Union



This presentation will focus on two crucial elements for the stakeholders engagement in the H2excellence network:



The Expansion phase



The Hydrogen Academy

The key relevance of the stakeholders active participation in the CoVE model is the starting point

WHY ARE STAKEHOLDERS SO RELEVANT FOR THE PROPER DEVELOPMENT OF A CoVE?

Stakeholders feed CoVE activities as:

- they are **consulted** for identifying the needs of a specific sector
- they are the **first users** of the CoVE training offer
- they foster at policymakers level the adoption of new curricula thus **boosting local skills** and the capacity to **enable innovation applications**

A CoVE is never a static entity!

Each Cove is supposed to grow both at local level and beyond the project borders to ensure the utmost sharing of results and opportunities at EU level.



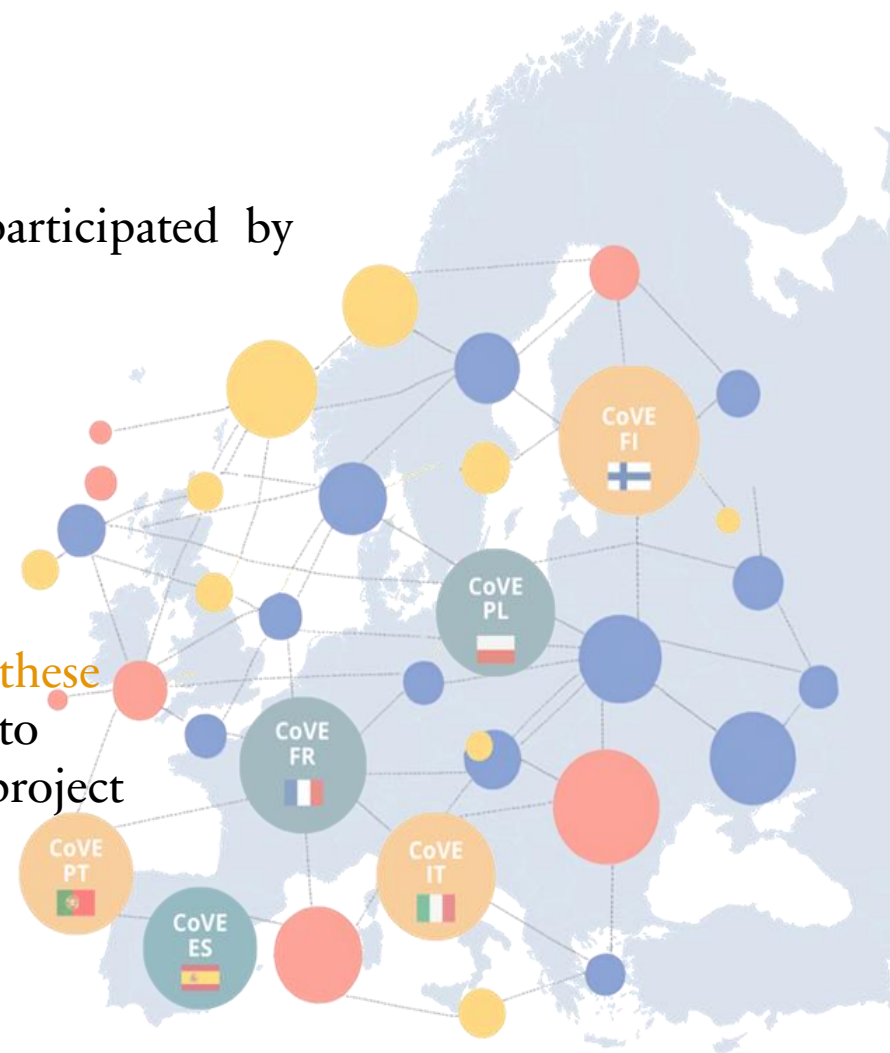
THE H2EXCELLENCE EXPANSION PHASE

The H2Excellence network is currently participated by

6 CoVEs

based in Finland, Spain, Portugal,
Italy, France and Poland

Now our network is ready to go **beyond these borders** and take on board **new partners** to deepen knowledge sharing and exploit project results



A CALL FOR EXPRESSION OF INTEREST IN JOINING OUR NETWORK AS A SATELLITE COVE HAS BEEN PUBLISHED

What is a Satellite H2Excellence Cove?

It is an entity or a group of entities, based in countries not represented in the H2Excellence project and eligible for the Erasmus+ program, **interested in promoting green hydrogen skills**. A Satellite CoVE will receive no funding, but will act on a voluntary basis as an Ambassador of the H2Excellence network.

Which benefits you can gain by joining as a Satellite CoVE?

- ✓ Access to **cutting-edge training** and **knowledge sharing** in green hydrogen
- ✓ Participation in exclusive **networking and cooperation events**
- ✓ Recognition through the **H2Excellence Satellite CoVE label**
- ✓ Opportunity to **visit flagship projects and hydrogen valleys** across Europe



○ Who can apply?

- VET providers
- Companies, industry or sector representative organizations
- Research institutes
- Innovation agencies
- Regional development authorities

not located in Finland, Spain, Portugal, Italy, France and Poland and based in EU Member States participating in Erasmus+ Programme and third countries members of EFTA and EEA: Norway, Iceland and Liechtenstein or the acceding/candidate countries or potential candidates: Serbia, Turkey and North Macedonia.

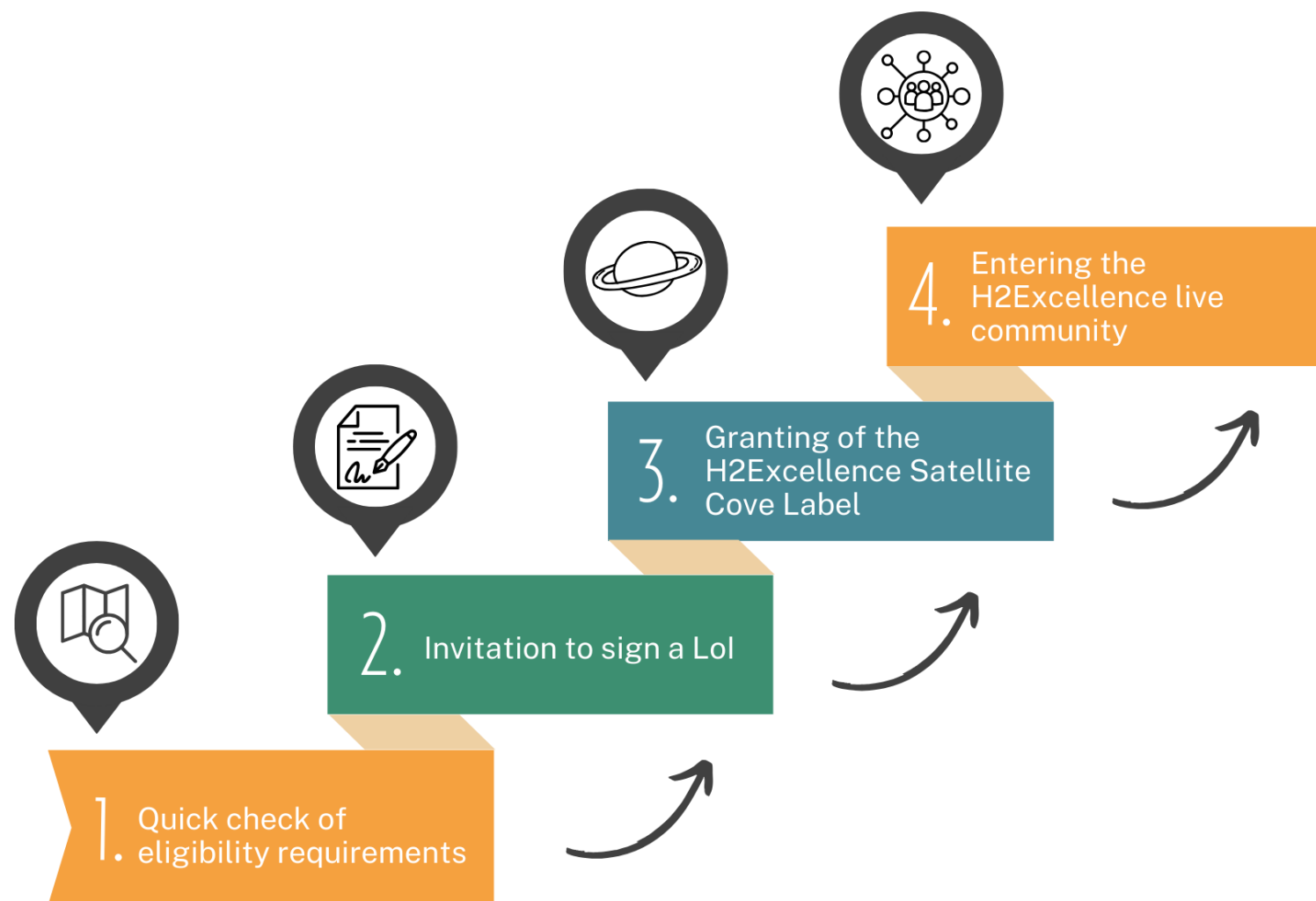
○ How to apply?

Sending a candidature is easy! Just fill the google form!
Scan the QR code to apply!

(deadline March 31 2026)



THE ADHESION PROCESS:



Don't wait, join our network!

Be part of the green hydrogen community!



Announcement!



**H₂Excellence
European
Hydrogen
Academy
Training for the future**

20–22
May 2026
Lisbon
Portugal

H₂EXCELLENCE HYDROGEN ACADEMY

H₂Excellence European Hydrogen Academy, organized by partner LNEG at the Meeting Centre of Parque das Nações, in Lisbon, is an opportunity to **learn, connect and explore** the fast-growing Hydrogen sector, intended for:

- **students** with a bachelor's or master's degree seeking for vocational training
- **professionals or researchers** in engineering, energy, environmental sciences and related fields
- **everyone interested** in the future of hydrogen technologies

2 full days of in-room lecture sessions, finishing with a technical external visit to companies near Lisbon:

- Expert-led **lectures**
- Overviews of **running projects, demos** and discussion **round-tables**
- **Networking** and collaboration opportunities





Further information
and preliminary program @
www.h2academylisbon.com

Free registration at the site
from 15th September!



Thank you!
angela.pulvirenti@fast.mi.it



Forum on Vocational Excellence 2025
H2Excellence Workshop: CoVEs as
Catalysts for the Hydrogen Economy
10 September 2025

H2Excellence training pathways
and the role of microcredentials
in hydrogen-related vocational
training

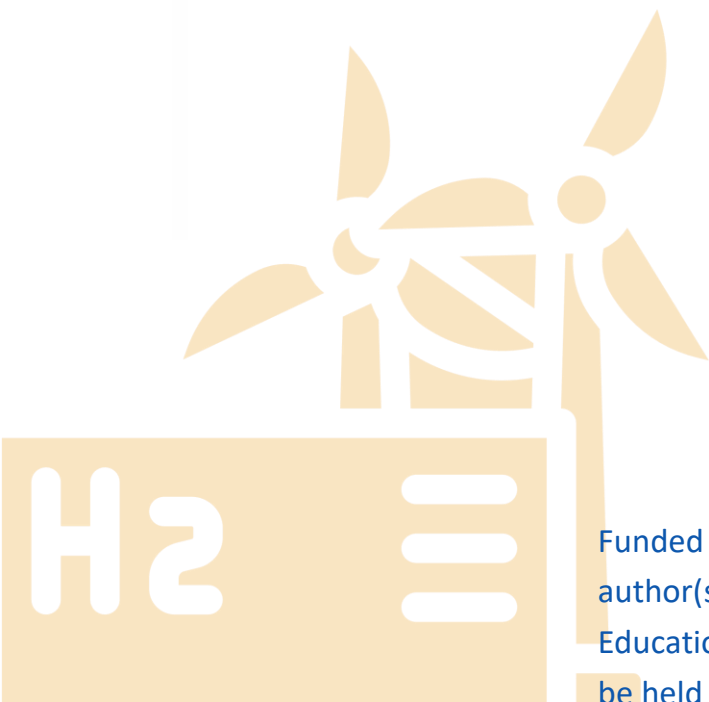
Evangelos Makris
Team Leader
EEO



Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.



Co-funded by
the European Union



PRESENTATION CONTENTS



FROM LABOUR MARKET NEEDS TO TRAINING PATHWAYS 2/2



01

Bridge Hydrogen Skills Gaps

tackle industry skill shortages in fuel cells & green hydrogen

02

Develop Multi-Level Training

for learners at various EQF levels (3–8) and for workforce upskilling

OUR MISSION AT A GLANCE

03

Upskill Educators & SMEs

Offer teacher training programs and technical support for companies (SMEs)

04

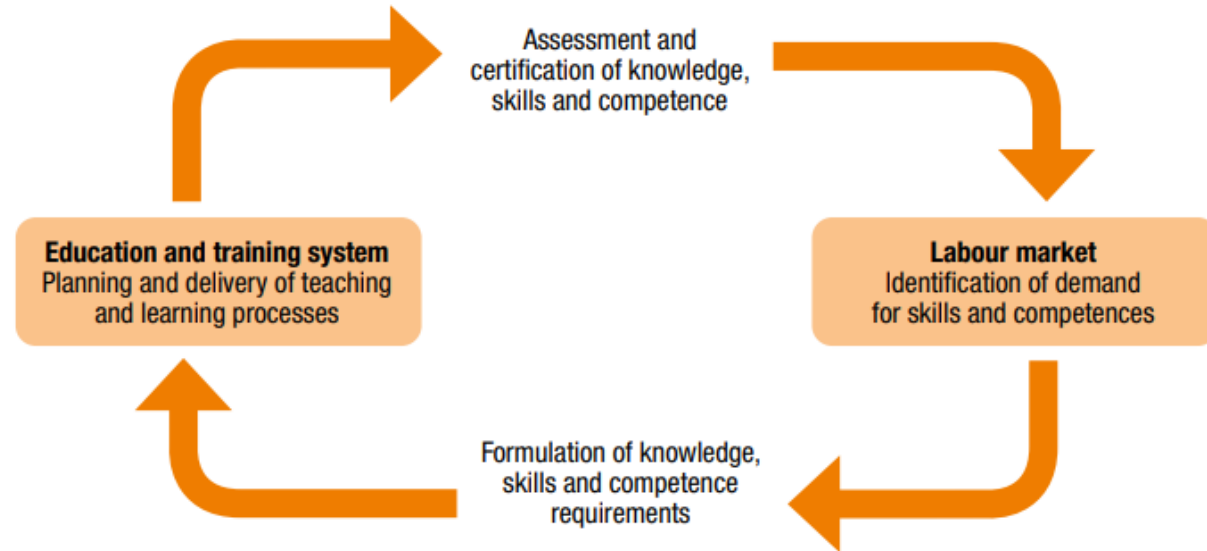
Foster Innovation Network

Create world-class reference points (labs, knowledge hubs) for hydrogen training

FROM LABOUR MARKET NEEDS TO TRAINING PATHWAYS 2/2

Learning Outcomes definition

“knowledge, know-how, information, values, attitudes, skills and/or competences a person has acquired and/or is able to demonstrate after completion of a learning process, either formal, non-formal or informal”.



Source: Cedefop (2013; 2021).

WP3 Training Pathways

Findings are translated into learning outcomes (knowledge, skills, autonomy/responsibility) that guide curriculum outlines, assessment criteria and EQF level alignment, ensuring transparency and comparability across countries.

WP2 Training Needs Analysis (TNA)

Surveyed companies and analysed hydrogen strategies to identify skills gaps and job profiles; this “labour-market intelligence” serves as our starting point.

Learning-outcomes-based feedback loops enable continuous dialogue between education and labour markets, aligning training with evolving skill needs.

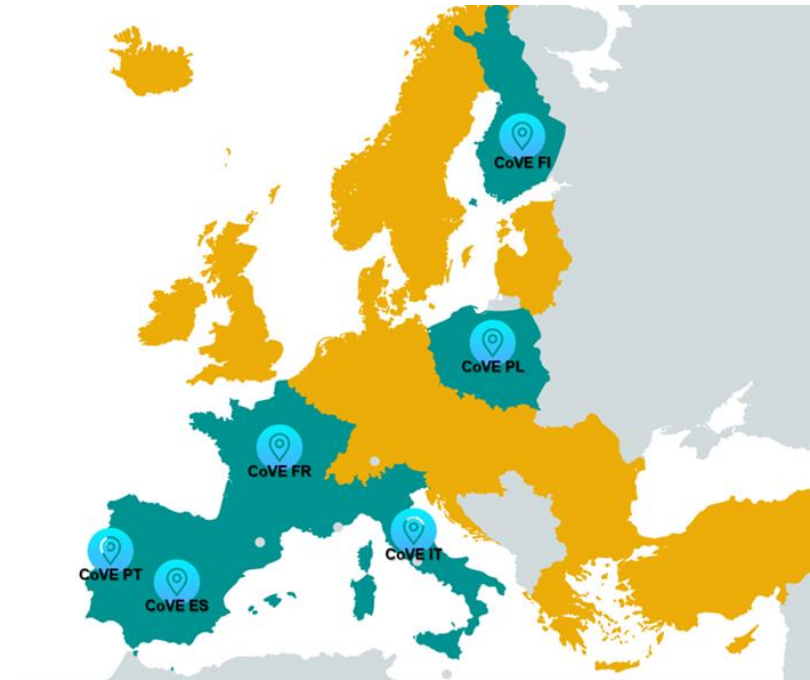
COVES AS CO-CREATORS

Centres of excellence: VET providers, universities, companies and research labs collaborate within CoVEs to define learning outcomes, ensuring relevance to real-world hydrogen technologies.

Continuous improvement: through the feedback loop, CoVEs regularly update learning outcomes and curricula to reflect emerging technologies, regulatory requirements and industry innovations.

Transnational collaboration: CoVEs operate locally but connect across borders, forming a European network for mutual learning, technical support and mobility.

Catalysts for innovation: by embedding in regional innovation ecosystems, CoVEs attract business investment, support SMEs and act as knowledge hubs for research and development.



24 partners across 9 EU countries, plus one international partner.

Coordinator:



Partnering countries:



International partner:



- **Competence-Based Design:** Based on industry skill needs and job profiles identified through WP2.
- **Co-Creation with Stakeholders:** Developed with input from industry, academia, and VET providers.
- **Alignment with EU Frameworks:** Outcomes-based design aligned with EQF and EU microcredentials standards.
- **Active Learning & Quality Assurance:** Focus on hands-on methods, digital tools, and EQAVET-aligned quality.

EQF 3–5 (Technician level)

Foundational vocational training for entry-level hydrogen technicians/operators.

10 modules

EQF 6–8 (Advanced – HE level)

Higher VET/academic courses for engineers and specialists in hydrogen fields.

10 modules

Lifelong Learning (LLL)

Continuous upskilling modules for the current workforce and industry professionals.

10 short courses

Train-the-Trainer

Specialized program to equip VET instructors with hydrogen technology teaching skills.

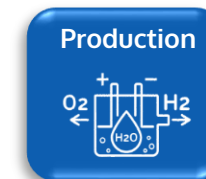
1 module

DEVELOPING TRAINING COURSES 2/3

- **Industry-Driven Content:** Topics were prioritized based on industry input (TNA survey) to target the most critical skill gaps.
- **Future-Oriented Skills:** Courses integrate emerging trends (e.g. smart grid integration, digital skills in hydrogen systems).
- **Alignment with EU Policies-Roadmaps:** Content aligns with national and EU hydrogen strategies (REPowerEU, Green Deal).



Modules span the entire hydrogen Value Chain:



e.g.
electrolysis
processes, hydrogen
generation
techniques



e.g.
Storage systems,
transport
infrastructure,
pipeline &
fueling
technologies

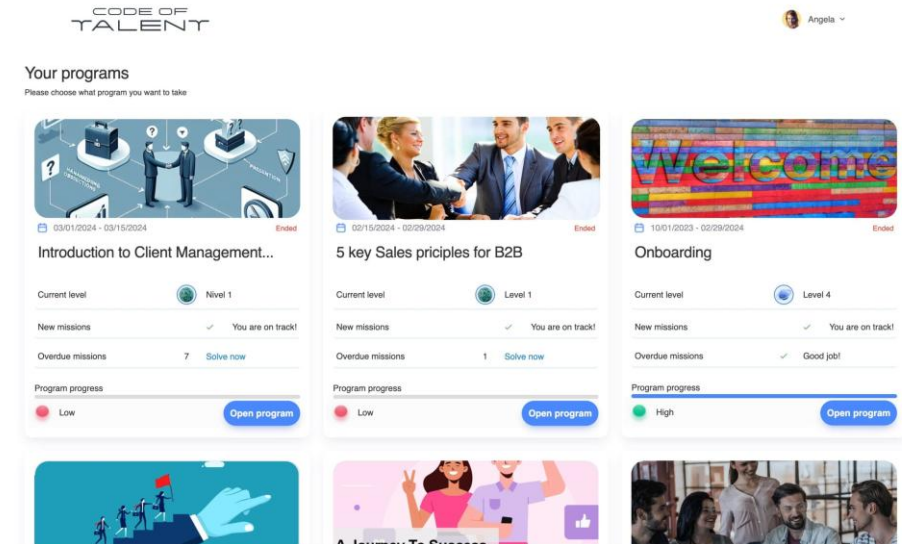


e.g.
Fuel cells
applications in
mobility
(vehicles, rail,
maritime) and
power generation,
industrial uses



e.g.
Safety
protocols, risk
management,
standards and
regulatory
compliance

- **Designing Courses with the Code of Talent Authoring Tool:**
 - **Gamified, social, personal & guided:** Code of Talent delivers microlearning journeys that are gamified, community-driven, self-paced and guided by trainers.
 - **Hands-on learning:** trainers design “missions” that challenge learners to apply knowledge through practical tasks and simulations.



By converting learning outcomes and curricula outlines into interactive microlearning missions, we ensure courses are engaging, measurable and scalable.

WHAT ARE MICROCREDENTIALS?

Microcredentials Definition

“A micro-credential is the record of the learning outcomes that a learner has acquired following a small volume of learning. These outcomes have been assessed against transparent standards and are described and recorded in a way that makes them portable and shareable. A micro-credential is underpinned by quality assurance and is designed to be stackable into larger qualifications or used independently.”

European Council Recommendation of 16 June 2022 (Official Journal of the EU, C 243/10)

- **Small volume of learning** – shorter and more flexible than traditional qualifications.
- **Learning outcomes based** – focused on what the learner knows, understands and can do.
- **Assessed & quality-assured** – outcomes must be validated through transparent processes.
- **Portable** – documented in a digital format, enabling recognition across borders and systems.
- **Stackable** – can be combined to build larger qualifications or used stand-alone to meet specific labour-market or personal learning needs.



Standard elements:
essential elements include learner identification, title, country/region and awarding body, learning outcomes, workload/ECTS, level, assessment type, participation mode and quality assurance

WHY MICROCREDENTIALS MATTER?

- **Stackability:** microcredentials can be combined (“stacked”) into larger qualifications, creating flexible learning pathways and enabling lifelong learning.
- **Interoperability:** alignment with EQF levels and standard information elements ensures microcredentials are recognised across borders and systems.
- **Individual learning accounts (ILAs):** ILAs (digital wallets with training entitlements) and microcredentials are complementary; ILAs can finance participation in short courses, while microcredentials certify the outcomes – together they support personalised lifelong learning pathways.

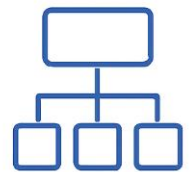
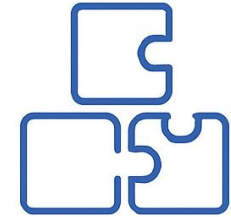
Why we adopted the MC framework?

Microcredentials

- Enhance transparency and trust,
 - Facilitate recognition by employers and other education providers, and,
 - support rapid upskilling for the green hydrogen sector
- all critical to meeting our project’s goals.

Pedagogical Approach

- **Modular & Flexible Learning:** Enables personalized, stackable learning paths.
- **Active, Learner-Centric Methods:** Emphasizes hands-on and project-based learning.
- **Outcomes-Based Design:** Clear learning outcomes aligned with EQF levels.
- **Standardized Curriculum Framework:** Uses common pedagogical and quality standards across CoVEs.



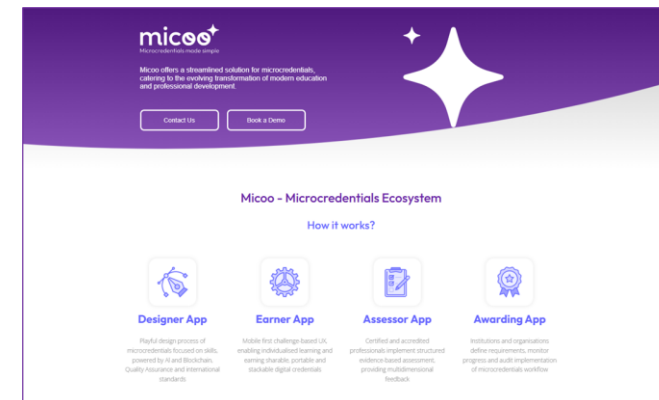
Organizational & Business Model

- **Integration into CoVE Programs:** Embedded in VET and short course offerings.
- **Cross-Border Recognition:** Aligned with EU standards for portability.
- **Stackability & Pathways:** Microcredentials can be combined toward full qualifications.
- **Dual Certification Value:** Academic certificates and digital badges enhance recognition.
- **Sustainable Business Model:** Attracts professionals and industry partners for upskilling.



Technology & Portability

- **Digital Badges & Credentials:** Issued with metadata on skills, level, and issuer.
- **Online Learning Platform:** Centralized access to modules and automated credentialing.
- **Interoperability & Standards:** Meets EU credentialing standards for recognition.
- **Scalability via Technology:** Enables wide issuance and easy employer verification.



“The future belongs to those who learn more skills and combine them in creative ways.”

Robert Greene, “Mastery”

Thank you!

SPEAKERS & TOPICS

- ***Margarida Segard*** – *Skilled workforce and cross-sector collaboration in the hydrogen economy*



Maria Margarida Segard is Director of ISQ Academy; Vice President of the European Association of Training Centers - EVBB; Advisor at the European Commission and UNESCO - DG Employment, DG Mare, in several high-level working groups, including 4.0, Green Skills, Adult Learning, Excellence in VET Training; Coordinator of major national, international and European projects and studies (in more than 40 countries); Founder, former President of the National Network for Social Responsibility RSO PT. Graduated in Law with post-graduate studies in Legal and Public Sciences, Portuguese Catholic University and an AESE MBA; Worked at the Ministry of Economy PEDIP I and the Ministry of Labor IEF, as coordinator of the National Professional Certification System, technician and lawyer and responsible for audits of ESF (European Social Fund) Training Programs; responsible for the national team of audits of training projects financed by the ESF.



Margarida Segard

Director of ISQ
Vice President of EVBB

mmsegard@isq.pt
+351 961201647

HYDROGEN THE WAY FORWARD



I
28 DE NOVEMBRO 2024

POLITICAL BACKGROUND

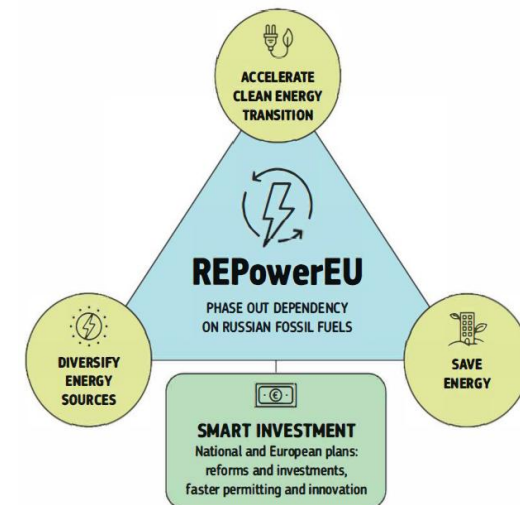


ESG – Environment, Social, Governance REPOWER EU

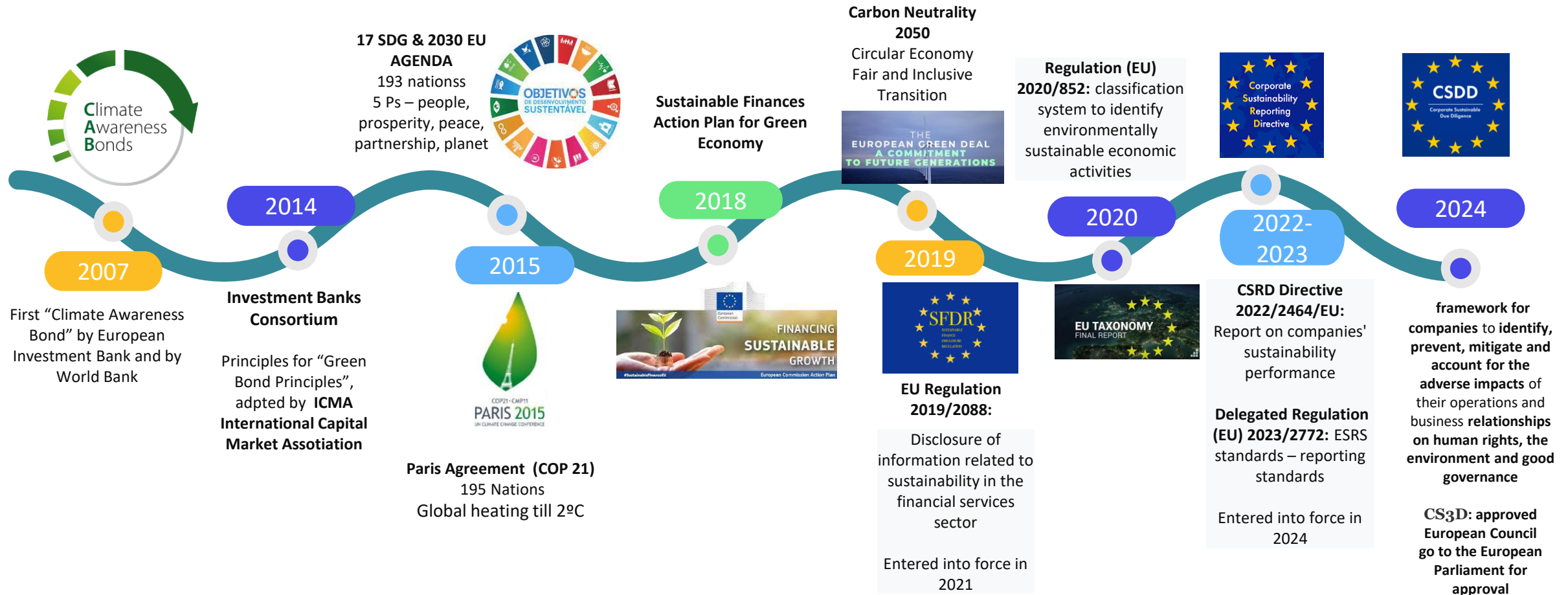
IMPACT ON ALL SECTORS, OCCUPATIONS, LEARNERS

SDG AND SUSTAINABILITY FOCUSES ON HOW A **COMPANY (OR INVESTMENT)**
IMPACTS THE WORLD

INCLUDES SUSTAINABILITY AS ONE OF ITS THREE PILLARS



ESG and H2





KEY JOB ROLES and GREEN SKILLS FORECAST

- **Benchmark** and capture some scientific and research studies and reports with high level quality and **results** (“**don’t reinvent the wheel**”)
- **Create** a skills development and training matrix with flexibility, **credits/micro credentials**, that allows deliverer **IVET (initial vocational training)** for youngsters) as well as **CVET (Continuous VET)** for adults and active workforce, for specialist or just for **democratizing GREEN SKILLS** and therefore supporting and accelerating green transition,
- **empowering all workforce and managers on the solutions and wiser sustainable decisions**

Some examples of **green skills forecast reports/studies**:

- Expert Group on Future Skills Needs, Skills for Zero Carbon report
- Report on the Analysis of Skills for Residential Construction & Retrofitting
- High Level Group for Green Skills (DG Employment)
- Vocational education and training and the green transition -A compendium of inspiring practices
- Skills forecast, CEDEFOP
- Skills PANORAMA
- GREEN SKILLS on European Education Area
- Greening jobs at VET Centers, UNESCO-Unevoc
- GREENCOMP, European Commission
- ...tion in cities



2024

- 1,8M jobs in green energy
- 500K jobs women in green energy
- 370K jobs in wind
- 100K jobs in H2

Europe 27 EU

By 2030

- 600K jobs in wind (includes offshore)
- 1 million skilled jobs in H2 sector
- Skills shortages 200 distinct job roles - technical (engineers, technicians)
- support (sales, finance, project management)

URGENT JOB NEEDS IN TRANSITION

- SKILLS APPROACH AND NOT JOB APPROACH – TRANSITION
- URGENT UPSKILLING AND RESKILLING (decarbonization)
- GREENING JOBS
- GREEN JOBS

WORKING FIELDS

- Electrolyser production and stack integration
- Fuel cell systems
- Equipment manufacturing
- Refuelling station integration and powertrain systems
- Production & Process
- Maintenance
- Storage Operations
- Project & Design

TECHNICAL ROLES (ENGINEER & TECHNICIAN) HIGH DEMAND

Electrical
Automation
H2 production specialist
H2 storage specialist
Fuel cell specialist
Robotics
Electrochemical
Industrial chemists
Certification experts
Power electronics
System production

Design engineer / Project designer

Sales engineer/technician
Administrative staff from public institutions

Finance/investments Project management

energy market analysts
financial analysts
supply chain and optimization consultants
energy strategists

SUPPORT ROLES

ISQ CASE

A world of engineering solutions

SOME ISQ SERVICES IN H2



PRODUCTION and STORAGE

Investment in Green Hydrogen production will increase in the coming years. ISQ supports in the licensing and permitting phase of the new hydrogen plants and ensures that the assets are built and operated within the rules and standards of quality, safety, and the environment to maximize their reliability and efficiency



Supervision of construction of H2 Production, Transport and Distribution facilities



Licensing and Environmental Impact Assessment of H2 Production Plants



Risk Analysis of Production Systems and Explosive Atmosphere Studies (ATEX)



H2 Systems Operation Safety Training

USE

The Green Hydrogen strategy will have an increasing importance in the energy mix in the coming years, with its use in industry as a raw material, as a fuel for the mobility sector and also for heating processes in energy intensive industries and buildings



Evaluation of materials and equipment for use in H2 systems



Feasibility studies for the integration of H2 in thermal processes



Inspection assessment and monitoring of fuel burning equipment



Risk Analysis and ATEX Studies



Inspection of gas stations



H2 Safety Training

TRANSPORT, DISTRIBUTION AND SUPPLY

The natural gas transmission and distribution networks will transport a mix of natural gas, green hydrogen and other renewable gases. ISQ performs studies for the repurposing of the existing gas pipeline infrastructures to operate with hydrogen and also provides QA/QC, inspection and testing of the pipelines



Inspection of storage tanks and transport and distribution networks



Assessment of the compatibility of materials and components for natural gas and H2 mix



Monitoring of gas distribution and transport networks



Risk Analysis and Explosive Atmosphere



Metrological evaluation of H2 measurement



Training of technicians and managers



REFERENCES IN HYDROGEN INNOVATION



ENDESA – SOCIAL INNOVATION IN DECARBONISATION RESKILLING: **hydrogen, solar, wind, electricity, welding, entrepreneurship**



GREEN HYDROGEN – H₂ FOR INDUSTRY, TRANSPORT AND DOMESTIC – inspections, testing, training



NATHURALY – first EUROPEAN STUDY and network 2006

transition to a hydrogen economy based the existing gas infrastructure to convey a natural gas/hydrogen mixture.



GREEN, CLIMATE, ACCOUNTABILITY AND SOCIAL BONDS – EVALUATION AND VERIFICATION, ESG DUE DILIGENCE (CERTIFIED BY ICMA)



SMART PHOTOVOLTAIC POWER STATIONS – INSTALLATION, MAINTENANCE AND MANAGEMENT



CERAMIC H₂ of conversion and adaptation of industrial natural gas networks to Hydrogen mixtures – in ceramic and glass industries.



REFERENCES IN HYDROGEN INNOVATION



ATE - Alliance for Energy Transition

Decision support tool for the conversion of natural gas pipes to hydrogen

Remote monitoring of gas networks (standard monitoring methods)

GRIDHRYVE – plug and play system to inject renewable gases into the grid to refuel vehicles .

2 Renewable production hubs (ceramic oven conversion).



GREEN, CLIMATE, ACCOUNTABILITY
AND SOCIAL BONDS –
EVALUATION AND VERIFICATION,
ESG DUE DILIGENCE (CERTIFIED BY
ICMA)



H2tALENT

aiming to establish a comprehensive hydrogen economy in the Alentejo region of Portugal, PIONEER regional HUB



Study and methodology for reconversion and adaptation of industrial gas networks for H2/NG mixtures – packaging



HERA main objective, HERA is intended to provide Electric Hybrid aircraft concepts allowing significant reductions in CO2 emissions, reducing fuel consumption compared to the 2020 reference.



GreenH2Atlantic

Installation and development of a 100MW electrolyser to be installed at the Sines thermal power plant facilities.



Co-funded by
the European Union



REFERENCES IN GREEN ENERGY INNOVATION



INOVATION HUB 4 AGRI- TECHNOLOGY IN GREEN AGRICULTURE



DEEP SEE MINING – LINKING ESA SATELLITE AND DEEP SEA MINERAL EXPLORATION



INTELICROP – SUSTAINABLE AGRICULTURE BY SATELLITE AND DATA SCIENCE



SMART PHOTOVOLTAIC POWER STATIONS – INSTALLATION, MAINTENANCE AND MANAGEMENT



E.TIJOLO – USE OF WASTE IN THE MANUFACTURE OF BRICKS, WITH A REDUCTION IN THE ENERGY



FLOATING OFFSHORE WIND FARMA SEMI-SUBMERSIBLE

ISQ ACADEMY

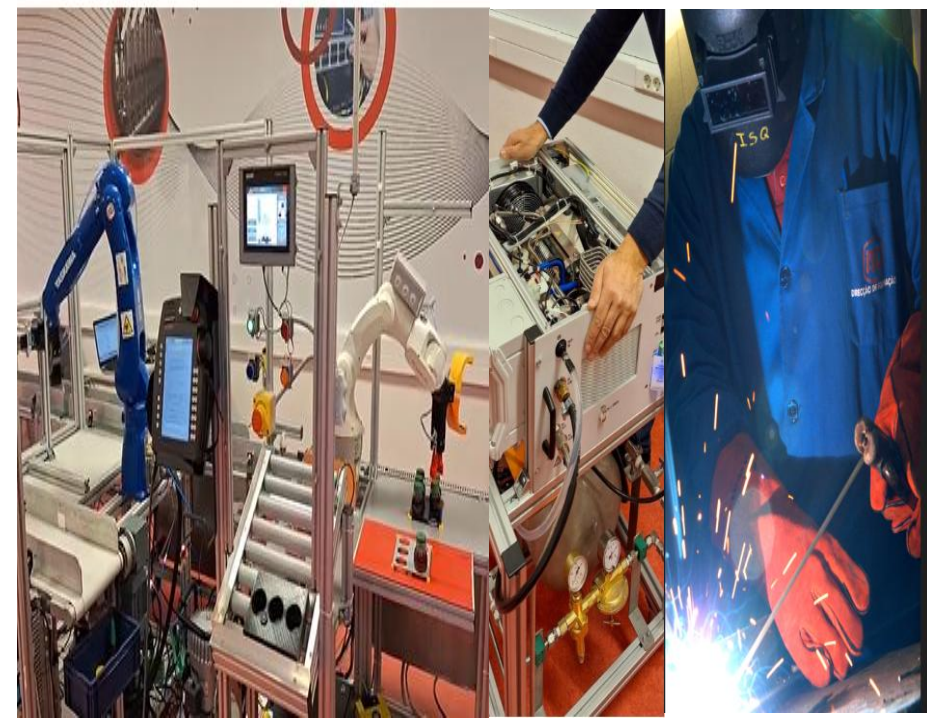
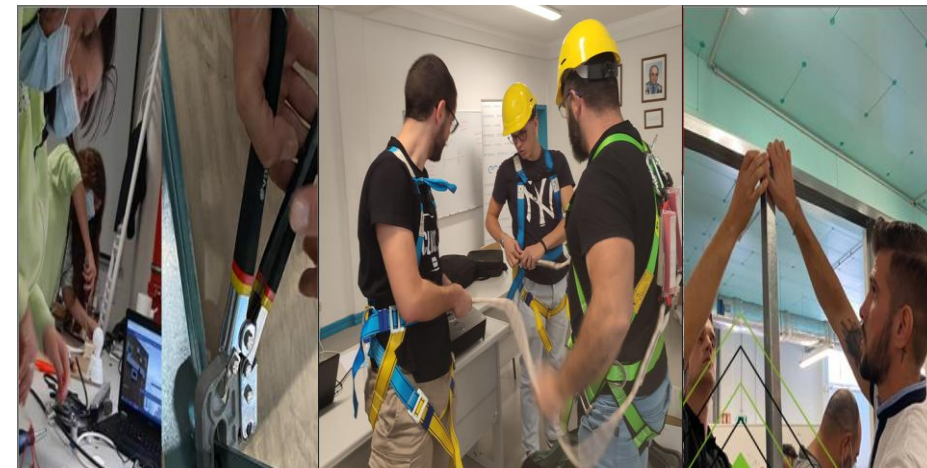


ISQ provide **TRAINING** and **HR CONSULTING** services focused on:

- ✓ Improvement of skills and excellent performance of staff in companies and industries
- ✓ Qualification and certification of people
- ✓ Systems and Talent Management



Since the **70's**, we have been providing training services, responding proactively to market needs, with international benchmarking and innovation, guaranteeing a global and local vision.





SUPER POWER SKILLS | HARD & SOFT, GREEN & DIGITAL, LEADERSHIP

BETTER PEOPLE, SOCIETY, PLANET AND PROSPERITY

ECONOMY 5.0



LEADERSHIP
SKILLS



SOFT SKILLS



4.0 DIGITAL SKILLS



GREEN SKILLS



TECH
SKILLS



LEADERS, TECHNICIANS, ENGINEERS





H2 training programs At ISQ Academy CoVE

- **Hydrogen Production:** Covers production methods, system efficiency, and practical demonstrations of the electrolysis process.
- **Hydrogen Storage and Applications:** Focuses on storage methods (compressed, liquid, adsorbent materials) and various applications, including fuel cells and industrial use.
- **Hydrogen Safety and Handling:** Emphasizes safety procedures, combustion characteristics, and prevention measures for handling hydrogen.
- **Production, Storage, and Safety in Hydrogen Operations:** A comprehensive program covering production, storage, and operational safety aspects of hydrogen technology.
- **Technical Programs on Hydrogen:** Advanced training on hydrogen's production, storage, distribution, and application in various sectors.
- **MASTER in Green Hydrogen:** A deep dive into the green hydrogen value chain, with modules covering production, storage, distribution, and regulatory requirements.
And Biomethane and Fuel Cells

TRAINING programs/modules level 3 to level 7



THE WAY FORWARD



LET'S
MOVE
BETTER
AND
FASTER ON
H2 IN
EUROPE

Business

Research

Training

EU training
programms

ALL Together



Partnership



Internationalization



Training programs mutually recognized



Skills forecast ongoing



Aligned with Political and Global
Energy programs



Holistic energy delivering



Margarida Segard
Director | ISQ
+351 96 120 16 47
mmsegard@isq.p



www.isqgroup.com



Consulte o catálogo de formação ISQ: academy.isq.pt

 Lisboa

 Porto



TAK OBRIGADA THANK YOU

Instructions

Go to

www.menti.com

Enter the code

2143 1868



Or use QR code

SATISFACTORY QUESTIONNAIRE

- Link:
<https://freeonlinesurveys.com/s/H2E-COP>



Thank You for Your Attention!

<https://h2excellence.eu/>

