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THE HYDROGEN EUROPE QUARTERLY

UPSKILLING THE HYDROGEN ECONOMY

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Welcome!



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From the CEO

Welcome to the Q3 2023 issue of the Hydrogen Europe Quarterly magazine. I hope all our readers had a pleasant summer break and are back, rested and eager, to continue our great work in decarbonising our European energy system.

I am proud to present to you this issue of our in-house magazine, which has a very clear focus: as we build up and scale up our hydrogen industry, we will need a large and passionate skilled workforce to get us there. The upskilling and reskilling of Europe for the hydrogen economy is a major, yet possibly overlooked, priority for our legislators and educators to focus on.

In this issue, our main story speaks to three companies whose work is directly linked to this issue. Boss Energy Consulting, Symbio Academy, and H2UB graciously provide us with key insights into where we are now, and where we need to be in order to train and hire the best and brightest in hydrogen. We are also proud to have spoken to representatives of Women in Green Hydrogen – if upskilling is the aim, then we cannot achieve it without the participation, and indeed leadership, of women in the sector.

Our member spotlight this quarter is the manufacturing giant Cummins, whose move into fuel cells and electrolyzers is great news for them and for the industry. Meanwhile our national and regional member spotlights cover, respectively, Slovakia and the Auvergne Rhone Alpes region of France – both regions boasting a proud industrial tradition and thus a clear avenue to decarbonising with hydrogen.

Finally, we hope you enjoy the important and in-depth analysis of our team. On the policy side you will find further updates on the famous Delegated Acts, plus additional information on how ammonia will contribute to the overall mission of energy decarbonisation. Meanwhile our intelligence update returns to the issue of skills via the Skills Task Force of the International Partnership for Hydrogen and Fuel Cells in the Economy, and a detailed mapping of how we can address the market's skills gap.

Skilling up Europe for the hydrogen revolution

With governments around the world committing to the speedy upscale of hydrogen capacity, there will naturally be an increased need for skilled labour up and down the value chain. In a still young sector, with the lofty aspirations that it has, we will inevitably see a dearth in talent. As such, the upskilling and reskilling of the workforce to prepare for this great transition is paramount. The Hydrogen Europe Quarterly speaks to representatives of three different companies working in their own way to meet this challenge head on.

Depending on the calculation and the timeframe, the hydrogen economy is estimated to create anything from one million to 20 million jobs worldwide by 2050, from engineers and manufacturers to project managers and consultants. A level of expertise at the financial and legal level will also be needed, as will many more operational and maintenance positions.

In Europe, the goal is to produce millions of tonnes of green hydrogen, transport it across the continent, import it from our neighbours, and use it to decarbonise steel, cement, chemicals, road transport, shipping, and aviation, to name but a few key sectors.

Hydrogen and its derivatives will affect so many sectors that the kinds of innovation that will result also means we will see an uptick in start-ups and entrepreneurship as we discover new solutions and new ways to apply old solutions.

Recruiting: Boss Energy Consulting

This innovation and movement is already happening, and the bottleneck of talent is already being felt, as Boss Energy Consulting, a “zero-carbon, renewable-energies recruitment business” founded in 2014, is already keenly aware.

The company has offices in London, Amsterdam and Singapore and expends a lot of time and energy on recruitment in pioneering markets. It was only a matter of time, then, that they would try their hand in the hydrogen sector.

“Roughly three or four years ago, we noticed a lot of traction in the hydrogen space and quickly understood that our services would transfer quite well,” Michael Johnson, the firm’s managing director, told the Hydrogen Europe Quarterly.

Both Johnson and George Richardson, a director at Boss, agreed that though the demand for



hydrogen talent is rising, the supply is hard to find. Richardson also pointed to an interesting phenomenon: that of a generational gap in talent.

"The first thing we see is a lack of talent in the sector between generations," he said, pointing to an increase in attention for hydrogen more than 20 years ago before its latest revival at the turn of this decade.

The result of this is a supply of experts approaching the end of their careers and a boom in newcomers to the field, with a large gap in between that must be filled.

"Hydrogen moves in ebb and flow in terms of supply and demand, and everyone is often fishing in the same pond," Richardson explained about the limited talent pool.

What is also notable is the type of skills being searched for by companies. Whereas a few years ago people needed planners and developers, projects that are now reaching late stage are seeking project managers and financiers to get them through the next phase.

"Recruitment has shifted to key strategic positions rather than mass hiring positions," said Ciara Willis, the European lead for hydrogen at Boss.

"Projects are reaching final investment decisions where they need expertise to build and deliver what's been promised, and that's where we are seeing a large bulk of recruitment," agreed Richardson.

The obvious solution of where to look – in a time of skill scarcity – is to look to reskilling those who may have transferable skills. Hydrogen crosses many applications and sectors and there are therefore often plenty of people with the expertise to transition. Hydrogen is a gas, and while it has its own properties the fundamentals of the safe and efficient transport of gases is not uncharted territory. Oil & gas practitioners provide a plentiful trove of talent to make the jump to hydrogen. However, some are more responsive to this idea than others.

Willis told us that "One or two years ago, when we were working in the US, people were a lot more open to transferring from oil & gas. It's more difficult to consult clients in Europe that this could work, but people are recognising it more and more."

This also affects other aspects of the recruitment process – not just finding the talent but placing it on a deadline.

"One main difficulty from a hiring perspective is time – due to the lack of talent we need to deliver the hiring process in a fast time period otherwise we lose the talent," said Johnson.

With all that in mind, what are the solutions to bridging the gap, increasing the talent pool, and accelerating the flow of skills towards hydrogen?

A big part of the answer is awareness. Willis, a member of Women in Green Hydrogen (who are featured later in this issue) is part of the network's mentorship programme, where she explained "they might be doing engineering or a special module on hydrogen and are interested but simply don't know how to get into it."

"As the industry progresses, removing barriers to entry by having people educated in Universities will start bridging the gap," Richardson continued.

Training: Symbio Academy

Universities are starting to do just that, with the likes of the University of Torino in Italy and the University of Delft in the Netherlands boasting freshly conceived hydrogen focused programmes, to name just two.

Meanwhile, in France, some companies are taking it upon themselves to spur on the necessary upskilling of its workforce. Michelin and Faurecia invested in Symbio, a hydrogen fuel cell company, in 2019. In only two years, it had tripled its workforce from around 100 employees to 300 by end of 2021, and then doubled it again to 600 currently.

Obviously, finding the talent is an issue that is familiar to Symbio, and to Jean-Baptiste Ballif, director of the Symbio Academy – which was set up to educate people to build up their skills that the full hydrogen ecosystem will need.

"When you're coping with scientific, pioneering topics, with huge growth in competence, it's certainly a challenge," he told the Hydrogen Europe Quarterly about the growth in skill needs.

"Hydrogen enhanced competencies are developed every day by the industry throughout the value chain. Symbio Hydrogen Academy primarily aims at formalising this knowledge: upskill internally, reducing time to competence and – by the same process – sharing and educating externally because there is a huge interest and demand but limited offer," he explained.

Learning on the go – as the Symbio Academy

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One thing was clear: to ramp up the hydrogen market, it was necessary to include all kinds of innovation and innovators”



is doing what few or none have done before – and navigating the space with limited resources are but two of the difficulties with this innovative programme. A third, explained Ballif, is convincing external partners that what the Academy is doing is the right way to approach the issue, especially as other universities and institutions race to set up their own programmes.

“There is an acceleration across academics, and many universities are getting involved in hydrogen. The challenge is maybe the need to also invest in appropriate infrastructure to support theory. You can’t effectively understand hydrogen without having access to hydrogen,” said Ballif.

What Ballif and the rest of the Symbio Academy believe is that a truly hands-on approach is necessary to understand and grow comfortable with hydrogen.

“What we’re developing is an open programme with industry and academics for everyone to discover what is meant by, for example, what is hydrogen? What is hydrogen mobility? What is hydrogen safety? With our partners, we are creating a network of hands-on facilities equipped with infrastructure such as benches to render training practical /tangible and effective. Because hydrogen goes far beyond theory,” he explained.

What he is talking about is providing what is known as a “fuel cell bench”, essentially a mini version of a fuel cell where people can see first-hand – literally – how it all works and the role of each of the moving parts.

Symbio is working to make these benches accessible and affordable for universities keen on teaching hydrogen. However, with a professional bench costing upwards of €500,000, these are very much out of most educational establishments’ price range. Symbio has launched a 6kW bench valued at €200,000 – less than half the professional equivalent – and is working to build an even smaller one. The Academy’s ethos is truly that “learning by doing” is what’s most essential when it comes to hydrogen.

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time to transform
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The internal results are, so far, extremely positive, with over two thirds of its operator workforce at Symbio having learned the trade in the Symbio Academy. Now, some of its earliest graduates have left Symbio to focus full-time on building these fuel cell benches and spreading the knowledge.

Connecting: H2UB

Building up the skilled labour is one piece of the puzzle, which Symbio is undoubtedly fulfilling. Another is finding that labour or finding the right project to which to give your skills – a task that Boss Energy is taking on to great effect. If you want to innovate and pursue your own ideas, however, this too can be tricky, especially in such a complex ecosystem as hydrogen, where innovation is so fast paced as to almost be chaotic.

H2UB, founded in 2021 in Essen, Germany, is providing guidance and networking opportunities for innovators across the Europe hydrogen value chain. Start-ups go to H2UB to be connected to other companies, universities and R&D institutions that can then progress in a structured and concerted way.

“Let’s not forget that using hydrogen is not an evolutionary process in the economy, it’s based on political decisions: we want to be climate neutral, and we want to reduce fossil needs,” said Uwe Kerkmann, H2UB’s CEO.

As such, Europe is not waiting for an organic market growth. Hydrogen is earmarked as a key solution for ambitious decarbonisation policies and as such is being accelerated somewhat artificially. And the task ahead is massive.

“We are addressing production of hydrogen, knowing that the EU will not be able to produce all we need. We are facing strategies for imports while still needing to develop and invest in the infrastructure. Then we have to transform industries to make them climate neutral,” said Kerkmann.

This is reflected, too, in the ethos of H2UB and its attitude to innovation – we need all hands on deck, and we need them as quickly as possible. To meet this challenge head-on, we would need as many bright minds and driven entrepreneurs working together towards this common goal. And the momentum has been impressive.

“One thing was clear: to ramp up the hydrogen market, it was necessary to include all kinds of innovation and innovators,” said Kerkmann. “I wouldn’t have expected at the end of 2021 that the development of H2UB and the hydrogen market would be so fast,” he added.

H2UB offers several services to these start-ups, like the ‘10-week sprint’ designed to accelerate one’s business and connect it with mentors and experts. Or the 3-week ‘bootcamp’ for people who want to found a new company. Helping to connect entrepreneurs with funding avenues and expertise, it is a useful one-stop shop for all those interested in growing the European hydrogen sector.

Kermann, too, is no stranger to the need for skills in order to fulfill this mission. What is interesting is that, at the start-up level, the shortages described by Boss Energy and Symbio are not quite as acute.

“Hydrogen start-ups are attracting well-educated people, sometimes already connected to the sector, but sometimes not. So, it’s interesting to see from a start-up perspective, that there doesn’t seem to be a big shortage in the skilled workforce. For the moment we see start-ups finding what they need,” he explained.

More generally, though, there is no doubt that this issue will become prominent as businesses grow and projects are developed. Kerkmann’s comments on this echo what was said by Boss Energy’s Richardson and Symbio’s Ballif:

“If you have the Final Investment Decision, then you need a skilled workforce to implement all those projects. The big challenge in this is that hydrogen is not strictly limited to related topics. You need technical and mechanical workforces in huge amounts,” he said.

All the interviewees are aligned on the need for people to access high-quality, bespoke, and dedicated educational opportunities. Academies like Symbio’s will help Boss Energy’s clients find the people they need, and H2UB’s network will ensure they have the tools they need to prosper.

“It takes a long time to transform educational systems. It’s high time to address this issue,” said Kerkmann.



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A conversation with Women in Green Hydrogen

Women in Green Hydrogen, a growing network of women working to connect, empower and change things within the hydrogen space, is in the process of becoming an NGO to officialise its position and open up new opportunities for the currently 100% volunteer-based organisation. Two of its leaders, co-founder Kathrin Goldammer and Co-lead of partnerships Alessia D'Addabbo, sat down with the Hydrogen Europe Quarterly to talk about the work done so far – and that which is still to come.

Founded amid the Covid-19 pandemic, Women in Green Hydrogen (WiGH) was born out of a small group of women interested in tackling the issue of gender imbalance in the sector together. That group formed the basis of the network whose central mission is to **connect** women in the industry, **empower** them to succeed, and **change** the way women are viewed in a historically male-dominated sector.

In just three years, membership has grown to over 4,000 members – demonstrating that there is absolutely no shortage of motivated and qualified women working up and down the hydrogen value chain, from engineers to project managers and executives. But the work has obviously not come without its own challenges.

"These women are everywhere, in all sectors," says Kathrin Goldammer, one of WiGH's co-founders and Managing Director of Reiner Lemoine Institute, a research outfit focused on decarbonisation, and which dedicates a lot of resources to hydrogen strategies.

"What was hard was listening to how similar our members' stories are about working in a male dominated sector. Not having any female colleagues, little to no female superiors. Being the only women present on all male panels. Their experiences are so alike," she explained.

The task is clear. The mission to change entrenched systems has defined the feminist movement from the very beginning, and despite progress being made, the work is not over. For WiGH, the fact that it's an exclusively volunteer-based organisation demonstrates the commitment of so many women to take on and continue this mission. But it also makes achieving its ambitions challenging. "It requires a lot of work to make everything

happen. We do what we can in the free time we have from our day jobs," Alessia D'Addabbo, a senior regulatory and policy analyst at Equinor, tells the Hydrogen Europe Quarterly.

"We have a lot of great ideas but sometimes we have to step down our expectations and ambitions to cope with internal capacity. But we don't surrender! We continue and persevere," she added.

Naturally, WiGH is not starting from nowhere – plenty of noise has been made in recent decades about redressing the gender balance in the workforce. And both Alessia and Kathrin are positive about the response to their work.

"There is already lots of awareness about improving gender balance, especially in the renewable energy sector," Alessia told us, emphasising that there are many organisations, companies and individuals who are open and willing to supporting WiGH's work.

WiGH's roughly 15 core members split their time between four working groups: a mentorship team; a partnerships team; an events team; and a communications team.



Kathrin Goldammer

Co-founder, Women in Green Hydrogen

The events team was, in many ways, the driving force to starting the organisation, with the objective of overcoming the issue of gender balance in events and conferences. Most readers will be familiar with the scene of multiple male-only panels, with perhaps one or two token women sprinkled in across several hours or days of discussions – often in moderating, rather than panellist, positions.

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There is already lots of awareness about improving gender balance, especially in the renewable energy sector

We want to be part of the discussion,” said Alessia, who leads the network’s partnerships programme, while Kathrin emphasised this founding idea: simply, “that we belong on these tables and panels”.

Both Alessia and Kathrin have seen a notable improvement in this endeavour, and the establishment of WiGH itself as a featured partner at many events. How? By simply rejecting invitations which proposed putting them to one side or treating them as an afterthought. And it worked, with WiGH present and prominent in the World Hydrogen Council, World Hydrogen Summit and, of course, the European Hydrogen Week.

“These challenges don’t bring us down but allow us to move forward. I’ve seen myself an improvement of number of women in events. If we manage to break the gender barrier in the renewables space, it will reshape the whole sector. It’s a matter of reconsidering the way we perceive the hydrogen industry,” explained Alessia.

“We’re not only changing the hydrogen world but aspects of the events world,” added Kathrin, pointing to WiGH’s innovative worksheet on gender balance plus its database of available and qualified women, which anyone can download and use to find women for their events.

What is also proving a huge success is WiGH’s mentorship programme, which connects senior women with more entry-level ones to help share knowledge and guidance while navigating the sector as a professional.

“The question we asked ourselves was how do we make the mentorship programme as easy yet as impactful as possible?” Kathrin, one of the programmes founders, explained.

WiGH reached out to the entire network – and beyond – asking interested participants to get involved as either a mentor or mentee with three years of experience sufficient to qualify as the former. Once the pairing was completed, it would kick off in an online meeting and every participant was provided with a ‘starter kit’ collated from Kathrin and others’ experience about what it’s like to be mentored – what questions one usually has, what solutions are offered, what exercises can be most impactful, and what topics of conversation must be addressed. The programme is now running into its third year with over 100 pairs of women representing a mix of students, interns and entry-level professionals.

(story continues on next page)



Alessia D'Addabbo

co-lead of partnerships, Women in Green Hydrogen

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High skilled people will want to work for you if you give them a sense of purpose and opportunity. And green hydrogen can do that, we're building the future

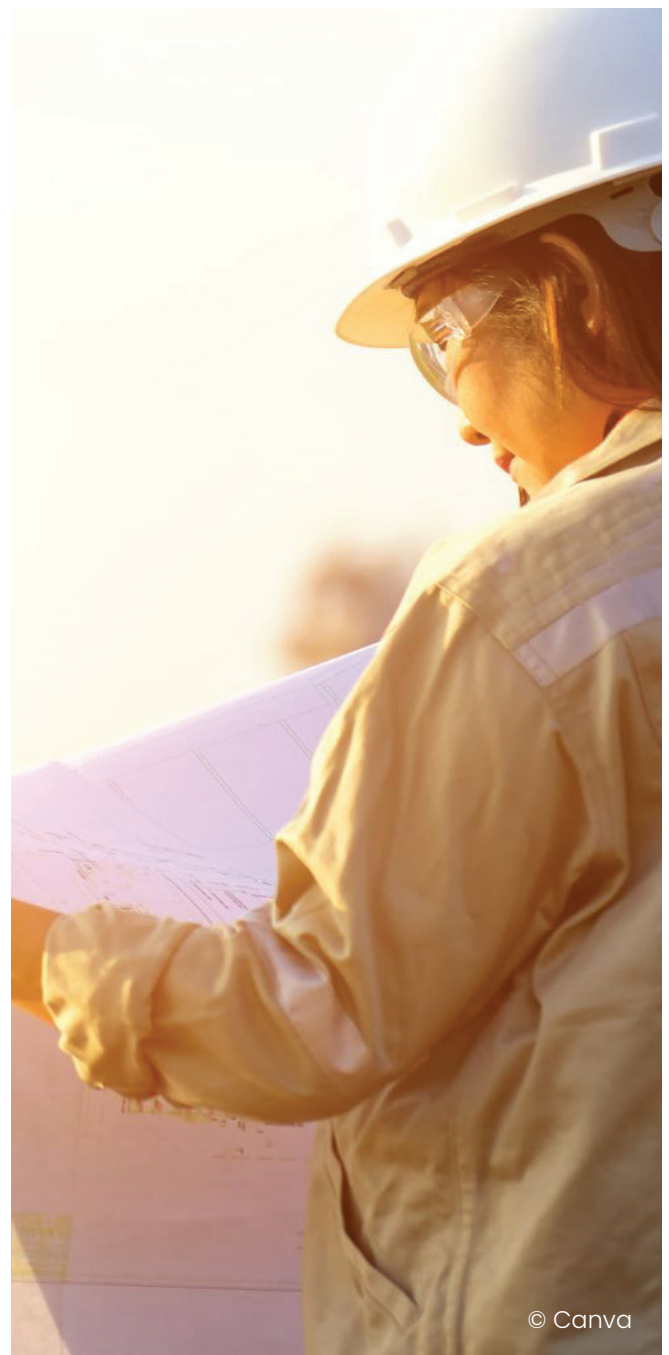
They will benefit from a minimum of four to five sessions per year, which the pairs are free to organise themselves, with the addition of separate follow-up sessions with the mentorship team to monitor progress. At the end of the year, both members of the pair receive a certificate attesting to their work together.

WiGH is aiming for bigger and better. Out of a desire to be able to pay its dedicated volunteer base, it has applied for legal status as a non-government organisation, which would enable it to apply for funds, participate in publicly funded projects and, hopefully one day, hire full-time staff to continue and improve upon the good work already done.

The benefits would be self-evident – for as much good work as WiGH is already doing, it has plenty of further ambitions which would be spurred on by legal status and the funding opportunities that come with it.

Ultimately, making women welcome in the hydrogen space benefits the sector as a whole. Excluding half the population from the workforce of a sector in dire need of skilled staff is a fool's errand, which we all know in principle but sometimes fail to act on. WiGH is there to ensure we do not fail here. Companies that open up to women will see their hiring challenges made easier.

“High-skilled people will want to work for you if you give them a sense of purpose and opportunity. And green hydrogen can do that, we're building the future,” said Kathrin.



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PROMINENT HYDROGEN PEOPLE

Anke Gabriele Rehlinger

In each issue of the Hydrogen Europe Quarterly, we will interview a prominent person in the hydrogen sector to talk about their involvement and interest in hydrogen, and the key issues that concern them. For this issue, we spoke to Anke Gabriele Rehlinger, Minister-President of the German state of Saarland.

Minister Rehlinger, what first brought your attention to hydrogen? How long until then did you see it as a viable solution to our environmental crises?

Hydrogen is the key technological opportunity to produce carbon-neutral steel in the future. There are many thousands of people working in the steel industry in Saarland. This transformation will only succeed in parallel with the success of the hydrogen ramp-up programme. Seven or eight years ago, as Minister for Economic Affairs, I began to explore Saarland's possibilities in this area. Hydrogen is the challenge to industrial policy of this decade.

How optimistic are you that hydrogen can be a success in Saarland, Germany, and Europe? Why?

Hydrogen is not the solution to all the problems, but it promises a realistic future for a whole range of applications. The steel industry has reached its decisions on investment and, as a result, created a huge demand for hydrogen. This demand almost automatically means that infrastructure and producers will follow. Saarland will become an important hub for hydrogen value chains also because we are thinking beyond borders in the direction of France and the Benelux countries.

In your opinion, how can hydrogen benefit Saarland?

We see an enormous scope of applications in the steel industry, but also in connection with fuel cells in the mobility sector, for example, through the company Bosch in Saarland. Hydrogen is a technological update on the way to the industry of the future.

What are the key challenges and opportunities for the local hydrogen sector in Saarland?

Tackling production, pipelines and other infrastructure, as well as the urgently required massive expansion of renewable energy sources in the shortest possible time, is a considerable challenge.



How much do you feel supported by the region and the federal government when it comes to promoting hydrogen?

The Federal Government's hydrogen strategy is a crucial step. However, there is still more to do to think beyond borders on a European scale. Long ago, the European Union developed from the 'European Coal and Steel Community', virtually a Saarland narrative. Today, we have to rethink the EU as the European community for hydrogen and renewable energy and, once again, Saarland could take centre stage.

What are the most urgent "needs" for the hydrogen economy right now?

We need a national and, then, also a European hydrogen transport network, the pipelines now being the most important aspect. In order to achieve this we must not allow the issue of nuclear power use to obstruct the expansion of the infrastructure in the long term.

Where do you see hydrogen in 10 years time?

In diverse applications in Germany and Europe: In the process, hydrogen should have contributed to securing tens of thousands of existing jobs in the industry and, at the same time, creating new ones.

Member spotlight:

Cummins Inc

As part of The Hydrogen Europe Quarterly, each issue our member spotlight covers one of Hydrogen Europe's members and its activities and ambitions in hydrogen. With more than 70 years of experience in the sector, US multinational Cummins is on the cutting edge of hydrogen innovation. We sat down with two leaders of its Accelera by Cummins brand: Piet Berens, Accelera's Managing Director for Electrolysers in EMEA/APAC, and Denis Thomas, Accelera's Business Development and Marketing Director for Electrolysers in EMEA/APAC, to discuss its current outlook and ambitions for the future.



Cummins Inc. has been a leader in the design and manufacture of engine and power generation systems for more than a century. The multinational company, originally founded in Indiana, USA, to develop diesel engines, has managed to maintain its position in a crowded, dynamic, and competitive market by keeping its eyes peeled and its ears tuned to the next big opportunity to innovate.

Enter hydrogen. While the company is no stranger to the molecule, having begun developing fuel cell and internal combustion engines (ICE) with hydrogen, it has seriously ramped up its capabilities in recent years.

The 2019 acquisition of Hydrogenics, a fuel cell and hydrogen production technologies manufacturer, was followed by the participation in NPROXX, a joint venture with ETC focused on hydrogen

storage tanks, in 2020. Finally, the launch in March this year of Accelera by Cummins, opened up new opportunities in fuel cells, batteries, e-axes, traction systems and electrolysers as the company worked towards its 'Destination Zero' strategy, a commitment to transition towards zero emissions in its products and processes. It is in fact more than just producing zero emissions engines, but about decarbonising the entire value chain from raw material extraction to the point of use.

"The acquisition of Hydrogenics accelerated our ability to further innovate and scale across a range of commercial markets, including mobility, transport, heavy industries, chemicals and renewables," explained Piet Berens, managing director of hydrogen at Accelera.

"The acquisition of Hydrogenics accelerated our ability to further innovate and scale across a range of commercial markets, including mobility, transport, heavy industries, chemicals and renewables," explained Piet Berens, managing director of hydrogen at Accelera.

The freedom of the consumer or customer to choose the right technology is a principle that Cummins holds dear, and which it applies to its strategy. For instance, in mobility, Berens believes that hydrogen is a superior application in trucks than in passenger cars, while when it comes to feedstocks there will be a range of applications for hydrogen – or possibly ammonia, or methanol. At the end of the day, Cummins trusts its customers to choose the right solutions for themselves depending on their criteria.

Unsurprisingly, given the regions of highest momentum in the hydrogen sector, Cummins recently identified the EU, North America, and China as their regions of priority. Places where they could see tangible signs of progress in the electrolyser markets and where they feel comfortable investing into manufacturing capabilities.

"We want to manufacture locally, close to our markets and customers. There is a willingness in these regions to have local manufacturers to create jobs," said Denis Thomas, Business Development and Marketing Director for electrolysers in EMEA/APAC at Accelera.

While acknowledging the frustrations of the saga in Europe concerning the Renewable Energy Directives (RED) and the Delegated Acts (DA), Thomas is pleased to see projects finally moving towards much needed final investment decisions.

"Fortunately, now RED compromise agreement is out and enforced and brings clarity to investors into those projects," he said.

That said, the EU still has some catching up to do in order to regain its position atop the pile – with Thomas highlighting the speed at which projects in the US are moving compared to on the other side of the Atlantic. The Biden administration's Inflation Reduction Act is largely to thank.

Last year, Cummins was awarded the contract to supply a 25MW electrolyser to a subsidiary of Florida-based NextEra Energy's green hydrogen plant while, in Canada, it is providing a 90MW electrolyser to Varennes Carbon Recycling. These recent successes, and the general market outlook in North America, are big reasons why Cummins

is converting one of its manufacturing sites in Fridley, Minnesota to become an electrolyser manufacturing site.

But it is of course not all glum news for Europe – the company is also investing into a Belgian production facility and is finalising construction of another in Spain, targeted for operations in January next year.

"The challenge we face as a global player is to have a foot in the door in local things," said Berens. "It's clear that this challenge is being faced head-on with concrete plans in key regions coming to fruition."



The challenge we face as a global player is to have a foot in the door in local things, it's clear that this challenge is being faced head-on with concrete plans in key regions coming to fruition

However, there are macro-level challenges that are still looming. Success for manufacturers like Cummins will depend in many ways on the global uptake of hydrogen and the timely upscaling of capacity and demand – which will require a level of coordination between public and private, national and supranational, arguably unseen before now.

"The main challenge is the coordination of different activities along the value chain. We are preparing manufacturing plants on a basis of projects that often get delayed, this is complex to manage," said Thomas.

"The upscaling factor is huge and hasn't really started yet," Berens surmised.



Piet Berens

Managing Director, Hydrogen Technologies



Upskilling the workforce

In-keeping with the theme of this edition of the Hydrogen Europe Quarterly, the issue of up and re-skilling a hydrogen workforce is also on the mind of Berens and Thomas.

“Three years ago, our electrolyser business counted 100 people. Now we are around 500,” explained Berens.

This sustained and impressive growth inevitably presents a need for a sophisticated and concerted recruitment strategy.

“It’s a challenge to find the right talent and to manage our growth. There aren’t enough skills on the market for some functions,” shared Thomas,

but the company is confident in its ability to both attract the limited number of skilled staff available as well as to train up new ones.

“We are an attractive employer with a clear purpose, so we have been able to get a lot of people in,” said Berens.

“We’ve already developed internal training for cross-sector recruits. As those trainings are not available on the market, we decided to set them up ourselves,” added Thomas.

Despite challenges and uncertainty when navigating the new world of hydrogen, both interviewees were confident and bullish on the future of the market and are demonstrably well-placed to not only succeed but also lead the hydrogen revolution.

“What is exciting is seeing the consensus now that hydrogen will play a key role in the energy transition. It’s not a question anymore about whether we will need hydrogen but about how to deploy it fast. Everyone agrees we need it,” said Thomas.

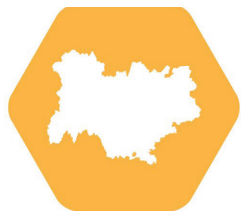
With strong levels of the type of coordination mentioned before, there is every chance of a bright future for Cummins’ hydrogen division and the market in general.

What advice would Thomas give legislators at this crucial time? It’s a familiar – but important – refrain: “Manage well the national level. The EU law is all well and good, but member states must implement it in a simple way and avoid imposing additional complex procedures and red tape.”



Denis Thomas

Business Development and Marketing Director,
EMEA/APAC



REGIONAL MEMBER SPOTLIGHT: Auvergne-Rhône-Alpes

For each issue of the Hydrogen Europe Quarterly, we speak to an EU region striving to position itself as key hydrogen contributors. For this issue, we spoke to Thierry Kovacs, Vice-President of the Auvergne-Rhône-Alpes Region, responsible for environment and ecology.

1. Thierry, can you tell us about the beginnings of hydrogen in the Auvergne-Rhône-Alpes region?

Auvergne-Rhône-Alpes has one of the highest concentrations of hydrogen industry players across the entire value chain (production, storage, transport, use/distribution). As such, the region has always believed in this vector as a way of combating air pollution and decarbonising its territory. We have a number of projects in the pipeline, including Symbio, ATAWAY, HRS and McPhy for hydrogen distribution stations, Storengy and its Hypster project for massive H2 storage in salt caverns, GCK and its retrofit solution for buses and snow groomers, and many more. At the last Hyvolution trade show at Porte de Versailles, Auvergne-Rhône-Alpes had the largest number of exhibiting companies (50 out of 280 companies, excluding Ile de France).

In Auvergne-Rhône-Alpes, we believe that the regions have an important role to play insofar as infrastructure and applications need to be deployed simultaneously to accelerate the market, with the most mature solutions focusing on mobility applications. When the government launches the price compensation scheme, the Region will take action to create favourable conditions for the industry's transition to low-carbon hydrogen, and could become involved in or support major projects in response to the calls for tenders that the government will launch for electrolyzers above 100 MW.

2. What does hydrogen bring to the region? How can it benefit from the technology?

The national and international development of hydrogen will benefit all companies in the region in terms of economic development, job creation and the influence of the regional economy. The industrial nature of most of these companies benefits from the region's policy of relocating its industrial base (already the leading industrial region in France). This development is already taking shape with the construction of major

production sites for Symbio, HRS, McPhy and ATAWAY, and the conquest of foreign markets such as Spain for HRS and ATAWAY.

3. What examples of hydrogen projects already exist in the Region?

The "emblematic" project is undoubtedly the H2 Zero Emission Valley (ZEV) mobility project, which came into being in 2018 as a result of cooperation between the Region, Engie and Michelin, and which secured support from ADEME in 2020 to build 18 stations powered by locally produced, carbon-free H2 and to help with the acquisition of more than 400 H2 vehicles (light or van-type) for professionals in the region. The project is making good progress, with 5 stations expected to be operational by the end of the year and more than 300 commitments to purchase vehicles. The 4 hydrogen cars in the Tour de France caravan demonstrated that H2 mobility in Auvergne-Rhône-Alpes is already possible.

Among the industrial projects already mentioned, we should mention VICAT's HYNOMI project to decarbonise its Montalieu cement plant in cooperation with HYNamics (an EDF subsidiary):



Thierry Kovacs

Vice-President of the Auvergne-Rhône-Alpes Region

The Hynovi project aims to capture 40% of the CO₂ emitted by the Vicat cement plant in Montalieu-Vercieu (38). The carbon produced by the plant will be recovered and combined with Hynamics' low-carbon hydrogen to produce carbon-free methanol.

The stakes are high: in ten years, global methanol consumption has doubled and is set to grow steadily between now and 2050, to meet the new needs of mobility and low-carbon chemistry.

Thanks to the installation of an electrolyser with a capacity of 330 MW by 2025 on the cement plant site, the capture of CO₂ emissions on leaving the kiln and the use of oxygen, VICAT expects to produce more than 200,000 tonnes of methanol per year, i.e. a quarter of France's total consumption.

4. What are some of the main challenges to scaling up hydrogen?

The main challenge is undoubtedly the cost of producing decarbonised or low-carbon hydrogen. Today, 95% of hydrogen production is carbon-based, and mass production has brought the price down to a few euros per kilo. We need to make the production of low-carbon H₂ competitive by amassing it, amassing its uses, and storing it in large quantities. Another related challenge is to develop the market for hydrogen vehicles at affordable prices – manufacturers need to get their act together!

5. Where do you see the hydrogen sector in 10 years' time? In the context of the Region? In the national context?

Auvergne-Rhône-Alpes must maintain its leadership and support its leading companies and their suppliers. What we are doing in Auvergne-Rhône-Alpes is:

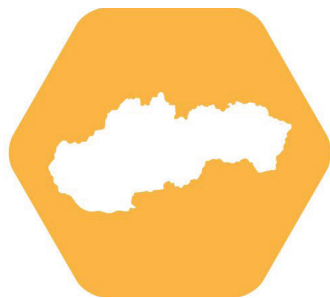
↑ Developing local ecosystems for mobility and industrial uses.

↑ The ZEV programme: 400 to 800kg/d stations to achieve economic equilibrium and for light and heavy mobility, H₂ production by electrolysis of water by pooling uses with 3 production sites, 1 per economic area.

↑ Developing mountain ecosystems, with a view to decarbonising ski resorts, an economic and tourism issue. Snowploughs, buses, etc.

This strategy will enable companies in the region across the value chain to develop their skills in this size of equipment, to prepare for future markets that will involve very large pieces of equipment.





NATIONAL MEMBER SPOTLIGHT:

Slovak National Hydrogen Association

For each issue of the Hydrogen Europe Quarterly, we will speak to national hydrogen associations of countries focused on becoming major contributors to the global hydrogen market. For this issue, we spoke to Ján Weiterschütz and Peter Hegedus from the National Hydrogen Association of Slovakia, NVAS.

Ján Weiterschütz, head of NVAS' executive committee, and Peter Hegedus, an executive committee member, are proud to present a positive and ambitious vision for hydrogen in Slovakia.

The two of them were involved from the very beginning in setting up NVAS as a response to the growing momentum of the hydrogen sector in Europe and the belief that Slovakia could not be left behind.

"All around Europe we saw that hydrogen was everywhere, and most of them already had a hydrogen association," explained Peter.

Both Peter and Ján had cut their teeth in the renewables trade, planning and developing wind farms in Slovakia and Czechia. They were keenly aware of the grid restriction and grid capacity issues that came with renewable energy and saw in the resulting discussions that hydrogen provided a solution to many of these issues.

In 2018, they got together and had set up the beginnings of Slovakia's first hydrogen association "in a matter of weeks". However, it wasn't entirely smooth sailing.

"It wasn't easy due to the political situation at the time, as the ministry wasn't a big fan of renewables or hydrogen. The first meeting looked like knocking on the door and nobody answering," said Peter. Since then, however, it has changed "dramatically" with a lot more widespread support for hydrogen.

In 2020, a new economy minister, Richard Sulik, was appointed. Initially a sceptic, he was convinced over the course of his two- and a-half year term as to the benefits of hydrogen and helped NVAS with its promotion, including making a public declaration that hydrogen is the future. He also oversaw the beginning of the development of Slovakia's hydrogen mandate.

Slovakia is a high-skilled economy with a substantial industrial and manufacturing base. Manufacturing, in fact, provides a quarter of all jobs in the country, with the automotive industry in particular often called the backbone of the Slovak economy, as one of the largest auto manufacturers in Europe. Volkswagen, Kia, Peugeot, Range Rover, and Rolls Royce all have manufacturing sites in the country.



Ján Weiterschütz
Head of NVAS' executive committee



Peter Hegedus
Executive committee member

As such, there is plenty of scope to use green hydrogen here and now, without having to create demand. “First and foremost, there is huge potential to replace our current grey hydrogen with green and blue,” said Jan, without hesitation, and it’s easy to see why.

Its chemicals industry consumes 200,000 tonnes per year, while its steel sector is responsible for 13.9% of the country’s total CO2 emissions. Refineries are exempt from hydrogen targets, but a move towards ammonia is planned, which should help.

Second is transport. Slovakia is one of a handful of countries with CAPEX subsidies for the construction of hydrogen refuelling stations. As mentioned above, it has a prominent auto manufacturing sector and mobility – following the passing of the EU’s Alternative Fuels Infrastructure Regulation (AFIR) – is set to be one of the major hydrogen sectors.

Of course, as a landlocked country with relatively low renewable energy resources, a lot of this hydrogen will need to be imported. But there is a solution for this. Slovakia has about half a dozen gas pipelines passing through its borders and conversion plans are already underway for at least one of these to be converted to hydrogen.

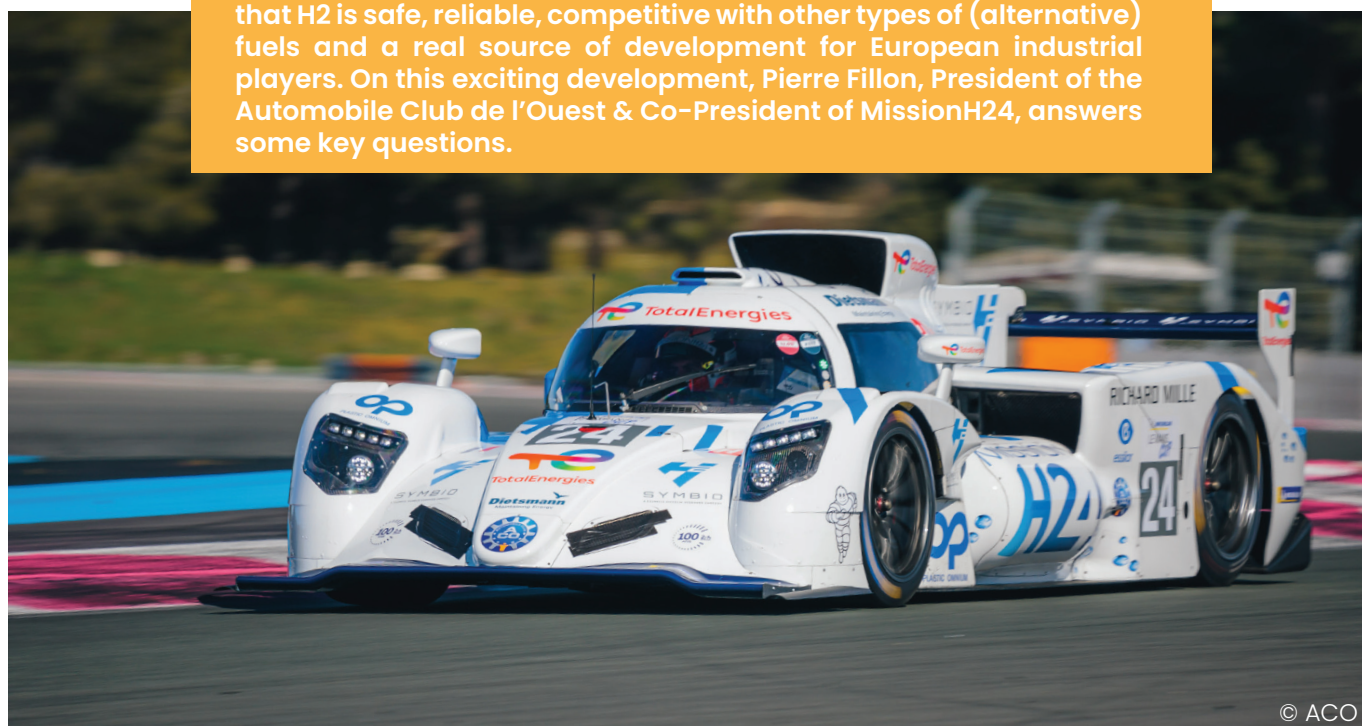
These pipelines also offer opportunities for the future. “We can play an important role in the transport of hydrogen from Ukraine once the war is over,” said Peter.

“With the import of huge amounts of hydrogen, industry in Slovakia can change – hard to abate sectors like refineries, fertilisers, ammonia, steel. If we can do that, then other hydrogen economies will develop rapidly,” he added.



How will the 24 Hours of Le Mans foster and accelerate hydrogen's deployment?

Launched in 2018 by the Automobile Club de l'Ouest and GreenGT, MissionH24 aims to have hydrogen racing vehicles compete against conventional combustion engines vehicles. The main objective is to popularize hydrogen decarbonized mobility, while demonstrating that H2 is safe, reliable, competitive with other types of (alternative) fuels and a real source of development for European industrial players. On this exciting development, Pierre Fillon, President of the Automobile Club de l'Ouest & Co-President of MissionH24, answers some key questions.



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There is a direct link between motorsport and mobility. In June 2023, we celebrated the 100th anniversary of the 24 Hours of Le Mans. 100 years of competition, 100 years of innovation applied to mobility for all. Since 1923, Le Mans has always been a technological laboratory, in tune with the economic, social, and environmental dynamics.

Here are just a few examples of technologies tested at Le Mans that are now used daily: road surfacing, fog lights, front-wheel drive, disc brakes, etc. Fifteen years ago, vehicle hybridization was also developed at the 24 Hours of Le Mans and in the FIA World Endurance Championship to reduce energy consumption. Today, in car dealerships, hybridisation is commonplace.

Nowadays, whilst the energy transition is paramount, the 24 Hours of Le Mans is committed to zero-emission competition and to the search for new and essential sustainable energies. Thanks to MissionH24, we are aiming to create a category dedicated to hydrogen prototypes (fuel cell or hydrogen-powered internal combustion engine). These prototypes are expected to compete for victory against vehicles equipped with conventional combustion engines. The target date is 2026-2027: the goal is to deploy hydrogen on racing tracks and then on roads, or even on water and in the air. Indeed, we are convinced that hydrogen can be an adequate solution for heavy and public transport, from trains, to boats, to planes.

But 2026 is tomorrow; will we make it in time? Well, in 2018, when we launched MissionH24, we were pioneers because hydrogen had never been used in competitions of that scale before. We had to create everything from scratch to launch our electric hydrogen prototype (LMPH2G) on the track in the endurance racing series Michelin Le Mans Cup.

Safety, sports regulations, hydrogen storage and production, refuelling, mobile hydrogen stations, tank, etc., everything had to be created, engineered, and tested in demanding field conditions.

To achieve our goals, we are working with our highly committed partners: TotalEnergies, Michelin, Symbio, Plastic Omnium, Richard Mille, Dietsmann & Essilor.

In 2022, the electric hydrogen prototype "H24", which succeeds to the LMPH2G, took part in 4 races, reaching the finish line each time. A real prowess for a new technology like this one!

The hydrogen competition is being met with a lot of curiosity and sometimes unexpected interest. A dozen automotive brands have shown interest in entering the hydrogen car race. We attracting equipment manufacturers who want to test their

technology under the extreme conditions of endurance racing.

We are also being approached by engineering schools to share our experience. We have notably built a privileged relationship with the University of Le Mans, which has several research laboratories devoted to hydrogen.

In the audience, many young spectators looking for careers in the energy transition sector are asking questions about hydrogen-related academic training. Our hydrogen refuelling station, located close to the Circuit to supply the city's buses and soon, garbage trucks, is regularly visited by people of all ages.

Last but not least, MissionH24 drew the attention of Ms. Mariya Gabriel, then European Commissioner for Innovation, Research, Culture, Education and Youth.

A few years ago, some expressed doubts about hydrogen. Now, it has turned into a hot topic of interest for manufacturers, industrial companies, energy suppliers, road hauliers and mobility users of all shapes and sizes. To deploy hydrogen, technology and professional training are key: motor racing and the 24 Hours of Le Mans will help to develop both!



Pierre Fillon

President of the Automobile Club de l'Ouest

Renewable Energy Directive III adoption: major milestone for the renewable H2 industry

REDIII, one of the last outstanding files in the Commission's mammoth Fit for 55 climate package, aims to bring the share of renewables in the bloc's overall energy mix to 42.5 percent by 2030. It is also absolutely crucial for the hydrogen nascent value chain as it sets concrete targets for renewable hydrogen in the industry and transport sector.

After several weeks of stalled talks on the Renewable Energy Directive, on June 16, EU ambassadors agreed to new rules boosting green energy. The deal was delayed by a French-led coalition seeking carve-outs in the text including a greater role for nuclear energy – against the will of nuclear-skeptic countries including Luxembourg, Austria and Germany. Now, the revised REDIII aims to help implement the ambitions set up in RePowerEU, with specific targets the EU institutions agreed on:

Industry:

42% of H2 used by industry must be RFNBO by 2030.

60% by 2035.

Transport:

an aggregate quota of 5.5% of energy in the transport sector needing to be met from advanced biofuels or RFNBOs by 2030.

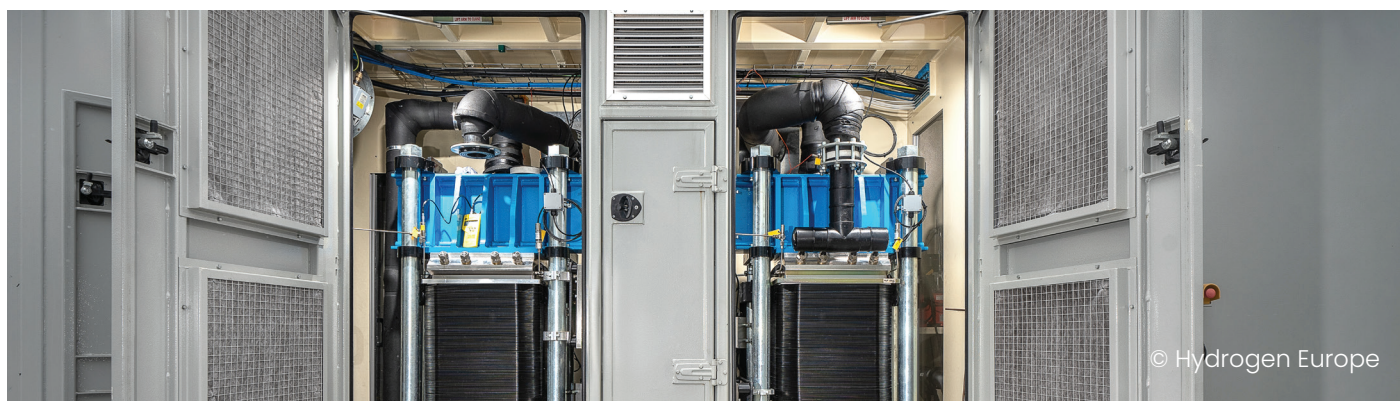
a sub-quota reserved for RFNBOs of 1% of energy in the transport sector.

The hydrogen industry welcomed the agreement with palpable relief. While the targets are far from

the ambitions set in RePowerEU, the market badly needs a stable and predictable legal framework with clear obligations (and financial support) for the offtakers. Still, three issues could significantly hamper both the level of ambition of the new industry target as well as the implementation of measures in Member States:

First, the ultimate level of the target (42%) might in the end be diluted for two set of reasons: i) general construction of the target and ii) ammonia specific measures. Indeed, the agreement foresees an exemption stipulated in Article 22b, allowing countries to reduce their industry renewable hydrogen target by 20% (so an effective 33.5% RFNBO target in industry), if the countries can comply with a number of criteria (namely, to be on track to meet the 2030 renewable target and prove that not more than 30% of the hydrogen is produced with unabated fossil fuels).

Moreover, the way the target has been formulated means it could eventually be met by importing all the final products (ammonia, methanol) from outside the EU, even if they are fossil-based, as the efforts required are based on the hydrogen demand of the particular country (if the ammonia is produced abroad, there is no hydrogen consumption and thus no need to make it green).



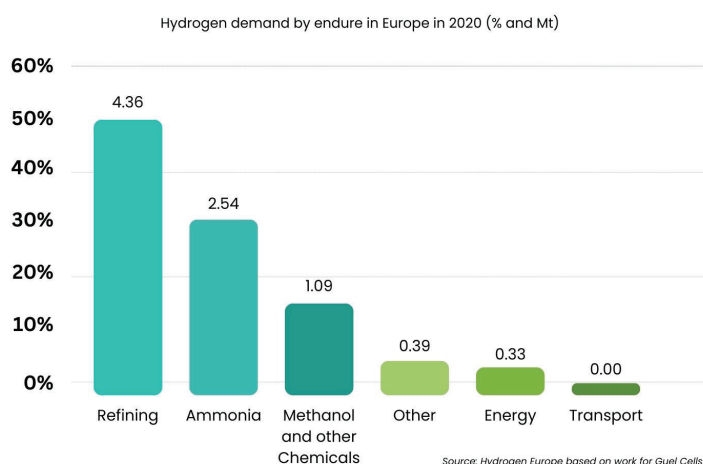
Thirdly, the existing Annex III of the REDIII does not allow for accounting imported green ammonia towards the numerator of the industry target. The only benefit of importing green ammonia (instead of domestic production) would be to reduce the denominator (as less hydrogen would now be used domestically to produce it) and would reduce the target proportionally to the share of imported ammonia. Yet, the target remains 42% x whatever hydrogen is still used for domestic ammonia production. The same effect would be obtained if one would simply import grey ammonia. In comparison, imported green methanol (instead of domestically produced), would simultaneously contribute towards the

numerator (methanol is mentioned in the ANNEX III so it is possible to calculate its calorific value) AND reduce the denominator (less hydrogen is now consumed domestically). If not sorted out, this will discriminate renewable ammonia imports against other imported carriers (e.g, methanol).

This is particularly problematic as 25% of hydrogen demand in the EU in 2020 corresponded to ammonia production needs. The binding industry RFNBO target could lead to approximately 1Mton of renewable hydrogen demand for the production of renewable ammonia, representing 2/3 of the overall industry target.

Europe's Hydrogen Demand per Sector (2020)

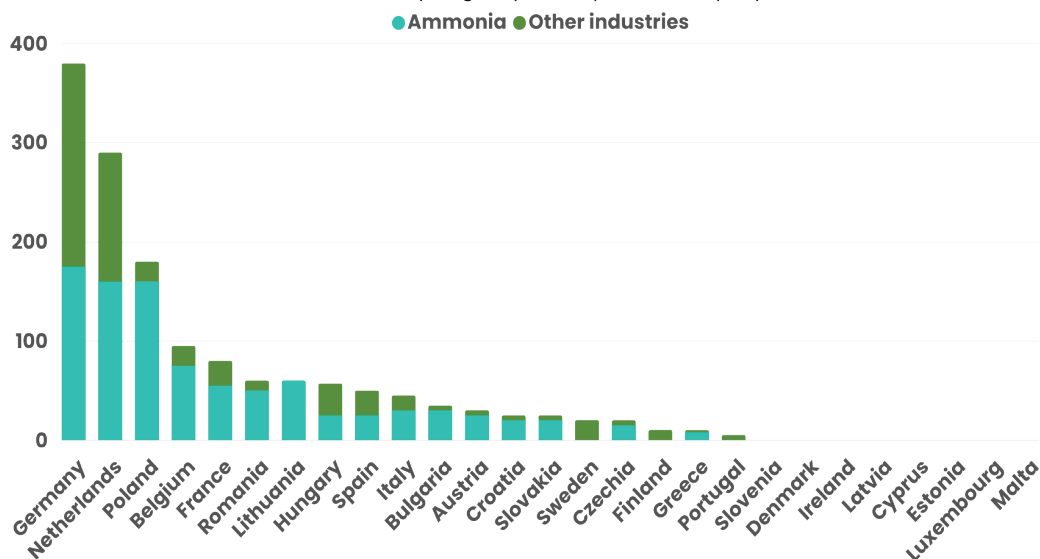
50% of 2020 European Hydrogen demand, 8.6Mt, was in the refining sector



Largest demand of H₂ for ammonia production would concentrate in Germany, the Netherlands, Poland, Belgium, France, Romania and Lithuania (see next figure).

Breakdown of the industry target for ammonia per country

RED 2030 industry target by country (in kt of H₂ per year)



However, the exact consequences of the issues identified above are yet to be clarified, as their exact impact will depend on national circumstances (that is the way Member States decide to operationalize obligations to meet the target). As of today, we are faced with several major uncertainties regarding the way Member States will transpose REDIII:

- To which extent will the European Commission allow to deduct ammonia plants (that are planning CCS investments) from the denominators to meet the target?

- How exactly will the issue of an incomplete Annex III be addressed? Our intelligence indicated the European Commission is likely to come with a specific Delegated Act to mend the omission, but the exact form, content and date release are not yet known.

- More generally, it is also unclear which method MS will use to ensure the industry target is met:

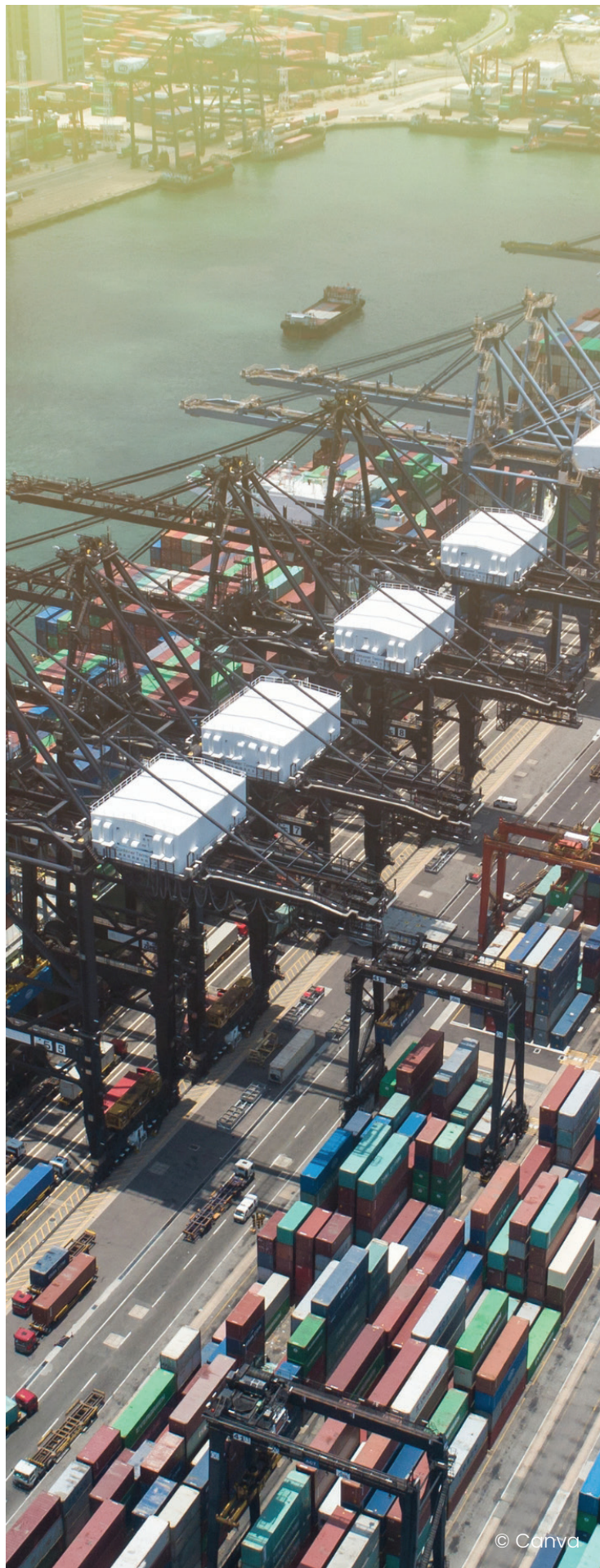
- Will all industry players have to comply with it, even if their hydrogen demand has been deducted from the target denominator?

- Will MS set a scheme of certificates so that obligations can be met with credits (interchangeable among companies)? If so, will these credits be applicable across borders or only within a Member State?

Hydrogen Europe will continue to closely monitor the developments at both EU and national levels regarding these issues and inform its members on the progress made.

Kamila Waciega

Energy Infrastructure Director, Hydrogen Europe



Renewable Energy Directive III Delegated Acts

The Delegated Acts on additionality have been on top on the energy policy agenda in Europe for the last three years. They are a fundamental piece on the hydrogen puzzle, as they define which type of hydrogen and hydrogen derived fuels are compliant with the Renewable energy Directive binding obligations for industry and transport (which is expected to drive most of the demand for clean hydrogen in Europe).



First proposed with RED2, the delegated acts were originally intended to set sustainability criteria for synthetic fuels in the transport sector; however, the revised RED3 in 2021 upped the stakes by imposing demand obligations on renewable fuels of non-biological origin (RFNBO) in industrial sectors. And the attention on their design from the international community became even more pronounced back in 2022 when the European Commission set the very ambitious target of 20 million tons of renewable hydrogen under the REPowerEU communication (10 of which would need to be imported).

Market size

After very hard negotiations between the Parliament and the Council and also within Member States, a final agreement on the RED3 was adopted in June: the RFNBO targets will be binding for both industry and transport sectors but the target on transport (5.5%) is to be achieved jointly with advance biofuels, thus reducing the incentive to invest in synthetic fuels and presenting a much smaller market than anticipated. Fuel suppliers have to guarantee that

at least 1% of the mix consists of RFNBO. This is equivalent to the amounts anticipated to be needed for satisfying the binding quotas in the aviation and maritime sectors (through their respective regulations ReFuelEU Aviation and FuelEU Maritime). The lion's share of demand, at least until 2030, is anticipated to come from implementation of the industry target, where at least 42% of the hydrogen consumed in the EU should be RFNBO.

There are many more forms and colours of clean and sustainable hydrogen than just RFNBOs. In fact, governments are allowed to provide state aid to both renewable and low-carbon hydrogen (including in principle also bio-based hydrogen, nuclear or fossil based with CCS). However, the European Commission has recently announced that the European Hydrogen Bank, funded with the revenue of the ETS through the Innovation Fund, will only support RFNBO projects, clearly stating the priority and sending a very strong signal to the market.

Final rules

So we can now all understand the importance of the definitions in the two Delegated Acts. While the definition of “additional” was not much challenged by industry, the main discussions focused around the temporal and geographical correlation, and for how long a transitional period should apply.

Talks around the main design elements slowly faded in February/March, when the final proposal was sent to Parliament and Council for the final green light. Both Delegated Acts have now been formally adopted by the European Commission and endorsed by the European Parliament and Council. They came into force on 10th July.

Implementation phase

Since March, the discussions have shifted onto the implementation phase. As the rules are now final, companies have started assessing and evaluating in depth how to legally comply with them in the most competitive way. And this is when a storm of clarifying questions emerged and hit Hydrogen Europe, the European Commission and other organisations. Could I produce different batches of hydrogen, some RFNBO, some low carbon? Can I produce synthetic fuels and allocate different emissions among the various fuel outputs? How do I exactly allocate the emission? If a country meets the 90% share of renewable electricity, no additionality is required; but what happens if the country falls behind the 90%? Are the CO₂ emissions from municipal solid waste incineration eligible? What constitutes an effective carbon pricing mechanism?

These and many more complex questions were raised. Hydrogen Europe published an Impact assessment report back in March providing our major interpretations of the rules, which is still very much valid and a must-read for those trying to learn more about the topic. However, these are not official clarifications, and the industry requested the European Commission to come up with a guidance document to clear up any uncertainty regarding the new rules. Hydrogen Europe shared a document with over 100 questions and proposed answers to inform the European

Commission about the most common concerns. The EC finally published a Q&A document 31st July. The document has been presented as a living one, meaning that it will undergo regular reviews. Some of the key questions remain unanswered but this is very much needed and welcome work by the EC.

Certification

Understanding the rules is not enough for project developers. In order to comply with the RED3, RFNBO production projects will need to be certified by a recognised voluntary certification scheme (following a similar approach as for biofuels and bioenergy markets under the RED). Such schemes need to be approved by the European Commission. As of August, no scheme is yet recognised for the certification of RFNBO, further delaying the implementation of projects and in many cases, delaying a possible investment decision. Hydrogen Europe joined other organisations in a public statement back in July to call for a speedy approval process along with a request to have further legal clarifications.

On of those future voluntary schemes will likely be CertifHy, which has been working with the wider industry since 2015 and managed to develop the first European Guarantees of Origin scheme for renewable and low carbon hydrogen. But considering some key questions remain unanswered by the European Commission, it is difficult to foresee when those organisations such as CertifHy will be able to provide a complete guidance document to fulfil their certification process, in particular with regards to imported RFNBOs.

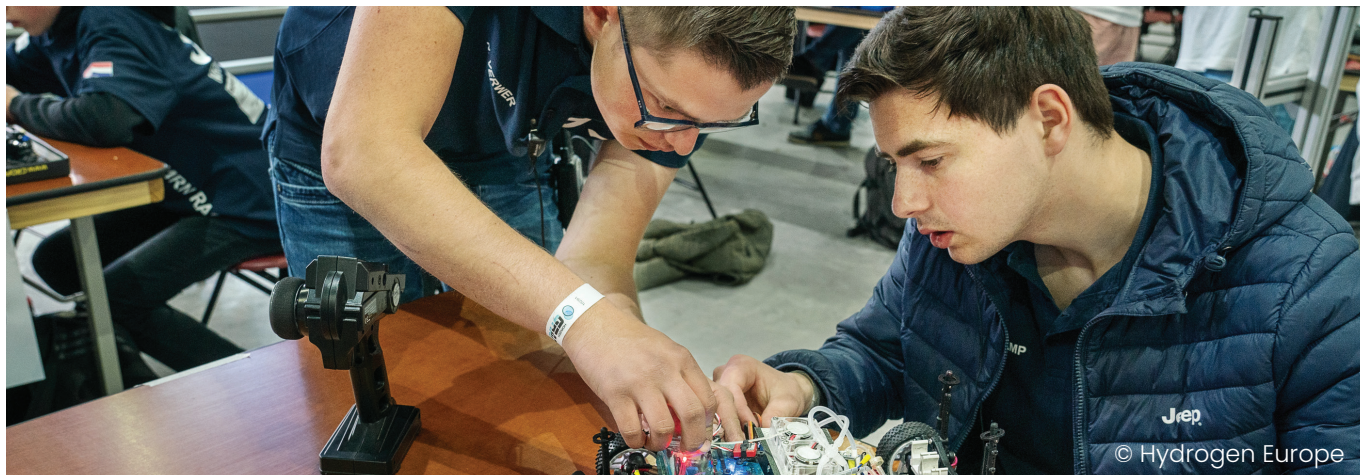
Hydrogen Europe remains committed to support the implementation process and we encourage the European Commission to consider a platform that allows a formal and regular exchange between industry, policy makers and certification organisation. Such a platform would tackle the most pressing questions and could develop pragmatic solutions to enable the acceleration of the ramp up of renewable hydrogen at a global scale.

Daniel Fraile

Chief Policy Officer, Hydrogen Europe

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Hydrogen Europe remains committed to support the implementation process and we encourage the European Commission to consider a platform that allows a formal and regular exchange between industry, policy makers and certification organisation

The Rising Demand for Hydrogen Skills in Europe: Addressing the Market's Skill Gap



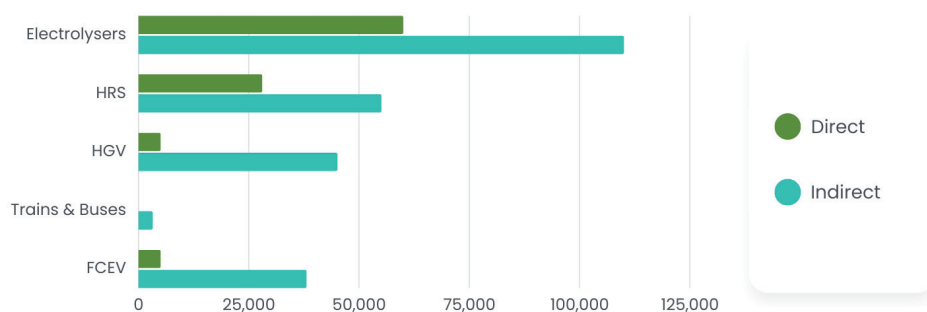
As Europe strives to achieve its ambitious climate goals and transition towards a greener future in which hydrogen plays a prominent role, the demand for hydrogen skills has skyrocketed.

The REPowerEU ambitious targets, alongside the adoption of the key “Fit for 55” files such as Alternative Fuels Infrastructure Regulation (AFIR) and the Renewable Energy Directive (RED), present a significant boost for the production, transport, distribution, and use of renewable hydrogen. With the EU’s renewed focus on strengthening the domestic manufacturing capacity for strategic sectors including hydrogen, outlined in the Net Zero Industry Act (NZIA), it becomes clear that the hydrogen sector will require substantial public and private investments in both physical infrastructure as well as, crucially, in skilled workers.

Recognising the scale of the demand for skills to drive the EU’s manufacturing push in strategic sectors, the NZIA also called for establishing Net Zero Academies for Europe tasked with developing and deploying education and training content to upskill and reskill workers. The future Hydrogen Academy, supported by the Clean Hydrogen Partnership, is expected to start with its work as of 2024.

Even before these initiatives, the Clean Hydrogen Partnership expected that the rapid development of the European hydrogen value chain will generate approximately 1 million highly skilled jobs by 2030 and up to 5.4 million by 2050. Hydrogen Europe estimates that the manufacturing of electrolyzers, hydrogen refuelling stations and fuel cell trains and vehicles alone would generate 249,000 jobs (98,000 direct and 151,000 indirect).

Estimated number of jobs created in Europe by 2030



Source: Hydrogen Skills Strategy

Understanding industry's skills needs

In this context, the **GreenSkillsforH2** project supported by the Erasmus+ programme and led by Hydrogen Europe, Hydrogen Europe Research and Karlsruhe Institute of Technology (KIT), conducted an interview campaign of relevant hydrogen stakeholders in 19 European countries representing the whole value chain to investigate, document and outline hydrogen-related jobs which are in high demand today and to anticipate those that would be need in the future.

The hydrogen sector is experiencing high demand for engineers and technicians specialising in chemical processes, industrial

engineering, health and safety, and high-voltage electricity. Project managers, capable of overseeing projects from inception to construction, are also challenging to find – largely due to the extensive experience and expertise required to handle hydrogen-related risks – and so are sales and marketing professionals, communication specialists, planners, developers, and operations and maintenance technicians.

The skills gap is not only reflected in industry. The public sector is also lacking knowledge and experience on hydrogen required for approving and authorising hydrogen projects, which hinders the timely deployment of hydrogen technologies and infrastructure.

Missing and hard to find Hydrogen related profiles

Missing ESCO Profiles	ESCO Code	Occurance in interviews
Engineering professionals (excluding electrotechnology)	214	103
Physical and engineering science technicians, drafts man, technician	311	37
Electrotechnology engineers	215	35
Sales, marketing, and public relations professionals	243	14
Project Managers	210	10
Physical and earth science professionals	211	9
Process control technicians	313	9
Finance professionals	241	5
legal professionals	261	2
Sales, marketing and development managers	122	2
Software and applications developers and analysts	251	1
Managing directors and chief executives	112	1
Total:		228

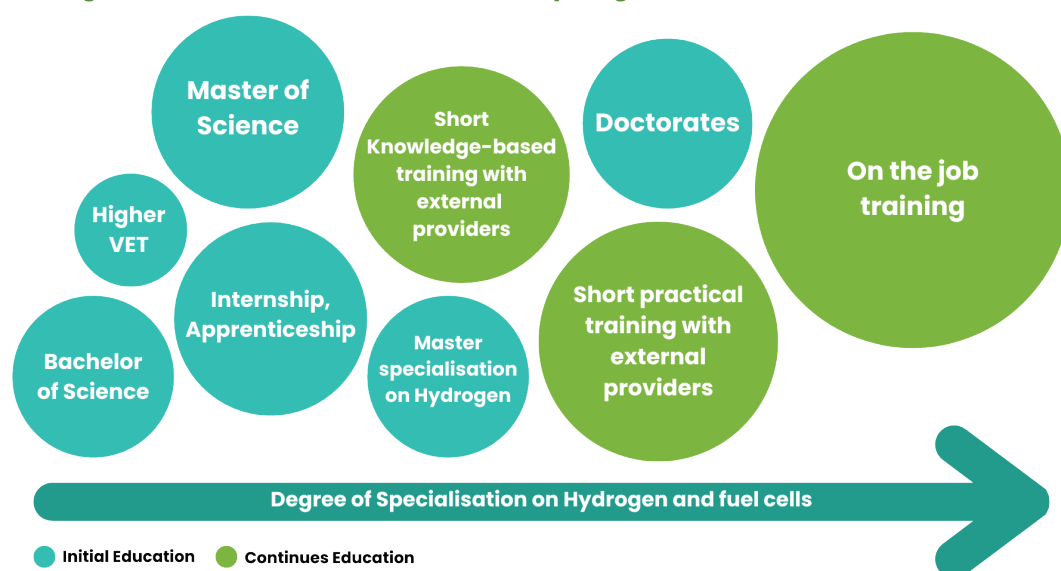
Source: Hydrogen Skills Strategy

Training and skilling programmes

As it stands, both the industry and the public sector are filling in skills gaps with on-the-job learning and short training courses delivered by external providers. However, a lack of qualified trainers and teachers, as well as costs associated with equipment and infrastructures needed to provide practical education, are emerging as major issues in rolling out training and skilling programmes. Collaboration between stakeholders – industry, regional authorities and knowledge and training

providers – at regional level fostering economies of scale and building on the expertise of various partners is proving to be a successful solution to overcome these barriers. Hydrogen Valleys have also emerged as a driving force for the development of training, as they create demand and career opportunities.

Training of Current Workers in the Field of Hydrogen



Another trend noted is the increase in the number of specialised programmes in hydrogen and fuel cells in initial education primarily at the Master's level. Modules on fuel cells and hydrogen are increasingly being introduced across degrees, highlighting the interdisciplinarity of the hydrogen sector. However, this is not yet reflected in the current composition of the hydrogen workforce as most workers employed were trained in another discipline.

Hydrogen Skills Strategy

Based on the research into the industry's skills needs and the training and skilling offers, GreenSkills4GH2 project has developed a Hydrogen Skills Strategy outlining recommendations for collective action to be done in the coming months and years to address the skills shortage. The immense task

of training and up- and reskilling of people to work in the hydrogen sector will require the active involvement of multiple stakeholders including institutions, companies, professional organisations in the hydrogen sector, other sectors affected by hydrogen advancements, as well as public authorities from local to European level.

Project such as GreenSkillsforH2 and the future Hydrogen Academy will contribute to addressing some of the recommendations outlined in the Hydrogen Skills Strategy. By gathering stakeholders at the EU level, these projects will facilitate knowledge sharing and best practices as well as providing much needed training guidance and material.

Katarina Muse

Manager for Regions and Skills, Hydrogen Europe

Six Strategic Axes for the Development of a Skilled Hydrogen Workforce



Source: Hydrogen Skills Strategy

Launch of the Skills Task Force of the International Partnership for Hydrogen and Fuel Cells in the Economy

As the hydrogen industry grows, the significance of a well-trained and skilled workforce to propel this development has become a pressing concern. At both local and national levels, initiatives are being crafted to comprehend and tackle the skills requirements for the hydrogen sector. These efforts seek to identify emerging job roles and those evolving and demanding new specialised hydrogen knowledge and skills. Once the diagnostic has been made, other activities aim to devise effective solutions and training programmes to meet these workforce needs.

In Finland, the FiTech cluster conducted a study to analyse the available hydrogen training offerings and research activities related to hydrogen. Based on this mapping, a consortium of universities was mandated to develop modules for students and professionals in the field, covering introductory topics as well as more specific ones (e.g. Catalytic processes and materials in sustainable hydrogen production). Similarly, France Hydrogène, the French national hydrogen association, published a White Paper on Skills and professions in the hydrogen industry in 2021.

Since then, initiatives like Def'Hy and Genhyo have been identifying hydrogen-related content in existing education and proposing updates to the curricula. In Belgium, the Belgian Hydrogen Council launched a mapping exercise this year to identify the current offerings and future aspirations in hydrogen education. Their aim is also to assess the skills required from the industry. Finally, at the European level, the project Green Skills for Hydrogen conducted a mapping and proposed a strategy for the EU to address industry needs and make the hydrogen sector more attractive to both workers and students. While the examples mentioned highlight the topic's relevance in Europe, the challenge of skills development to

support the deployment of a hydrogen economy is not limited to Europe but is a global concern.

Recognising the global significance of the skills development challenge, the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) has launched an international task force to address this on an international scale. Established in 2003, the IPHE is an international organisation aiming at promoting cooperation among countries in hydrogen and fuel cell research development, and fostering common codes and standards, and information sharing on infrastructure development. Its current 24 members are government representatives from partner countries, and the European Union, represented in this partnership by the European Commission. Recently, the IPHE initiated a new task force on skills with the aim of facilitating hydrogen skills development through knowledge sharing among countries. The task force is kicking off this summer and is co-chaired by representatives from Costa Rica and South Africa.

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The challenge of skills development to support the deployment of a hydrogen economy is not limited to Europe but is a global concern

The main objective of this initiative is to create a comprehensive database of hydrogen value chain skills and training, supplemented by recommendations on how to foster skills development for hydrogen, focusing on countries new to hydrogen activities. In the initial stage, participants will collaborate to establish a database structure. The expertise and experiences of partners will be leveraged to identify existing and anticipated job roles, along with the necessary skills, knowledge, and qualifications for each role.

The IPHE's database will provide a metric for each country to compare its own skills landscape with the required competencies for hydrogen project development and technology implementation throughout the value chain.

This comparative analysis will help countries identify potential skills gaps and enable targeted efforts to foster a proficient and capable workforce for hydrogen-related endeavours. It is worth noting that the available skills reservoir to draw upon will vary greatly from one country to another. Factors like previous experience of local industries working with hydrogen (e.g., petrochemical industry) or the presence of sectors sharing similar skills (e.g., oil and gas industries) provide a foundation for further development that can be applied to the hydrogen sector.

Additionally, the status of curriculum development and the required accreditation offered by organisations conducting hydrogen training will be used as inputs. The complete list of elements to be considered for inclusion in the database remains open, as discussions among participants may reveal new relevant elements. The specific metrics and output format for each element will be determined in the course of the activities. Enabling statistical data on the hydrogen workforce and hydrogen related training will be a key consideration of the task force, which is expected to run at least until August 2024.

For Europe's ambitions, ensuring that partner countries possess the necessary skills and expertise to produce hydrogen is crucial. As outlined in REPowerEU, the EU aims to import 10Mt of renewable hydrogen to Europe by 2030, which will require partner countries to step up their production of hydrogen. In light of this, Europe has a role to play in facilitating skills development and capacity building. Several research and technology organisations and universities have formed sustainable training partnerships with organisations outside the EU, to train staff from companies on specific technology segments or to disseminate hydrogen knowledge. As a member of the IPHE, the EU has expressed its commitment to actively contribute to the IPHE Skills Task Force, further enhancing international collaboration in developing hydrogen-related skills and knowledge.

Julia Cora

Project Manager, Hydrogen Europe Research (HER)



Events Overview

UPCOMING Q3–Q4 EVENTS

Workshop: What's next for alternative fuels in transport and how to best use national and EU funding for deployment of hydrogen refueling infrastructure

Tuesday, 12 September 2023

10:00 – 12:00

Online



The European Union has taken ambitious steps to address the challenges posed by climate change and reduce greenhouse gas emissions. As part of its commitment to sustainable energy solutions, the EU has prioritized the deployment of hydrogen refuelling stations to support the widespread adoption of hydrogen powered vehicles. The Alternative Fuels Infrastructure Regulation (AFIR) plays a crucial role in facilitating the establishment of these refuelling stations across the member states. Furthermore, the EU is leveraging the Alternative Fuels Infrastructure Facility (AFIF) to secure the financing required for the implementation and expansion of this vital infrastructure. The AFIF is a financial instrument established by the EU to support the deployment of alternative fuel infrastructure, including hydrogen refuelling stations. The facility aims to bridge the gap between public and private investments, providing funding to eligible projects and ensuring the implementation of AFIR's targets. It's crucial to maintain AFIF beyond 2023 and to learn more about the future opportunities of this financial instrument.

On the policy tools side, IPCEI efforts are bearing fruits for the development in several sectors in the hydrogen value chain as shown by Hy2Tech and Hy2Use, that have settled recently their governance structure, but hydrogen mobility has been tackled until now in a scattered manner. The two first IPCEI waves on Hydrogen approved have supported little in terms of infrastructure creation and volume beyond R&I and FID projects rather focused on mobility technologies. The same approach seems to prevail in relation with the Mobility wave prenotified to the European Commission in November 2022. The explanation is

that other state aid tools would be more suitable and should therefore be used for this purpose, in particular the newly adopted Global Block Exemption Regulation (GBER) and the State Aid Framework for Climate, Energy and Environment (CEEAG) which include new categories of aids for HRS and zero emission vehicles.

While this approach questions the ability of IPCEIs to implement fully integrated approaches in the mobility sector, HRS market stakeholder and OEMs are now confronted to the need to quickly seek alternative funding for the deployment of relevant infrastructure across the Member states.

One of the major leverages identified to achieve the legislative goals is the mobilisation of the RRF at national level. To this end the European Commission updated on 4th of April this year its guiding templates to assist Member States in the design of their national plans under the RRF, including for deploying HRS for road vehicles and the acquisition of zero and low-emission road vehicles^[1].

The success of deploying hydrogen refuelling stations heavily relies on collaboration between the European commission, member states, private companies, and other relevant stakeholders. Governments need to provide regulatory support, streamline permitting processes, and offer incentives to attract private investments in building and operating refuelling stations. Public-Private Partnerships (PPPs) have proven effective in implementing sustainable infrastructure projects, and the same approach can be applied to develop hydrogen refuelling stations.

[1] https://competition-policy.ec.europa.eu/state-aid/legislation/rrf-guiding-templates_en

The Hydrogen Europe Autumn Market

Wednesday, 20 September 2023
Plein Publiek BXL
Time: 18:30 – 22:00



The Hydrogen Europe Autumn Market, is the third of a series of quarterly “Hydrogen Europe’s Seasonal Markets” events that we organise through 2023.

It will take place in Brussels, Belgium, face-to-face, and invitees had the opportunity to come together with members and stakeholders of the hydrogen sector, in a great networking atmosphere set in the heart of Brussels.

H2 TALK – Fueling the Future: Developing skills for the hydrogen revolution

Thursday 21 September ,
15:00 – 16:30 CEST
Online



Hydrogen Europe is pleased to invite you to its next “Hydrogen Talk” webinar covering the topic: “Fueling the Future: Developing skills for the hydrogen revolution” Join us on Thursday, 21 September, at 15:00 CEST for this 90-minute-long webinar.

The energy transition towards sustainable solutions has put the hydrogen economy in the spotlight. However, to be successful in delivering on its decarbonisation potential, the hydrogen sector needs a skilled workforce.

The REPowerEU’s ambitious targets alongside the adoption of the key Fit for 55 files driving the demand for hydrogen, such as of Alternative Fuels Infrastructure Regulation and the Renewable Energy Directive,

present a significant boost for the production, transport, distribution, and use of renewable hydrogen. Adding on that the EU’s renewed focus on building up a domestic manufacturing capacity for strategic sectors, including hydrogen, expressed in the Net Zero Industry Act and it becomes clear that the hydrogen sector will require substantial public and private investments in both physical infrastructure as well as skilled workers.

Even before these initiatives, the rapid development of the European hydrogen value chain was anticipated* to generate approximately 1 million highly skilled jobs by 2030 and up to 5.4 million by 2050.

Skills development in the hydrogen sector is essential for Europe's energy transition and building a competitive and resilient economy. If not approached properly and urgently, it can act as a bottleneck to the scale up of the sector.

To address the current skills shortage and anticipate future needs, policymakers, industry stakeholders, and knowledge providers must collaborate to understand the scope of the issue and to develop effective education and training programmes to equip individuals with the expertise needed to support the widespread adoption and integration of hydrogen technologies in the economy.

In light of this, we invite you to join our H2 Talk on Fueling the Future: Developing skills for the hydrogen revolution where our panellist will discuss the following issues:

- Aligning supply and demand of hydrogen workers and bridging the skills gap.
- Emphasizing diversity and inclusion in the hydrogen workforce.
- Raising awareness and attractiveness of hydrogen careers.
- Developing training programmes to meet the industry needs.
- Collaboration with EU, national and regional policymakers to support training, skilling and reskilling programmes.

*(Hydrogen Roadmap Europe : A sustainable pathway for the European Energy Transition, 2019).

https://www.clean-hydrogen.europa.eu/media/publications/hydrogen-roadmap-europe-sustainable-pathway-european-energy-transition_en

H2 TALK – H2 MED: FROM VISION TO ACTION

Tuesday, 18 October 2023
15:00 – 16:30 CEST
Online



Hydrogen Europe is pleased to invite you to its next "Hydrogen Talk" webinar covering the topic: "H2 Med: from vision to action" Join us on Thursday, 19 October, at 15:00 CEST for this 90-minute-long webinar.

The project H2 Med is a key pillar of the European hydrogen backbone and of the overall vision of a competitive, liquid, pan-European hydrogen market by 2030. France, Spain, and Portugal have been committed to realizing this ambitious project, and as of January 2023, Germany has also come on board. The hydrogen pipeline located under the Mediterranean Sea would transport renewable

hydrogen, enabling its accelerated deployment in Europe and connecting the Iberian Peninsula and its considerable production and import potential to the French infrastructure and the hydrogen demand in Northern Europe. The pipeline may transport about 10% of the EU's hydrogen needs for 2030.

This webinar will provide an in-depth look at the challenges and opportunities related to this project, just weeks before the publication of the first Union list of projects of common interest for hydrogen of which the H2 Med project could be an integral part.

Energy Transition Europe 2023

13 – 14 November, 2023 London

REUTERS EVENTS™

ENERGY TRANSITION EUROPE 2023

London 13–14 November #ETE2023



Energy Transition Europe is where the continent's foremost energy, finance and government leaders unite to lay the foundations of a net zero future whilst accelerating away from market turbulence. We'll explore how stakeholders will reinvent their business models and engender growth through technology enhancement, cross-sectoral collaboration, supply chain synchronization, and rapid decarbonization. Alongside a two-day executive conference, we'll host a series of executive receptions and networking functions, in-depth roundtable and workshop sessions.

The Hydrogen Europe Winter Market

Monday, 20 November 2023,
18:30 – 22:00 CET
Brussels



The Hydrogen Europe Winter Market, is the last of a series of quarterly "Hydrogen Europe's Seasonal Markets" events that we organise through 2023.

It will take place in Brussels Expo, Belgium, as part of the Hydrogen Week.

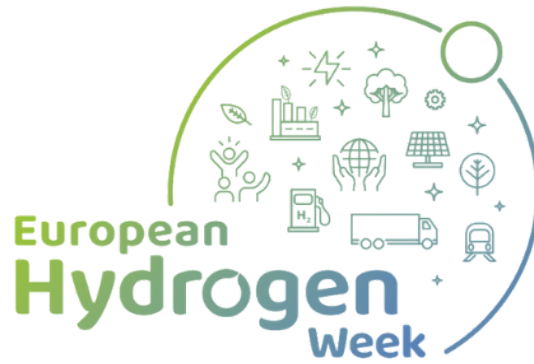
General Assembly

**Tuesday, 12 December
between 18:30 – 22:00,
Brussels, Belgium**



The Hydrogen Europe's General Assembly (GA) will take place on Tuesday, 12 December 2023.

Note: All materials related to Hydrogen Europe's General Assembly can be found in Members Only Area (MOA).



20–24 November 2023
Brussels, Belgium

www.euhydrogenweek.eu

The EU Hydrogen Week 2023 will have **multiple conference streams, over 25 sessions** and **200 expected speakers** that will deep dive into all things hydrogen – from industry trends, challenges and opportunities to innovation, new technology, and more. Participants will be able to navigate thought-provoking sessions, as well as take part in captivating and interactive demonstrations on our exhibition floor and get a taste of what the future clean energy system will look like – with plenty of time for unmatched networking with like-minded individuals.



The Programme

High-Level Policy Conference
Hall 11, Main Auditorium

B2B Forum
Hall 7, B2B Auditorium

DAY 1

MONDAY, 20.11.2023 OPENING DAY

Session 1: Hydrogen and the global challenges ahead

14:00 – 15:00

Session 1: Regulation, code & standards: A guidebook into hydrogen trade

Session 2: Storing clean hydrogen in Europe

16:00 – 17:00

Session 2: Financing the global hydrogen ecosystem

DAY 2

TUESDAY, 21.11.2023

Session 3: The Hydrogen Bank

10:00 – 11:00

Session 3: Clean Hydrogen Monitor 2023

Session 4: Scaling up electrolyzers manufacturing

12:00 – 13:00

Session 4: Sector coupling and hydrogen storage: the role of hydrogen in future energy systems

Session 5: Ensuring a resilient EU hydrogen supply chain through the Green Deal Industrial Plan

14:00 – 15:00

Session 5: Deployment of the hydrogen ecosystem: a view from EPCs

Session 6: The role of hydrogen in decarbonising road transport

16:00 – 17:00

Session 6: Start up pitched from the H2UB HYDROVERSE

DAY 3

WEDNESDAY 22.11.2023

Session 7: Hydrogen backbone: the necessary link

10:00 – 11:00

Session 7: Hydrogen for maritime

Session 8: The hydrogen import challenge: the strategic role of EU ports

12:00 – 13:00

Session 8: Hydrogen for aviation

Session 9: Driving forward EU research and innovation in hydrogen technologies

14:00 – 15:00

Session 9: Liquified hydrogen: the untapped potential?

Session 10: Synergies to increase EU funding impact and boost the hydrogen economy

16:00 – 17:00

Session 10: Hydrogen derivatives

DAY 4

THURSDAY 23.11.2023

Session 11: Rolling-out and scaling-up Hydrogen Valleys in Europe

10:00 – 11:00

Session 11: Start-up pitched from the H2UB HYDROVERSE

Session 12: Empowering citizens: building up the skills and knowledge for the new hydrogen economy

12:00 – 13:00

Session 12: Hydrogen production pathways

Session 13: Clean Hydrogen Partnership independent scientific advisory workshop part 1 – global technology trends, outlook

14:00 – 15:00

Session 13: Hydrogen for buildings and industrial heat

Session 14: Clean Hydrogen Partnership Independent scientific advisory workshop part 2 – technology

16:00 – 17:00

END: NO B2B Forum session

DAY 5

FRIDAY, 24.11.2023

TBD I Webinar: On the way to COP 28

TBD I Webinar: Emerging markets

Become an exhibitor



INCREASED VISIBILITY

Raise your organisation's visibility to a large audience of potential customers.



BRAND BUILDING

Exploit the chance to build your brand recognition and establish your business as a leader in the industry.



LEAD GENERATION

Don't miss the opportunity to generate leads by meeting interested attendees.



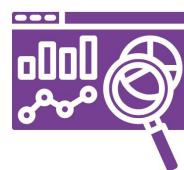
SALES

Our exhibition can provide a platform for sales, allowing organisations to showcase and sell their products or services directly to interested clients.



NETWORKING

network and building relationships with other organisations and industry professionals.



MARKET RESEARCH

Fairs can provide valuable insights into consumer preferences and industry trends, helping businesses to stay competitive and adapt to changing market conditions.

Check out how to become an exhibitor at:
euhydrogenweek.eu/become-an-exhibitor/



A warm welcome to all our new Hydrogen Europe members



ABB

ABB is a technology leader and pioneer, collaborating with customers in utilities, industry, transportation and infrastructure to write the future of industrial digitalization together.



Alba Emission Free Energy

Alba Emission Free Energy was born in 2021 to bring together all the Petronor (Repsol Group) company's decarbonization and energy transition initiatives; its areas of action being renewable hydrogen, synthetic fuels, sustainable mobility, and the circular economy; and applying a quick scalable pilots and later industrial plants strategy.



CONTACT

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Alfa Laval Technologies

Alfa Laval is a leading global provider of first-rate products in the areas of heat transfer, separation and fluid handling. Alfa Laval aims to help enhance the productivity and competitiveness of its customers in various industries throughout the world – including across the hydrogen value chain.



CONTACT

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Aliaxis Group

At Aliaxis, we design sustainable, easy to install, and innovative solutions to address the world's water challenges and accelerate the transition to clean energy. Thanks to our 15,000+ employees, our pipes and fitting systems meet our customers' most demanding needs for the building, infrastructure, industrial and agriculture sectors. Operating in over 40 countries, the Company is active through leading local brands and generated €4.3 billion revenue in 2022.



CONTACT

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Clear Corporate Finance

Clear Corporate Finance, the Data-driven Corporate Finance, Project Finance Specialist in Renewables & Scale Up Companies. Assisting our clients, offering a unique blend of Renewable projects, Corporate Finance deals, M&A and Investment opportunities to investors and financiers. Active in Europe, Asia and Australia.



CONTACT

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CNET – CENTRE FOR NEW ENERGY TECHNOLOGIES, S.A.

EDP-NEW is the R&D department of the EDP group that focuses on European funded projects across all the sectors in the electricity supply chain. Employing roughly 50 people, it's the largest company in Portugal in terms of EU R&D funding.



CONTACT

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Cryomotive GmbH

Established in October 2020, Cryomotive is a German hydrogen mobility startup located in Bavaria, Germany, focusing on developing and standardizing high-density hydrogen onboard storage and refueling technology and offering accompanying cryogenic hydrogen engineering services for automotive, shipping and aviation application.



CONTACT

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Duisburger Hafen AG

Duisburger Hafen AG (duisport) is the owner and management company of the Port of Duisburg, the largest inland port in the world. The duisport Group offers full-service packages for the port and logistics location in the areas of infra- and suprastructure including settlement management. In addition, the subsidiaries provide logistic services such as the establishment and optimization of transport and logistics chains, rail freight services, facility management, contract and packaging logistics, and the management of the port.



CONTACT

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DVGW e.V. Deutscher Verein des Gas- und Wasserfaches

The German Technical and Scientific Association for Gas and Water (DVGW) promotes safety, hygiene, and environmental standards in the gas and water sector. With 13,600+ members, it sets recognized technology rules, prioritizing climate-neutral gases like hydrogen. DVGW leads research, training, and certifications, ensuring industry-wide standards for a secure international supply. Established in 1859, DVGW is nonprofit, independent, and nationwide, operating through regional and district groups, with a central office in Bonn and branches in Berlin and Brussels.



CONTACT

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Ecolab Europe GmbH

Ecolab is a global sustainability leader offering water, hygiene and infection prevention solutions and services that protect people and the resources vital to life. Building on a century of innovation, we deliver comprehensive science-based solutions, data-driven insights and world-class service to advance food safety, maintain clean and safe environments, optimize water and energy use, and improve operational efficiencies for customers around the world.



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ERM FRANCE

ERM, the largest pure-play sustainability advisory firm globally, partners with organizations to address net zero and decarbonization goals through integrated low-carbon technology solutions. The recent acquisitions of E4tech and Element Energy have added over 20 years of expertise in the hydrogen sector to ERM's technical, environmental, and policy knowledge.



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FETSA Federation of European Tank Storage Associations AISBL

FETSA represents Europe's bulk liquid storage sector, with terminals across various locations. Over 140 companies manage 692 terminals, serving as vital connectors for sea, road, rail, and pipeline logistics. These terminals balance supply and demand for energy, chemicals, and more, ensuring essential liquids are available when needed. Strategic terminals are deemed Critical National Infrastructure, supporting industries, transport, and defense with emergency reserves.



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Gea Energia CRIO, S.L.

Company specialized in the design and construction of cryogenic installations: satellite plants for regasification of liquefied natural gas; refuelling natural gas stations; biogas and biomethane production and upgrading plants and demo pilot of new technologies for hydrogen production. Our services include design, construction, operation, maintenance, and our own design software control.



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GENVIA SAS

Genvia is a clean hydrogen technology venture created to meet the decarbonization challenge by accelerating affordable clean hydrogen production and applications at scale. The result of 15 years' research and development, Genvia's high-performance electrolyser and fuel cell systems are based on a proprietary solid oxide technology that offers improved efficiency, true reversibility and fuel versatility over competing approaches. Headquartered in Béziers, France, the company represents a unique combination of French science and global engineering, and benefits from the strength of a group of partner companies that include CEA, SLB New Energy, VINCI Construction, Vicat Group and Occitanie Region.



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Graforce GmbH

Grace force GmbH was founded in 2012 and it is based in Berlin Adlershof. We offer Power-to-X plants for generation of CO₂-free or CO₂-negative hydrogen and synthetic raw materials. We hold three patents for application of different plasma processes (high-frequency discharge, dielectric barrier discharge, coronal low-frequency discharge). Production capacities: Methane Plasmatolysis – expansion up to 50 MW/a through customers and partners.



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aramco



Aramco Overseas Company

One of the world's largest integrated energy and chemicals companies, creating value across the hydrocarbon chain, and delivering societal and economic benefits to people and communities around the globe who rely on the vital energy we supply. We are committed to playing a leading role in the energy transition. We have a responsibility to help the world achieve a net-zero economy, and our people are working hard to help solve the world's sustainability challenges.



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GÜNEY MARMARA KALKINMA AJANSI

Güney Marmara Development Agency (GMKA), under the Ministry of Industry and Technology, fosters regional collaboration between public, private sectors, and civil society. The area in Western Turkey, including Balıkesir and Çanakkale Provinces, is rich in renewable energy like wind, solar, geothermal, and biogas. Thriving machinery production supports green hydrogen potential.



CONTACT

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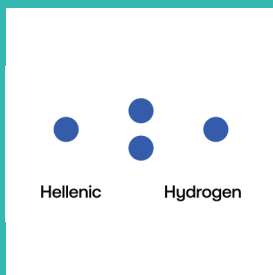
H2 Energy Esbjerg Aps

H2 Energy was established in 2014 with the vision of playing an active role in the fight against climate change. Our goal is to make hydrogen from renewable energy a mainstay of our energy systems. For this very reason, we intend to build a 1 GW hydrogen plant in Esbjerg.



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HELLENIC HYDROGEN S.A.

Hellenic Hydrogen is a Joint Venture established by Motor Oil Hellas (MOH) and Public Power Corporation (PPC), two of the leading companies in the Greek energy market, with the aim of advancing the formation of an innovative energy solution for tomorrow.

At the top of Hellenic Hydrogen's business and strategic planning is the design, development and implementation of projects that accelerate the energy transition and promote the green transformation. In this context, our company is launching renewable hydrogen production projects in Greece, utilizing the experience, know-how and potential of its shareholders in the developing platform for the production and distribution of



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HyCologne – Wasserstoff Region Rheinland e.V.

HyCologne – Wasserstoff Region Rheinland e.V. unites 50+ stakeholders in politics, industry, and research for hydrogen tech projects. Operating since 2007 in the Rhineland and beyond, it pioneered chemical industry by-product hydrogen for fuel cell buses over a decade ago. This effort positioned the Rhineland as a European leader in adopting hydrogen propulsion for public transport.



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HyET Electrolysis B.V.

HyET E-Trol is a fast-growing energy technology start-up focusing on the development of low cost, high efficiency electrolyzer systems for green hydrogen production. The two key technologies under development are high differential pressure AEM electrolyzers and high temperature proton conducting solid oxide electrolyzers.



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HYREN HIDRORENOVABLE S.L.U

Hyren, a green hydrogen platform by Rolwind (www.rolwind.com) and Matrix Renewables (www.matrixrenewables.com), specializes in producing, transporting, storing, and supplying green hydrogen, along with related engineering services. We serve various sectors: industry, mobility, storage, P2X, and export. Beyond supply, we help adapt systems for hydrogen use in customer processes. With a skilled team and over 12 GW of managed renewable energy, our mission is to create and maintain green hydrogen production, storage, and treatment systems. Our vision is to excel in hydrogen infrastructure design, construction, operation, and commercialization.



CONTACT

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Ohmium Europe, S.L.

Ohmium designs, manufactures, and deploys modular, scalable proton exchange membrane (PEM) electrolyzers that enable cost-competitive green hydrogen production. The company's suite of electrochemical products help customers achieve their sustainable energy goals for industrial, transportation, and energy projects. Headquartered in the United States, with manufacturing facilities in India and operations worldwide, Ohmium has a global green hydrogen project pipeline of more than 1.8 GW across three continents. In 2023, Ohmium raised \$250 Million in Series C financing, led by TPG Rise Climate.



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Quantron AG

Quantron AG is a platform provider and specialist in sustainable mobility for people and goods; in particular, for trucks, buses and vans with all-electric drive trains and H2 fuel cell technology. As a high-tech spin-off of the renowned Haller KG, the Augsburg/Bavaria-based company combines more than 140 years of commercial vehicle experience with the very latest emobility know-how, and positions itself globally as a partner to existing OEMs.



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Région Centre-Val de Loire

The Regional Council of Centre-Val de Loire is a public authority at the heart of the challenges of the economy, climate change, transport, and territorial solidarity. Within its territory, the region mobilizes private and public actors as well as research laboratories to create renewable hydrogen ecosystems.



CONTACT

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Region of Western Macedonia

The Region of Western Macedonia has been the core energy producing area in Greece. It is now a region in transition towards the post-lignite era and intends to become a H2 based economy, offering big investing incentives, willing to host investments in H2 production and energy storage.



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Renew Power Private Limited

ReNew Power India Private Ltd (ReNew Power), established in 2011, is one of India's leading renewable energy companies and independent power producers (IPPs) having a diverse portfolio of solar and wind projects across various states in India of 13.4 GW of operational and committed capacity. ReNew develops, builds, owns, and operates utility-scale wind energy projects, utility-scale solar energy projects, utility-scale firm power projects and distributed solar energy projects. One of the key strengths of ReNew Power lies in its vertical integration as a contracted and independent power producer with diverse execution capabilities. ReNew is also involved in developing emerging decarbonization solutions like green hydrogen, energy storage, carbon markets, and solar manufacturing, and is poised to further corporate net-zero transition goals as a preferred decarbonization partner.



CONTACT

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Renewable Energy Hamburg Clusteragentur GmbH

Short distance between producers of green hydrogen and industrial offtakers, a future energy import harbour, the great range of use cases for fuel cell technology in transport and logistics, the direct connection into trans-European transport networks: These factors enable the Metropolitan region of Hamburg to become an international hydrogen hotspot.



CONTACT

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The logo for Rocksoft OÜ consists of the word "ROCKSOFT" in a bold, orange, sans-serif font.

Rocksoft OÜ

Rocksoft OÜ is an Estonian company founded in 2008. The company specializes in ERP implementations and process digitalization. Main competences are Oracle technology, eBS and Netsuite. For Manufacturing companies we offer Monitor ERP software. Its team has over 20 years of experience working with B2B and B2C companies of all sizes.



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The logo for HyInHeat features a dark blue circular icon with a white flame symbol to the left of the text "HYINHEAT" in a bold, dark blue, sans-serif font.

RWTH Aachen University

HyInHeat realizes the implementation of efficient hydrogen combustion systems to decarbonize heating and melting processes of the aluminum and steel sectors, covering almost their complete process chains. To reach this overarching objective within the project, furnace and equipment such as burners or measurement and control technology but also infrastructure is redesigned, modified and implemented in eight demonstrators at technical centers and industrial plants.



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SACHSEN-ANHALT

Ministerium für
Wissenschaft, Energie,
Klimaschutz und Umwelt

Ministry of Science, Energy, Climate Protection and the Environment of the federal state Saxony – Anhalt

The state Saxony-Anhalt already offers good starting conditions and has decades of experience in production, transport and industrial use of hydrogen. For Saxony-Anhalt, the development of a green hydrogen economy is one of the most important targets for the near future.



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SITEC

SITEC Industrietechnologie GmbH

SITEC is an international system supplier for automated manufacturing systems and a partner for the series production of precision parts. The company develops production-ready solutions for laser material processing and automated assembly. SITEC grows with the challenges of its customers and the market, such as the development of new products in the field of e-mobility or fuel cells.



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SMARTAL

ENGINEERING
OÜ

Smartal Engineering OÜ

Smartal Engineering OÜ offers the customer a better service and solution. Our competent team has higher education and more than 10 years of engineering experience. We are ready to solve various projects both in the field of electricity/automation and in the field of mechanics.



CONTACT

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Strohm

Strohm is the leading composite pipe company Strohm with the world's largest track-record for Thermoplastic Composite Pipe (TCP), a strong, non-corrosive, spoolable pipe technology delivered in long lengths and reducing total installed and life cycle cost for subsea flowlines, jumpers and risers. Strohm's TCP has proven to reduce the CO2 footprint of pipeline infrastructures by more than 50%. The company is committed to driving sustainability with its range of TCP solutions which enable clients towards their net-zero carbon emissions targets and supports the renewables sector.



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Świętokrzyska Grupa Przemysłowa INDUSTRIA S.A

INDUSTRIA blends tradition and technology for eco-friendly progress. Aims: emission-free mines, green transport, and regional energy shift. Leading Łaszczyński Brothers' Central Hydrogen Cluster, INDUSTRIA drives emission-free energy access and transformation.



CONTACT

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SYMBASE SPÓŁKA AKCYJNA

We focus on green chemicals. In 2018 we opened own R&D where we can make tests for our customers solutions for better and greener construction materials. In 2020 we developed Elastomers and Wood division, this year we established Food division, Each year we organises seminar for our customers where we inspire them to be more green and help people in need. We share our CSR activities, from the beginning we help others, kids in need, buying themequipment, supporting monthly base for their daily needs, In 2022 we spent 30% of our profit for CSR.



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TAURON INWESTYCJE SPÓŁKA Z OGRANICZONĄ ODPOWIEDZIALNOŚCIĄ

TAURON Inwestycje Sp. z o.o., a TAURON Group subsidiary, handles investments, R&D, and low/zero-emission asset operation for power, heat, and alternative fuels. Created from TAURON Wytwarzanie S.A., it's a pioneer in Poland's hydrogen economy, leading in energy transition and hydrogen-derived fuels via European projects since 2015.



Turkish Wind Energy Association

Established in 1992, the Turkish Wind Energy Association (TWEA) was created to advance wind energy through research, utilization expansion, and economic integration. It unifies Turkey's wind energy sector, spanning the entire value chain and actively engaging in legal regulations. TWEA collaborates with national energy entities and is a key member of both Wind Europe and GWEC, making it a prominent non-governmental force in Turkish wind energy.



Varo Energy

VARO Energy (VARO) is an energy company headquartered in Zug, Switzerland. It operates in manufacturing, storage and distribution, marketing and trading, with businesses in biofuels, green hydrogen, biomethane & bio-LNG, nature-based carbon removals and e-mobility. The company is focused on the Benelux countries, Germany, France and Switzerland. VARO Energy's shareholders Investment firm, Carlyle Group and the global energy and commodities company Vitol. The company CEO is Dev Sanyal.





VÚTS, a.s.

Our company was founded in 1951 under the name of RESEARCH INSTITUTE OF TEXTILE MACHINES, however, our activities for more than 25 years go beyond the field of research and development of textile machines. We continue a long tradition and have been a unique research and development company since our beginning and have been a significant contributor to the development of technology.



CONTACT

info.vuts@vuts.cz



Yeşil Hidrojen Üreticileri Derneği – Green Hydrogen Producers Association

H2DER is a Green Hydrogen Producers Association, providing expertise on green hydrogen. It includes renewable energy companies, academics, and experienced policymakers. H2DER focuses on shaping regulations, laws, and fostering collaborations to meet market demands.



CONTACT

info@h2der.org



Software AG

Software AG simplifies the connected world. Founded in 1969, its technology creates the digital backbone that integrates and connects “things” like sensors, devices, and machines. It helps 10,000+ organizations to become truly connected enterprises and make smarter decisions, faster. The Company has about 5,000 employees across more than 70 countries.



CONTACT

research@softwareag.com



Electric Hydrogen Co.

Electric Hydrogen (EH2) is a deep decarbonization company pioneering electrolyzer technology for low-cost, high-efficiency, renewable hydrogen systems. With a leadership team that's revolutionized other clean energy sectors at Tesla and First Solar, EH2 is driving industrial decarbonization to scale.



CONTACT

info@eh2.com



NextEra Energy Global Holdings B.V.

NextEra Energy, Inc. (NYSE: NEE) is a leading clean energy company headquartered in Juno Beach, Florida. NextEra Energy owns a competitive clean energy business, NextEra Energy Resources, LLC (NEER), which, together with its affiliated entities, is the world's largest generator of renewable energy from the wind and sun, a world leader in battery storage, and is driving the development of the green hydrogen economy.



CONTACT

media.relations@nexteraenergyresources.com

With more than 500+ members, including EU regions and national associations, we encompass the entire value chain of the European hydrogen and fuel cell ecosystem. Our vision is to propel global carbon neutrality by accelerating European hydrogen industry

Job market

Hydrogen Pipeline Engineer

BOSS Energy Consulting

Full time – Paris, Île-de-France, France (On-site)

Description:

- Collaborate with cross-functional teams to design, model, and optimize hydrogen pipeline systems for maximum efficiency, safety, and reliability.
- Assess and recommend appropriate materials for hydrogen pipeline construction to prevent material degradation and ensure long-term integrity.
- Ensure compliance with safety regulations and standards, including those specific to hydrogen transportation, and implement risk mitigation strategies.
- Evaluate the environmental impact of hydrogen pipelines and develop strategies to minimize emissions, leaks, and other potential environmental concerns.
- Implement quality control processes and conduct inspections to ensure the highest standards are met during pipeline construction and maintenance.
- Develop and implement maintenance schedules and monitoring protocols to proactively address issues and prevent downtime.
- Create and oversee emergency response plans for pipeline incidents, including leak detection and mitigation strategies.
- Stay up-to-date with evolving regulations related to hydrogen transportation and ensure that pipeline systems adhere to all applicable laws and codes.
- Collaborate with other engineering disciplines, project managers, and stakeholders to ensure successful project execution.
- Stay informed about the latest developments in hydrogen pipeline technology and contribute to research efforts aimed at advancing the field.

Deadline: 26-10-2023

Apply here: <https://www.boss-energy.co.uk/>



Membership retention officer

Hydrogen Europe

Full time – Brussels

Description:

- Retain current members, increase members' satisfaction, decrease attrition, and develop strong referral sources. Implement member retention strategies to ensure long-term relationships.
- Analyzing customer behavior and gathering information about members complaints.
- Resolving members' issues.
- Train and develop staff on retention best practices.
- Create monthly reports to track retention metrics, including members retention rates, member satisfaction, and sales conversion.
- Assist in organizing, managing, and updating internal databases.
- Identify trends and recommend and implement new retention strategies.
- Work with our various teams to generate retention marketing plans.
- Research market conditions and identify new potential referral sources.
- Oversee implementation of retention programs; advise on new and innovative retention strategies.
- Communicating with members and their representatives. Manage internal meetings to propose member retention solutions.
- Building positive relationships with members and their representatives.

Deadline: 17-09-2023

Apply here: <https://hydrogeneurope.eu/job-market/membership-retention-officer/>



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Senior Commercial Manager

BOSS Energy Consulting

Full time – Stockholm County, Sweden (On-site)

Description:

– Establish and uphold the project's overall commercial strategy and logic.

– Work closely with local developers and off-takers of businesses to create the hydrogen purchase agreement (HPA). This includes:

– Create HPA with an acceptable risk level for us and alignment with the project's power sourcing strategy.

– Take charge of negotiations with the client.

– Obtain internal signoffs for the HPA that are required. Assist the Markets team in establishing the PPA requirements and obtaining an appropriate power hedging arrangement, such as a power purchasing agreement (PPA), for the project.

– Ensure that the project submits an adequate request for public funding.

– Ensure that the project's efforts to acquire new clients are consistent with its overall commercial strategy and logic.

Deadline: 29-09-2023

Apply here: Contact Charlie Plant, Hydrogen Recruitment Consultant – charlie.plant@boss-energy.co



Senior Engineer in Hydrogen Systems

TECNALIA

Full time – Spain, San Sebastian

Description:

– Design, construction and testing of test benches for electrolysis components (stack, separators, power electronics...).

– Development of models of components and processes of the hydrogen value chain (generation, compression, storage, dispensing, production of vectors such as ammonia or methanol...) for their sizing and optimization of CAPEX and OPEX.

– Design of electrolysis stacks and their components (cells, MEAs, bipolar plates...).

– Design and execution of tests in pilot plants in collaboration with other Tecnalia groups.

– Analysis of experimental results and comparison with commercial equipment (benchmarking).

– Preparation of project and service offers in collaboration with the market team and project managers.

Participation in meetings and presentation of results to customers and technology partners.
Writing of reports and technical justifications.

Deadline: 31-12-2023

Apply here: <https://tecnalia.talentclue.com/es/node/97463255/33992676/modal>



Business Development Manager Hydrogen (m/f/d)

Aliaxis Deutschland GmbH

Full time – Belgium, Brussels

Description:

– Develop a sales growth strategy to achieve revenue targets and expand Aliaxis' market presence in the hydrogen industry;

– Implement the market strategy and ensure business development and sales growth in EMEA;

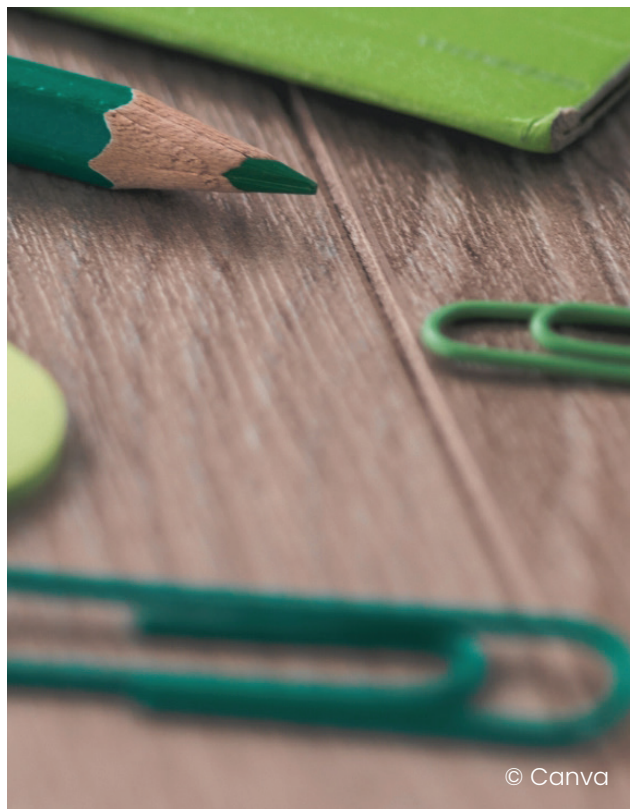
– Identify and develop new business opportunities in the hydrogen energy market, including identifying potential customers, partners, and suppliers;

– Identify pilot projects and opportunities for co-creation to develop and sell Aliaxis' solutions, apply learnings to improve Aliaxis' future offering;

– Provide market and customers insights to Marketing and Innovation teams to feed the innovation pipeline and develop innovative solutions to meet customer needs; Collaborate with Customer Service and Technical Back Office to capture market opportunities.

Deadline: 29-09-2023

Apply here: Contact Charlie Plant, Hydrogen Recruitment Consultant – charlie.plant@boss-energy.co.uk



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