



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update October 2023: European Commission

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Covered Period	April 2023 to October 2023

1. New Initiatives, Programs, and Policies on Hydrogen and Fuel Cells

EU's Renewable Energy Directive

Agreement reached on 16 June 2023 on a legally-binding target to “raise the share of renewable energy in the EU's overall energy consumption to 42.5% by 2030”.

EU countries that choose to do so can complement this target with “an additional 2.5% indicative top-up that would allow reaching 45%”.

This roughly means doubling the share of renewables in the EU's energy mix, which currently stand at 22.1%.

The revised directive also adds targets for buildings and seeks faster permitting processes for wind and solar projects with the introduction of dedicated “acceleration areas” for renewables.

Publication on 20 June 2023 of two Delegated Acts required under the Renewable Energy Directive.

The Commission has formally published the two delegated acts outlining detailed rules on the EU definition of renewable hydrogen, following the end of the period of scrutiny for the European Parliament and Council. The final texts are unchanged from the [draft acts adopted by the Commission on 13 February 2023](#). The rules formally entered into force 20 days following their publication in the Official Journal.

DA on additionality:

It defines under which conditions hydrogen, hydrogen-based fuels or other energy carriers can be considered as a Renewable Fuel of Non Biological Origin (RFNBO). The Act clarifies the principle of “additionality” for hydrogen set out in the EU's Renewable Energy Directive. Electrolysers to produce hydrogen will have to be connected to new renewable electricity production. This principle aims to ensure that the generation of renewable hydrogen incentivises an increase in the volume of renewable energy available to the grid compared to what exists already. In this way, hydrogen production will be supporting decarbonisation and complementing electrification efforts, while avoiding pressure on power generation.

The additionality principle in the Delegated Act establishes that installations generating renewable electricity must not have come into operation more than 36 months before the entry into operation of the electrolysers that will produce the renewable hydrogen.

In order to allow the sector to adapt to the new rules, while scaling up to meet the demand, the rules will gradually become more stringent with time:

- First movers on renewable hydrogen production coming into operation before 2028, may produce renewable hydrogen from existent renewable energy plants for a transition period (until 1 January 2038). After that, the additionality rules must be complied with.



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

- The monthly correlation between the renewable installation and the renewable hydrogen producer will be applicable until 31 December 2029, unless Member States decide to introduce the hourly correlation already as of 1 July 2027.
- The installation generating the renewable electricity sourced by the electrolyser must be located in the same electricity bidding zone (in practice mostly the same Member State) than the electrolyser, an offshore bidding zone or an interconnected bidding zone.

The requirements for the production of renewable hydrogen will apply to both domestic producers as well as producers from third countries that want to export renewable hydrogen to the EU to count towards the EU renewables targets. A certification scheme relying on voluntary schemes will ensure that producers, whether in the EU or in third countries, can demonstrate in a simple and easy way their compliance with the EU framework and trade renewable hydrogen within the Single Market.

DA on methodology for calculation GHG emissions for RFNBOs

The second Delegated Act provides a methodology for calculating life-cycle greenhouse gas emissions for RFNBOs. The methodology takes into account greenhouse gas emissions across the full lifecycle of the fuels, including upstream emissions, emissions associated with taking electricity from the grid, from processing, and those associated with transporting these fuels to the end-consumer. The methodology also clarifies how to calculate the greenhouse gas emissions of renewable hydrogen or its derivatives in case it is co-produced in a facility that produces fossil-based fuels.

Alternative Fuel Infrastructure Regulation

Adoption of the alternative fuel infrastructure regulation (AFIR) on 20 July 2023 - the new law for more recharging and refuelling stations across Europe.

The text of the regulation provides for specific deployment targets that will have to be met in 2025 or 2030, in particular:

- From **2025** onwards, fast recharging stations of at least 150kW for **cars and vans** need to be installed every **60 km** along the EU's main transport corridors, the so-called 'trans-European transport (TEN-T) network.
- Recharging stations for **heavy-duty vehicles** with a minimum output of 350kW need to be deployed every **60 km** along the TEN-T core network, and every **100 km** on the larger TEN-T comprehensive network from 2025 onwards, with complete network coverage by **2030**.
- **Hydrogen refuelling** stations serving both cars and lorries must be deployed from 2030 onwards in all urban nodes and every **200 km** along the TEN-T core network.
- The stations will have a daily supply capacity of **one ton/day of hydrogen at a pressure of 700 bars** for all modes of road transport.
- **Maritime ports** welcoming a minimum number of large passenger vessels, or container vessels, must provide **shore-side electricity** for such vessels by 2030.
- **Airports** must provide electricity to stationary aircraft at all gates by 2025, and at all remote stands by 2030.
- **Users** of electric or hydrogen-fuelled vehicles must be able to **pay easily** at recharging or refuelling points with payment cards or contactless devices and without a need for a subscription and in full price transparency
- **Operators** of recharging or refuelling points must provide consumers **full information** through electronic means on the availability, waiting time or price at different stations.



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

FuelEU Maritime

Adoption on 25 July 2023 of the FuelEU maritime initiative – the new law to decarbonise the maritime sector.

The new regulation contains the following main provisions:

- Measures to ensure that the **greenhouse gas intensity** of fuels used by the shipping sector will gradually decrease over time, by **2% in 2025**, **6% from 2030**, **14.5% from 2035**, **31 % from 2040**, **62% from 2045** and to **80% from 2050**.
- A special incentive regime to support the uptake of the so-called **renewable fuels of non biological origin** (RFNBO) with a high decarbonisation potential.
- An exclusion of **fossil fuels** from the regulation's certification process.
- An obligation for passenger ships and containers to use **on-shore power supply** for all electricity needs while moored at the quayside in major EU ports as of 2030, with a view to mitigating air pollution in ports, which are often close to densely populated areas.
- A voluntary **pooling mechanism**, under which ships will be allowed to pool their compliance balance with one or more other ships, with the pool – as a whole - having to meet the greenhouse gas intensity limits on average.
- Time limited **exceptions** for the specific treatment of the outermost regions, small islands, and areas economically highly dependent on their **connectivity**.
- Revenues generated from the regulation's implementation ('**FuelEU penalties**') should be used for projects in support of the maritime sector's decarbonisation with an enhanced transparency mechanism.
- **Monitoring** of the regulation's implementation through the Commission's reporting and review process.

The new rules will apply from 1 January 2025, apart from articles 8 and 9 which will apply from 31 August 2024.

ReFuelEU Aviation

On 25 April 2023, The Council and the European Parliament reached a provisional political agreement on a proposal aiming to decarbonise the aviation sector and create a level playing field for a sustainable air transport (ReFuelEU aviation initiative).

The proposal aims to increase both demand for and supply of **sustainable aviation fuels (SAF)**, while ensuring a level playing field across the EU air transport market. It is a major proposal which aims to put air transport on the trajectory of the EU's climate targets for 2030 and 2050, as SAF are one of the key short- and medium-term tools for decarbonising aviation. It should provide a way out of the situation which is hindering their development: low supply and prices that are still much higher than fossil fuels.

Key elements of the agreement include:

- The obligation for aviation fuel suppliers to ensure that all fuel made available to aircraft operators at EU airports contains **a minimum share of SAF from 2025** and, from 2030, **a minimum share of synthetic fuels**, with both shares increasing progressively until 2050.
- The establishment of a **transitional period** allowing fuel suppliers to reach the SAF blending mandate as a weighted average of the quantities they have supplied across the Union, in order to facilitate the organisation of the sector during its creation phase, without affecting the overall level of emissions.
- The obligation for aircraft operators to ensure that the yearly quantity of aviation fuel uplifted at a given EU airport is at least 90% of the yearly aviation fuel required, to avoid emissions related to extra weight caused by **tankering** practices.
- **Reporting** obligations for fuel suppliers and aircraft operators.



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

ReFuelEU Aviation has been voted positively by the European Parliament and the Council vote should take place in October. The final signature and publication in the OJ should take place in the weeks following the Council's vote.

The Hydrogen and gas markets decarbonisation package

The legislative proposals aim to create dedicated hydrogen infrastructure and a hydrogen market by applying market rules in two phases: before and after 2030. They also set rules for consumers protection and strengthen security of supply.

The proposals introduce a definition of low-carbon hydrogen (greenhouse gas savings of at least 70%) and a certification system for low-carbon hydrogen including a methodology for determining emission savings to be spelled out in a Delegated Act by the end of 2024. To promote a dedicated hydrogen infrastructure, the proposals also foresee a new governance structure in the form of the European Network of Network Operators for Hydrogen (ENNOH). The goal is to encourage investment in hydrogen infrastructure while avoiding the emergence of natural monopolies. Measures to ensure more coherent network planning for electricity, gas, and hydrogen at national level have been also proposed.

An agreement of the EU Member States on a general approach was reached at the Energy Council on 28 March 2023. The Parliament adopted in its positions in plenary on 14 March 2023. The package is still under discussion by the EU institutions.

The Clean Hydrogen Alliance

Set up in July 2020, the European Clean Hydrogen Alliance is part of EU efforts to ensure industrial leadership and accelerate the decarbonisation of industry in line with its climate change objectives. The European Clean Hydrogen Alliance supports the large-scale deployment of clean hydrogen technologies by 2030 by bringing together renewable and low-carbon hydrogen production, demand in industry, mobility and other sectors, and hydrogen transmission and distribution. It aims to promote investments and stimulate the rollout of clean hydrogen production and use.

The Clean Hydrogen Alliance has now more than 1800 members. One of the main milestones is the pipeline of investment projects to deploy hydrogen technologies.

Electrolyser Declaration & Partnership

Achieving the ambitious renewable hydrogen targets will require a significant increase in installed electrolyser capacity to 90-100 GW LHV (measured in terms of hydrogen output). However, industry's capacity to manufacture electrolysers is currently estimated to be only 1.75GW LHV per year. To ramp-up electrolyser manufacturing, Commission officials and 20 European electrolyser manufacturers met in Brussels on 5 May to sign a Joint Declaration. In the **Declaration**, the companies agreed to **a ten-fold increase in electrolyser manufacturing capacity in Europe to 17.5GW per year by 2025**.

On the 26th June 2023, the Electrolyser Partnership organised the 2nd CEO Electrolyser Summit, where its members had the opportunity to sit in a roundtable with high-level officials from the European Commission, to discuss and take stock of what has been done in the past year after the launch of the Joint Declaration back in May 2022.

At the time of the signature of the Joint Declaration, the capacity of electrolyser manufacturing in Europe was estimated at 2.5 GW. Today in Europe there is approximately 3.1GW of production capacity with several manufacturers planning to increase it to 21GW by 2025,



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

reflecting the expected demand outlook in Europe and globally. Investments are not just taking place in electrolyser manufacturing facilities but also throughout the supply chain such as for membranes, advanced materials for membranes, and other balance of plant components.

Two new Industrial Alliances relevant for the hydrogen sector have been set-up and are now starting to deliver.

The Renewable and Low-Carbon Fuels Industrial Alliance

The Renewable and Low-Carbon Fuels Industrial Alliance is a key flanking measure to the FuelEU Maritime and RefuelEU Aviation initiatives. Following endorsement by the Industry Strategy project group of Commissioners in November 2021, The Alliance was launched by the Commission Velez on 6 April 2022. Since the launch the Alliance has developed and adopted the Work Plan at the General Assembly in July 2022, established 4 Roundtables (following an internal call for experts) which have met 5 times each and grown to **223 members**.

The Alliance project pipeline will be the flagship deliverable. We are progressing fast to make sure that the investment decisions can take place as soon as possible, since the EU has now implemented demand measures through the RefuelEU Aviation and FuelEU Maritime regulations. The RLCF Alliance is an open platform welcoming businesses from around the world. Up till now, 10 members of the Alliance have indicated USA as their country of headquarters, including GA Aviation, Royal Caribbean Group, Goldman Sachs, U.S. Grains Council to name a few.

AZEA – The Alliance for Zero-Emission Aviation

Launched in June 2022 the Alliance for Zero-Emission Aviation is a voluntary initiative of private and public partners who share the objective to prepare the aviation ecosystem to the entry into commercial service of hydrogen-powered and electric aircraft. These novel propulsion technologies will contribute to decarbonise intra-EU flights and enable new climate-friendly mobility offers.

The Alliance will establish a vision on how these technologies may deploy on the different segments of the aviation market. It will identify the needs for decarbonised electricity and hydrogen and the infrastructure required to produce this energy, distribute it and supply it at airports. While the availability of decarbonised electricity and hydrogen at the appropriate airport in the required quantities constitutes one of the main challenges to be addressed, the Alliance will also perform a thorough analysis of the ecosystem to identify all other potential barriers and issue recommendations to address them. To perform this analysis 6 Working Groups have been established early 2023 (Rollout scenarios for electric and hydrogen-powered aircraft and related “figures of reference”; Decarbonised electricity/hydrogen supply; Aerodromes; Aviation regulation, certification and standardisation; Integration of electric and hydrogen-powered aircraft into European network; Incentives). Two reports have already been issued: “Current Standardization Landscape” and “Aviation Regulatory landscape for hydrogen and electric aircraft” as well as a Progress report describing the work done by the different WG over the 6 first months (all available [here](#)).

After this initial phase the Alliance will develop further actions that could include for instance:



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

- Raising awareness amongst airports about the impact of those new technologies on their future activities and the potential of role of Hydrogen Valleys may have (many airports, as part of their decarbonisation effort, are developing as clean energy hubs).
- Promotion of investment projects and facilitating access to finance.
- etc.

The Alliance brings together players from across the aeronautical industry and from the aviation community in the wider sense, such as energy producers (incl. for instance Air Liquide, Linde, Hydrogen Europe, etc), standardisation organisations, regulators, regions, and many other relevant players including NGOs and Trade-Unions. In the coming months, the Alliance intends to start an effort to progressively involve Member States more closely.

Hydrogen in the European Research Area (ERA)

The European Research Area policy agenda includes, for the period 2022-2024, action 11 – an ERA for green transformation, which calls for accelerating R&I and improving the collaboration between private and public R&I activities in the Member States towards early market deployment of clean technology solutions. Action 11 contains three sub-actions, of which action 11.1 (Pilot on green hydrogen) and action 11.2 (SET Plan revamp) are relevant for hydrogen.

The ERA pilot on green hydrogen (ERA action 11.1), has seen the collaboration of 25 Member States, 5 associated countries and the European Commission, to develop a joint SRIA, which was published on 18 March 2022. As a contribution to the ERA pilot on green hydrogen, the Commission published in January 2022 the Commission Staff Working Document (SWD) titled 'Building a European Research Area for clean hydrogen - the role of EU research and innovation investments to deliver on the EU's Hydrogen Strategy'.

The revamp of the Strategic Energy Technology (SET) Plan (ERA action 11.2) is planned, as a Commission's Communication, to be adopted in 2023. The work is co-led by DG RTD, DG ENER and the JRC. It will implement the ERA pilot on green hydrogen (ERA action 11.1) through a new Implementation working Group (IWG) on Hydrogen.

2. Hydrogen and Fuel Cell R&D Update

Results of Call for Proposals 2022-2 of Clean Hydrogen JU

As a result of the Call for Proposals 2022-2 (deadline 20 September 2022), the Clean Hydrogen JU received 74 proposals and signed eventually 23 grant agreements, where half are collaborative projects funding research activities (RIA) and the other half innovation actions (IA). Overall, 34 countries are taking part in the projects. The Clean Hydrogen JU contribution will be € 184 mil, which includes € 49 mil from the RePower EU top-up.

In total for Call 2022, the Clean Hydrogen Partnership received an impressive number of 153 proposals from 1.524 organisations, established in 61 different countries, reflecting an ever-increasing interest in the development of hydrogen projects. While still running projects from the past programme H2020, the Partnership managed to sign 50 new grant agreements by mid-July and are in the final stages of grant preparation for remaining 3.

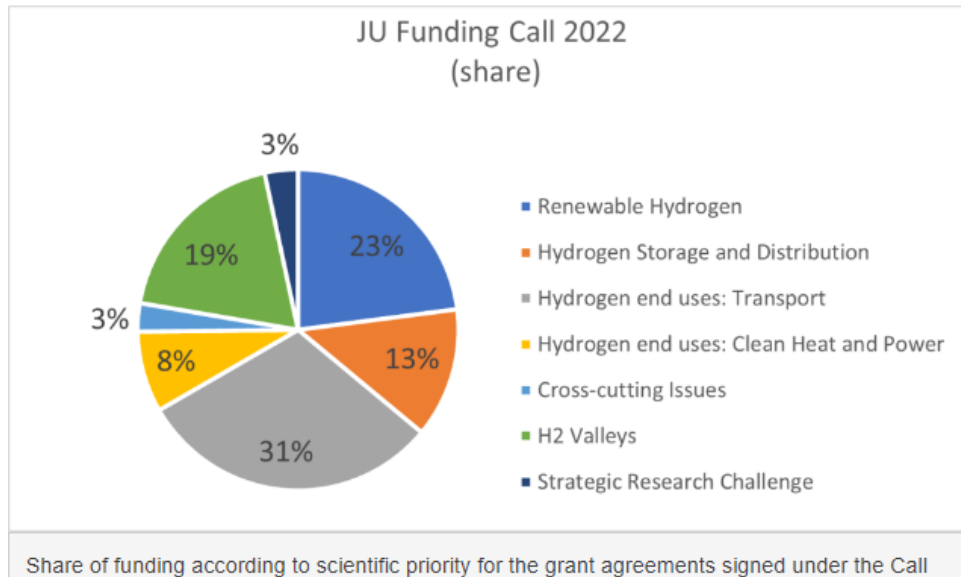
These projects will significantly advance research on hydrogen technologies, with the aim to improve efficiency and reduce cost of renewable hydrogen production, further develop storage and distribution solutions, and stimulate the use of low carbon hydrogen in hard to abate



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

sectors, such as energy intensive industries, aviation, or heavy-duty transport.

An overview of the grants signed so far as part of Call 2022 (Call 2022-1 and Call 2022-2) per research pillar can be seen in the pie chart below:



Collaboration of Clean Hydrogen JU with the European Innovation Council and SMEs Executive Agency (EISMEA) (June 2023)

On 25th November 2022, the Clean Hydrogen Joint Undertaking (JU) and the European Innovation Council and SMEs Executive Agency (EISMEA) signed a letter of intent to agree on the principles of a future collaboration on clean hydrogen.

In this context, they organized in June a workshop on “Seawater sourcing for renewable hydrogen and chemicals”. Counting with a presence of different stakeholders from public institutions, industry, academia, it brought together discussions about the present and future technological innovations in using seawater directly for electrolysis – and in light of addressing the water stress that the production of green hydrogen can exacerbate.

3. Demonstration, Deployments, and Workforce Developments Update

HEAVEN project completes world's first piloted flight of liquid hydrogen powered electric aircraft

Project HEAVEN¹, supported by the Clean Hydrogen Partnership, aiming to demonstrate the feasibility of using liquid, cryogenic hydrogen in aircraft, announced it has successfully completed the world's first piloted flight of an electric aircraft powered by liquid hydrogen.

The demonstration day consisted of four flights powered by liquid hydrogen as part of the project's flight test campaign, including one flight that lasted for over three hours. The flights were completed with H2FLY's piloted HY4 demonstrator aircraft, fitted with a hydrogen-electric fuel cell propulsion system and cryogenically stored liquid hydrogen that powered the aircraft.

Results of the test flights indicate that using liquid hydrogen in place of gaseous hydrogen will double the maximum range of the HY4 aircraft from 750 km to 1,500 km, marking a critical step towards the delivery of emissions-free, medium- and long-haul commercial flights. The

¹ https://www.clean-hydrogen.europa.eu/projects-repository/heaven_en



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

consortium is led by H2FLY and includes the partners Air Liquide, Pipistrel Vertical Solutions, the German Aerospace Center (DLR), EKPO Fuel Cell Technologies, and Fundación Ayesa.

[Inauguration of the HyPSTER project, the first demonstration facility for renewable hydrogen storage in salt caverns](#)

The Clean Hydrogen Partnership funded project HyPSTER², the first demonstrator of renewable hydrogen storage in a salt cavern.

HyPSTER is the first renewable hydrogen storage demonstrator in a saline cavity supported by the European Union and the Clean Hydrogen Partnership. With a total budget of 15.5 million Euros, including 5 million Euros funded by the Clean Hydrogen Partnership, this unique pilot paves the way for the creation of an industrial sector for renewable hydrogen storage and for techno-economic replicability at other sites in Europe.

Launched in January 2021, HyPSTER is moving to the implementation stage, to produce and store hydrogen at the Etrez site (near Lyon – France). On the production side, a 1 MW electrolyser will generate 400 kg of hydrogen per day. On the storage side, test operations will begin in the EZ53 cavity. This will be followed by around a hundred cycles of hydrogen pressure variation over 3 months, with no inflow or outflow of hydrogen. These tests will enable to confirm the ability to store hydrogen with safety standards similar to those that have been in place for natural gas for over 70 years. At the end of these test cycles, the hydrogen will be extracted and analysed to ensure the quality of the gas in the cavern.

After this experimental stage, the scale will change in 2024: hydrogen production and storage will gradually amplify, until the salt cavern's full capacity is used up in 2026, i.e. almost 50 tonnes (equivalent to the daily consumption of 2,000 buses). This will enable to supply the region's industrial players and hydrogen filling stations.

4. Events and Solicitations

Publications

[Study on hydrogen in ports and industrial coastal areas \(September 2023\)³](#)

This is the second in a set of three reports prepared for the Clean Hydrogen Partnership aiming to allow port authorities and other port-related stakeholders to navigate easily through the relevant considerations for hydrogen (carriers) related activities of interest to them.

The second study informs stakeholders and policymakers on the areas of priority for overcoming technological, safety and non-technical (policy, regulatory, governance, strategic) gaps for the timely development of hydrogen related activities and infrastructure in EU port areas.

Although the transformations expected in ports as a result of the emergence of a European hydrogen economy are specific to each port, with different implications expected for sea and inland ports, the recommendations on strategic actions for port authorities and other port-related stakeholders outlined in the report are intended to encompass the entire European port ecosystem, and are therefore not tailored to any particular port archetype (e.g., seaport or inland port, logistics and transport, urban, industrial, or bunkering).

² https://www.clean-hydrogen.europa.eu/projects-repository/hypster_en

³ https://www.clean-hydrogen.europa.eu/media/publications/second-report-study-hydrogen-ports-and-industrial-coastal-areas_en



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

Survey report on the awareness of Hydrogen Technologies (July 2023)⁴

One of the Clean Hydrogen Joint Undertaking objectives is to increase public and private awareness, acceptance, and uptake of clean hydrogen solutions, through cooperation with other European partnerships under Horizon Europe.

Understanding how people think about hydrogen technologies and how this influences acceptance is an important area of future research as it can inform effective policy and industry standards, public education, and messaging, and assist with the implementation of the technology.

For this purpose, a public opinion survey was conducted in autumn 2022 in 27 EU countries to analyse and assess European citizens' attitudes towards and level of knowledge of hydrogen technologies and determine a baseline for monitoring changes in public opinion over time.

The survey explores a range of issues, including knowledge and awareness of energy in general and of hydrogen energy in particular.

- Europeans across all sociodemographic subgroups have a high level of awareness of hydrogen energy, with over eight in ten respondents (82%) declaring that have seen, read or heard something about hydrogen (82%).
- 69% of the respondents believe that hydrogen is a sustainable energy source. In particular, hydrogen is considered positively in terms of its environmental impact with an average rating of 3.9 out of 10. In comparison, fossil energy is widely seen to have the most negative impact on the environment with an average rating of 7,7 out of 10.
- Most Europeans (70%) also agree that hydrogen has a role to play in reducing energy dependence of their country.
- Hydrogen is also seen as safe. Six in ten (59%) respondents in the EU believe that hydrogen is as safe as any other energy source. Only 17% disagreed that hydrogen energy was safe but there was a high level of don't know responses (24%) suggesting a key gap in current public knowledge.

Events & Initiatives

European Hydrogen Week (20-24 November 2023)⁵

The Clean Hydrogen Partnership, Hydrogen Europe, Hydrogen Europe Research and the European Commission have teamed up to bring the entire hydrogen sector in one place for a whole week of conferences, exhibition and networking opportunities.

In addition to the well-established policy sessions, it will feature the sixth edition of the Clean Hydrogen Partnership Awards, celebrating the best innovation, success story, project outreach and, including a prize for European Hydrogen Valleys.

Visitors will have access to multiple conference streams, over 25 sessions and 200 expected speakers to deep dive into all things hydrogen - from industry trends, challenges and opportunities, innovation, new technology, and more. Participants will be able to navigate from session to session, 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.

⁴ https://www.clean-hydrogen.europa.eu/media/publications/awareness-hydrogen-technologies-survey-report_en

⁵ <https://euhydrogenweek.eu/>



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

[EU Hydrogen Research Days \(15-16 November 2023\)](#)

The two-days event will kick-start the European Hydrogen Week and, following the tradition of the past 15 years, provide an excellent visibility platform for on-going projects and initiatives of the Clean Hydrogen Partnership.

The EU Research Days (previously called Programme Review Days - PRD) aim to give an overview on the progress of the Clean Hydrogen JU funded projects. Initiated in 2011 (as an answer to the JU mid-term evaluation recommendations), this annual event held in autumn presents the progress of the portfolio of hydrogen relevant projects funded by the Clean Hydrogen JU and its predecessors, as well as other the EU research programmes, identifying key achievements but also potential areas to be addressed or reinforced in subsequent years.

The event also provides an excellent visibility platform for projects and technological developments achieved in the sector and provides networking opportunities for the participants while facilitating the exchange of ideas and best practices. Moreover, it acts as a platform for the wider scientific community to express its opinions and views on the Programme of the Clean Hydrogen JU.

Information on the past EU Research Days can be found on the Clean Hydrogen Partnership website⁶.

[Relaunch of the European Hydrogen Observatory \(29 September 2023\)](#)⁷

The purpose of the event is to unveil the new Observatory, present the new elements, its logo, website and social media presence. There'll be as well sessions with the Observatory partners regarding the International Energy Agency, Hydrogen Europe, and education & research. The event is fully online.

The European Hydrogen Observatory, formerly known as Fuel Cells & Hydrogen Observatory, is a platform developed by the Clean Hydrogen Joint Undertaking. Its main mission is to provide comprehensive and up-to-date information about the deployment of fuel cell and hydrogen technologies in Europe. It is part of the EU's efforts to promote clean and sustainable energy solutions and to support the transition towards a low-carbon economy.

The Observatory collects data from various sources, including industry stakeholders, research institutions, and government agencies, and presents this information in a user-friendly and accessible manner. The goal is to promote transparency, share best practices, and facilitate informed decision-making regarding hydrogen technologies among policymakers, industry players, researchers, and the general public.

The mission was to create a platform that provides easy access to the cutting-edge research and insights of the Hydrogen Observatory and facilitates building strong connections with a global audience. The focus was not just on aesthetics, but also on a user-centric experience, facilitating seamless navigation and effortless engagement.

[Relaunch of the European Hydrogen Valleys Platform \(8 May 2023\)](#)⁸

⁶ https://www.clean-hydrogen.europa.eu/knowledge-management/annual-programme-review/eu-research-days_en

⁷ https://www.clean-hydrogen.europa.eu/media/news/european-hydrogen-observatory-relaunch-2023-09-15_en

⁸ https://www.clean-hydrogen.europa.eu/media/news/relaunch-hydrogen-valley-platform-2023-05-16_en



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

Under the Mission Innovation “Clean Hydrogen Mission” and on behalf of the European Commission, the Clean Hydrogen Partnership organised on 8 May 2023 an online event dedicated to the re-launch of the Hydrogen Valleys Platform⁹. Based on extensive collection of primary data from the projects, the platform provides comprehensive insights into the most advanced and ambitious Hydrogen Valleys around the globe.

The Hydrogen Valley platform is a global collaboration platform for all information on large-scale hydrogen flagship projects and aims to facilitate a clean energy transition by promoting the emergence of integrated hydrogen projects along the value chain as well as by raising awareness among policy makers. On this platform, the most advanced Hydrogen Valleys around the globe provide insights into their project development. The visitors can explore the world map and discover the profiles of the Hydrogen Valleys represented on the platform or go to the analysis section to find out more about the projects on an aggregate level. They can also get in touch with a Hydrogen Valley developer directly via the matchmaking section. The platform now features 55 hydrogen valleys identified in the EU, at different stages of development from the concept to pre-FID to operational.

This work will lead to the publication of the European Roadmap for Hydrogen Valleys, to be published on the last quarter of 2023. The Call for Evidence, open to all stakeholders, ended last September and gathered more than 120 responses.

[Clean Aviation and Clean Hydrogen joint workshop on H2-powered aviation \(25-26 April 2023\)](#)¹⁰

Representatives of the European aeronautic and hydrogen industries and research communities gathered in Brussels on 25 - 26 April 2023, for a workshop jointly organised by the Clean Aviation and Clean Hydrogen Joint Undertakings.

Participants discussed the status of the hydrogen-powered aviation roadmap as well as future research and innovation needs and made a series of recommendations.

The workshop comprised a plenary session, where the status of the hydrogen-powered aviation roadmap was presented, along with six technical sessions on topics including H2 aircraft architectures, on-board liquid hydrogen storage, H2-burn gas-turbines powertrain system, H2 Fuel-Cell integrated powertrain system, refuelling processes, airport infrastructures and ground operations, as well as safety and certifications.

Considering the Strategic Research and Innovation Agendas of the Clean Aviation and Clean Hydrogen Joint Undertakings, along with the hydrogen-powered aviation roadmap, participants identified potential gaps and barriers within the roadmap. This resulted in a set of key recommendations, including to accelerate the H2 technology maturation, integration and demonstration, increase alignment between the two partnerships and Horizon Europe Cluster 5 Work Programme, and gain more understanding on the climate impact of H2-powered aviation emissions (non-CO2 emissions).

5. Investments: Government and Collaborative Hydrogen and Fuel Cell Funding

The Clean Hydrogen Partnership has selected 15 regions to receive support in the framework of the latest Project Development Assistance (PDA) initiative. The regions are from a total of

⁹ <https://h2v.eu/>

¹⁰ https://www.clean-hydrogen.europa.eu/media/news/key-recommendations-clean-aviation-and-clean-hydrogen-joint-workshop-h2-powered-aviation-2023-07-12_en



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

ten different countries (EU Cohesion Countries, European islands and Outermost Regions) and have been selected following a two-stage application and evaluation process.

The projects proposed by the regions cover a wide range of hydrogen applications, from hydrogen buses in the cities to ferries that connect island communities as well as industrial applications such as glass manufacturing.

The selected regions will now receive targeted support from dedicated hydrogen consultants, beginning in early 2023. This will allow these regions to further develop their project plans, thus advancing the deployment of fuel cell and hydrogen technology in Europe, particularly in areas that have seen limited hydrogen deployments to-date.

The initiative will also deliver a wider impact in other regions beyond the 15 selected, through the planned "Observer Network" activities that will be run throughout 2023.

More information can be found at the initiative website: <https://www.h2regions.eu/>.

Innovation Fund

The Innovation Fund's **third call for large-scale** projects was closed on 16 March 2023. For this call, the European Commission has received 239 applications from innovative clean tech projects. As announced on 13 July 2023, 41 projects have been selected and invited to prepare a grant agreement with the Commission. The total grants amount to more than EUR 3.6 billion and will support projects aiming to bring innovative technologies to the market in energy-intensive industries, hydrogen, renewable energy, and manufacturing components for energy storage and renewable. Among them, there are 8 projects directly targeting the hydrogen sector, plus an additional 11 projects indirectly related with the production and use of hydrogen. Among the ones directly related:

- **H2M:** located in the Netherlands, H2 Maasvlakte plans to construct and operate an electrolyser in the Port of Rotterdam area, mainly powered by wind electricity. The electrolyser will be installed on the site of an existing coal power plant to repurpose utility infrastructure such as grid connections and demineralized water supply. The hydrogen production is intended for off-take in refiners in the Port of Rotterdam area, e.g. for synthetic bio-fuel production. The plant will be suitable for grid-ancillary services through flexible and optimised dispatch, to relieve grid congestion issues.
- **Columbus:** located in Belgium, Columbus targets the avoidance of direct CO₂ emissions from lime production by transforming CO₂ into e-methane at an industrial scale in Belgium. The objective is to demonstrate a first-of-a-kind new integrated process: capture CO₂ emissions from an oxycombustion lime kiln and combine it with green hydrogen produced by electrolyzers to produce e-methane. The produced e-methane is suitable for injection into the national natural gas (NG) grid but could also be used either by industrial users or as an alternative fuel in the transport sector.
- **T-Hynet:** located in Spain, Columbus targets the avoidance of direct CO₂ emissions from lime production by transforming CO₂ into e-methane at an industrial scale in Belgium. The objective is to demonstrate a first-of-a-kind new integrated process: capture CO₂ emissions from an oxycombustion lime kiln and combine it with green hydrogen produced by electrolyzers to produce e-methane. The produced e-methane is suitable for injection into the national natural gas (NG) grid but could also be used either by industrial users or as an alternative fuel in the transport sector.
- **GH2A:** located in Portugal, GREENH2ATLANTIC will develop and demonstrate a novel, scalable and flexible 96 MW green H₂ production system, using pressurised alkaline technology. The electricity required for the hydrogen production will be provided by additional solar power and additional wind capacity, supplied via PPA through the electricity grid.



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

- **EnergHys:** located in the Netherlands, EnergHys aims to establish a complete value chain of scalable renewable hydrogen production from renewable energies to end-users. The intention is to use the produced renewable hydrogen to help decarbonise hard-to-abate industrial customers and the mobility sector by replacing grey hydrogen. The project benefits from the proximity to the North Sea Port and renewable energy landing points and its future connection to the local hydrogen backbone.
- **Asturias H2 Valley:** Located in Spain, it will be a Power-to-Hydrogen Hub to produce and supply renewable hydrogen with electricity supply from renewable power plants (wind, solar). The production site will be located inside the facilities of the already existing conventional coal power plant; its location gives direct access to potential off-takers and future scaling up potential.
- **Hyncrease:** located in Germany, the main objective of the project is to upscale the production capacity for innovative clean-tech equipment, i.e., electrolyzers and fuel cells components. The focus is related to designing, constructing and validating highly efficient manufacturing lines based on Industry 4.0 principles that will also guarantee a low environmental footprint of the products. This facility will include different manufacturing lines for electrolyzers and fuel cells components. The innovation proposed will enable to reduce the total cost of ownership of these electrochemical devices used for the conversion of power into hydrogen and vice versa, allowing to reduce the current economic barriers of such clean-tech equipment and facilitate their adoption in the market.
- **CFCPILOT4CCS:** located in the Netherlands, this project will use carbonate fuel cells (CFCs) to capture and concentrate CO₂ streams, aiming to reduce the effective cost of Carbon Capture and Storage, in particular in energy intensive industries. The pilot will test the operation of the system with live pre-treated flue gas compositions, interconnection of parallel CFC modules, and integration into existing industrial processes

The **third call for small-scale projects** was launched on 30 March 2023 with a budget of EUR 100 million, and closed on 19 September 2023. The results from the evaluations will be made public during the first quarter of 2024.

The European Hydrogen Bank

The European Hydrogen Bank, announced by President von der Leyen in her State of the Union address, provides support to move the hydrogen economy from niche to scale and contribute to ambitions to produce 10 million tonnes (Mt) renewable hydrogen in the EU and import another 10 Mt to the EU by 2030.

The objective of this facility is to cover the cost gap between renewable and fossil hydrogen in the absence of a sufficient green market premium, whilst leveraging a maximum amount of private financing into subsidized projects.

Alongside reducing the cost gap, the bank will contribute to early market formation by providing price/cost discovery through competitive auctions.

On the 16th of March, alongside the Net Zero Industry Act, a dedicated communication was published on the functioning of the Hydrogen Bank and its proposed activities

European Hydrogen Bank: Proposed activities



Figure 1. The four pillars of activities related to the European Hydrogen Bank

The four pillars of action of the European Hydrogen Bank are indicated in the Communication and are presented on Figure 1.

The domestic side of the bank will be implemented through auctions under the Innovation Fund. The Commission will launch in autumn 2023 a first auction for supporting the production of renewable hydrogen. Winners of this auction will receive a fixed premium for each kg of renewable hydrogen produced over a period of 10 years. The Terms and Conditions (T&C) for the auctions have been published on 30 August.

For the international leg, following the joint announcement of Commissioner Simson and German Minister Habeck of 31 May, work on TeamEurope approach is ongoing. For this, the Commission is working closely with H2Global and Member States to establish the first joint European action under the international leg of the European Hydrogen Bank. This also includes exploring de-risking options e.g. by the European Investment Bank.

Important Projects of Common European Interest (IPCEI) on Hydrogen

The first 2 Hydrogen IPCEIs: Hy2Tech and Hy2Use are up and running. The first General Assembly took place on 28 March 2023 in Berlin and the second one is scheduled beginning of December. It will be the moment to take stock of projects implementation and to assess developments.

Additional IPCEIs in the pipeline

- **3rd Hydrogen IPCEI – Hy2Infra**
 - Focus: hydrogen production and infrastructure (pipelines, ports, storage facilities...)
 - State of play: under assessment (Q4 2023)
- **4th Hydrogen IPCEI – Hy2Move**
 - Focus: hydrogen use in the mobility and transport sectors
 - State of play: under assessment (Q1-Q2 2024)



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

Other State Aid instruments – Projects under Climate, Environmental protection and Energy Aid Guidelines (CEEAG).

For stand-alone or dedicated infrastructure projects, environmental protection projects, there are other more suitable and streamlined State aid compatibility rules, such as the CEEAG.

Few projects are now supported under this scheme, the majority addressing the decarbonisation of the steel sector.

6. Regulations, Codes & Standards, and Safety Update

No update



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY