



INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update November 2022: European Commission

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

REPowerEU

The College adopted the **REPowerEU Communication on 8 March 2022**. This has two main pillars: the most immediate being to replenish EU gas stocks for the forthcoming winter, and to provide Member States with options to tackle high energy prices; and in the medium-term, to reduce dependence on Russian fossil fuel by diversifying our gas supplies, and through the green transition – renewable energy, energy efficiency and immediate energy savings to lower consumption

REPowerEU introduced a “**Hydrogen Accelerator**” de facto doubling the Hydrogen Strategy/Fitfor55 *renewable* hydrogen production in the EU from approx. 5.6m tons to 10m tons per year (2030 target), and setting the additional target of 10m tons imported hydrogen, which will in turn reduce our external dependencies on fossil fuel imports.

The Communication also sets a target of 80GW additional wind/solar power generation capacities for hydrogen production.

The Commission announced that it would:

- further develop the regulatory framework to promote a European market for hydrogen;
- support the development of a hydrogen infrastructure, including storage facilities and port infrastructures;
- assess state aid for hydrogen projects including hydrogen IPCEIs as a priority;
- frontload the EU Innovation Fund to accelerate hydrogen deployment in industrial sectors and enhance EU manufacturing capabilities of equipment such as electrolyzers;
- support pilot projects on renewable hydrogen production and transport in the EU neighbourhood starting with a Mediterranean Green Hydrogen Partnership;
- conclude Green Hydrogen Partnerships with third countries;
- with industry establish a Global European Hydrogen Facility.

As regards the autumn proposals on REPowerEU, the Commission proposed on 14 September an emergency regulation to address high electricity prices. This was adopted by the Council on 30 September. A gas purchases solidarity regulation, proposed on 18 October, is being discussed among MS, with a view to find political agreement at the Energy Council on 24 November.



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As part of RePowerEU, the European Commission announced in May 2022¹ to increase the budget of the Clean Hydrogen Partnership (CH-JU) with an additional €200 million (to be matched by the same amount from the private members) to double the number of hydrogen valleys in Europe by 2025 to fifty. The implementation is foreseen in a staged approach over three years (€60 million in 2023, €60 million in 2024 and €80 million in 2025). Complementary, the European Commission is co-leading the Clean Hydrogen Mission of Mission Innovation. The Mission aims at accelerating a global hydrogen economy through establishing 100 hydrogen valleys worldwide by 2030. The priorities for the coming year, the so-called 'sprints', are outlined below:

- The first sprint aims to ensure the identification of 100 hydrogen valley project ideas by 2023 and facilitate the delivery of these valleys.
- The second sprint will support other non-MI countries and developing countries to create and deploy Hydrogen Valleys.

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.

To make it easier for renewable and low-carbon gases to access the existing network, the legislative proposals introduce the possibility:

- to blend up to 5% hydrogen into cross-border gas networks. Voluntary agreements for higher blends States remain possible. This will allow the transmission of hydrogen cross-border from an early stage.
- The proposals permit operators of gas networks to also operate hydrogen networks, subject to legal and asset unbundling.

The goal is to encourage investment in hydrogen infrastructure while avoiding the emergence of natural monopolies.

The proposals introduce a definition of low-carbon hydrogen (greenhouse gas savings of at least 70%) and a certification system for low-carbon hydrogen to be spelled out in detail 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). A single network planning for electricity, gas, and hydrogen will be required at national level.

Article by article examination started in the Council in July. An orientation debate on key elements was held on 25 October at the Transport, Telecommunications and Energy (TTE) Council. The objective remains to reach a general approach at the TTE of 19 December.

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.

¹ [Commission Communication on the REPowerEU plan](#)



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The Clean Hydrogen Alliance has now more than 1700 members. One of the main milestones is the pipeline of investment projects to deploy hydrogen technologies.

The pipeline provides an overview of European hydrogen projects, helps create integrated European hydrogen value chains, and profiles projects, in particular with investors. The [Project pipeline \(europa.eu\)](#) can be searched by project archetype (type of project), project location, project promoter, or planned date of entry into operation.

Following the 2022 summer update, **the pipeline contains now 850 projects**. Projects total **a capacity of 67 GW by 2030** and are located all across Europe. Interestingly, > 75% set out to enter into operation by end of 2025

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**.

A Partnership was established in September 2022. It involves 45 members (20 electrolyser manufacturers plus components, materials, and membrane manufacturers; research and innovation organisations; testing and certification bodies).

Two following task forces were created: (i) a task force on access to raw materials and supply chain is providing input to Commission's future Critical Raw Materials Act (in preparation) and (ii) a task force on access to funding and financing is providing input to Commission's contracts for difference for hydrogen

Finally, a working Group on standardisation on hydrogen was created with the main objective the development of a roadmap on standardisation which will be presented at the European Hydrogen Forum on 5 December 2022.

The Clean Hydrogen Joint Undertaking (JU)

The Clean Hydrogen Joint Undertaking (JU) was established on 30 November 2021. In close collaboration with other partnerships and in synergy with other EU, national and regional research funding programmes, it aims to strengthen and integrate Union scientific capacity to accelerate the development and improvement of advanced clean hydrogen applications ready for market, across energy, transport, building and industrial end-uses.

To achieve these ambitious objectives, the EU will support the Clean Hydrogen JU with €1 billion euro for the period 2021-2027, complemented by at least an equivalent amount of private investment from the private members of the JU.

On 25 February 2022, the Governing Board of the Clean Hydrogen JU adopted the Strategic Research and Innovation Agenda² (SRIA) for the period 2021-2027 of the JU and its (first) Annual Work Programme³ (AWP) for 2022. The SRIA identifies the key priorities and the essential technologies and innovations required to achieve the objectives of the JU for the

² https://www.clean-hydrogen.europa.eu/about-us/key-documents/strategic-research-and-innovation-agenda_en

³ https://www.clean-hydrogen.europa.eu/about-us/key-documents/annual-work-programmes_en



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duration of the Programme, while the AWP is implementing them on an annual basis, mainly via Call for Proposals, and within the available budget.

On 25 October 2022, the Annual Work Programme 2023 was approved by the Governing Board. The largest share of funding goes to energy applications, notably renewable hydrogen production and storage. The main features are:

- Renewable hydrogen production
- Hydrogen storage
- Heat and Power applications covering both fuel cells and turbines
- Hydrogen Valleys

2. Hydrogen and Fuel Cell R&D Update

Launch of the 2022 Call for Proposals of Clean Hydrogen JU

The Clean Hydrogen JU launched its first [Call for Proposals](#) in March 2022. Over EUR 300 mil are planned to be made available for supporting projects that boost renewable hydrogen production, reduce its costs, develop its storage and distribution solutions, and stimulate the use of clean hydrogen in hard to abate sectors, such as energy intensive industries, aviation or heavy-duty transport. The Call will also continue to help stimulating the deployment of “hydrogen valleys” across Europe, complex projects that cover the entire hydrogen value chain in a specific region, scaling-up hydrogen deployment and creating interconnected hydrogen ecosystems across Europe.

A total of 41 topics were part of the Call for proposals, including 10 for renewable hydrogen production, 11 for hydrogen storage and distribution, 8 for transport and 4 for heat and power. In addition, 5 projects will support cross-cutting issues. The Call will also support 2 hydrogen valleys and 1 strategic research challenge. The Call had two deadlines, the first on 31st of May 2022, allocated a budget of EUR 179.50 mil, while the second had deadline on 20th September 2022, allocated a budget of EUR 121 mil.

A total of 151 proposals were submitted for the complete Call, 79 for the first deadline and 74 for the second one. The evaluations for the first deadline [were announced](#) on the 31st of August 2022, while for the second deadline are expected in January 2023. Concerning the first evaluation, 50 of the proposals passed the threshold, while the total budget requested for above-threshold proposals was EUR 263.5 mil. It is expected that the first grant agreements will be signed by December 2022.

3. Demonstration, Deployments, and Workforce Developments Update

- To date, **1,791** FCEVs have been contracted through Clean Hydrogen JU, out of which **1,325** are currently deployed and **426** planned or in development phase (mainly via [H2ME](#), [H2ME2](#) projects and [ZEFER](#) project).
- **283** FC buses have been deployed until today through Clean Hydrogen JU and **71** are planned or in development phase. A total of 298 buses have been deployed or planned to be deployed through the [JIVE](#) and [JIVE 2](#) projects (including all buses currently under development).
- **193** HRS are deployed in Europe, out of which **85** deployed via Clean Hydrogen JU (mainly via [H2ME](#) and [H2ME2](#) projects, 4 discontinued). A chart displaying key data on the number and type of the majority of hydrogen refuelling stations deployed in Europe, including location and capacity can be found [here](#) or [here](#).
- **4,161** μ CHPs contracted via Clean Hydrogen JU, out of which almost **3,000** already



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deployed (mainly via [PACE](#) and [EneField](#) projects – around 95% of total Clean Hydrogen JU μ CHPs).

4. Events and Solicitations

Events & Initiatives

Participation in the Connecting Europe Days (Lyon, June 2022)

The Clean Hydrogen Partnership participated as part of the greater “Hydrogen Pavilion” which has also included some of the flagship infrastructure projects funded by the partnership.

European Hydrogen Week (24-28 October 2022)

After the two successful editions of the European Hydrogen Week, the Clean Hydrogen JU organised an entire week of events dedicated to the new partnership and its essential role in contributing to the 2050 climate neutrality goals. The third edition of the European Hydrogen Week was opened by a high-level policy conference, followed by the Flagship Event and Expo and 2 days of Programme Review Days (PRD) in order to give the supported project a platform to present their achievements and milestones.

The energy crisis has increased pressure on governments, industry and researchers to deliver clean, affordable power to ensure Europe’s competitiveness and quality of life. As a result, several speakers have called for a faster rollout of hydrogen technology for transport, homes, businesses and industry. Speakers also agreed that the sustainability and safety of hydrogen energy technologies, and public awareness of its benefits are among the essential elements needed to ensure a smooth deployment.

Clean Hydrogen Partnership Awards 2022 – 26 October 2022

The Clean Hydrogen Partnership awards, announced during the European Hydrogen Week in Brussels on **26 October 2022**, celebrate projects that have achieved excellence in clean hydrogen technologies research and innovation. Now in their fifth year, the awards provide an added incentive for project beneficiaries to bring research and innovation to the market.

This year’s award categories recognise the best innovation, success story, project outreach and, for the first time, the recently established European hydrogen valleys.

The finalists for the best innovation awards were selected by the partnership, based on the results in the European Commission’s [EU Innovation Radar Platform](#). The public then voted for the winning one. The Clean Hydrogen Partnership selected the winning outreach and valley projects.

1. Best Innovation Award electrolyser – the engines of green power

The winner was the novel anion exchange membrane developed by the [NEWELY](#) project. The consortium aimed to develop a new anion-exchange membrane water electrolyser (AEMWE) that is cheaper and more efficient than what is currently available. The consortium focused on improving three elements: the membrane, electrode, and cell design and stack. “The membrane is a big innovation, but it’s only when we combine all three elements that we see the true potential of AEMWE.”

The project developed a 2 kW five-cell prototype. The membrane has very good mechanical stability and is set to become the most efficient and cost-competitive AEMWE. AEMWEs combine the best features of alkaline and polymer electrolyte water electrolysers.

2. Best Success Story: advancing membrane technology



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The [GAIA](#) project won the Best Success Story. GAIA developed and tested advanced electric vehicle fuel cell components that meet stringent durability and performance requirements, taking the technology another step closer to commercial deployment and helping to decarbonise the transport sector. The project's automotive membrane electrode assemblies (MEAs) achieved a 6 000-hour lifetime and a leading power density of 1.8 W/cm² at 0.6 V in full-size cell short-stacks. A techno-economic evaluation of the technology developed by the team still needs to be completed to determine how the GAIA MEA measures up to the ambitious EUR 6/kW cost target.

3. Best Outreach:reaching out and making waves

The [SHIP FC](#) project won the Best Outreach Award, which recognises EU funding beneficiaries who communicate effectively about their project. SHIP FC is making the case for zero-emission propulsion for large, long-range vessels. A modular 2 MW fuel cell using ammonia as fuel is being tested on a large construction vessel for at least 3 000 hours over one year. Socio-technical models and analysis will be performed, and feasibility studies conducted on other vessels.

4. European H2 Valley 2022 Award: a triple valley success

The three winning valleys are [HEAVENN](#) in the Netherlands, [Basque Hydrogen Corridor](#) in Spain (BH2C), and [eFarm](#) in Germany. The Clean Hydrogen Partnership and its predecessor, the FCH JU, started working on the concept of hydrogen valleys in 2017. Currently, 38 European hydrogen valleys at different stages of development are part of the [Mission Innovation Hydrogen Valleys Platform](#). Of these, 17 have reached financial investment decision level, an important step for project realisation in the near term.

Participation in the Transport Research Arena (November 2022)

TRA, the Transport Research Arena, is the largest European research and technology conference on transport and mobility. The Clean Hydrogen Partnership and the European Commission (DG MOVE) co-organised a session on "Hydrogen Valleys in Coastal Areas – Accelerating the hydrogen economy in Ports on 16 November 2022 in Lisbon, Portugal. The session was part of the extended programme of the Transport Research Arena and discussed the importance of hydrogen valleys in coastal areas, how to accelerate the hydrogen economy in ports and their importance towards a green transition.

Solicitations / Procurements

- The Clean Hydrogen JU published a call for tenders on 07/06/2022 for the [European Hydrogen Observatory](#). Deadline to express interest was 26/08/2022.
- The Clean Hydrogen JU published a call for tenders on 18/07/2022 for the [Technical Assistance to Generate Synergies with Members States and Regions](#). Deadline to express interest was 2/09/2022.
- The Clean Hydrogen JU published a call for tenders on 19/07/2022 for the [Study on Sustainable Supply Chain and Industrialisation of Hydrogen Technologies](#). Deadline to express interest was 16/09/2022.

Seventh Meeting of the Hydrogen Energy Network (24/05/2022)

The Hydrogen Energy Network is an informal group of experts from Member States set up by DG ENER in 2019, composed by representatives from the ministries in charge of the energy policy. HyENet aims to support MS to develop on the opportunities offered by hydrogen as an



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energy carrier, acting as a platform of exchange of information, sharing of good practices, experiences and latest developments as well as joint work on specific issues.

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

Innovation Fund

The results of the second call for large-scale projects of the **Innovation Fund** were published on 11 July 2022. Among the 17 projects selected for grant agreement (total budget EUR 1.5 billion), three are directly addressing clean hydrogen production and use:

- The **HH** (Holland Hydrogen) project, which will supply a **400 MW electrolyser** with Dutch offshore wind (200MW trial by 2025, 400MW by 2027). The produced hydrogen will be supplied to the Pernis refinery via a new high capacity “open-access” 40 km pipeline to replace fossil derived hydrogen use in the production of road fuels. Hydrogen will also be used to refuel heavy duty trucks across Belgium and the Netherlands.
- The **FUREC** project (Fuse, Reuse, Recycle), will process non-recyclable solid waste streams and transform them primarily into hydrogen. The process will first be deployed at Chemelot, Geleen, the Netherlands, a major chemicals cluster with excellent logistical connections for waste collection and potential for future carbon dioxide utilisation and storage. The capacity of the FUREC project produces **54 kt per year of hydrogen**.
- The **ELYgator** project, a **200 MW electrolysis project** in Terneuzen (Netherlands), which will produce 15,500 tonnes of renewable hydrogen per year. The goal of the project is to demonstrate an innovative and highly flexible large-scale electrolyser, fully sourced with renewable energy and fully integrated in the cross-border industrial basin. The electrolyser will be flexible with dispatch following wind and solar power production. The renewable hydrogen produced will be fully traceable along the supply chain, regulation-compliant and fuel cell-ready to supply hard-to-abate sectors in both industry and mobility.

The third call for large-scale projects was launched on 3 November 2022. With a budget of EUR 3 billion – double the budget of the previous call. This call also contains specific topics with allocated budget as follows:

- **General decarbonisation** (budget: €1 billion) seeking innovative projects in renewable energy, energy-intensive industries, energy storage or carbon capture, use, and storage, as well as products substituting carbon-intensive ones (notably low-carbon transport fuels, including for maritime and aviation);
- **Innovative electrification in industry and hydrogen** (budget: €1 billion) seeking innovative projects in electrification methods to replace fossil fuel use in industry as well as renewable hydrogen production or hydrogen uptake in industry;
- **Clean tech manufacturing** (budget: €0.7 billion) seeking innovative projects in manufacturing of components as well as final equipment for electrolysers and fuel cells, renewable energy, energy storage and heat pumps;
- **Mid-sized pilots** (budget: €0.3 billion) seeking highly innovative projects in disruptive or breakthrough technologies in deep decarbonisation in all eligible sectors of the Fund. Projects should prove the innovation in an operational environment but would not be expected to reach large-scale demonstration or commercial production.



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The call is open for projects located in EU Member States, Iceland and Norway until 16 March 2023.

The second small-scale call (CAPEX below EUR 7.5 million) was open until 31 August 2022 and is currently in the last phase of evaluations 66 applications were received, including in hydrogen. The Commission will inform the applicants and publish the results of the evaluation at the end of 2022.

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 the European Hydrogen Bank 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.

The Hydrogen Bank will be designed to complement already existing public funding resources for development of the production, use and infrastructure of hydrogen at both EU and MS level, already adding up to more than €30 billion. Since the existing cost gap between renewable and fossil hydrogen will disappear eventually and the nascent hydrogen market will evolve towards a mature commodity market, the bank should be a temporary mechanism.

The European Hydrogen Bank will not be a physical entity as such but should become a policy instrument to contribute to early market creation and it will include:

- A domestic leg of operations. Contracts for Difference (CfD) auctions to incentivize hydrogen production and the development of Carbon Contracts for Difference (CCfDs) to support hydrogen applications in industry will form the core of the domestic leg of the bank.
- An international leg: work is in progress concerning the international leg to enable renewable hydrogen imports to the EU. Project risks, project finance environments and legal and regulatory conditions for hydrogen outside Europe differ and this has to be reflected in the design of financial instruments that will shape the international leg.

Important Projects of Common European Interest (IPCEI) on Hydrogen

The concept of important projects of common European interest (IPCEIs) is enshrined in Article 107(3)(b) of the Treaty on the Functioning of the European Union. It enables the Commission to approve State aid that Member States aim to grant for very large, risky and ambitious cross-border EU wide projects, notably on breakthrough innovations or for the construction of open infrastructures of great importance for the EU.

IPCEIs represent an important contribution to the achievement of strategic objectives of the Union, notably in view of their positive spill-over effects. They bring together Member States and stakeholders throughout the Union to undertake integrated and large-scale projects that provide significant benefits to the Union and its citizens, overcoming important market or systemic failures and societal challenges, which could not otherwise be addressed.



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The Commission's approval of these IPCEIs is part of the wider Commission efforts to support the development of an innovative and sustainable European hydrogen industry.

The IPCEI Communication complements other State aid rules such as the Climate, Energy and Environment Aid Guidelines (CEEAG), the General Block Exemption Regulation (GBER) and the Research, Development and Innovation (R&D&I) Framework, which allow supporting innovative projects whilst ensuring that potential competition distortions are limited. The IPCEI Communication supports investments for R&D&I and first industrial deployment on condition that the projects receiving this funding are highly innovative and do not cover mass production or commercial activities. They also require extensive dissemination and spillover commitments of new knowledge throughout the EU, as well as a detailed competition assessment to minimise any undue distortions in the internal market.

1. IPCEI Hy2Tech

The Commission approved on 15 July 2022 EUR 5.4 billion of aid for Important Project of Common European Interest in the hydrogen technology value chain, which could trigger EUR 8.8 billion private investments. The 41 projects from 35 companies in 15 Member States (see list below) will be constructing 33 automated production lines for electrolyser manufacturing and creating 18.000 direct jobs and supporting 2.000 young scientists.



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Commission approves up to €5.4 billion support
by 15 Member States for an Important Project
of Common European Interest (IPCEI) in the
Hydrogen Technology value chain
“IPCEI Hy2Tech”



2. IPCEI Hy2Use

The second hydrogen IPCEI was approved on 21 September 2022. The total state aid under this IPCEI amounts to just under EUR 5.3 billion which could trigger €7bn private investments. This IPCEI contains 35 projects from 29 companies in 13 Member States + 2 Projects from Norway



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IPCEI Hy2Use will support (i) the construction of hydrogen-related infrastructure, notably large-scale electrolysers and transport infrastructure, for the production, storage and transport of renewable and low-carbon hydrogen; and (ii) the development of innovative and more sustainable technologies for the integration of hydrogen into the industrial processes of multiple sectors, especially those that are more challenging to decarbonise, such as steel, cement and glass.

Commission approves up to €5.2 billion support by 13 Member States for an Important Project of Common European Interest (IPCEI) in the **Hydrogen value chain** "IPCEI Hy2Use"

Hydrogen Infrastructure	Hydrogen applications in Industry
<ul style="list-style-type: none"> Air Liquide France Air Liquide Netherlands - CurtHyl Air Liquide Netherlands - ELYgator Bay of Biscay Hydrogen (Petronor/Repsol) Bondalti Cartagena Hydrogen Network (Repsol) ENGIE Belgium ENGIE Netherlands Fluxys H2 Aboño (EDP) H2-Fifty H2 Los Barrios (EDP) HyCC Iberdrola MassHylia (TotalEnergies and ENGIE France) Ørsted P2X Solutions* PKN Orlen Shell Uniper 	<ul style="list-style-type: none"> Borealis Enel Green Power/Endesa ENGIE Belgium Everfuel* Hybrit Development IAM Caecius NextChem RINA-CSM RONA SardHy Green Hydrogen Solar Foods* South Italy Green Hydrogen TECforLime TITAN Cement VERBUND

Competition
*SMEs

3. Additional IPCEIs in the pipeline



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- **3rd Hydrogen IPCEI – RHATL**
 - Focus: hydrogen production and infrastructure (pipelines, ports, storage facilities...)
 - State of play: pre-notification between April and September 2022
- **4th Hydrogen IPCEI**
 - Focus: hydrogen use in the mobility and transport sectors
 - State of play: pre-notified during month of October 2022

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.

3 projects are supported under this scheme:

- Project from BASF: The European Commission has approved the German government's plan to provide BASF with EUR 134 million in aid for the production of green hydrogen, thereby helping BASF to contribute to the “greening of the chemical value chain and the transport sector,”
- Projects from Salzgitter AG. EUR 1 billion for the SALCOS[®] - Salzgitter Low CO₂Steelmaking transformation program. SALCOS[®] is aimed at converting steel production at Salzgitter into low carbon crude steel production in three stages over the period up until 2033. The first stage with a crude steel capacity of 1.9 million tons a year is scheduled to go live as early as the end of 2025. As part of the full transformation, two direct reduction plants and three electric arc furnaces will be built and will then incrementally replace the blast furnaces and converters. The transformation will enable the steel production that was formerly based on coking coal to be replaced by a new hydrogen-based route. Approximately 95 % of the annual carbon emissions totalling around 8 million tons are to be saved, thereby avoiding approximately 1 % of Germany's carbon emissions.
- Project from Cobra. The European Commission has approved a EUR 220 million grant to support Cobra - a Spanish infrastructure company - in the production of renewable hydrogen.

6. Regulations, Codes & Standards, and Safety Update

Overall, the Clean Hydrogen JU activities on Regulation, Codes, and Standards (RCS) can be summarised as follows:

- [Research grants](#), mostly on Pre-Normative Research activities. Over the last period, 3 PNR projects have concluded and 4 PNR projects are still ongoing. Additional Information on the 7 projects (supported through research grants) can be found further below.
- [Cooperation with JRC](#), which includes activities of diverse nature around this topic, e.g., harmonization of testing protocols. Over the last years, several [technical reports](#) have been published, but no further reports have been released in the last period.
- Cooperation with [CEN-CENELEC Sector Forum Energy Management and Energy Transition \(SFEM\)](#) Working Group Hydrogen (WG H2), to outline roadmaps about the



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needs for standardization, challenges, etc. Over the last period, the Clean Hydrogen JU has been cooperating with CEN-CENELEC SFEM WG H2, notably with the Task Force set up on 'Hydrogen quality needs for industrial uses' and has supported the development of an online survey to collect inputs from the industrial stakeholders to support the standards development. Link to the survey: https://ec.europa.eu/eusurvey/runner/CEN_CLC_SF_JTF_H2qInd_EUSurvey (deadline for inputs: 31 December 2022).

- [FCH Observatory module on Policy and RCS](#), provides users with a comprehensive overview of the most relevant policies, rules and standards that directly or indirectly affect the development and deployment of the hydrogen technologies covered by the observatory. This section of the portal is updated on an annual basis and the last set of [reports](#) was released in February-March 2022.
- The activities of the 'Regulations, Codes and Standards Strategy Coordination (RSC SC) Task Force'. The main goal of the RCS SC Task Force is the definition, coordination, and monitoring of the strategy related to RCS within the Programme with the goal of increasing the EU impact in RCS development in Europe and beyond, with the focus but not limited to Standards. The kick-off of these activities is expected in December 2022.

Concerning the research grants, in the last period, the following 3 projects have been concluded:

- [HYTUNNELS-CS](#) : PNR for safety of hydrogen driven vehicles and transport through tunnels and similar confined spaces. The project targets UN GTR #13 "Global technical regulation on hydrogen and fuel cell vehicles" and standards of ISO/TC 197 "Hydrogen Technologies" and CEN/CLC/JTC6 "Hydrogen in Energy Systems". Project end date: 31 July 2022.
- [AD-ASTRA](#): PNR on degradation mechanisms and definition of Accelerated Stress Testing (AST) protocols for SO cells. Project end date: 31 August 2022.
- [PRHYDE](#): PNR centred on developing refuelling protocols for heavy-duty hydrogen vehicles, on-road and off-road (rail, maritime). The project has cooperated with the US, Japan, and South Korea. Project end date: 30 September 2022.

Besides, the following 4 projects are ongoing

- [THYGA](#): PNR on the impact of blends of natural gas and hydrogen on end use applications in the domestic and commercial sectors. The project targets many different standards and committees. Project end date: 31 March 2023.
- [HIGGS](#): PNR covering the gaps of knowledge of the impact that high levels of hydrogen could have on the high-pressure gas infrastructure, its components, and its management. Project end date: 31 December 2023.
- [MultHyFuel](#): PNR on H2 refuelling stations in multifunctional contexts (multiple fuels). Project end date: 31 December 2023.
- [e-SHYIPS](#): PNR on hydrogen-based fuels solutions for passenger ships. Project end date: 31 December 2024.

On safety, in addition to the projects, the [European Hydrogen Safety Panel \(EHSP\)](#) carries out most of the safety-related activities at the JU Programme level. The mission of the EHSP is to assist the JU at both programme and project levels in ensuring that hydrogen safety is adequately managed and to promote and disseminate a hydrogen safety culture within and outside the JU programme.

Over the last period, the EHSP has been focused on the compilation of engineering and CFD



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models and tools for hydrogen safety, risk assessment methods, etc., and on updating reports released in previous years, such as the guidance document for the 'Safety Planning and Management in EU hydrogen and fuel cell projects', or the document on the 'Statistics, lessons learnt and recommendations from the analysis of the Hydrogen Incidents and Accidents Database (HIAD 2.0)'. With respect to the latter, it is worth mentioning that the number of events within HIAD 2.0 has been increasing from about 250 events in 2018 to 700+ events in 2022. The release of these reports is expected by the year-end or the beginning of next year at the latest.

In addition, the EHSP has continued over the last period with the assessment of all JU projects from a safety-related perspective and 4 safety plans of JU-funded projects have been reviewed, providing recommendations for their improvement where necessary. Besides, the EHSP has continued to provide support to any project consortium that did not have its own safety expertise or wishes an independent view.

Last, in terms of promoting a high-level hydrogen safety culture, the EHSP has organised a Safety Planning and Management in EU Hydrogen and fuel cell projects webinar to provide guidance on safety planning, monitoring, and reporting for hydrogen and fuel cell projects in Europe, and has participated in several events and conferences, such as the European Hydrogen Energy Conference 2022 (EHEC 2022), or 10th International Seminar on Fire and Explosion Hazards (ISFEH). Further information can be found on this [link](#).



Summary Country Update November 2022: European Commission⁴

Transportation	Target Number	Current Status ⁵	Partnerships, Strategic Approach	Policy Support
Fuel Cell light duty Vehicles ⁶	No target	To date, 1,791 FCEVs have been contracted through Clean Hydrogen JU, out of which 1,325 are currently deployed and 426 planned or in development phase, while 40 have been decommissioned.	Addressed through Clean Hydrogen JU Demo projects	Grant with maximum contribution from Clean Hydrogen JU
FC Bus	No target	- 283 buses deployed in Europe through Clean Hydrogen JU (of which 13 discontinued) - 71 more buses planned or developed through Clean Hydrogen JU	Addressed through Clean Hydrogen JU Demo projects	Grant with maximum contribution from Clean Hydrogen JU
Fuel Cell Trucks ⁷	No target	-14 garbage trucks contracted through Clean Hydrogen JU (REVIVE) -16 trucks contracted through Clean Hydrogen JU (H2Haul)	Addressed through Clean Hydrogen JU Demo projects. As of today marginal activity, however upcoming projects will demonstrate a fleet within the next years (minimum 150 trucks).	Grant with maximum contribution from Clean Hydrogen JU

⁴ Data reflecting state of play end of 2022.

⁵ Data covering both FCH JU and FCH 2 JU projects (for simplicity referred to just as FCH JU), all inherited now by the Clean Hydrogen JU.

⁶ Includes Fuel Cell Electric Vehicles with Range Extenders

⁷ As above



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Forklifts	No target	- 335 deployed in Europe (of which 273 via Clean Hydrogen JU)	Addressed through Clean Hydrogen JU Demo projects	Grant with maximum contribution from Clean Hydrogen JU
Aviation & Maritime	No target	- 4 fuel cell vessels planned - 1 pilot aircraft planned	Addressed through Clean Hydrogen JU Demo projects. As of today marginal activity.	Grant with maximum contribution from Clean Hydrogen JU
H ₂ Refueling Stations	Target Number	Current Status	Partnerships, Strategic Approach	Policy Support
70 MPa On-Site Production	No target	-193 HRSs deployed for road transport (buses, cars, trucks MHVs) and around 82 planned or under construction.	Addressed through Clean Hydrogen JU Demo projects	Grant with maximum contribution from Clean Hydrogen JU
70 MPa Delivered	No target	From the above, 85 HRS have been deployed via Clean Hydrogen JU out of which: <ul style="list-style-type: none"> • 12 x 350 delivered H2 • 7 x 350 onsite production • 7 x 350 unspecified 	Addressed through Clean Hydrogen JU Demo projects	Grant with maximum contribution from Clean Hydrogen JU
35 MPa On-Site Production	No target	<ul style="list-style-type: none"> • 4 x 700 delivered H2 • 2 x 700 onsite production • 31 x 350/700 delivered H2 	Addressed through Clean Hydrogen JU Demo projects	Grant with maximum contribution from Clean Hydrogen JU
35 MPa Delivered	No target	<ul style="list-style-type: none"> • 14 x 350/700 onsite prod. • 3 (others) trucked-in • 2 (others) onsite production 	Addressed through Clean Hydrogen JU Demo projects	Grant with maximum contribution from Clean Hydrogen JU



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Stationary	Target Number ⁸	Current Status	Partnerships, Strategic Approach	Policy Support
		<ul style="list-style-type: none"> 4 have been decommissioned - 27 additional HRSs contracted via Clean Hydrogen JU 		
Small ⁹	No target	4,161 contracted via Clean Hydrogen JU of which 2,978 deployed	Medium-scale deployment through Clean Hydrogen JU demo project	Grant with maximum contribution from Clean Hydrogen JU
Medium ¹⁰	No target	74 contracted of which 36 deployed	Small-scale demo projects via Clean Hydrogen JU	Grant with maximum contribution from Clean Hydrogen JU
Large ¹¹	No target	2 deployed of which one deployed (in China) and 1 planned	Small-scale demo projects via Clean Hydrogen JU	Grant with maximum contribution from Clean Hydrogen JU
District Grid ¹²	No target			
Regional Grid ¹³	No target			

⁸ Targets can be units installed and/or total installed capacity in the size range indicated

⁹ <5 kW (e.g., Residential Use), excl. telecom backup

¹⁰ 5kW – 400 kW (e.g., Distributed Residential Use), excl. telecom backup

¹¹ 0.3MW – 10 MW (e.g., Industrial Use)

¹² 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)

¹³ 30MW plus (e.g., Grid Storage and Systems Management)



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Telecom backup	No target	10 deployed via Clean Hydrogen JU, of which 9 medium and 1 small	Small-scale demo projects via Clean Hydrogen JU	Grant with maximum contribution from Clean Hydrogen JU
H₂ Production	Target¹⁴	Current Status	Partnerships, Strategic Approach	Policy Support
Fossil Fuels ¹⁵	No target	Out of scope of the Clean Hydrogen 2 JU		
Water Electrolysis ¹⁶ (PEM, Alkaline, SOEC)	Renewable hydrogen: 6 GW by 2024, 40 GW by 2030 (EU Hydrogen Strategy ¹⁷)	37.6 MW of electrolyzers deployed in Europe through Clean Hydrogen JU and another 34.9 MW planned. The total water electrolysis capacity ¹⁸ in EU27 is estimated around 120 MW.	Projects via Clean Hydrogen JU	Grant with maximum contribution from Clean Hydrogen JU
By-product H ₂	No target			
Energy Storage from Renewables	Target¹⁹	Current Status	Partnership, Strategic Approach	Policy Support

¹⁴ Target can be by quantity (Nm³, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target

¹⁵ Hydrogen produced by reforming processes

¹⁶ Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)

¹⁷ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0301&from=EN>

¹⁸ Combining information from Hydrogen's Europe [Clean Hydrogen Monitor 2022](#) (reporting for EU+EFTA+UK) and FCHO [Technology and Market Report](#), March 2022

¹⁹ Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity



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Power to Power ²⁰ Capacity	No target			
Power to Gas ²¹ Capacity	No target	40 Clean Hydrogen JU (Research & Demonstration) projects contribute directly or indirectly in the PtG concept with 140.5m€ funding.	Projects via Clean Hydrogen JU	Grant with maximum contribution from Clean Hydrogen JU

²⁰ Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity

²¹ Operator has the opportunity to provide the stored energy in the form of hydrogen back to the energy system through multiple channels (e.g., merchant product, enriched natural gas, synthetic methane for transportation, heating, electricity)