INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update April 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 next 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 announces that it will:

- 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 electrolysers;
- 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.

The Hydrogen and gas markets decarbonisation package

On 15 December 2021, the European Commission published its legislative proposals to decarbonise the EU's gas markets. The objective is to accelerate the shift from fossil natural gas to renewable and low-carbon gases such as hydrogen. The legislative proposals aim to create dedicated hydrogen infrastructure and a hydrogen market by applying market rules in two phases: before and after 2030.

In the first phase, the proposals create the right environment for investments and hydrogen uptake through lighter-touch regulation, the removal or reduction of cross-border tariffs, and regulatory exemptions for hydrogen valleys.

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.

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 1700 members. One of the main milestones was the publication, at the European Hydrogen Forum on 30 November 2021, of 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 pipeline includes 769 projects from all parts of the value chain: hydrogen production; transmission and distribution; applications in industry, transport, energy systems, and buildings. Many projects combine hydrogen production and its use in industries such as chemicals, refining, steel, or in transport applications, in particular heavy-duty road transport and maritime transport. The projects are located in the four corners of Europe, with 60% set to enter into operation (first phase) by 2024 and 80% by the end of 2025.

Much of the initial infrastructure centres on emerging hydrogen clusters and more than 110 projects concentrate on pipelines.

Key observations from the overview are that 87% of hydrogen production projects are electrolysers potentially producing green hydrogen and that the estimated hydrogen production (electrolysis capacity) is around 52.4 GW by 2030, which exceeds the 40 GW target set out in the Hydrogen Strategy.

The Project pipeline (europa.eu) was published to coincide with the Hydrogen Forum and can be searched by project archetype (type of project), project location, project promoter, or planned date of entry into operation.

The Clean Hydrogen Joint Undertaking (JU)

The Clean Hydrogen Joint Undertaking (JU) was established on 30 November 2021. The new JU, building on the experience and good collaboration between the industrial, research and public sectors as exhibited in the Fuel Cells and Hydrogen JU, aims to contribute to EU's ambitious climate and energy goals for 2030 and 2050 by supporting clean hydrogen technologies and allowing them to take a central place in the climate neutral economy of the future.

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. It will fund a large number of research & innovation activities, focusing the renewable hydrogen production, as well as hydrogen transmission, distribution and storage, alongside selected fuel cell end-use technologies in hard to abate sectors (industry and heavy transport).

On 25 February 2022, the Governing Board of the Clean Hydrogen JU adopted the Strategic Research and Innovation Agenda[1] (SRIA) for the period 2021-2027 of the JU and its (first) Annual Work Programme[2] (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 duration of the Programme, while the AWP is implementing them on an annual basis, mainly via Call for Proposals, and within the available budget.

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 €300 million will 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.

[1] https://www.clean-hydrogen.europa.eu/about-us/key-documents/strategic-research-and-innovation-agenda_en
[2] https://www.clean-hydrogen.europa.eu/about-us/key-documents/annual-work-programmes_en

A total of 41 topics will be 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. This call will also support 2 hydrogen valleys and 1 strategic research challenge.

Green Hysland - Inauguration of the first renewable hydrogen industrial plant in Mallorca

On 14 March 2022, the first industrial renewable hydrogen plant in Spain was inaugurated in Mallorca turning the island into the first renewable hydrogen hub in southern Europe. With a support of an EU grant of 10 million Euro by the Clean Hydrogen Partnership, the project is part of the Power to Green Hydrogen Mallorca project, led by Enagás and ACCIONA Energía, with the participation of IDAE and CEMEX. The project is a perfect example of how hydrogen and fuel cell technology can effectively contribute to the decarbonisation of European islands. It is the first hydrogen ecosystem in Southern Europe which can serve as a blueprint for similar Hydrogen valleys across Europe. (Read More)

'StasHH' defines standard for fuel cell modules for heavy-duty applications

Project "StasHH" has hit a major milestone by setting the first ever standard for fuel cell modules for heavy-duty applications, such as hydrogen trucks. This will help to reduce market fragmentation, effectively lower costs and increase the competitiveness of fuel cell technology as a means to decarbonise transport. This standard aims to globally impact the uniform development of fuel cell modules by setting clear rules regarding physical dimensions and physical and digital interfaces. The "StasHH" standard is thus a real game changer as it provides clear advantages for users and producers of fuel cell modules in their common goal towards reaching market competitiveness of heavy-duty fuel cell applications.

Hydrogen refuelling station for buses inaugurated in Rotterdam

On Friday 11 March one more hydrogen refuelling station (HRS) was inaugurated in Rotterdam (The Netherlands), as part of the CEF Transport funded MEHRLIN project. This project aims to demonstrate a new demand-led commercial model for the deployment of hydrogen refuelling stations by carrying out a test of the economies and practicalities of operating large hydrogen refuelling stations. So far it has deployed 7 large hydrogen refuelling stations in Hürth, Wermelskirchen-Koln, Wuppertal (Germany), Bolzano (Italy), Rotterdam (the Netherlands) and London and Birmingham (the UK).

More than 70 hydrogen fuel cell buses operate in these locations and use the refuelling stations. The zero-emission buses have been funded by three different EU projects supported by the Clean Hydrogen Joint Undertaking (3Emotion, JIVE and JIVE2). Daily operations are currently being monitored to gather technical and economic feedback to improve operations and financing options in light of a further roll out across Europe of zero emission buses.

PRESLHY Project. Towards safer Liquid Hydrogen-based systems and infrastructures

The project PRESLHY, concluded in 2021, performed pre-normative research activities for the safe use of liquid (cryogenic) hydrogen LH2 as an energy carrier. PRESLHY activities have carried out analytical work, numerical simulations, and experimental testing in order to increase the current knowledge on aspects related to the safety of LH2 and supporting the development of international standards. Its main achievements are:

- development and validation of engineering tools and CFD models addressing three safety-related areas: 1) cryogenic hydrogen release and dispersion**;** 2) ignition of cryogenic hydrogen mixtures and 3) combustion of cryogenic hydrogen
- gaining insights into the behaviour of LH2 in high-risk situations and provision of real data for the validation of the tools and models

- chapter on LH2 safety in the Handbook of Hydrogen Safety of the International association HYSAFE
- guidelines for the safe design and operation of LH2 infrastructure
- supporting the development of international regulations, codes and standards on LH2.

3. Demonstration, Deployments, and Workforce Developments Update

- To date, **1,610** FCEVs have been contracted through Clean Hydrogen JU, out of which **1064** are currently deployed and **546** planned or in development phase (mainly via H2ME, H2ME2 projects and ZEFER project).
- **119** FC buses have been deployed until today through Clean Hydrogen JU and **247** are planned or in development phase. A total of 315 buses have been deployed or planned to be deployed through the JIVE and JIVE 2 projects (including all buses currently under development).
- **179** HRS are deployed in Europe, out of which **72** deployed via Clean Hydrogen JU (mainly via H2ME and H2ME2 projects). A chart displaying key data on the number and type of hydrogen refuelling stations deployed in Europe, including location and capacity can be found here or here.
- **4,176** µCHPs contracted via Clean Hydrogen JU, out of which almost **3,000** already deployed (mainly via PACE and EneField projects – around 95% of total Clean Hydrogen JU µCHPs).

4. Events and Solicitations

Events & Initiatives

Clean Hydrogen Partnership Info Day 2022 (15/03/2022)
Following the publication of the Call for proposals, the Clean Hydrogen Partnership organised an Info Day on 15 March 2022. The Clean Hydrogen Partnership has launched its hydrogen research call for proposals – €300.5 million will be made available for proposed projects in an unprecedented drive to support the creation of cutting-edge hydrogen technologies. On 15 March 2022, during the Info Day 2022, the Programme Office introduced the various call topics and presented the Clean Hydrogen JU rules and procedures to submit proposals.

Clean Hydrogen JU Expert Workshop on Environmental Impacts of Hydrogen (31/3/2022 and 1/4/2022)
This online workshop was organized by the Clean Hydrogen JU as a result of a number of communications and scientific publications on the environmental impacts of hydrogen to gain further insights on this subject and assess the need for action in this respect. It was organized by the Clean Hydrogen JU with the support of the European Commission, the U.S. Department of Energy, Hydrogen Europe, Hydrogen Europe Research, the Hydrogen Council and IPHE.

The online workshop focused on gaining a better understanding and knowledge of the environmental impacts of hydrogen and hydrogen releases, and has three main objectives:

- Provide further insights on the current/ available knowledge on the environmental impacts of hydrogen (phenomena).
- Share evidence-based information on human-made hydrogen releases (sources, quantities, etc.).
- Support reaching a better understanding and assessing the need for action.

The outcome of the 2-day workshop will be a report drafted by the Joint Research Centre (DG JRC) of the European Commission with a summary of the workshop, its results, and learnings.

Webinar - Safety Planning and Management in EU hydrogen and fuel cell projects (22/04/2022)
With the support of the European Hydrogen Safety Panel (EHSP), the Clean Hydrogen Joint Undertaking is organizing this webinar to provide guidance on safety planning, monitoring, and reporting for hydrogen and fuel cell projects in Europe.

During the webinar, the EHSP experts together with the Joint Research Centre of the European Commission will provide an overview of the guidance document for the Safety Planning and Management in EU hydrogen and fuel cell projects published in 2021, give recommendations for safety plan preparation and highlight the importance of the European Hydrogen Safety Reference Database (HIAD 2.0). It will also offer an opportunity to exchange lessons learned from incidents of hydrogen accidents and their impact on the hydrogen acceptance and deployment

Hannover Messe (30/05-02/06/2022)
The Clean Hydrogen JU will be present at HANNOVER MESSE together with NOW GmbH (German National Organisation Hydrogen and Fuel Cell Technology). With more than 200 exhibitors, it is the leading trade fair for hydrogen and fuel cells and where the international hydrogen community meets to discuss new opportunities and applications.

European Hydrogen Week (date tbc, October 2022)
After the two successful editions of the European Hydrogen Week, the Clean Hydrogen JU will plan 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 will be opened by a high-level policy conference, the Stakeholder Forum and following by 2 days of Programme Review Days (PRD) in order to give the supported project a platform to present their achievements and milestones.

Solicitations / Procurements

- The Clean Hydrogen JU published a call for tenders on 10/12/2021 for the **Support to Mission Innovation 2.0 – Clean Hydrogen Mission H2.0 Valley Platform.** Deadline to express interest was 19/01/2022.

- The Clean Hydrogen JU published a call for tenders on 21/12/2021 for the **Project Development Assistance for Regions II - Cohesion Countries, Outermost Regions and Islands.** Deadline to express interest was 04/02/2022.

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

The results of the first call for large-scale projects of the **Innovation Fund** were published on 16 November 2021. Among the 7 projects selected for grant agreement, two are directly addressing clean hydrogen production and use:

- The **HYBRIT** (Hydrogen Breakthrough Ironmaking Technology) project plans to replace the coal-based blast furnace technology with direct reduction based on fossil-free hydrogen. The project will produce approximately 1.2 Mt of crude steel annually, representing 25% of Sweden's overall production, with the potential to avoid 14.3 Mt CO2eq of greenhouse gas (GHG) emissions over the first ten years of operation. The amount of the Innovation Fund grant is EUR 143 million.
- The **SHARC** (Sustainable Hydrogen and Recovery of Carbon) project will reduce emissions at the Porvoo refinery in Finland, by moving away from the production of grey hydrogen towards both green hydrogen production through of electrolysis and

blue hydrogen production by applying carbon capture technology. In the first ten years of operation, the SHARC project will avoid more than 4 Mt CO2eq. The amount of the Innovation Fund grant is EUR 88.3 million.

The second call for large-scale projects was launched on 26 October 2021. With a budget of EUR 1.5 billion - a 50% increase compared to the previous call - 138 applications were received in all eligible categories. Applicants will be informed about the results of the evaluation in the third quarter of 2022.

In the small-scale call (CAPEX below EUR 7.5 million), 32 projects for a total budget of grants worth EUR 108 million were approved, out of which 4 hydrogen projects in Spain (2), Italy and Poland. The second call for small-scale projects was launched on 31 March 2022 with a budget of EUR 100 million. Applicants will be informed about the results of the evaluation in the first quarter of 2023.

6. Regulations, Codes & Standards, and Safety Update

Overall, the Clean Hydrogen JU activities on Regulation, codes and Standards (RCS) are the following:

- Research grants, mostly on Pre-Normative Research activities. Over the last period, 10 PNR projects have been ongoing (see details in previous EC Country Report).
- The activities performed by the 'Regulations, Codes and Standards Strategy Coordination (RCS SC) Group', a working group composed of industry and research centres around these topics. The RCS SC Group has contributed to better coordination concerning RCS issues in the FCH 2 JU Programme, including the identification of RCS priorities for the Annual Work Programmes and proposals for standardization for the Annual Union Work Plan (AUWP) on Standardization of the Commission. Nevertheless, this group hasn't had much activity over the last period.
- Cooperation with JRC, which includes activities of diverse nature around this topic, e.g. harmonization of testing protocols. Over 2021, several technical reports have been published: (i) Historical Analysis of FCH 2 JU Stationary Fuel Cell Projects, (ii) Historical Analysis of FCH 2 JU Electrolyser Projects, and (iii) EU harmonised terminology for hydrogen generated by electrolysis.
- Cooperation with CEN-CENELEC SFEM WG H2 to outline roadmaps about the needs on standardization, challenges, etc. Over the last period, the Clean Hydrogen JU is keeping cooperating with SFEM WG H2, in particular with the Task Force set up on Industrial Needs Hydrogen Quality, and the organisation of three expert workshops on (i) Heavy-Duty Vehicles, (ii) Maritime applications, and (iii) Liquid Hydrogen.
- 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 FCHO. This section of the portal is updated on an annual basis and in July 2021 a new set or reports has been released.

Whilst most of the PNR activities in the Clean Hydrogen JU will be implemented as part of the activities within the Horizontal Activity 1: Cross-cutting Issues (JU SRIA, Section 3.6), a strategic and coordinated approach is needed at the Programme level. To this end, the Clean Hydrogen JU is going to set up a 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 ultimate goal of increasing the EU impact in RCS development in Europe and beyond, with the main focus but not limited to Standards.

On safety, the FCH 2 JU launched the European Hydrogen Safety Panel (EHSP) in 2017. The mission of the EHSP is to support projects in assuring that hydrogen safety is adequately managed and to promote and disseminate a high-level hydrogen safety culture within the FCH 2 JU Programme and now in the Clean Hydrogen JU. Over the last period, the EHSP has published two new reports.

- A new guidance document for the Safety Planning and Management in EU hydrogen and fuel cell projects is available. Building on the first safety planning guidance document published in 2019, the new document provides further information on safety planning, monitoring, and reporting for hydrogen and fuel cell projects in Europe. It helps EU projects to incorporate state-of-the-art hydrogen safety by integrating safety learnings, expertise and planning.
- A new guidance document for the Safety Planning and Management in EU hydrogen and fuel cell projects. Building on the first safety planning guidance document published in 2019, the new document provides further information on safety planning, monitoring, and reporting for hydrogen and fuel cell projects in Europe. It helps EU projects to incorporate state-of-the-art hydrogen safety by integrating safety learnings, expertise and planning.

An analysis of safety data and events contained in the European Hydrogen Incidents and Accidents Database (HIAD 2.0). The number of events within HIAD 2.0 has been increasing from about 250 events in 2018 to almost 500 events in 2020. The EHSP, in close collaboration with the Joint Research Centre (JRC) of the European Commission, has published the lessons learned from their in-depth assessment in a report, which includes recommendations stemmed from those lessons for different sectors and applications involving hydrogen.

The research supporting this document has been presented in the 9th International Conference on Hydrogen Safety (ICHS2021) by the EHSP, which received the Best Paper award.

Last, preliminary lists of the phenomenological models, risk assessment approaches and computational fluid dynamics (CFD) models developed from JU projects and elsewhere by the international hydrogen safety community have been compiled with links to relevant published documents.

These form the basis of the planned work in 2022 towards developing a one-stop-shop for hydrogen safety engineering, which will include comprehensive lists of phenomenological models, risk assessment approaches and CFD models for hydrogen safety engineering applications.

Summary Country Update December 2021: European Commission[3]

Transportation	Target Number	Current Status[4]	Partnerships, Strategic Approach	Policy Support
Fuel Cell light duty Vehicles[5]	No target	To date, 1,610 FCEVs have been contracted through Clean Hydrogen JU, out of which 1064 are currently deployed and 546 planned or in development phase.	Addressed through Clean Hydrogen JU Demo projects	Subsidy per vehicle in demo projects
FC Bus	No target	- 132 buses deployed in Europe through Clean Hydrogen JU (of which 13 discontinued) - 247 more buses planned or developed through Clean Hydrogen JU	Addressed through Clean Hydrogen JU Demo projects	Subsidy per vehicle in demo projects
Fuel Cell Trucks[6]	No target	-15 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	Subsidy per vehicle in demo projects

[3] Data reflecting state of play end of 2021.
[4] Data covering both FCH JU and FCH 2 JU (for simplicity referred to just as FCH JU)
[5] Includes Fuel Cell Electric Vehicles with Range Extenders
[6] As above

Forklifts	No target	- 335 deployed in Europe (of which 273 via Clean Hydrogen JU	Addressed through Clean Hydrogen JU Demo projects	Subsidy per vehicle in demo projects
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.	Subsidy per vehicle in demo projects
H_2 Refueling Stations	**Target Number**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
70 MPa On-Site Production	No target	-179 HRSs deployed for road transport (buses, cars, trucks MHVs) and around 70 planned or under construction. From the above, 72 HRS have been deployed via Clean Hydrogen JU out of which: • 10 x 350 delivered H2 • 7 x 350 onsite production • 2 x 350 unspecified • 4 x 700 delivered H2 • 2 x 700 onsite production • 28 x 350/700 delivered H2 • 11 x 350/700 onsite prod. • 3 (others) trucked-in • 1 (others) onsite production	Addressed through Clean Hydrogen JU Demo projects	Fixed amount of subsidy per HRS installation
70 MPa Delivered	No target		Addressed through Clean Hydrogen JU Demo projects	Fixed amount of subsidy per HRS installation
35 MPa On-Site Production	No target		Addressed through Clean Hydrogen JU Demo projects	Fixed amount of subsidy per HRS installation
35 MPa Delivered	No target		Addressed through Clean Hydrogen JU Demo projects	Fixed amount of subsidy per HRS installation

		• 4 have been decommissioned - 36 additional HRSs contracted via Clean Hydrogen JU		
Stationary	**Target Number[7]**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
Small[8]	No target	Ca 4176 planned via Clean Hydrogen JU of which 2999 deployed	Medium-scale deployment through Clean Hydrogen JU demo project	Fixed amount of subsidy per unit
Medium[9]	No target	74 planned of which 36 deployed	Small-scale demo projects via Clean Hydrogen JU	Funding dependent on power level
Large[10]	No target	2 deployed of which one deployed (in China) and 1 planned	Small-scale demo projects via Clean Hydrogen JU	Funding dependent on power level
District Grid[11]	No target			
Regional Grid[12]	No target			

[7] Targets can be units installed and/or total installed capacity in the size range indicated
[8] <5 kW (e.g., Residential Use), excl. telecom backup
[9] 5kW – 400 kW (e.g., Distributed Residential Use), excl. telecom backup
[10] 0.3MW – 10 MW (e.g., Industrial Use)
[11] 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)
[12] 30MW plus (e.g., Grid Storage and Systems Management)

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	Funding dependent on power level
H_2 Production	**Target[13]**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
Fossil Fuels[14]	No target	Out of scope of the Clean Hydrogen 2 JU		
Water Electrolysis[15] (PEM, Alkaline, SOEC)	No target	16.8 MW of electrolysers deployed in Europe through Clean Hydrogen JU (of which 13 discontinued) and another 53.8 MW planned. According to the Fuel Cell and Hydrogen Observatory, total water electrolysis capacity[16] in EU27 has reached 34.1 MW.	Projects via Clean Hydrogen JU	
By-product H_2	No target			
Energy Storage from Renewables	**Target[17]**	**Current Status**	**Partnership, Strategic Approach**	**Policy Support**

[13] Target can be by quantity (Nm^3, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target
[14] Hydrogen produced by reforming processes
[15] Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)
[16] https://www.fchobservatory.eu/observatory/technology-and-market/hydrogen-supply-capacity
[17] Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity

Power to Power[18] Capacity	No target			
Power to Gas[19] 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	

[18] Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity

[19] 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)