INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update June 2021: European Commission

Name	Patrice Millet
Contact Information	patrice.millet@ec.europa.eu
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1. New Initiatives, Programs, and Policies on Hydrogen and Fuel Cells

The European Commission's proposal for the Clean Hydrogen Partnership is still under discussion by the European Council and the European Parliament, and should be adopted by fall 2021. The European Commission, emphasizing the importance of hydrogen in the medium to long term, in order to achieve its ambitious goal of climate neutrality by 2050, proposes to fund the Partnership with €1 billion for the period 2021-2027, complemented by an at least equivalent amount of investment from the private sector members of the partnership, raising the total funding to above €2 billion.

As a sign of the growing interest in hydrogen, six other sectoral partnerships will also support hydrogen technologies, namely road transport, train, maritime, aviation, clean steel and clean process industries which now consider hydrogen as a key tool to achieve their climate objectives.

The 'fit for 55' Climate and Energy Package

To achieve the EU's increased 2030 climate ambition, all economic sectors and policies will need to make their contribution. The 'fit for 55' climate and energy package is a comprehensive step in overhauling the climate and energy policy framework to align it to the EU climate ambition. It includes the following policy initiatives.

Revision of the Renewable Energy Directive (RED II)

The main objective is to increase the EU's renewables target from the current 32% to 38 - 40%, in line with the 2030 Climate Target Plan. The proposal could lay down measures to increase the share of renewables in all sectors of the economy (heating and cooling, transports, but also industry) and strengthen the sustainability criteria for biomass use. It could include the introduction of an EU wide certification system for renewable and low-carbon fuels. The proposal would also aim at giving a strong push for electrification.

Revision of the Energy Efficiency Directive (EED)

It aims to increase the current energy efficiency target of 32.5% to 36-37% for 2030. The proposal could include measures driving energy efficiency in all key sectors of the economy through mandatory energy savings obligation. It could contribute to addressing energy poverty and help accelerate the renovation rate for public buildings.

Revision of the Alternative Fuel Infrastructure Directive (AFID)

The aim of this revision is to ensure that sufficient interoperable recharging and refuelling infrastructure will be in place throughout the EU and ensure that infrastructure investments indeed go hand-in-hand with the required vehicle uptake to reach the ambitious emission targets, first by 2030 and then towards 2050.

The proposal will include more binding targets for infrastructure rollout, including for hydrogen refuelling infrastructure along the TEN-T core network and urban nodes in support

of the ambition set by the Green Deal and Sustainable and Smart Mobility Strategy, namely to have at least 1,000 hydrogen stations by 2030 and half of them by 2025. It will also mandate technical specifications for hydrogen refuelling infrastructure, where still needed (for example liquid hydrogen refuelling), following the adoption of related standards by the European Standardisation Organisation.

TEN-T Regulation

The overarching goal of the revision of the TEN-T regulation is to contribute to the European **Green Deal** objectives and the realisation of the **Sustainable and Smart Mobility Strategy** (SSMS).

In the context of **alternative fuels**, the revised TEN-T regulation will make a close link with the revised Directives on the deployment of alternative fuels infrastructure, and on intelligent transport systems by including specific standards into the TEN-T.

The process of adoption of the **legislative proposal** revising the TEN-T regulation will be launched after the summer break in view of adoption in October/November.

FuelEU Maritime

As part of the 'Fit for 55' package, the Commission is planning to make a legislative proposal to increase the deployment and use of renewable low-carbon fuels in the maritime sector. Following public consultations, there was an overwhelming preference for a goal-based approach compared to more prescriptive mandates on certain technologies. We are therefore considering expressing our targets in terms of greenhouse gas intensity of the energy used on board (GHG per MJ). An additional limit will be set for the most polluting ships at berth (i.e., cruise ships, containerships, and roll-on passenger ferries).

ReFuelEU Aviation

In the coming weeks, the Commission is expected to adopt a legislative proposal to boost significantly the uptake of sustainable aviation fuels (SAF) and maintain a level playing field among market players in the EU aviation internal market.

SAF means advanced biofuels and synthetic fuels. Synthetic fuels would be subject to a specific sub-mandate, a priori starting in 2030. Hydrogen is a key "ingredient" to produce synthetic fuels, and therefore the aviation sector will rely on hydrogen already in the short term.

2. Hydrogen and Fuel Cell R&D Update

Successful test operation of the world's largest high-temperature electrolysis module
Sunfire, global leader in solid oxide electrolysis (SOEC) technology, achieves a major milestone in the development of its second generation innovative high-temperature electrolysers. The company successfully operated and tested a 225 kW (0.225 MW) electrolysis module, which is setting the base for the planned distribution of a multi-megawatt electrolyser to Neste's refinery in Rotterdam in the scope of the EU-funded MultiPLHY project. (Read More)

PECSYS – demonstrating the solar driven hydrogen production in a large photo-electrochemical system
PECSYS project developed a considerable number of innovative solutions for hydrogen generation by exploring different combinations of photovoltaic PV (photovoltaic) materials and electrolysers. The winning technology consists of full-sized silicon heterojunction

modules and CuInGaSe modules directly connected to detached PEM electrolysers without power electronics. Such a system, with a solar collection area of 10.5 m², was successfully tested in the real environment in Jülich (GER) for 9 months. Based on the results achieved by the demonstration system, the final technology readiness level (TRL) of the PECSYS technology is estimated as **6** (on a scale from 1 to 9). Further development is needed to increase the efficiency and long-term durability, in particular of the thermally integrated systems. (Read More)

COSMHYC project. Bringing hydrogen compression from concept to reality

A four-year FCH JU-funded project (2017-2020), COSMHYC (Compression of Hydrogen at refuelling Stations) developed an innovative hybrid compression solution focusing in particular on improving performance, lowering costs, and reducing the noise level produced by the mechanical processor. Impact of COSMHYC project:

- Development of prototypes for the metal hybrid (MH) and the mechanical compressors.
- Increase energy efficiency while optimising the temperature of operation for the MH (<150 degrees)
- Reduced noise levels related to the mechanical processor. The noise levels at a 5 m distance recorded 53,4 – 69,9 dB
- Decreased investments and operational costs. (Read More)

GAIA - Next Generation Automotive Membrane Electrode Assemblies

GAIA has the overall aim of developing high performance automotive membrane electrode assemblies (MEA) that integrate new materials and designs to reach the cost target and providing high power density at high current density. Despite the setback imposed by the current health and safety measures, the project has successfully achieved its mid-term goals in June 2020:

- 10-cells short stack reached the power-density target of 1.5W/cm3 at 0.6V under EU reference conditions
- mass activity of 0.89 A/mgPt in a MEA with reduced cathode loading of 0.1 mgPt/cm2
- membrane durability increased over 2 700 hours of drive cycle testing with a low voltage decay rate of 6 µV/hour

To achieve the final objectives, further developments and testing will include a new ionomer, membrane, catalyst compositions and designs, new catalyst layer constructions, tailored gas diffusion and microporous layers. (Read more)

3. Demonstration, Deployments, and Workforce Developments Update

- To date, **1457**[1] FCEVs have been contracted through FCH JU, out of which **988** are currently deployed and **330** planned or in development phase (mainly via H2ME, H2ME2 projects and ZEFER project).
- **119** FC buses have been deployed until today through FCH JU and **235** are planned or in development phase. A total of 300 buses have been deployed or planned to be deployed through the JIVE and JIVE 2 projects (including all buses currently under development).
- **159** HRS are deployed in Europe, out of which **72** deployed via FCH 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.
- **4358** µCHPs contracted via FCH JU, out of which **2880** already deployed (mainly via PACE and EneField projects – around 95% of total FCH JU µCHPs).

[1] Latest status 17/11/2020, including non-commercial vehicles

4. Events and Solicitations

European Hydrogen Week (29/11/2021)
To match the unprecedented interest in hydrogen technologies, FCH JU will dedicate an entire week of events - from 29 November to 3 December 2021 - to the essential role of hydrogen in meeting the 2050 climate neutrality goal of the European Green Deal and boosting the economic recovery.

The series of events taking place during the week include the European Hydrogen Forum, the meeting of the Clean Hydrogen Alliance, the FCH JU Programme Review Days and the FCH JU Awards (now at the fourth edition). The European Hydrogen Forum, which takes place on 29 November, will mark the launch of the Clean Hydrogen Partnership – as the successor of the Fuel Cells and Hydrogen Undertaking.

The event will bring together key policy-makers, industry representatives, civil society organisations and the research community to discuss the breakthroughs and opportunities of green hydrogen technologies in achieving climate neutrality while creating jobs and growth. We expect more than 5,000 participants online - from Europe and beyond.

Zero Emission Bus Conference 2021 (17/11/2021)
The Paris Zero Emission Bus Conference follows the successful 2nd edition held in Cologne, Germany, in November 2018. Over 360 global stakeholders representing 220 organisations attended the event. Expert speakers debated routes to commercialisation and discussed technological readiness of the two zero emission options: battery and fuel cell buses. ZEB 2021 will call on European manufacturers, policy makers and operators to scale up their zero emission ambitions to become global leaders in. (Read more)

The 4th International Workshop On Degradation Issues of Fuel Cells and Electrolysers (30/09/2021)
The 4th edition of the International Workshop on Degradation Issues of Fuel Cells and Electrolysers will take place this year from 30 September to 02 October in Corfu, Greece. Co-organised by FORTH/ICEHT, the University of Birmingham (UoB) and the Horizon 2020, FCH JU funded project - NewSOC, the event will cover different subjects: Durability requirements in Fuel Cell and Electrolyser applications Mechanisms limiting Fuel Cell or Electrolyser Durability. (Read more)

International Conference on Hydrogen Safety (21/09/2021)
The ninth edition of the biennial International Conference on Hydrogen Safety (ICHS2021) will be taking place in Edinburgh on 21st to 23rd September 2021. Organised by the Scottish Government and HySafe, the event will focus on the overarching theme of 'Safe Hydrogen for Net Zero'. The conference will present the state-of-the-art, new developments, regulatory and normative aspects and practical implications with regard to hydrogen safety. (Read more)

f-cell 2021 Energizing Hydrogen Business (14/09/2021)
The annual event for Hydrogen and Fuel Cell experts provides an extensive overview of relevant international markets and industries as well as technological advancements. The interactive format offers an ideal platform for experts and newcomers alike to connect, discuss and set up sustainable business relationships. f-cell 2021 consists of a conference with interactive sessions and trade fair. (Read more)

2nd International Hydrogen Aviation Conference (IHAC 2021) (2/9/2021)
The 2nd International Hydrogen Aviation Conference (IHAC 2021) will be held at Glasgow, Scotland on Thursday, 2nd September 2021. The 2nd International Hydrogen Aviation

Conference (IHAC 2021) will focus on the use of hydrogen in aviation, the associated benefits, and emerging challenges. (Read more)

European Fuel Cell Forum 2021 (29/6/2021)
The EFCF 2021, taking place from 29 June to 2 July, addresses issues of low-temperature Fuel Cells and electrolysers including CO2 reduction. These technologies are also strongly linked to hydrogen and its processing. The conference topics will range from fundamental understanding of the relevant materials as well as of the kinetics and mass/heat/water transport processes, H2 purification, compression, storage and distribution, all the way to the implementation in real-world devices. (Read more)

The FCHgo International Award event (15/6/2021)
The winners of the FCHgo International Award will be announced during an online ceremony on 15 June from 15:00 to 17:00. FCHgo is a European project funded by FCH JU, dedicated to fostering knowledge about fuel cell and hydrogen technology by delivering an educational model for schools. The project application phase for the FCHgo Award competition has closed, but the international selection of candidate projects is in progress. (Read more)

Solicitations / Procurements

The FCH 2 JU published a call for tenders on 06/05/2021 for a Study on Hydrogen in Ports and Industrial Coastal Areas. Deadline to express interest is on 14 June 2021.

The online Mission Innovation Hydrogen Valley Platform went live in January 2021, with 32 Valleys spread around the world. This was further enlarged with a new batch of four projects in June 2021. The final report of this procurement was published and announced during the launch of the Clean Hydrogen Mission within the Mission Innovation 2.0, together with the intention to further develop the platform with a new procurement to be launched soon, aiming at having it operational as of end-2021 and until 2023. The Report on Hydrogen Valleys provides insights into the emerging hydrogen economies around the world, with its findings being based on data gathered through this global information sharing platform set up by the FCH JU under the Innovation Challenge 8 'Renewable and Clean Hydrogen' of Mission Innovation and funded by the European Commission.

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

The 2020 (first) yearly Innovation Fund's (funded with allowances from the EU's Emission Trading System) calls for large- and small-scale projects, worth EUR 1 bn and EUR 100 mn respectively, were closed in Q1-2021.

In the large-scale call, 314 proposals were deemed admissible and 70 (worth about EUR 6.7 bn of request for support and potential to avoid 402 MtCO2e over 10 years) were actually invited for the second stage of the selection process. Hydrogen related projects account for over ¼ of these 70 proposals. Different paths for green H2 production account for about 40% of these H2 projects; blue H2 share is about 25% of the green H2 projects share; CCU (combining it with H2 for Methanol & Ethanol) projects are about double of the blue H2; and projects exclusively dedicated to H2 usage account for close to 1/3 of the H2 projects.

In the small-scale call (CAPEX below EUR 7.5 mn), 232 proposals were received of which yet again over ¼ are hydrogen related.

6. Regulations, Codes & Standards, and Safety Update

The Regulations, Codes & Standards Strategy Coordination (RCS SC) Group of the FCH 2 JU coordinates the strategy on RCS within the FCH 2 JU, with a focus on the identification of strategic themes for RCS development and their proposed follow-up.

With regard to standardisation, the only progress is on the WG1 of the CEN/CENELEC JT6 on the *Hydrogen in energy systems - vocabulary*, with a draft prEN ISO 24078.

The European Hydrogen Safety Panel (EHSP) continues its work on increasing the number of the safety data and events contained in the European Hydrogen Safety Reference Database (HIAD 2.0), currently above 550 events, and a new public report is being prepared with the summary of the findings, lessons learnt and recommendations stemmed from the assessment performed.

On public outreach, a revamped website is being prepared which will include a set of "Frequently Asked Questions (FAQs)" about hydrogen safety.

Summary Country Update June 2021: European Commission

Transportation	Target Number	Current Status[2]	Partnerships, Strategic Approach	Policy Support
Fuel Cell light duty Vehicles[3]	No target	To date, 1457 FCEVs have been contracted through FCH JU, out of which 988 are currently deployed and 330 planned or in development phase.	Addressed through FCH 2 JU Demo projects	Subsidy per vehicle in demo projects
FC Bus	No target	- 119 buses deployed in urope through FCH JU (of which 13 discontinued) - 235 more buses planned or developed through FCH JU	Addressed through FCH 2 JU Demo projects	Subsidy per vehicle in demo projects
Fuel Cell Trucks[4]	No target	-15 garbage trucks contracted through FCH JU (REVIVE) -16 trucks contracted through FCH JU (H2Haul)	Addressed through FCH 2 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
Forklifts	No target	- 335 deployed in Europe	Addressed through FCH 2 JU Demo projects	Subsidy per vehicle in demo projects
Aviation & Maritime	No target	- 4 fuel cell vessels planned - 1 pilot aircraft planned	Addressed through FCH 2 JU Demo projects. As of today marginal activity.	Subsidy per vehicle in demo projects

[2] Data covering both FCH JU and FCH 2 JU (for simplicity referred to just as FCH JU)
[3] Includes Fuel Cell Electric Vehicles with Range Extenders
[4] As above

H_2 Refueling Stations	Target Number	Current Status	Partnerships, Strategic Approach	Policy Support
70 MPa On-Site Production	No target	-159 HRSs deployed for road transport (buses, cars, trucks MHVs) and another 75 planned or under construction. From the above, 72 HRS have been deployed via FCH 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 • 4 have been decommissioned - 36 additional HRSs contracted via FCH JU	Addressed through FCH 2 JU Demo projects	Fixed amount of subsidy per HRS installation
70 MPa Delivered	No target		Addressed through FCH 2 JU Demo projects	Fixed amount of subsidy per HRS installation
35 MPa On-Site Production	No target		Addressed through FCH 2 JU Demo projects	Fixed amount of subsidy per HRS installation
35 MPa Delivered	No target		Addressed through FCH 2 JU Demo projects	Fixed amount of subsidy per HRS installation

Stationary	Target Number[5]	Current Status	Partnerships, Strategic Approach	Policy Support
Small[6]	No target	Ca 4191 planned via FCH JU of which 2903 deployed	Medium-scale deployment through FCH 2 JU demo project	Fixed amount of subsidy per unit
Medium[7]	No target	88 planned of which 50 deployed	Small-scale demo projects via FCH 2 JU	Funding dependent on power level
Large[8]	No target	2 deployed of which one deployed (in China) and 1 planned	Small-scale demo projects via FCH 2 JU	Funding dependent on power level
District Grid[9]	No target			
Regional Grid[10]	No target			
Telecom backup	No target	10 deployed via FCH JU, of which 9 medium and 1 small	Small-scale demo projects via FCH 2 JU	Funding dependent on power level

[5] Targets can be units installed and/or total installed capacity in the size range indicated
[6] <5 kW (e.g., Residential Use), excl. telecom backup
[7] 5kW – 400 kW (e.g., Distributed Residential Use), excl. telecom backup
[8] 0.3MW – 10 MW (e.g., Industrial Use)
[9] 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)
[10] 30MW plus (e.g., Grid Storage and Systems Management)

H_2 Production	Target[11]	Current Status	Partnerships, Strategic Approach	Policy Support
Fossil Fuels[12]	No target	Out of scope of the FCH 2 JU		
Water Electrolysis[13] (PEM, Alkaline, SOEC)	No target	16.8 MW of electrolysers deployed in Europe through FCH JU (of which 13 discontinued) and another 53.8 MW planned		
By-product H_2	No target			
Energy Storage from Renewables	**Target[14]**	**Current Status**	**Partnership, Strategic Approach**	**Policy Support**
Power to Power[15] Capacity	No target			
Power to Gas[16] Capacity	No target	39 FCH JU (Research & Demonstration) projects contribute directly or indirectly in the PtG concept with 143m€ funding.		

[11] Target can be by quantity (Nm^3, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target
[12] Hydrogen produced by reforming processes
[13] Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)
[14] Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity
[15] Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity
[16] 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)