



Hydrogen Europe

Research

HYDROGEN EUROPE RESEARCH

Policy Working Group 24/09/2021

Agenda

1. Welcome & Approval of the agenda
2. Subgroup updates
3. Latest news on the Clean Hydrogen JU
4. Latest updates on EU news

Subgroup updates

Technical Paper

Content – reminder

- Research areas that should be further funded in the EU and in Member States, beyond the scope of the CHE partnership
 - Absent from the SRIA/MAWP and not covered in CH JU
 - Present in the SRIA/MAWP but not specifically or not enough

A **questionnaire** was sent to HER members to collect their feedback on 14th of July.

- **40 responses** received
- From **28 organisations**
- Established in **14 countries**



Research Priorities Questionnaire

The Hydrogen Europe Research Policy Working Group is currently working on a paper which aims to share the research priorities identified for the FCH sector. Whilst a similar work was undertaken with our industry partner when drafting the Strategic Research and Innovation Agenda (SRIA), this paper will present an overview of the strategic research activities that should be funded further in the EU and Member States from the perspective of the scientific community.

IMPORTANT: These priorities should go beyond the scope of the Clean Hydrogen Joint Undertaking and not be included in the SRIA or the Multi-Annual Work Plan.

Link to the SRIA: <https://www.hydrogeneurope.eu/wp-content/uploads/2021/04/2021027-SRIA-CHE-final-draft-1.pdf>

The scope of the paper is to provide several priorities for fuel cell and hydrogen technologies from the perspective of the research community to the different stakeholders. It will acknowledge and support the work undertaken within the next JU, and other European partnerships, but also stress the basic research priorities that are not covered due to lack of budget. It will also be important to ensure that the research community can gather the best competences, skills and technological infrastructures.

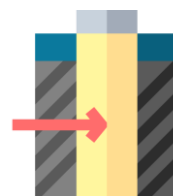
The goal is to identify gaps in research funding for FCH and the impact that further research would have on the sector. This paper will be shared with:

- 1) Policy makers & Funding Agencies – Entities responsible for funding at national and European level. The paper will help them to identify areas where public investment would be of added value.
- 2) Industry – This paper will contribute to shed light on research areas which should be of high priority. These priorities could eventually be incorporated into the SRIA following discussions with Hydrogen Europe.

Technical Paper – Hydrogen Production

Main elements received

- **Photoelectrolysis** – mentioned in the MAWP but to a limited extent
- Low TRL electrolysis technologies: **PCEL & AEMEL** – covered in the JU but to a limited extent
- **Biomass pyrolysis producing carbon black**
- **Co-electrolysis** – introduction of a hydrogen carrier during the hydrogen production step
- Multi-scale and multi-physics **modelling**, experimental characterisation at various scales (cell/stack/system) and advanced microstructural characterization – can apply for end-uses too
- More generally, the **sustainability of electrolysers** – reduction of CRM and PGM use (& dependence on supply from countries outside the EU)
- Colour of hydrogen should not be the main focus but methods of production with lowest carbon footprint



Technical Paper – Hydrogen Logistics

Main elements received

- **Metal hydride compression** – mentioned in the MAWP but to a limited extent
- **Chemical hydrides** – sodium borohydride
- Advanced technologies for **(De-)Hydrogenation of Liquid Organic Hydrogen Carriers**, as well as their “eco-friendliness” – some are not considered in CH JU
- **Life cycle evaluation and possible degradation** of structural materials from the utilisation of hydrogen
- More generally, having mature and widespread infrastructure and networks were mentioned – this may be not as relevant as a research priority though



Technical Paper – Hydrogen End-Uses

Main elements received

- Innovative and safer **fuelling protocols** for transport end-uses
- Multi-scale and multi-physics **modelling**, experimental characterisation at various scales (cell/stack/system) and advanced microstructural characterization – can apply for hydrogen production too
- **Onboard hydrogen generation** technologies (from liquid fuels)
- **Testing facilities** capable of testing and integrating stack operations with other system components
- Hydrogen **space mining**
- More generally, increasing the **durability and efficiency of fuel cell systems**, in actual operating conditions, over the entire life cycle, gathered interest – this should already be tackled in CH JU though
- The **sustainability of fuel cells** was mentioned – reduction of CRM and PGM use



Technical Paper – RCS & PNR

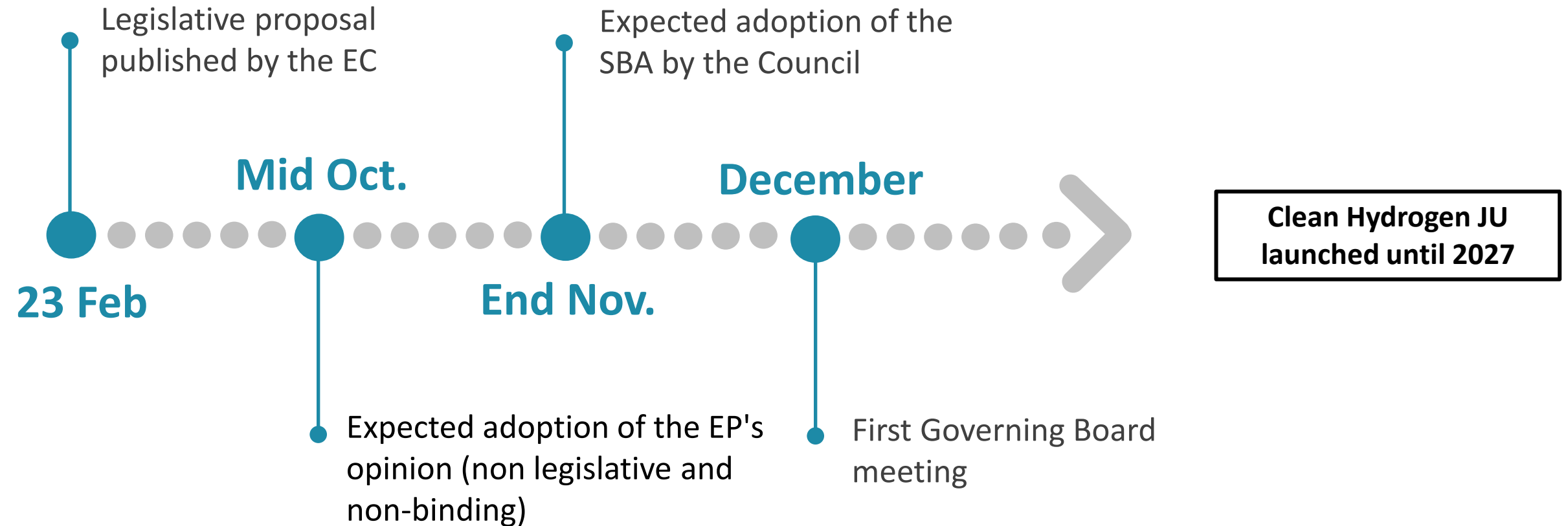
Main elements received

- There is a lack of **PNR in safety**, leading to poorly informed RCS – safety aspects mentioned:
 - Safety of large scale (stacked) electrolyser systems
 - Safety of underground storage
 - Safety of hydrogen storage onsite and onboard
 - Safety of LOHC transport
- **Accelerated stress testing protocols**
- Breakthrough safety technologies excluding any type of storage tank rupture



Latest news on the Clean Hydrogen JU

CH JU update - SBA adoption



Meetings with MEPs - HER's president:

- Meeting request sent to 5 MEPs active on the SBA
- Opportunity to introduce Hydrogen Europe Research and to hand out the Communication Paper

CH JU Update – MAWP/AWP

MAWP

- Third draft received from PO on the 29th of July:
 - Integration of comments received from EC/HE-HER/SRG
 - New chapters: sustainability & circularity panel, synergies with other PPPs, international cooperation
 - Minor updates of KPIs
- Next steps:
 - Review and comments from HE-HER to be sent by the 4th of October
 - Finalisation of interactions between PPPs
 - Final version to be ready by the end of the year
- MAWP to become a binding document? Still uncertain

AWP

- 2nd drafts of topics for AWP21-22 sent to PO & EC on 17th of September
- CG-PO-EC meetings to take place on 20th and 22nd of October
- Next GB meeting: 10th of November
- AWP23 activities will be launched at roadmap level **soon**

Latest update on EU news

FIT for 55

13 legislative proposals published on 14 July. Notable reactions from European institutions:

European Commission

- Divisions among Commissioners regarding the new ETS and the Amendment of the regulation setting CO2 emission standards for cars and vans.
- The Commissioner for Budget, Johannes Hahn voted against the proposal.

European Parliament:

- Oppositions on the creation of a new ETS for road transport and buildings
"The associated climate gains are extremely small and the political costs are extremely high" (MEP P. CANFIN, Renew Europe, FR)
- Divisions on the end of free carbon allocation to companies

Council:

- Critics on the new ETS for buildings and road transport

FIT for 55 - maritime and aviation

2 parallel initiatives with different approaches for maritime and aviation: **ReFuelEU Aviation and FuelEU Maritime.**

- Aviation: pushing for a share of sustainable fuel by taxing polluting fuel.
- Maritime: limits in terms of greenhouse gas intensity of the fuel.

	Share of sustainable fuel in aviation	Greenhouse gas intensity of the fuel for maritime applications
Currently	Less than 0,01%	-
2025	2%	2%
2030	5%	6%
2035	20%	13%
2040	32%	26%
2045	28%	59%
2050	63%	75%

Pact for Research and Innovation in Europe

In July the EC proposed a [Council Recommendation on a Pact for R&I in Europe](#).

1. Values and principles for research and innovation

Restating the values and freedom of scientific research as well as the common EU objectives.

2. Priority areas for joint action

This includes research infrastructures with the goal to develop further the open access, including for e-infrastructures. Recommend employing a broader range of funding sources and novel ways for funding transnational and virtual access.

3. Prioritising investments and reforms

Investment objectives, including an increase of the share of national public R&D expenditure committed to joint programmes, research infrastructures and European Partnerships to 5% of national public R&D funding by 2030.

4. Policy coordination

Common ERA agenda, policy online platform, ERA scoreboard, etc.

This text must now be amended and adopted by the Council.

It echoes with HER's activities and discussions on OITB and on a mapping of R&T infrastructures.

Consultation of the ERA H2 initiative

A **public consultation** is open a part of the European Research Area **pilot initiative on Green Hydrogen**. The agenda Process on Green Hydrogen originates from the joint programme of the EU Council presidency trio of Germany, Portugal and Slovenia (2020-2021).

Goal: to develop a joint Strategic Research and Innovation Agenda (SRIA) by the end of the year.

3 seed papers have been prepared for this work and the consultation is open to give feedback on the research questions identified.

- Production
- Transport/Infrastructure
- Market stimulation

3 workshops will then be organised to discuss the inputs received.

Have a look: <https://survey.pt-dlr.de/index.php?r=survey/index&sid=268919&lang=en>

Deadline: 26
September

Alliance on processors and semiconductor technologies

- **19 July – The European Commission launched an [Alliance on processors and semiconductor technologies](#)**. Objective: the EU should be able to produce 20% of the world production by 2030.
- The Alliance aims to identify and combat the bottlenecks to which European industry is exposed. Above all, it will seek to define "technology roadmaps" for the Union in order to reduce its dependence on third countries to gain international market share.
- The Alliance also aims to make a technological leap forward for the EU and to achieve 2-nanometre accuracy to meet the future needs of European industry [current accuracy in Europe 22nm, in South Korea and Taiwan 5 nm in the US 7nm].
- Further actions:
 - Launch of an IPCEI
 - Legislative proposal for a European Chips Act to create a European chip ecosystem

Upcoming initiatives

- **Other initiative 14 December** a [series of proposals](#) is expected from the European Commission, including:
 - Reducing methane emissions in the energy sector
 - Revision of the Third Energy Package for gas
 - Commission Communication: restoring sustainable carbon cycles - [Feedback](#) open until 7 October
- **New initiatives for 2022**
 - Legislative proposal on carbon removal certification
 - Legislative proposal on an EU framework for harmonised measurement of transport and logistics emissions
 - EU Action Plan on Digitalising the energy sector

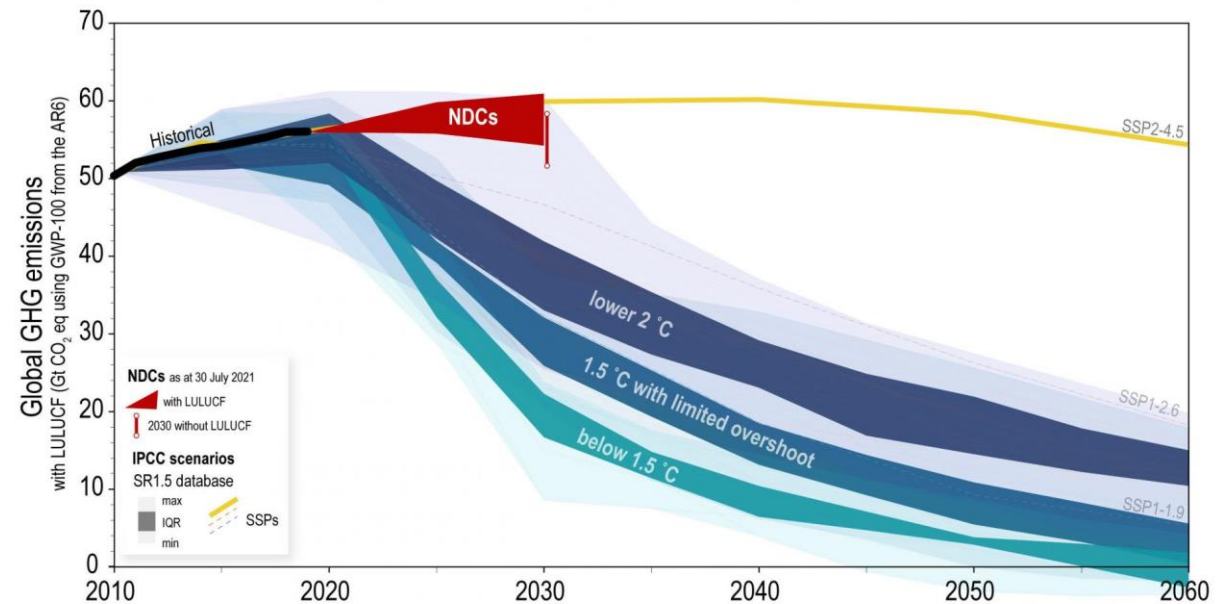
Emissions reduction

Global Methane Pledge:

- On 18 September the EU and the US announced an initiative to reduce global methane emissions, to be launched at the COP 26 which will take place in Glasgow in November.
- Objective: reduce global methane emissions by at least 30% by 2030 (compared to 2020 levels).
- Current commitment: EU, US, Argentina, Ghana, Indonesia, Iraq, Italy, Mexico, UK.

Synthesis of climate action plans made by the UN:

- 191 Parties
- Current Climate Plans would lead to an increase in global GHG emissions in 2030 compared to 2010, of about 16%. According to the latest IPCC findings, such an increase may lead to a temperature rise of about 2.7C by the end of the century.



Study

Study from ACER (Agency for the Cooperation of Energy Regulators): Transporting Pure Hydrogen by Repurposing Existing Gas Infrastructure: Overview of existing studies and reflections on the conditions for repurposing

- Based on 24 studies on the technical and financial aspects of repurposing existing gas infrastructures for hydrogen (gas industry, public institutions, H₂ industry, academics, think tanks, etc.).
- Repurposing is feasible and cheaper than building new pure hydrogen networks.
- Studies also draw attention to the suitability of salt cavern facilities for storing hydrogen, noting that these facilities are geographically clustered in selected areas in a few EU Member States.
- For hydrogen transport, the studies reviewed show that distance and volume are the main factors determining the most cost-effective mode of transport. At this time, transporting pure liquefied hydrogen by ship is not cost-efficient. Shipping hydrogen as a constituent of ammonia appears to be considerably cheaper.
- Several studies conclude that, based on industrial hydrogen demand, technology and cost assumptions, there is no indication that a large-scale pan-European hydrogen network would be justified.

Study

"How green is blue hydrogen?", R. W. Howarth and M. Z. Jacobson *Energy Science & Engineering* published by Society of Chemical Industry and John Wiley & Sons Ltd., 12 August 2021 ([here](#))

- Investigation on the lifecycle greenhouse gas emissions of blue hydrogen accounting for emissions of both carbon dioxide and unburned fugitive methane.
- Conclusions:
 - Total carbon dioxide equivalent emissions for blue hydrogen are only 9%- 12% less than for gray hydrogen
 - Fugitive methane emissions for blue hydrogen are higher than for gray hydrogen because of an increased use of natural gas to power the carbon capture.
 - the greenhouse gas footprint of blue hydrogen is more than 20% greater than burning natural gas or coal for heat and 60% greater than burning diesel oil for heat
- Assumptions: 3.5% emission rate of methane from natural gas and a 20- year global warming potential

This study was [criticized](#) by SINTEF Energy's:

"We find the **boundary conditions and parameters used in the study not representative for European conditions** and are puzzled by the technology and process choices in the paper. Thus, the results cannot be generalised to conclude on the topic of CO₂ footprint from hydrogen produced from natural gas with carbon capture and storage (CCS)."

Thank you for your participation!

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Annex - FIT for 55

Package of legislative proposals proposed by the European Commission on 14 July

Updates to existing EU laws	Policy field
Revision of the EU Emission Trading System (EU ETS), including revision of the EU ETS Directive concerning aviation, maritime and CORSIA	Emissions
Effort Sharing Regulation (ESR)	Emissions
Amendment of the Renewable Energy Directive to implement the ambition of the new 2030 climate target (RED)	Energy production
Amendment of the Energy Efficiency Directive to implement the ambition of the new 2030 climate target (EED)	Energy efficiency / Buildings
Revision of the alternative fuels infrastructure directive (AFID)	Transport
Amendment of the regulation setting CO2 emission standards for cars and vans	Transport / Emissions
Revision of the energy taxation directive	Taxation
New legislative proposals	
A carbon border adjustment mechanism (CBAM)	Emissions
A Climate Action Social Facility	Fund
ReFuelEU Aviation – on sustainable aviation fuels	Transport
FuelEU Maritime – on greening Europe’s maritime space	Transport

Annex - FIT for 55

Other EU law review planned	Policy field
RED II delegated act on Renewable Fuels of Non-biological Origin (<i>planned for end 2021</i>)	Energy / Fuel
EU Taxonomy - possible inclusion of nuclear and natural gas	Taxonomy
Hydrogen and decarbonised gas market package (<i>planned for Q4 2021</i>)	Gas market

One of the topic identified as relevant by the WG would be to follow the discussions around the method to measure carbon footprint. This aspect is transversal and would be relevant across policies.