



Hydrogen Europe

Research

HYDROGEN EUROPE RESEARCH

Policy Working Group 19/01/2022

Agenda

1. Welcome & Approval of the agenda

2. Updates on activities

- *Technical paper*
- *Verif-Hy - sharing facts on hydrogen to feed in the public debate*

3. Latest updates on EU institutions' activities

- *Delegated Act of RED II - leaked version discussion*
- *CBAM & AFIR - presentation of the German Hydrogen Council position*
- *Ongoing EU initiatives*
- *New Presidency Trio of the EU Council*
- *Upcoming initiatives from EU institutions*

4. EU Funding and Opportunities

Updates on Activities

Technical Paper - update

By the end of **next week** a **finalised version of the Technical paper** with the layout will be shared with the Board for **validation before publication**.

Noticeable editing:

- Inclusion of a new point in transverse activities to cover models and scenario analysis tools
- Inclusion of a new point to investigate on the impact of physical / chemical / biological effects in large hydrogen storage facilities
- The importance of materials and safety being cross-cutting, it will be reminded in an introductory paragraph
- General reshuffling to avoid repetitions and ease the reading

In parallel Simona has started to work on the **layout** of the paper [see next slide]

Technical Paper - update



RESEARCH POSITION PAPER

FOR A LONG PERSPECTIVE
IMPACT OF EUROPEAN
RESEARCH AND INDUSTRIAL
SECTORS

January 2022



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INTRODUCTION

1. Developing a supportive regulatory framework for next generations hydrogen technologies
2. Ensuring a strong European industrial leadership through research and industry collaboration
3. Fostering synergies for hydrogen development between European, national and local levels

RESEARCH CHALLENGES

RESEARCH PRIORITIES

1. Hydrogen production
2. Hydrogen logistics
3. Hydrogen end-uses
4. Transverse activities

CONCLUSIONS

Verif-Hy

Who they are

A group of 5 independent academics, scientists and engineers who are working to bring an *evidence-based viewpoint to the heart of the hydrogen discussion*.

1. Bernard Van Dijk – Airplane performance lecturer at Amsterdam University of Applied Sciences
 2. David Cebon – Professor of Mechanical Engineering, University of Cambridge
 3. Jochen Bard – Director of Energy Process Technology Division, Fraunhofer IEE
 4. Tom Baxter – Visiting Professor University of Strathclyde, Ex-BP Engineer
 5. Paul Martin – Chemical Engineer and Process Development Expert
- *Stand for supporting what the scientific evidence indicates, putting facts at the centre of any justification for using hydrogen in the energy transition.*
 - *Ensure that any public investments in hydrogen reflect the most effective path forward in our journey towards net-zero emissions by 2050.*



Verif-Hy

4 main recommendations:

- 1. Zero emission hydrogen is a unique opportunity for governments to speed up the energy transition. However, the only true zero emission hydrogen is that made from renewable electricity.** Governments must prioritise support for the only zero emissions hydrogen – green hydrogen – which is made from additional renewable energy such as wind and solar power. Blue hydrogen, which is produced by burning natural gas and attempting to capture carbon emissions with CCS, should be approached with caution. That’s because CCS is always partial, fugitive methane emissions during production and transportation are significant, and the risk of lock-in to expensive fossil fuels are very real.
 - For HER, the GHG footprint should be the norm of evaluation, not the colour. HER promotes the elaboration of a sound approach to evaluate the carbon footprint related to the production, distribution and usage of hydrogen. HER strongly supports the development of a methodology based on scientific and technical approaches to calculate the direct and indirect GHG emissions, whilst also supporting the consideration of other sustainability criteria to provide a comprehensive overview of what is at stake.
 - As electric systems become decarbonised (with new renewable energy capacity or other low-carbon power generation capacity), electrolytic hydrogen produced connected to the grid will have a lower carbon footprint.
 - Do we want to “defend” blue hydrogen? If yes, the response to the hydrogen methane leakage paper from SINTEF could be used.
- 2. Deploy green hydrogen for hard to decarbonise sectors, starting with where grey hydrogen is used today.**
 - It is common sense that current grey hydrogen production should be decarbonised and that all hydrogen production should emit the least amount of GHG as possible.
 - However, there is a clear and identified need for hydrogen in sectors currently not using this energy vector and where decarbonisation solutions cannot be provided by direct electrification. Thus, the need to upscale low-carbon hydrogen production for sectors currently using hydrogen, whilst simultaneously decarbonising hydrogen production for new uses. For this, it is essential to continue research on innovative technologies which will enable the decarbonisation of so called “hard to abate” sectors in the future.

Verif-Hy

3. Hydrogen shouldn't be used to delay deploying electrification alternatives available today, such as in heating and transport. Hydrogen isn't the best solution if it's more risky or expensive than already deployable alternatives like electrification. Research shows that it is too risky and too expensive to use hydrogen to heat buildings or to power road transport. Producing hydrogen uses vast amounts of energy, which is a fundamental flaw when comparing it with other electrification alternatives. Heating buildings with boilers using green hydrogen takes about six times more electricity than using electric heat pumps. Similarly, it takes about 3.3 times more electricity to power a hydrogen fuel cell lorry than one running on an Electric Road System. Certainly if affordable hydrogen solutions are ultimately developed for these areas, it shouldn't be at the expense of rolling out what we know works now, like heat pumps and energy efficiency measures. The latter of which can also help reduce citizen's bills. Focusing on the wrong demand sectors for hydrogen, such as heating and transport, would be an expensive mistake that can be avoided with other cheaper alternatives. Prioritising electrification, energy efficiency and a focus on green hydrogen for heavy industries will bring jobs to the UK and EU.

➤ **HER disagrees with the statement that research has shown that it is 1) *too risky* and 2) *too expensive* to use hydrogen for heating and transport modes.**

1) **Much research on safety has been undertaken for hydrogen technologies which has led to the elaboration of standards and norms which take into consideration the risks of hydrogen use. Today, there are many solutions for producing, storing and using hydrogen that are available without posing a threat to individuals.**

2) **Some final uses, such as heating and long-distance transport, require high energy density which cannot be provided by electrical technologies without noticeably increasing the size of their batteries or electric systems (thus reducing the overall efficiency as the weight increases). Hydrogen has the potential to overcome these barriers and can serve as a better alternative for long-distance transport (trucks, ships, planes) as well as for heat and power applications. Furthermore, the efficiency of hydrogen technologies has increased over the past decades to reach high-levels. The next generation of technologies will aim to maintain or improve the performances of hydrogen technologies whilst making them more sustainable (notably with a reduction in the use of materials). Finally, with upscaling and economies of scale, the cost of hydrogen technologies will decrease over time.**

3) **Electrification and hydrogen technologies should not be antagonistic but should rather complement themselves.**

Verif-Hy

4. **Given how valuable green hydrogen is, blending it into the existing gas grid does not make sense due to its limited impact on emissions savings.**

It is widely understood that current natural gas transmission infrastructure can carry a maximum of a 20% mix of hydrogen before needing expensive retrofits. Hydrogen-ready natural gas transmission pipelines do not exist today. Blending hydrogen with natural gas reduces the energy content, meaning more of the mix is needed to deliver the same amount of energy to the consumer. Furthermore, the safety of hydrogen in domestic environments is questionable and where hydrogen is burned in a gas cooker or gas boiler, it still generates NOx emissions. To build on our previous point, hydrogen does not make sense to use to heat buildings, which is where the majority of the UK and EU natural gas grid services serve. Before blending our valuable green hydrogen into the natural gas grid, the priority needs to be areas where we can have significant and immediate emissions reductions, such as replacing highly polluting grey hydrogen as outlined in our second point.

- **On blending, the natural gas grids in place offers an enormous storage potential (daily or seasonal), in addition to being an initial backbone for hydrogen distribution. There are many research projects (HyDeploy, HyBlend, ThyGa, Higgs...) underway which aim to find solutions for hydrogen distribution using these current assets, as well as identifying pathways to pure-hydrogen retrofitting.**
- **On safety, again, much research has been undertaken for hydrogen technologies. This has led to the elaboration of standards and norms which take into consideration the risks of hydrogen use. Today, there are many solutions for using hydrogen in domestic environments which do not pose a threat to the citizens.**
- **On NOx emissions when burning hydrogen in a cooker or boiler, they are proportional to the heat generated by the system – for domestic applications these emissions are low, however there is research undertaken to better understand combustion dynamics of hydrogen with the aim of finding paths to reduce even further these NOx emissions. Furthermore, cookers and boilers operating on hydrogen must comply with EU regulation on NOx emissions, thus they must emit less than the agreed threshold.**
- **Can additional/better arguments be provided for blending?**

Verif-Hy

On the points mentioned during the panel discussion that hydrogen only serves the interests of the petrol and gas industry, HER is an example that this is not the case. HER's members are public entities or non-profit organisations representing the European scientific community active on fuel cells and hydrogen technologies, and working in collaboration with a wide range of industrial stakeholders, from SMEs to large integrated groups. Over 500 scientists, all over Europe, participate to the activities of the association – namely in the identification of multi-annual and annual research priorities of the Clean Hydrogen Partnership, as well as the elaboration of research and innovation topics in the field of hydrogen and fuel cell technologies. This is only the tip of the iceberg, with thousands of researchers in Europe undertaken research on hydrogen technologies.

- Insert list of stakeholders active in the hydrogen sector, showing that the share of the gas and petrol industry remains marginal – more for HE to do?

More generally, science should provide facts on the performance of hydrogen technologies and their incumbent carbon footprint, based on clear and transparent studies and experiments. However, other industrial, economic and social parameters should also be taken into account.

Latest updates on EU institutions' activities

Delegated Act RED II - *leaked version discussion*

COMMISSION DELEGATED REGULATION (EU) .../...

of XXX

supplementing Directive (EU) 2018/2001 of the European Parliament and of the Council by setting out appropriate rules for the production of renewable hydrogen from electricity

Introduces additionality for renewable hydrogen production.

For hydrogen to be renewable it should be "*produced from additional renewable electricity*". It may come:

- 1) from directly connected installations producing renewable electricity
- 2) from the grid

For directly connected installations, 3 conditions area laid out:

- The installations generating renewable electricity are connected to the electrolyser via a direct line;
- The installations generating renewable electricity came into operation in the same year as the electrolyser or later;
- The electrolyser is neither directly or indirectly (via the installation generating renewable electricity) connected to the grid, electricity is not taken from the grid for the production of renewable H₂.

For electricity from the grid:

- contract with a provider for the claimed amount of electricity used in producing renewable hydrogen
- installation that came into operation in the same 12 months than the electrolyser
- no operating or investment aid for the production of renewable electricity
- given time of consumption [detailed rules art. 4-d, imbalance settlement period]
- same bidding zone for both installation or the competent national authorities have determined that there is no systematic electricity grid congestion between the bidding zones

Delegated Act RED II - *leaked version discussion*

Proving that renewable electricity is used for the production of hydrogen

Hydrogen producers should show that **production of renewable hydrogen takes place in the same quarter of the hour as the production of the renewable electricity**, or that more renewable electricity is being produced in the bidding zone than on average.

Information must be provided for each quarter of hour by producers on:

- The methods applied to determine the share of renewable energy used for the production of hydrogen.
- The amount of electricity used for the production of hydrogen. [including different sources]
- The amount of renewable electricity generated by the installations generating renewable electricity, regardless of whether they are directly connected to an electrolyser and regardless whether the renewable electricity is used for the production of the renewable hydrogen or for other purposes.
- The share of renewable electricity in the grid mix as reported by the national transmission system operator.
- The amount of produced renewable hydrogen and non-renewable hydrogen.

Phasing in period - shall come into force in 2025:

- The 12 months period for both the installation generating renewable electricity and the electrolyser
- The condition that the renewable electricity supplied is not subsidised

Delegated Act RED II - *positions of stakeholders*

Hydrogen Europe - A workable approach to additionality geographic and temporal correlation is key to the achievement of the EU Hydrogen Strategy ([June 2021](#))

"Hydrogen Europe has expressed concerns regarding the practical implementation of additionality principle criteria not the principle itself. "

Regarding the 12 months period:

- The lead time for investments into some renewable electricity generation assets (e.g., offshore wind – up to 7 years) does not coincide with the time needed to construct an electrolyser (less than 2 years). Until new electricity capacity is available, electrolyser project developers will therefore have a very low incentive to build. >> Mainly addressed with the phasing in in 2025
- Once that 12-month period is over, the possibility to increase the scale and size of the electrolyser would be hindered.
- Electrolysers should be allowed to use surplus renewable electricity for renewable hydrogen production. >> Possibility to consume during the imbalance settlement from the grid

Regarding the 15-minute interval:

- There is currently no technological, practical and legal way of aligning hydrogen production and energy production within a 15-minute interval. Such means will drive up OPEX.
- Recommend a span time of one month, moving forward 24h.
- Phase in period until instruments are available using power purchase agreements.

Delegated Act RED II - *positions of stakeholders*

Hydrogen Europe - A workable approach to additionality geographic and temporal correlation is key to the achievement of the EU Hydrogen Strategy ([June 2021](#))

- Countries with already high RES-shares (early movers) and consequently less potential to build new RES-E (compared to other countries) are also placed at a competitive disadvantage.
- Additionality criteria should apply to all new renewable electricity demand including for instance BEVs and heat pumps. Additionality is a discriminatory measure for the hydrogen sector.

Delegated Act RED II - *positions of stakeholders*

CEA - [Answer to the public consultation on the Directive for renewable energy](#) (in French)

The CEA underlined that the EC should explicitly define a timetable for the gradual reduction of the validity of GOs to 1 hour. [currently 1 year]

Creating a double system of guarantee of origin for electricity - one for the general case and one for hydrogen is not the right approach:

- it will not correct the flaws of the general system
- the multiplication of certification systems induces an additional degree of complexity
- the differentiated treatment between hydrogen production, which would be subject to a functional and rigorous mechanism, and other industries, which would continue to be subject to a deficient mechanism, constitutes a lasting breach of equity between industrial sectors and does not meet the requirements of technological neutrality

In the case of hydrogen, **the guarantees of origin of the electricity used should, from the outset, have been produced in the same hour as their use.** This will prevent the hydrogen industry from being structured around unsustainable business models that would then be difficult to challenge: i.e. producing hydrogen continuously, independently of the instantaneous low-carbon electricity production.

CBAM - Carbon Border Adjustment Mechanism

EU importers will buy carbon certificates corresponding to the carbon price that would have been paid, had the goods been produced under the EU's carbon pricing rules.

AFIR - Alternative Fuel Infrastructure Regulation

Promote the development of infrastructure over all transport sectors and all alternative fuels[2][3] or energies.



◆ STELLUNGNAHME

29. OKTOBER 2021

Vorschlag der EU-Kommission zur Verordnung zum Aufbau von Infrastruktur für alternative Kraftstoffe (Alternative Fuel Infrastructure Regulation – AFIR)

◆ STELLUNGNAHME

15. DEZEMBER 2021

Vorschlag der EU-Kommission zur Einführung eines Grenzausgleichsmechanismus (CBAM)

Is your organisation following these topics?
Would you wish to develop a HER position on them?

Ongoing initiatives from EU institutions

Refuel Aviation - *[Paper of the French presidency](#), in French.*

Discussion among Member States on the definition of Sustainable alternative fuels:

- Last compromise (December) limiting to biofuels that are not produced from food or feed crops, and to synthetic renewable fuels of non-biological origin
- Several Member States have called for the inclusion of first generation biofuels as well as recycled carbon fuels in this list.
- Several Member States also advocate an approach based on technological neutrality

Discussions on incorporation thresholds.

Gas Package

- [Proposal for a Directive](#) on common rules for the internal markets in renewable and natural gases and in hydrogen
- [Proposal for a Regulation](#) on the internal markets for renewable and natural gases and for hydrogen (recast)

Defines 'Low-carbon hydrogen' = from non-renewable sources, GHG emission reduction threshold of 70%;

Introduces certification schemes

Proposes to establish an EU-wide 10-year network development plan

Proposes to set up a European Network of Hydrogen Network Operators (ENNOH)

Blending - cap on hydrogen blending in the transnational gas flux at 5%

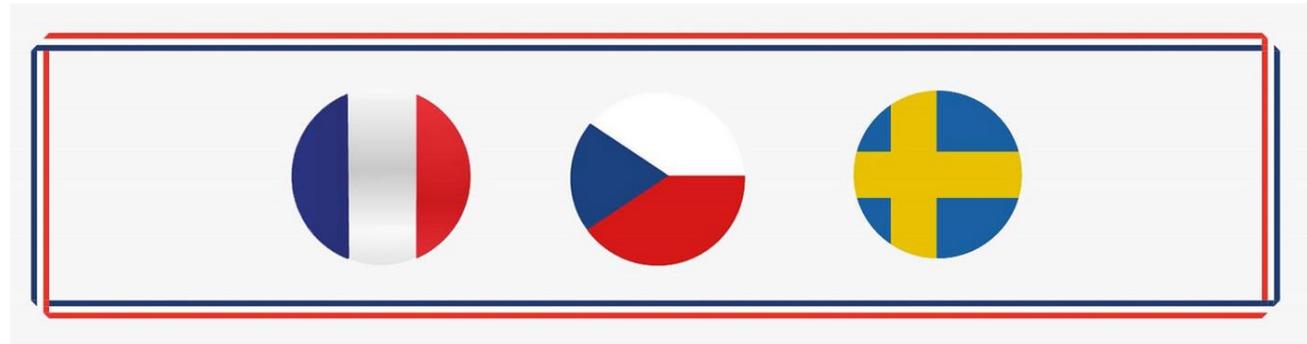
New Presidency Trio of the EU Council



From 1st January the French presidency of the Council has started. The following files have been put forward in their [Programme](#):

- Push forward discussions on the renewable energy and energy efficiency directives
- Start work on the gas package, revising the Regulation on conditions for access to decarbonised gas transmission networks, including hydrogen
- Initiate discussions on the proposal for a regulation on methane emissions in the energy sector
- Transport: AFIR, ReFuelEU Aviation, FuelEU Maritime

The 6-months rotating presidency works by trio and the opening of this new trio by France will be followed with Czechia and Sweden. See their [programme](#).



On research, "The objective is to strengthen the research infrastructure landscape and the research effort (fundamental, applied and disruptive) in the Union."

Initiatives from EU institutions

Published

Communication on a European strategy for universities - will be tackled in the remit of the Skills Working Group

Proposal for a Council Recommendation on building bridges for effective European higher education cooperation - will be tackled in the remit of the Skills Working Group

Upcoming

EU Solar Strategy - Communication to be published in Q2 2022 - [call for evidence](#) open until 12 April 2022

Renewable energy projects – permit-granting processes & power-purchase agreements - Recommendation [call for evidence](#) open until 12 April 2022

Energy diplomacy - European strategy on international energy engagement - Communication to be published in Q1 2022

EU Funding and Opportunities

Calls from EMPIR

The European Metrology Programme for Innovation and Research (EMPIR) has launched its 2022 Call on Wednesday 12th of January

The European Partnership on Metrology Call 2022 addresses the following topic areas:

- Metrology support for health
- Integrated European Metrology
- Metrology support for digital transformation
- Metrology support for Regulations and Standards
- Research Potential

Stage 1 of the Call for Potential Research Topics (PRTs) shall open from 12 January 2022 to 21 February 2022.

Stage 2 of the Call for Joint Research Projects (JRPs) is currently planned to open on 23 June 2022 to 03 October 2022.

The total Call budget is of EUR 15 million. For external partners (i.e. non-metrology institutes), a maximum of 25-50 % of the project budget can be allocated (TBC). More information can be found via the following link: <http://www.metpart.eu/>

Call for applications EU experts

Call for applications for the selection of members of the Commission expert groups on EU Missions:

- Adaptation to Climate Change
- Cancer Mission
- Restore our Ocean and Waters
- Climate-Neutral and Smart Cities
- Soil Deal for Europe Mission

Each advisory group may be composed of up to 15 experts whose aim will be to **provide advice and recommendations for the implementation of the action plans of each of the five missions**, but also to raise awareness among citizens. Members are appointed for 3 years. However, their mandate can be renewed for up to two additional years.

Mission Board members will be expected to work around 15-20 days per year



Mission Board members or legal entities controlled by them cannot be applicants or participate in any manner in any proposals submitted for calls under the EU Missions part of the Horizon Europe work programme. If an organisation employing a Mission Board member does act as an applicant, mitigating measures should be established within the institution if necessary (e.g. "firewalls" between the departments involved in submitting proposals, and the Mission Board member). When an organisation employing a Mission Board member appears in a proposal in a missions call, the Mission Board member and the organisation may be asked by the Mission Manager to sign a declaration that the Mission Board member was not involved in the preparation of the proposal and did not provide privileged information to the applicants.

Thank you for your participation!

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