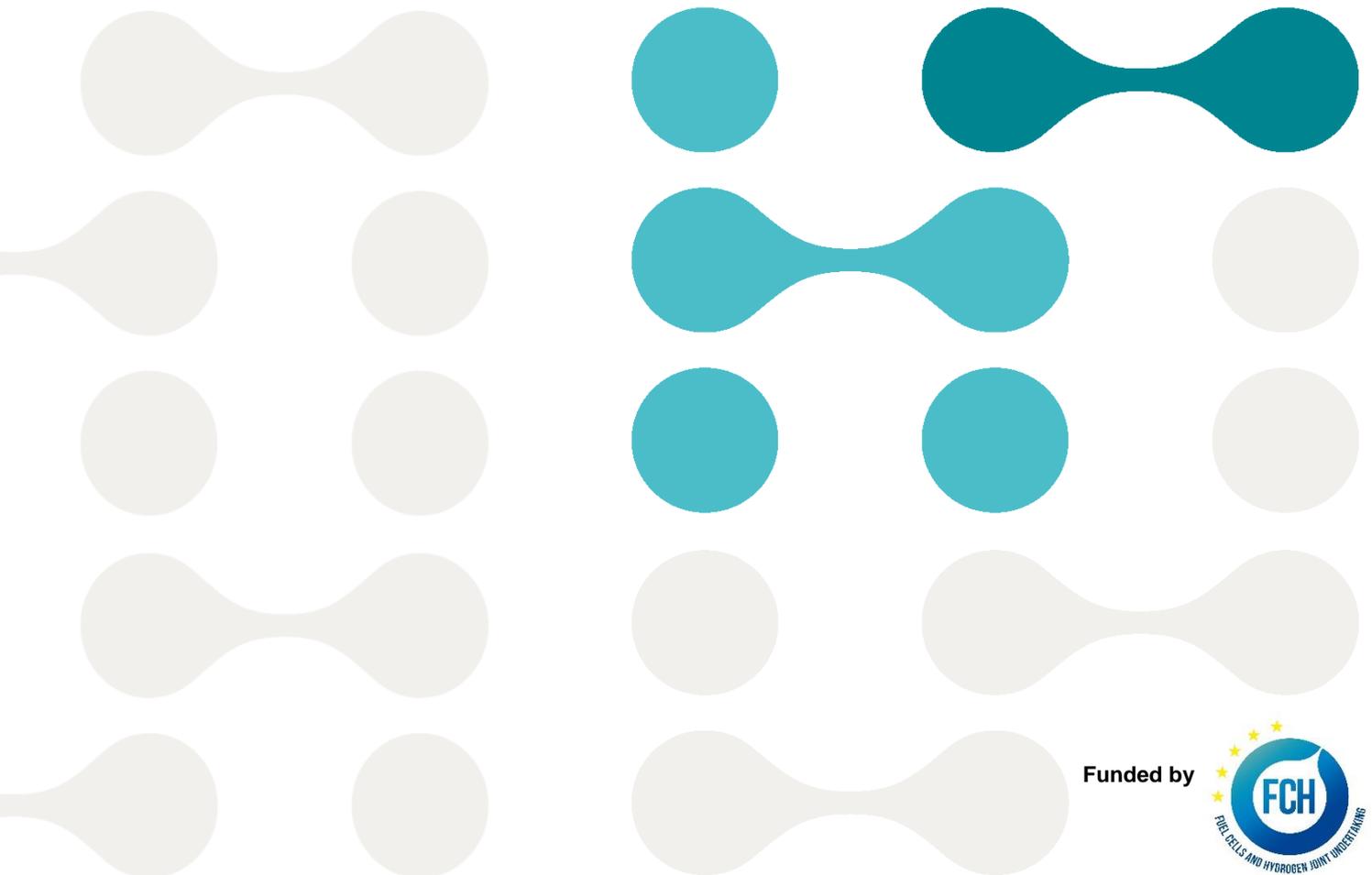


**H2FUTURE**

Green Hydrogen

## **D10.4: Actions to reach energy and environmental policy makers at national and European levels**



Funded by



## Document Information

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## Revision History

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Review	10.01.2022	Robert Paulnsteiner	Second draft for review
<b>Final</b>	28.01.2022	Martin Brunner	Final Version

# 1 Introduction

## 1.1 The H2FUTURE Project

As part of the H2FUTURE project a 6 MW polymer electrolyte membrane (PEM) electrolysis system will be installed at a steelworks in Linz, Austria. After the pilot plant has been commissioned, the electrolyser is operated for a 26-month demonstration period, which is split into five pilot tests and quasi-commercial operation. The aim of the demonstration is to show that the PEM electrolyser is able to produce green hydrogen from renewable electricity while using timely power price opportunities and to provide grid services (i.e. ancillary services) in order to attract additional revenue.

Subsequently, replicability of the experimental results on a larger scale in EU28 for the steel industry and other hydrogen-intensive industries is studied during the project. Finally, policy and regulatory recommendations are made in order to facilitate deployment in the steel and fertilizer industry, with low CO<sub>2</sub> hydrogen streams also being provided by electrolysing units using renewable electricity.

## 1.2 Purpose of Work Package 10.4

Workpackage 10.4 lists actions to reach energy and environmental policy makers at national and European levels. VERBUND organizes a yearly one day workshop (Year 3, 4 and 5) after the commissioning, bringing players of the energy and environmental policy players for a one day visit of the plant. All application value chain players are invited.

The aim was to show that the PEM electrolyser is able to produce green hydrogen from renewable electricity while using timely power price opportunities and to provide grid services (i.e. ancillary services) in order to attract additional revenue.

The mutually agreed communication goals and messages of the project consortium were:

- Green Hydrogen is the key enabler for deep decarbonization of the sector.
- Increase stakeholder consciousness for the need for renewable energies and the future demand for green hydrogen.
- In steel production, the basic prerequisite is the continuous availability of green electricity or hydrogen 24 hours a day, 7 days a week.
- Only mature electrolysis technologies can be scaled up to the GW range.
- A transformation of the energy system is a prerequisite for decarbonization.
- Integration of PEM electrolysis in industrial network and using it as primary and secondary frequency reserve is tested and implemented

Commissioning of the plant was finished with end of February 2020 and the pilot tests started right after that. But this time was also the moment when COVID hit our world and the planned workshop (VGB TC “Future Energy System” meeting in Vienna and Linz) and visits had to be cancelled or postponed to an at that time uncertain date in future.

However, VERBUND managed to reach the designated players of the energy and environmental policy players via other forms than visits and designated workshops at the site.

During the numerous events, conferences, workshops and meetings (details see final report) held in the course of the project, VERBUND experts always met stakeholders from the energy and environmental sectors.

These meetings were used to communicate the messages and concerns around green hydrogen. The focus was not only on highlighting the complexity of the project itself, but also on relevant laws, standards and requirements. Of course, the legal situation and the environment have changed in the course of the project and the messages had to be adapted. A detailed description of legal aspects and regulatory characteristics can be found in Report 9.5, which was written with input of all project partners under the lead of TNO.

After the commissioning - which coincided exactly with the beginning of the pandemic - a workshop with TÜV Sued could be used to meet the people from the energy and environment sector. Also in the course of the 100 years VGB Congress, relevant stakeholders from all over the EU could be met to provide information and messages. Furthermore, the framework of the regulatory workshop for WP10.7 in 2021 was used to talk to the designated target group. The following sections provide more details about these three events.

## 2 TUEV Sued Workshop February 3<sup>rd</sup> 2021

Under the headline “Energy from Hydrogen” a panel of experts took a look at the future prospect of hydrogen in the Industry and was followed by a discussion with experts from testing companies, ministries, authorities and companies.

During the workshop, systemic considerations of the production, transport, distribution and use of hydrogen in the mobility and transport sectors, industry and the overall energy system were examined. In the keynote speech, the Austrian Hydrogen Strategy: “*A 360° perspective on innovation, research, regulations and European comparison*” was highlighted by an expert from Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology.

A panel of experts from government, innovation and research, as well as application and safety, addressed the topic in detail. Well over 100 interested parties took part in this TUEV Sued Online Impulse.

The speaker of the Austrian Ministry for Climate, Mr. Streitner stated: “*In order to implement the measures for renewable hydrogen in Austria accordingly, not only strategic plans are needed, but also concrete funding programmes for R&D, H2 mobility and business models. It needs the targeted development of infrastructure so that the market can ramp up accordingly. All of this must be able to take place under the spirit of a level playing field for all participants; the corresponding legal framework conditions must also be created. Industry has a very special role to play in achieving climate neutrality: in the steel industry alone, the H2 demand is over 16 TWh.*”

The panel discussion made clear – and it was a common understanding for all panellists - renewable hydrogen will play an important role in achieving climate neutrality in Austria.

### 3 100 years VBG September 22<sup>nd</sup> and 23<sup>rd</sup> 2021

One focus of the congress was the topic of hydrogen. The expert opinion from this community is defined as follows:

*“The energy supply of the future will be sustainable, environmentally friendly, safe and economical. The expansion of renewable energies is therefore one of the central building blocks of European climate and energy policy. Along with the increasing need for flexibility in the energy system, hydrogen is considered a key technology of the future. Hydrogen produced in a climate-neutral manner is a universal energy carrier that plays a central role, especially for sector coupling.”*

The experiences from the H2FUTURE project were presented during a lecture and discussion. Colleagues from voestalpine and Siemens were also present at the event and gave their presentations

The paragraph below is an abstract of the project leader's presentation:

“The EU flagship project "H2FUTURE" supported by FCH-JU brings together energy suppliers, the steel industry, technology providers and research partners, all jointly working on the future of energy. With global steel demand set to increase by around 6 % by 2030, greening the steel industry is essential for the energy transition. This will require the integration of highly volatile renewable energy resources, through the use of hydrogen technologies. For this reason, the European Hydrogen Roadmap identifies steel as the leading sector for new feedstock applications of hydrogen.

Under the coordination of the utility VERBUND, the steel manufacturer “voestalpine” and “Siemens”, a PEM electrolyser manufacturer, a large-scale electrolysis system has been installed and is operated at the voestalpine steel plant in Linz in Austria.

With a capacity of 6MW "H2FUTURE" is currently the world's largest and most advanced hydrogen pilot facility using proton exchange membrane (PEM) electrolysis technology for producing green hydrogen from renewable electricity for direct iron-ore reduction.

In addition the electrolyser has been prequalified with the support of APG, the Austrian transmission system operator, in order to provide grid-balancing services such as primary, secondary or tertiary reserves while utilising the commercial electricity trading pools of VERBUND.

By this way the PEM electrolyser is able both to use timely power price opportunities in order to provide affordable hydrogen for current uses of the steel making processes and to attract additional revenues from grid services, which improves the hydrogen price attractiveness from a two-carrier utility such as VERBUND.

The plant produced its first cubic meters of green hydrogen in November 2019. It is currently in demonstration operation phase which is split into five pilot test periods with various test scenarios and a quasi-commercial operation period until June 2021. In a nutshell, the fundamental goal of H2FUTURE is to demonstrate that an industrially integrated PEM electrolyser is able to produce green hydrogen and supply grid services at the same time. Concepts to continue this EU flagship project are already in the pipeline.”

The picture below shows Mr Bürgler from voestalpine giving his presentation on the developments in steel production with green hydrogen.



Picture by VGB

The following section briefly reflects the content of Mr Bürgler's presentation:

“In 2015 the long-term target on climate protection was announced in the UN’s Paris Agreement with a limitation of the average temperature increase by max. 2 °C in 2100 compared with the pre-industrial period. The EU Green Deal of 2019 defined a climate-neutral Europe by 2050. Latest decisions set an intermediate target of CO<sub>2</sub> reduction by 55 % in 2030 compared with 1990 in Europe’s roadmap for the Paris Agreement.

Under consideration of long time investment cycles, the CDA (carbon direct avoidance) concept with hydrogen based on the integration of DR/EAF technology is a realistic concept for the transformation of integrated BF/BOF steelmaking sites. The stepwise replacement of carbon as reducing gas by natural gas and hydrogen, development projects for large scale hydrogen production, new hydrogen based reduction technologies and a new role of a steelmaking in a renewable energy system support the transformation to a CO<sub>2</sub> neutral process.”

## 4 Online Workshop with regulatory bodies, energy and environmental experts February 21<sup>st</sup> 2021

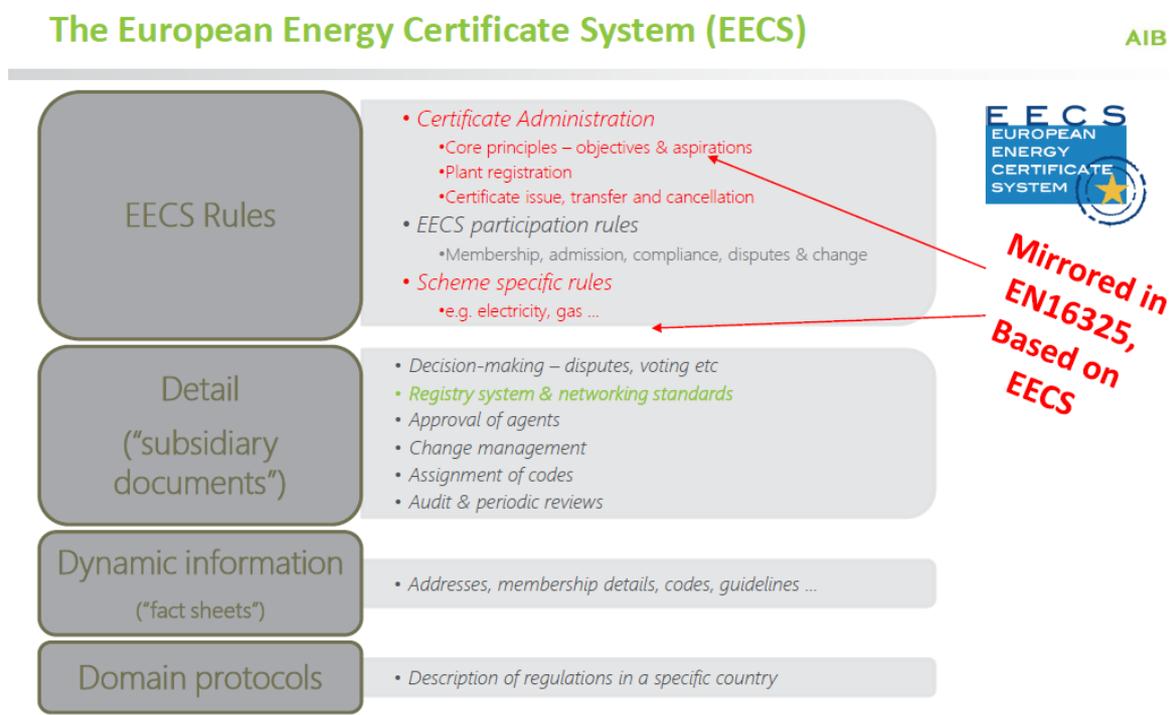
The workshops with regulators were also used to address the group of stakeholders from the energy and environment sector. Among the audience and online discussants were experts and staff from the following institutions:

Austrian Federal Ministry for Climate Action, NHP Attorneys at Law, Entsog, E-Control, Energy Regulatory Office, EDF R&D, EIB - European Investment Bank, Energy and Water Services Regulatory Commission of the Republic of North Macedonia, Alex Barnes & Associates, AB Energy Consulting Limited, Public Utilities Commission of Latvia, Union Française de l'Electricité (UFE) etc. to name just a few of the more than 170 participants.

A special point that was dealt with was the certification of green hydrogen. This certification was carried out for the first time in Austria at the H2FUTURE plant. An expert from AIB (Association of Issuing Bodies) was recruited for the workshop.

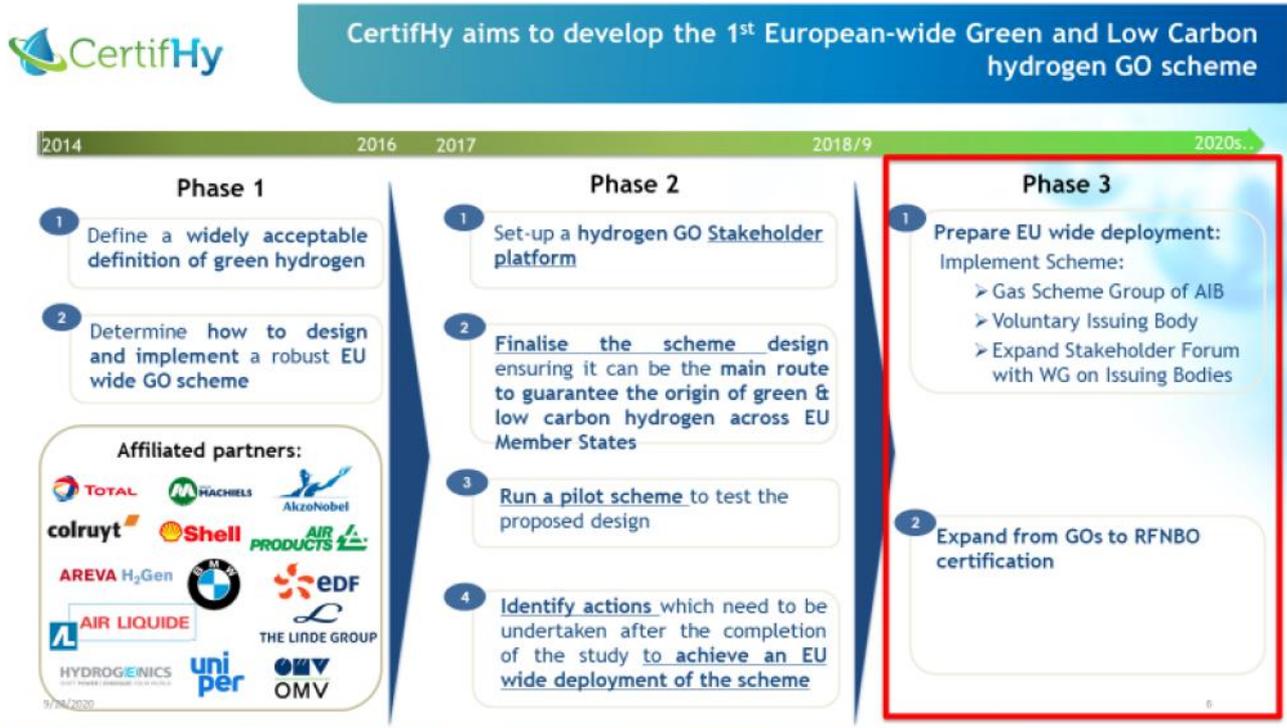
AIB presented the approach to certification from a European perspective, while the H2FUTURE project manager reported on his experiences with certification via CertifyHy from the project

The following picture shows the European Energy Certifications System as shown by AIB.





Where the next picture shows the approach of CertifHy.



The project coordinator talked about the experiences via the certifying process within H2FUTURE. Following slide summarizes the experience throughout the certifying.

**H2FUTURE – green hydrogen certification Summary**

FCH | FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

H2FUTURE

- Clean and safe Hydrogen production via water electrolysis by PEM technology
  - No chemicals needed
  - "Impurities" in hydrogen are only water vapor and traces of oxygen
  - Low pressure system with small amount of hydrogen in the plant
  - Dependent on electricity source
- Complex circumstances due to site integration
  - Advantages due to availability of utilities (deionized water, cooling water, nitrogen,...)
  - Challenges as to documentation of plant parameters
- Challenges in setting the criteria for green hydrogen
  - Various electrolysis processes (comparability)
  - Different quality requirements of end consumers (considering also future consumers)
- Challenges regarding competitiveness towards fossil processes (SMR)
  - Criteria as to eligibility of green hydrogen (e.g. electricity mix, additionality,...)

## 5 Summary

In general, it can be said that the interest in the project was huge. The stakeholders from the energy and environmental sector were highly interested in information and exchange of experiences from the project. The pandemic severely restricted the possibility to visit the project and the project members did not prevent them from sharing insights into the plant, its processes and findings with the group mentioned above