

HYDROGEN IN NORTH-WEST EUROPE: UNLOCKING OPPORTUNITIES THROUGH REGIONAL COOPERATION



**Report of the main findings of the presentation
webinar**

INTRODUCTION

On the 3rd and 4th May 2021, the online webinar on “Hydrogen in North-West Europe: unlocking opportunities through regional cooperation” was organized by the Roundtable on North-West European region of the Hydrogen Initiative of the Clean Energy Ministerial (CEM-H2I), with the support of the International Energy Agency (IEA) and Clingendael International Energy Programme (CIEP). In this two-day online event, the IEA and CIEP study “[Hydrogen in North-West Europe: a Vision towards 2030](#)” was presented and discussed among policymakers, government high-level representatives, companies and international organizations. This study was commissioned by the Dutch government to serve as the basis for discussions within the region on what is needed to create a regional liquid hydrogen market.

MAIN TAKE AWAYS OF THE FIRST DAY OF THE WEBINAR

- There is a **large potential for North-West Europe** to become frontrunners on clean hydrogen. The success of the region is key to successful implementation of the European hydrogen strategy.
- The **North Sea is the powerhouse** in the region for renewable electricity generation and renewable and low-carbon hydrogen. The North Sea is key for system integration and for achieving our decarbonization targets.
- Need to define **unified regional hydrogen policy**, which also includes non-EU member states, and is based on geographical conditions.
- Need to **stimulate cross-border projects on infrastructure**.
- Studies like this are needed to **monitor** the development of the market, the implementation of strategies and to promote transparency for policymakers, investors, and all stakeholders.

The second day of the webinar focused on the conditions needed to create the regional hydrogen market from the perspective of the companies that are active in hydrogen in North-West Europe. The chairperson **Rodrigo Pinto Scholtbach**, Senior Policy coordinator at the Ministry of Economic Affairs and Climate Policy of The Netherlands, welcomed the participants and summarized the main take-aways from the first day of the webinar with government representatives.

After the welcome and introduction, **Coby van der Linde**, Director of CIEP, summarized the main conclusions of the study. She pointed out that the North-west European region is currently one of the largest hydrogen demand centers in the world, but most of it comes from unabated fossil fuels, leading to high CO₂ emissions. She explained that the hydrogen demand could grow by one-third to 2030 but ambitious policies are required to stimulate new applications and clean hydrogen production. Some government programs have been funded, like in Germany and France, while in other countries funding still

needs to be organized. She stressed the possibility for hydrogen trade in the region, since some countries will have more demand than supply and vice versa. Regional flows could become a reality already in 2030. She also pointed out that focusing only on electrification will not be enough. Green molecules are needed in the regional economy, so it is important that governments give strong support to their development. She concluded by saying “*there is thus a strong case for hydrogen in North-west Europe, with the large pipeline of projects for renewable and low-carbon hydrogen production and that the development of cross-border infrastructure can help as a flywheel to kick start the regional hydrogen market and help projects to become a reality*”. Afterwards, representatives from the Hydrogen Council, European Investment Bank and Hydrogen Europe reflected on the study and

presented their views on the opportunity for companies in North-West Europe within a regional hydrogen market.

Views on the opportunities for companies in this region



Daryl Wilson
Executive Director
Hydrogen Council

Mr. Wilson stated that this region is at the cornerstone of the global hydrogen market and that it has a leadership role in developing innovative policy and technology. He encouraged the region to maintain this position and to scale up soon. He cautioned the region to not repeat past mistakes as it takes a leading role, since hydrogen allows a holistic way of thinking. He encouraged the region to think in new ways about how to bring the sectors together and to fully realize the integrated value of hydrogen.



Roland Schulze
Manager
European Investment Bank

Mr. Schulze pointed out that decarbonizing the energy system becomes more capital intensive and that uncertainties of policies can inhibit investments in new technologies, because projects are too risky. From a bank perspective, he pointed out that for hydrogen financing to become a reality a number of things need to happen, such as the need for supply chain development, widespread infrastructure deployment, massive investments in renewable energy production and public support (subsidies and carbon pricing). He stressed as well on the importance of timing. Investments cycles are around 25 years. That means that there are only two investment cycles in which to meet carbon neutrality in 2050 and that action is therefore needed now. He concluded by saying how encouraging it is that many companies and governments are convinced that hydrogen is needed.



Jorgo Chatzimarkakis
Secretary General
Hydrogen Europe





Mr. Chatzimarkakis welcomed the study because it is fact-based and it clearly shows that 60% of the demand is already in this region. This is a very important aspect because the industries using hydrogen could abate CO₂ emissions immediately. That is important for investors, because the market is already in place. With large clients already in place and concentrated around harbor areas, the chicken and egg problem can be overcome. He called upon the region to strive for ambition. Even though there are tools in place such as the European Green Deal and the UK Climate Change Act, new policy instruments are needed to lower the levelized cost of hydrogen. He pointed out examples such as Carbon Contracts for Difference (CCfD) at the consumer side, but also tests with auctions to stimulate the production site. He finished his remarks by stressing the importance of cooperation within the region.

EXPLORING THE OPPORTUNITIES: SESSIONS AND COMPANIES' VIEWS

The IEA and CIEP identified four priorities in the study:




1. Build upon the large, unused potential to co-operate on hydrogen in the north-western European region.
2. Identify what is needed to develop an integrated regional market.
3. Develop supporting schemes with a holistic view of the hydrogen value chain.
4. Identify the best opportunities to simultaneously decarbonise current hydrogen production and deploy additional low-carbon supply.

During the webinar, four sessions were held based upon the four recommendations from the study. In each session, 3-4 companies pitched their views and ideas. The pitches were followed by interesting discussions. The scheme below shows the main question per session and the companies that presented their 2 minute pitch.

1	2	3	4
<p>What are the main steps needed to develop an integrated regional hydrogen market?</p>	<p>What kind of cross-border projects can be initiated to boost the development of the NW European hydrogen market?</p>	<p>What type of supportive mechanisms are needed for the hydrogen value chain?</p>	<p>What are the elements needed for a strategy to reduce emissions from existing hydrogen producing assets (industry) while simultaneously developing additional production for new applications (mobility and beyond)?</p>
			

The following section summarizes the main points presented by the companies and the conclusions of each session.

Session 1: What are the main steps needed to develop an integrated regional hydrogen market? Chair: Coby van der Linde, Director, CIEP





		
<ul style="list-style-type: none"> • All colors of hydrogen need to be transported within the same infrastructure. It is important to have pure hydrogen and not blended. Blending can take place near the distribution network. • Repurposing of natural gas pipelines needs to be allowed. Low calorific gas pipelines can now be transformed to hydrogen pipelines. • Coordination between members states on cross-border infrastructure. • Certification of hydrogen - fortunately the EU is working on this. A systematic approach is needed, covering all technologies and specifying the CO₂ footprint. • EU standardization • Adaptation of EU legislation relating to CO₂ certification for all modes of transportations. • Incentives on the demand side need to be considered to bridge the gap to financial viability, such as CAPEX support and CCfD 	<ul style="list-style-type: none"> • The industry is ready to deliver the required technology. • Pace of implementation needs to be sped up. • More renewable generation deployment. This is the feedstock for green hydrogen. • Investment insecurities, i.e. electricity price and carbon prices and CCfD can help diminish these uncertainties. • Transparency: many customers don't know where they can get hydrogen in the future. Transparency will help the market develop. • Infrastructure and public acceptance. • International harmonization on how to define green hydrogen. • Certificates and avoiding carbon leakage. 	<ul style="list-style-type: none"> • Bring the projects to scale and find the right market conditions. • Market conditions: secure offtake and then production can be realized. We know technology is ready, providers are also ready to scale. • Demand incentives can assist this. Important Project of Common European Interest (IPCEI), CCfD, CAPEX and OPEX supports and no constrains on the production requirements in the revision of the Renewable energy Directive (REDII). • Transport of hydrogen is key in connecting producers and consumers. • Time for partnering and regional cooperation. • Need large investments in renewable production and infrastructure. • System integration - electricity, gas and chemicals need to come together. An optimum can be achieved with hydrogen. • Blending in the transition. • Guarantees of origin, and harmonizing definitions between member states

Conclusions

Discussion on hydrogen moves from color-based focus to policy instrument focus. Renewable hydrogen might already be competitive in some markets and low-carbon

hydrogen can help ensure security of supply. Once the right policy instruments are combined and put into place, a desired effect could be realized but side effects could arise, such as unwanted levels of bureaucracy, ambiguous targets or inefficient cross-border competition.

**Session 2: What kind of cross-border projects can be initiated to boost the development of the NW European hydrogen market?
Chair: Roland Schulze, Managerial Adviser, European Investment Bank**

	<ul style="list-style-type: none"> • Large scale electrolysis • Large scale CCS projects • Hydrogen gas infrastructure • Ecosystems with ambitious targets and commitment
	<ul style="list-style-type: none"> • GW Green Hydrogen Value Chains • Large scale renewable power, offshore wind
	<ul style="list-style-type: none"> • Hub and spoke concept (North Sea Wind Power Hub) • Roll out of large-scale offshore wind • Coupling of electrolysis and offshore wind • Develop hydrogen infrastructure with storage • Strengthen the power grid
	<ul style="list-style-type: none"> • Energy islands (example Bornholm) • Interconnectors between countries • Production of e-fuels with green hydrogen





Conclusions

In addition to discussing what kind of cross-border projects can boost the development of the regional hydrogen market, the presenters also highlighted what is needed to initiate these cross-border projects, such as:

- ❖ **Infrastructure and regulatory framework**
- ❖ **Off-takers for renewable hydrogen and support schemes for demand**
- ❖ **Mechanisms to target efficient locations for electrolyzers from an energy infrastructure perspective**
- ❖ **Support mechanisms for scaling up electrolyzers**
- ❖ **European guarantees of origin**

The discussion in this session also focused on the quality of hydrogen, with views on how the Renewable Energy Directive (REDII) could evolve. The specifications of the markets will be crucial for the required quality. There are basically two trends: ultra-pure hydrogen for use in fuel cells and less pure hydrogen for combustion processes. Therefore, standardization on a regional level is needed. REDII could allow uptake of both renewable and low-carbon hydrogen, with high level of CO₂ capture and storage, to allow the market to evolve more rapidly and scale-up. The focus must be renewable hydrogen in the long-term.

Session 3: What types of supportive mechanisms are needed for the hydrogen value chain? Chair: Daryl Wilson, Executive Director, Hydrogen Council

	<ul style="list-style-type: none"> • Policy framework • Financial support is needed to make electrolysis projects viable
	<ul style="list-style-type: none"> • Support the reuse of existing infrastructure at sea: This will save time with regard to permitting of pipelines and cables, and costs • System integration is key, so offshore wind deployment can be accelerated by re-using existing gas infrastructure if hydrogen is the energy carrier instead of electricity • Cross border collaboration: pipelines already run between the UK, NL, DK and DE and can be repurposed for H₂ transport • Mix of investment and operational subsidies required • CCfD for hydrogen uptake • Certification
	<ul style="list-style-type: none"> • Cross border collaboration, especially on gas pipeline infrastructure, is needed for the execution of the projects • The right government support in place is needed to take FID • RED II implementation should enable full potential of green hydrogen and thus consider existing renewable capacity • Infrastructure: plannability of the available infrastructure • Learning from gas markets, unbundling for example • Regulatory measures for supply and demand • Combined tenders for offshore wind and hydrogen
	<ul style="list-style-type: none"> • Ambition and enthusiasm in private sector, government and policy sector • Political will to move towards the hydrogen economy • Policy needs to enable bridging the gap between grey, blue and green hydrogen. ETS helps but is not sufficient. • Develop enormous amounts of renewable power. Current policies in rewarding blocks at large scale do not exist. • Financial instruments should support demand but also production, while maintaining a level playing field in Europe. • Large-scale Infrastructure: the gas infrastructure can be repurposed for hydrogen transportation.

Conclusions

The most crucial elements to unlock projects were identified to be those that will allow large scale, which will be essential for lowering the costs. Additionally, using existing assets (i.e. pipeline and installed renewable electricity capacity) while developing new assets is fundamental, as permitting, developing and planning have long lead times. Finally, how CCfD can be applied to unlock opportunities was briefly discussed. It was concluded that it is important that CCfDs work for all types of hydrogen irrespective of color. In combination with ETS and carbon pricing, CCfDs can help to kick start the market and then be gradually reduced.

Session 4: What are the elements needed for a strategy to reduce emissions from existing hydrogen producing assets (industry) while simultaneously developing additional production for new applications (mobility and beyond)?
Chair: Jorgo Chatzimarkakis, Secretary General, Hydrogen Europe

	<ul style="list-style-type: none"> • Decarbonize existing assets and do it at scale, as fast as possible. This means CCS is needed • Produce clean hydrogen and consume in refineries to reduce existing emissions • Encourage new markets, working with partners, working with new industries
	<ul style="list-style-type: none"> • Deltalinqs company (located in the port of Rotterdam) have a 3 step decarbonization plan with several projects working towards execution • “Circular” or “Renewed” hydrogen: refinery fuel gas as feedstock to produce low carbon hydrogen • This will replace the natural gas that is currently used in industries for high temperature processes • Capture of CO₂ emissions and storage in gas fields • In the future, fuel gases produced at, for instance, bio-refineries can be converted to hydrogen at the facility • Issues are: Financial de-risking
	<ul style="list-style-type: none"> • Decarbonizing existing hydrogen uses and developing new ones in mobility applications. • Electrolysis can be deployed quickly and upscaling can provide rapid decarbonization • Clustering of electrolysis hubs where the demand is concentrated and then interconnecting with infrastructure. • At the same time grow the mobility sector. Opportunities in ports, bus depots, etc. • This has to be bottom up. Focus on discrete steps that will eventually become the hydrogen economy, but in the early years focus on large processes and mobility.
	<ul style="list-style-type: none"> • Decarbonizing the fertilizer industry and expanding use in shipping. • The ammonia production centers can still be used, and existing infrastructure and terminals are completely ready. No new infrastructure needed.

Conclusions

In this session several industrial processes were identified with high potential to rapidly decarbonize the existing hydrogen demand, such as ammonia production and refinery processes, the latter with CCS. Renewable hydrogen production via electrolysis is also a key enabler to decarbonize existing and new applications. Promising applications mentioned were:

- ❖ **Mobility and shipping**
- ❖ **Gas grid and mini interconnected hydrogen grids**
- ❖ **Industry as launching customers for heating processes**

Lastly, the role of CCfDs was discussed in the emerging hydrogen market. It was concluded that it has great potential but that it might be more complex for hydrogen than in other markets. It is important to learn from previous experiences, for example from offshore wind, and design tailored CCfDs for different applications, instead of using a one solution-fits-all approach.

CONCLUSIONS

Rodrigo Pinto Scholtbach closed the webinar by providing the following conclusions:

1. It is clear that there is a need to accelerate the implementation of the policies of the governments and to develop proper supportive instruments. The revision of state aid rules this year is required to support the industry. We have to remember to keep a level playing field in the region. Governments are doing all things possible to accelerate the introduction of hydrogen in the region.
2. There is a need for more investment security. The EU is in the middle of the revision of TEN-E, REDII, state aid and decarbonization package. This is a critical year to put all the elements into place to build the right framework to accelerate the development of a regional liquid hydrogen market.
3. More political commitment is needed. A regional policy strategy could help in strengthening the cooperation and increasing political support. We have the potential to do so by combining all the existing and new cross-border initiatives
4. Transparency is critical. It is important to continue monitoring the market and policy progress. The study done by IEA and CIEP is a very useful instrument to support and facilitate the dialogue in this region and to boost the cooperation within companies. We want to continue this dialogue and explore, together, the steps needed to kick-start this new market.