

AURORA

Hydrogen Conference

London 2022

Wednesday 9 November | Central Hall Westminster

The Emerging Hydrogen Economy:

Finding Opportunities
& Maximising Value



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Panel Partners:



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Hydrogen Conference

London 2022

DEAR FRIENDS AND COLLEAGUES

It was my great pleasure to welcome you to our first Hydrogen Conference. The event was hugely successful with more than 400 attendees, showing a high level of interest and engagement on the topic of how hydrogen can support the energy transition.

Just a few years ago, this was a relatively niche and academic topic, but the setting of Net Zero targets in the UK and Europe led many to question how we will address 'hard to abate' sectors. It is clear that hydrogen will play an important role in reducing our reliance on fossil fuels—an issue amplified by the energy crisis resulting from the War in Ukraine. While there is still uncertainty about the use of hydrogen in heating and transportation, it will play a critical role in decarbonising industry and providing flexibility in the power system alongside renewables.

The Aurora Hydrogen Conference focused on how to find opportunities in the hydrogen space and maximise value. I hope this pack helps distil our main takeaways from the day. It is obviously impossible to do justice to the experience of being there and the richness of the questions and challenges in the room, but we hope this is a useful synopsis.

We were incredibly grateful to be joined by thought leaders from industry and Government to give their views on the challenges to delivering hydrogen ambitions. Many thanks to Chris Stark for his engaging interview and to the following for bringing their insights to our panel sessions: Alexander Voigt, Ana Quelhas, Annant Shah, Dalia Majumder-Russell, Henry Rushton, Paro Konar, Sebastian Vogel, and William Mezzullo.

We are also very grateful to our Premium Partner, SSE, and our Panel Partners, CMS and HH2E, for supporting the event and making it a success.

Finally, thank you to the team at Aurora, including the panel chairs and keynote speakers, but especially to Narcisa-Camelia Danila and Kim Carroll the driving force behind all our large events for their commitment and hard work.

Given the success of the event, we look forward to welcoming you for another Aurora Hydrogen Conference in 2023!

Richard Howard, Research Director, Aurora



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We were proud sponsors of the **Aurora Energy Research** Hydrogen Conference which took place in London on Wednesday. The event explored the emerging #hydrogen economy and looked at the role hydrogen will play in achieving #netzero ambitions.

Our Director of Strategy & Route to Market, **Annant Shah**, was part of a panel examining the question, "what does it take to launch a successful hydrogen production project?"

Reflecting on the conference and the panel discussion, Annant said: "Events like this are important in bringing together parties from across the value chain to share learnings and experiences, as collaboration will be the key to unlocking emerging technologies and benefiting from economies of scale. As premium partner for the conference, it was a great opportunity to emphasise SSE's growing ambition in low-carbon hydrogen, and further raise our profile as a leading voice in the sector."



Alexander Burton • 2nd
Strategy Analyst at RES | Departmental Prize Winner in MSc...
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Very interesting day at **Aurora Energy Research's** Hydrogen Conference yesterday!

With Russia described as having effectively 'weaponised energy', domestically-produced green hydrogen will become a cheap means to improve energy security.

Agreed with the panelists stating that to kickstart hydrogen production at a national level initially, projects will be decentralised and in close proximity to industrial off-takers - the low-hanging fruit. However, only optimal when applied to processes that cannot be decarbonised through electrification.

Interesting to hear that demand and infrastructure are now consistently the biggest differentiators when assessing the market attractiveness of European countries, with supply and policy & regulation generally at greater levels of maturity.

For the UK, the **Climate Change Committee** forecast the hydrogen market to grow to two thirds of the size of the current power sector by 2050... the times ahead look busy, but exciting!



James-Augustine Foley • 2nd
Executive Director at Santander Corporate & Investment Ba...
5d

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#AuroraHydrogenConference #G

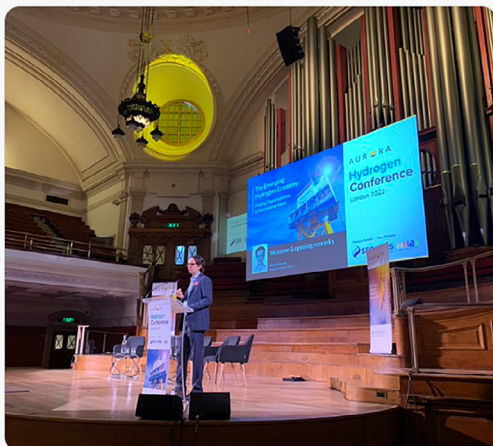
"Policy is needed to enable financing for the next decade of hydrogen development" and "it is difficult to conceive a net zero economy without low carbon hydrogen" - **Chris Stark**, CEO of the Climate Change Committee speaking at the #AuroraHydrogenConference.

Clearly stating the significant need for both policy and financiers to play a role in enabling low carbon hydrogen for years to come. Certainly we're ready to play our role at #Santander to facilitate this.

If anyone else in my network is in attendance please let me know via PM.



Matthew Knight @SoutherlyBreeze • 9 Nov
Off we go @UKenergywonk opens #aurorahydrogenconference



3



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Positive and with his usual good humour, at the #AuroraHydrogenConference **Alexander Voigt** expressed his confidence in a future energy system in Europe based primarily on solar, wind and hydrogen, a future that will come faster than anticipated as renewable power will expand much quicker than we expect today.

Green hydrogen is perfect for making use of the inevitable and significant surplus of renewable power generation, converting peak power rather than wasting it, and also helping to stabilise power grids.

Hydrogen is essential to decarbonise and provide competitively priced security of energy supply to hard-to-abate industries, although we are experiencing significant first demand from the road freight transportation sector.

Exciting debate with **Paro Konar**, Department for Business, Energy and Industrial Strategy (BEIS), **Sebastian Vogel**, RWE and **William Mezzullo**, Centrica, so well moderated by **Thekla von Bülow**, Aurora Energy Research

#Aurora, thank you for the fantastic organisation and for welcoming us in such a beautiful and historical building. Compliments to the team, **Richard Howard**, **Narcisca-Camelia Danila** and all other team members.



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Hydrogen Economist

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Replacing gas-fired peaking plants with hydrogen-fired plants by 2035 could cost £2.1bn

Gas | Carbon capture | UK

Hydrogen best option for UK power flexibility – Aurora

Stuart Penson
9 November 2022

Hydrogen-fired peaking power plants cheaper than storage

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11 Nov, 2022

Lack of realism 'polluting' hydrogen ramp-up for serious players, developer says

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Research finds hydrogen could play key role in decarbonising UK power system

By Charlie Currie on Nov 09, 2022 | Translate

NEWS | POWER

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Aurora Energy Research has said hydrogen can play a key role in the decarbonisation of the UK's power system, offering a low-carbon alternative to gas-fired generation.

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NEWS

Aurora Energy Research: Hydrogen can provide low-carbon flexibility to UK power system

MONTEL Language: EN Light News Market data
Part of the Montel Group

Green H2 may displace gas in UK power system by 2035 – study

Power | Renewables | 09 Nov 2022 12:33



HYDROGEN ECONOMY

Hydrogen Can Provide Low-Carbon Flexibility to UK Power System – Aurora Energy Research

November 10, 2022 | Add comment | 4 min read



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The UK is trialling hydrogen blending into gas networks

Gas | RWE | UK

RWE challenges hydrogen blending push

Stuart Penson
10 November 2022

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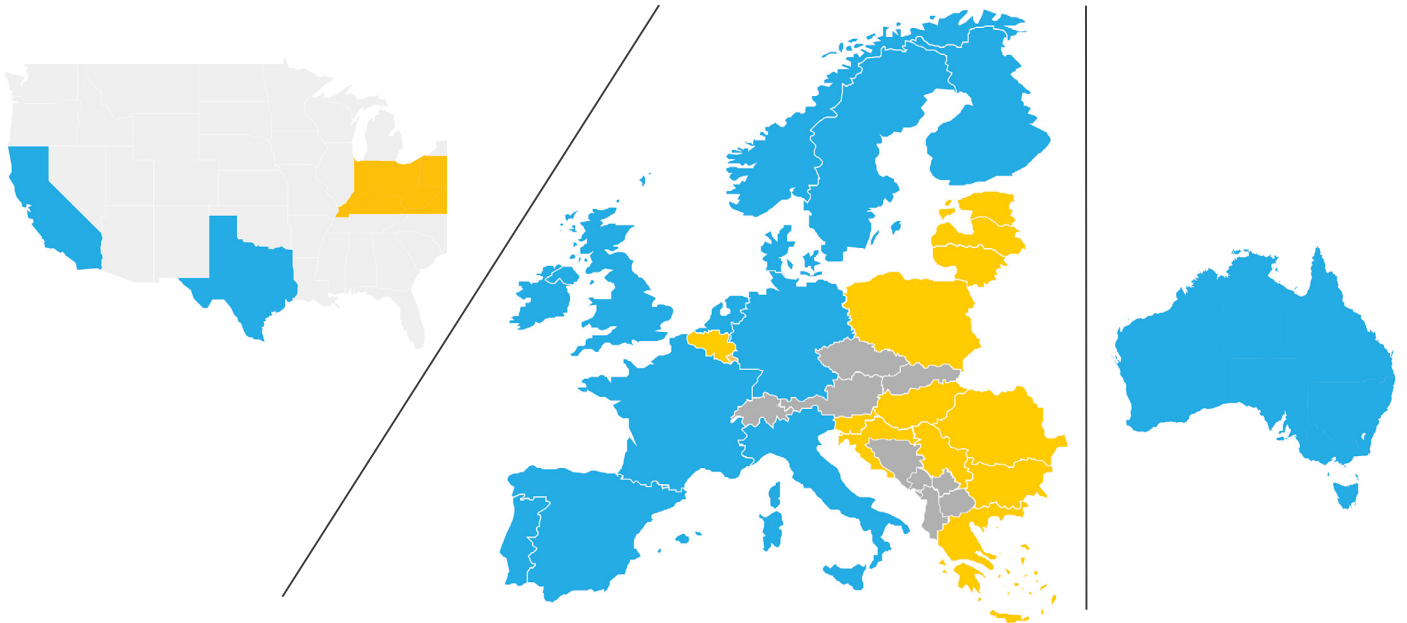
Efforts better directed at replacing grey hydrogen in sectors such as refining and chemicals, says strategy director at German company

Efforts to develop demand for low-carbon hydrogen should focus on directly replacing existing feedstock in sectors such as refining and chemicals rather than blending into natural gas networks, German energy company RWE told the Aurora Hydrogen Conference in London this week

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PROGRAMME HIGHLIGHTS

INTERVIEW AND Q&A

THE ROLE OF HYDROGEN IN REACHING NET ZERO

Speakers:

- Chris Stark, Chief Executive, Climate Change Committee
- Dan Monzani, Managing Director, UK & Ireland, Aurora

Summary:

Chris and Dan discuss hydrogen as the ‘secret sauce’ for a Net Zero power system, enabling a high share of renewables while providing complementary, low-carbon, flexible generation.

Chris discussed hydrogen’s use cases, stating the focus on decarbonising the power sector has led to neglect of decarbonising other sectors where hydrogen could play a role. Chris argued that there are better applications for hydrogen than in heating. Instead, he believes we should focus on building energy efficiency, and heat pumps would be the core solution to decarbonise heating. Chris is in favour of hydrogen peakers for providing low-carbon flexibility in the power system and sees gas CCS as largely unproven and expensive. He also sees hydrogen as a better option for low-carbon baseload generation than nuclear which he sees as expensive and difficult to build in the required quantities before 2050.

When asked about how he sees the issue of policy competition, Chris does see the UK competing with other countries, though he tends not to see a shortage of capital as being the primary blocker but rather a lack of policy to direct that capital to where it is needed. There is some promise in the UK government’s recently announced support for hydrogen production, such as its Hydrogen Business Model and Net Zero Hydrogen Fund; however, Chris stated the need for further support on the demand side, particularly for hydrogen in the power sector.

Dan asked Chris whether now was the right time to be pushing hydrogen—in the midst of a cost-of-living crisis and the UK’s deepening ‘fiscal hole’—Chris was clear that there is no time to waste and we must act now if we are to hit the government’s new target of 10 GW production by 2030. In addition, he sees material benefits to the UK economy ‘getting going on hydrogen now’, particularly due to the innovations it will drive in decarbonising the industry.



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AURORA KEYNOTE

WHERE ARE THE OPPORTUNITIES FOR HYDROGEN IN EUROPE?

Speaker:

Dilara Caglayan – Senior Associate,
European Hydrogen Service, Aurora

Summary:

The European Union and several European countries have released hydrogen roadmaps and strategies in the last two years, suggesting hydrogen will play a key role in decarbonising the economy—particularly in addressing 'hard to abate' sectors such as industry, and in balancing variable renewable power generation. The increasing interest in hydrogen creates opportunities and challenges for investors and developers.

We expect hydrogen demand to grow by more than 500% in 2050, within the mobility, industrial, and heating sectors. The increase in demand will be seen mostly in the new applications of hydrogen, such as Direct Reduction of Iron (DRI) in steelmaking, and hydrogen or its derivatives as transport fuel.

A European support similar to the Inflation Reduction Act (3 EUR/kg) could halve production costs and make renewable hydrogen cost competitive with natural gas derived hydrogen (blue and grey hydrogen). In order to switch from today's fossil fuel derived hydrogen to renewable hydrogen, nearly 20 bn EUR/year is required in Europe.

According to our Hydrogen Market Attractiveness Report (HyMAR), Germany, The Netherlands, and the United Kingdom are the most attractive countries for hydrogen not only because they score very well in the supply and policy ratings but also because of their demand and infrastructure potential.

Click [HERE](#) to view the presentation

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Investing in European hydrogen: Where are the key markets?

With the total global electrolyser pipeline totalling nearly 1 terawatt (or more than 3,000 times the installed capacity), the hydrogen market space is booming with opportunities!



Part of the European Hydrogen Market Service, the biannual Hydrogen Market Attractiveness Report (HyMAR), gives you an edge in the market:

- A comprehensive slide deck (roughly 40-60 slides), the HyMAR is designed to provide you with key insights and analysis into opportunities in the market
- Understand the latest policy updates and incentives and how they might impact you
- Explore what is coming up and in development with the global electrolyser project database
- Dive into hydrogen market sizing analysis for demand scenarios by country and sector



Scan the QR code for a shortened report

Note: this is part of the European Hydrogen Market Service

Table of contents from the October 2022 HyMAR report

- I. Introduction to HyMAR**
Scores and comparison with April 2022
- II. Policy and Market Updates**
Policy and regulatory overview of hydrogen market news since April 2022
- III. Aurora's Global Electrolyser Database**
Global overview
European project pipeline
- IV. Production cost of renewable hydrogen**
Blue hydrogen
Co-location business model
- V. Hydrogen Demand**
European hydrogen demand
Methodology: industry, transport, heating
National hydrogen demand forecasts

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PANEL DISCUSSION

NAVIGATING THE EUROPEAN POLICY AND MARKET LANDSCAPE

Chair: **Thekla von Bülow**, Co-Head of Advisory, Central Europe, Aurora

Panellists:

- **Alexander Voigt**, Co-Founder and Board Member, HH2E
- **Paro Konar**, Director for Hydrogen and Industrial Carbon Capture, BEIS
- **Sebastian Vogel**, Director, Hydrogen Strategy, RWE Generation
- **William Mezzullo**, Head of Hydrogen, Centrica Energy Markets & Trading



Summary:

The panel discussed and compared the UK and German hydrogen strategies. William and Paro agreed that the strategy published in 2021 was a start for the UK but that there is plenty more to do: 'policies have been set out, but now projects need to get going.' Alexander asserted that hydrogen's role in the German power system will be to meet peak power demand, not baseload. Sebastian's perspective was that we need to be selective about the projects in which hydrogen is used, 'let's get the basics done first, focus on issues that need hydrogen [in order to decarbonise].'

Thekla asked the panellists about Germany's focus on green hydrogen, leading to a discussion on the importance of remaining colourblind with Paro stating the focus should instead be on carbon content. Discussion moved into blending with Alexander commenting that blending makes for a good business model. Paro noted the UK will make a strategic decision on hydrogen blending in 2023 with Sebastian's comment about the interconnectedness of the European gas networks implying that blending will be more difficult on a large scale.

Panellists discussed the future of hydrogen, questioning whether it will become global. The group discussed global renewables projects, and hydrogen's role within these could be to capture full potential.



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AURORA KEYNOTE

HYDROGEN AS A SOURCE OF FLEXIBILITY FOR THE UK ENERGY SYSTEM

Speaker:

Anise Ganbold – Head of Research, Global Energy Markets & Hydrogen, Aurora

Summary:

Anise explored hydrogen's ability to replace gas as Britain's source of flexible power generation. Despite the UK government's pledge to decarbonise the national power system by 2035, we forecast that Britain is set to remain reliant on unabated gas-fired peaking power plants, which would run for 700 hours in 2035, meeting demand when variable solar and wind output falls.

Anise considered hydrogen's advantages over other low-carbon alternatives to unabated gas-fired peakers and investigated how the UK could source the hydrogen needed to fire peakers instead of gas. Our modelling shows that hydrogen-fired power plants would be cheaper to run than new abated gas-fired plants when operating at low load factors, making hydrogen the more economic low-carbon option for peaking power plants.

Renewable generators could produce the hydrogen needed to fire peakers using co-located electrolyzers, Anise suggested. Increasing renewable and nuclear generation capacity by 7.5% in Great Britain, relative to our base case, would produce enough hydrogen needed to fire peaking power plants by 2035. Under this scenario, 11 TWh of renewable generation would be curtailed in 2035. This surplus generation could instead power electrolyzers, producing a zero-carbon fuel for peaking plants and creating an additional revenue stream for renewable generators.

Relying on curtailed renewable generation to produce the hydrogen needed to fire peaking power plants would require 10 TWh of hydrogen storage, as we forecast that periods of high renewable curtailment will not align with peak power demand.

Replacing gas-fired peakers by 2035 would cost £21bn, including the additional renewable, nuclear, and storage installations. Replacing gas-fired peakers solely with batteries would cost up to £112bn, while building new gas plants with CCS to replace unabated peakers would cost £22bn.

Click [HERE](#) to view the presentation

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PANEL DISCUSSION

WHAT DOES IT TAKE TO LAUNCH A SUCCESSFUL HYDROGEN PRODUCTION PROJECT?

Chair: **Emma Woodward**, Senior Associate, Aurora

Panellists:

- **Ana Quelhas**, Managing Director for Hydrogen, EDPR
- **Annant Shah**, Director of Strategy & Route to Market, SSE Renewables
- **Dalia Majumder-Russell**, Partner (Energy), CMS
- **Henry Rushton**, Director, Energy Sector, ING Bank

Summary:

The panel considered the key factors that can make a hydrogen production project successful in an investment landscape characterised by a high degree of uncertainty.

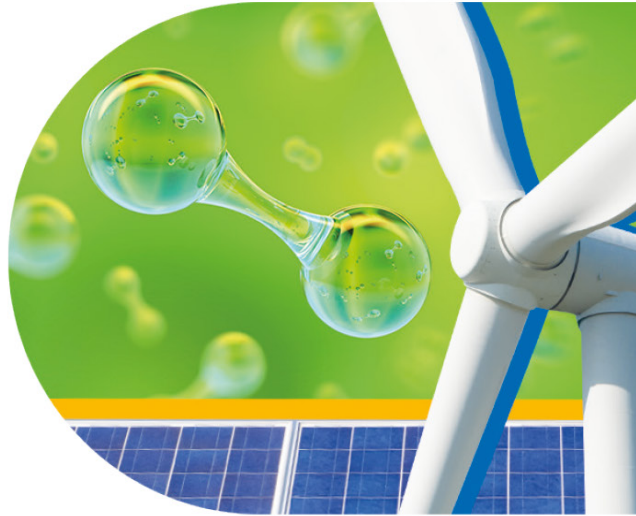
Panellists discussed the importance of securing a robust off-take agreement. In this context, existing hydrogen consumers that do not have an alternative to hydrogen use often present the most compelling business cases. The need to think about the entire value chain of projects was also identified as a key factor. Here, decentralised projects with proximity to industrial clusters present more attractive opportunities in the short-term.

Finally, the panellists highlighted the fundamental role of having cruciality of a stable policy and regulatory environment, one that is also harmonised across countries. Without this, the deployment of projects will still face too much risk, delaying the development of a European hydrogen market.



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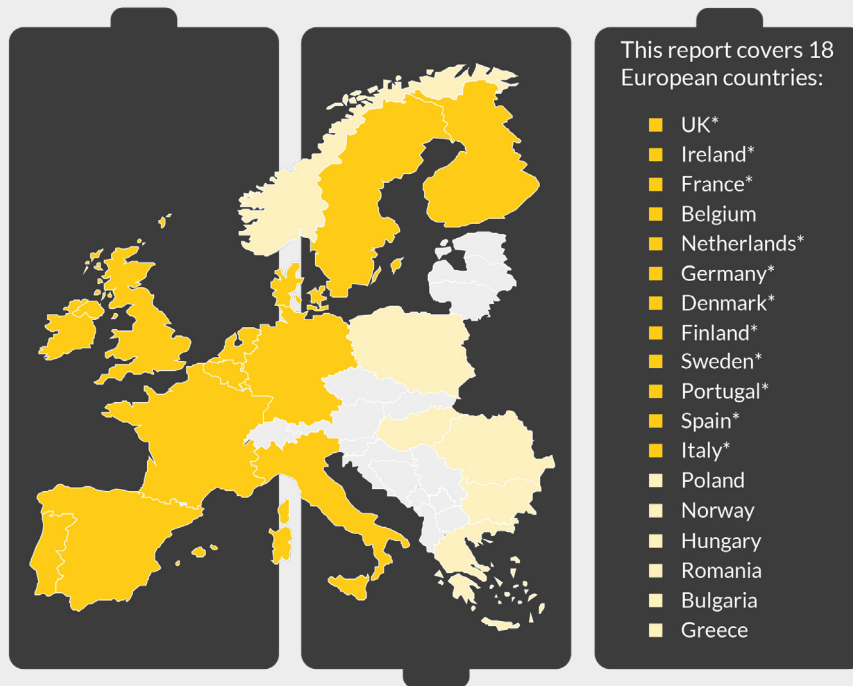


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Oxford 2023

Wednesday, 29 March 2023

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