

CLASS NK WEBINAR SERIES

The outlook for hydrogen in Europe

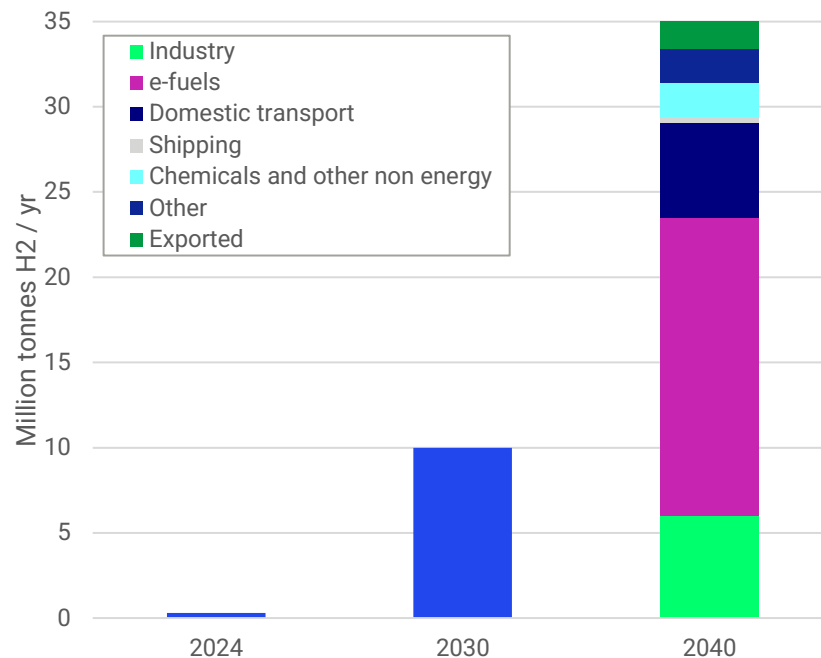
June 2024



What is EU ambition for clean hydrogen?

The EU sees green hydrogen as a key means to decarbonise hard-to-abate sectors

- The EU is aiming to **reduce emissions by 55% by 2030** and is pushing for **90% reduction by 2040** compared to 1990^{1,2}.
- To meet this, **EU is aiming to produce 10 million tonnes of green hydrogen per annum by 2030** and according to recent EC analysis, could need **35 million tonnes to meet 2040 targets**^{1,2}.
- This must be built from **near zero in 2024**³



Complied with production and demand data from EC, EU and Hydrogen Europe^{1,2,3,4}

1 [Recommendation for 2040 emissions reduction target \(europa.eu\)](https://european-council.europa.eu/media/en/press-room/data/2023/09/20230920_IP001001.pdf),
 2 [European Climate Law - European Commission \(europa.eu\)](https://european-council.europa.eu/media/en/press-room/data/2023/07/20230714_IP001001.pdf),
 3 [Clean Hydrogen Monitor 11-2023 DIGITAL.pdf \(hydrogeneurope.eu\)](https://hydrogeneurope.eu/wp-content/uploads/2023/11/Clean-Hydrogen-Monitor-11-2023-DIGITAL.pdf)
 4 [EUR-Lex - 52024SC0063 - EN - EUR-Lex \(europa.eu\)](https://eur-lex.europa.eu/eli/reg/2024/1153/oj)

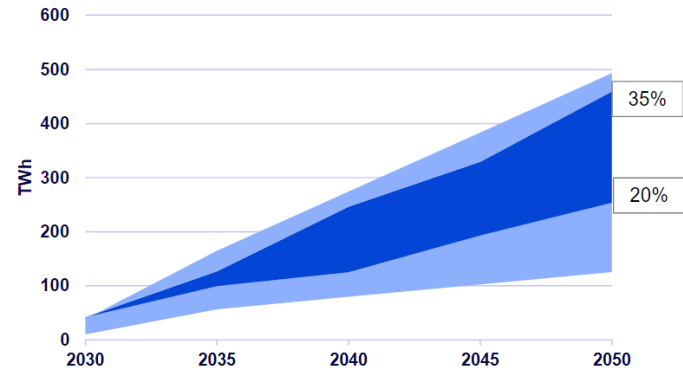
What is UK ambition for clean hydrogen?

The UK is focussing on decarbonising industrial clusters

- **Target of 10GW** of clean hydrogen production **by 2030**, with up to **6GW from electrolytic hydrogen**
- Targeting decarbonization of **'hard to electrify'** industries, and support providing greener, flexible energy across power, heat, transport, and potentially heat in buildings.
- Valuable for **energy security** and independence by providing **flexibility and energy storage**
- Illustrative demand in 2035¹ is shown on the right.

Hydrogen demand could be 20-35% of UK final energy consumption by 2050

percentage = hydrogen as proportion of total energy consumption in 2050



Data from UK Hydrogen Strategy Analytical Annex

Industry	25-55 TWh by 2035
Power	5-30 TWh by 2035
Heat in buildings	0-60 TWh by 2035
Transport	20-30 TWh by 2035

¹ Based on analysis for the Hydrogen Transport and Storage Networks pathway (2023)

Despite targets outcomes are less clear

This is evidenced by headlines both optimistic and pessimistic

NEWS ARTICLE | 19 February 2024 | Directorate-General for Climate Action

European Hydrogen Bank pilot auction: 132 bids received from 17 European countries

"Takes guts" | Shell gives green light to 200MW Dutch green hydrogen project powered by offshore wind

UK reveals winners of first hydrogen allocation round

December 14, 2023, by Ajsa Habibic

UK government has concluded the first hydrogen allocation round (HARI) and selected eleven projects, totalling 125 MW capacity, to receive over €2 billion

Germany to back €20 billion bid to build hydrogen pipe network

By Nikolaus J. Kurmayer | Euractiv.com | Est. 4min | 15 Nov 2023 (updated: 16 Nov 2023)

'Barely 1GW of green hydrogen capacity would be installed in Europe by 2030 at current rate': Hydrogen Europe

Industry association adjusts its forecasts for total 2024 electrolyser capacity downwards by 4GW

Cost of electrolyzers for green hydrogen production is rising instead of falling: BNEF

Inflation and subsidy delays clobber economics of making and installing renewable H2 equipment

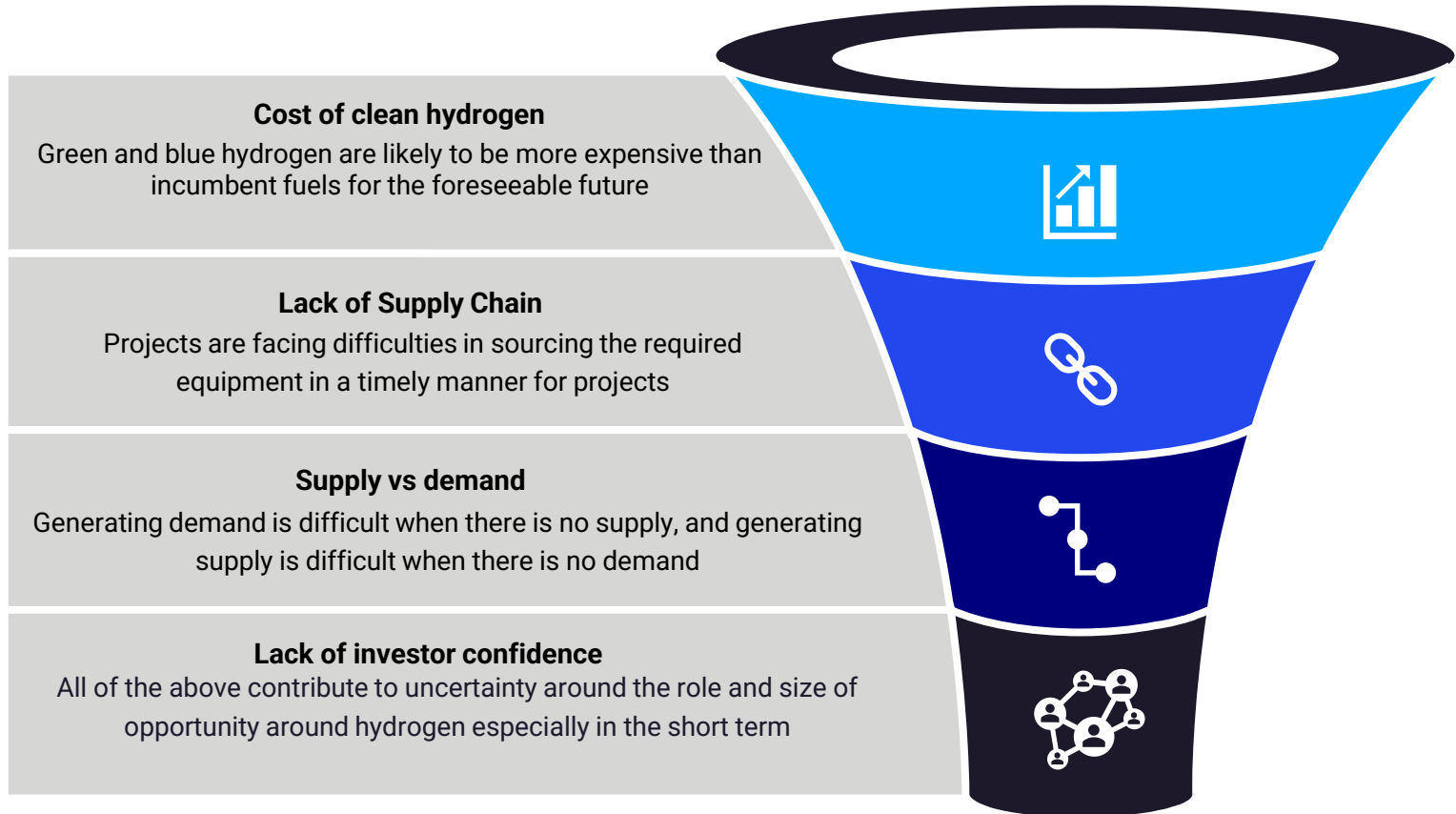
'Green hydrogen is too expensive to use in our EU steel mills, even though we've secured billions in subsidies'

Head of ArcelorMittal's European arm says that decarbonised steel could be made with imported DRI instead

21 February 2024 11:55 GMT | UPDATED: 21 February 2024 11:56 GMT | By Rachel Parkes

Steel giant ArcelorMittal has said it cannot operate its European plants using green hydrogen, despite being granted billions of euros of EU subsidies to install equipment to do so, because the resulting green steel would be unable to compete on international markets.

What are the barriers to hydrogen adoption?



What is the status of hydrogen in Europe?

Project developers are awaiting confirmation of subsidies to reach FID

- **High costs of clean hydrogen** mean projects have been slow to hit Final investment decision (FID) and move to construction
- BCG estimates **green hydrogen at €5-8/kg** compared to **~€2-3/kg for grey hydrogen** and even less for natural gas¹
- Therefore, many of these are waiting for production incentives including:
 - **€800m** from the **European Hydrogen Bank** auction for up to €4.50/kg renewable H₂ produced²
 - Resulted in funding **1.5GW of production** with very low a **clearing price of €0.48 / kg**
 - 500 MW projects in **Spain and Portugal** largest projects funded
 - German-led **H2Global scheme** which could unlock **€5bn** for purchasing hydrogen from outside of Germany²
 - **Denmark** has awarded **\$177m** in fixed payments for 10 years for **280 MW of projects**²

20 MW
Largest
operational project

1.5 MW
Average project
size in 2023²

200 MW
Largest Green H₂
project to hit FID

¹ [Turning the European Green Hydrogen Dream into Reality: A Call to Action \(bcg.com\)](https://www.bcg.com)

² [Review of 2023 | Trends in the global hydrogen sector | Hydrogen news and intelligence \(hydrogeninsight.com\)](https://hydrogeninsight.com)

³ [EU's Hydrogen Bank auction clears below 50 euro cent/kg, funding 1.5 GW | S&P Global Commodity Insights \(spglobal.com\)](https://www.spglobal.com)

How is the UK targeting barriers?

Incentives are incoming but supply chain and innovation are drawing attention

- The UK government is also pursuing **production incentives** to establish hydrogen supply and value chains:
 - Cluster sequencing is looking to **back two industrial clusters** with over **£1bn** in the NW and NE of the UK to enable **blue hydrogen** production¹
 - **125 MW** of green hydrogen production awarded through **HAR1** and **HAR2** will back **875MW**, with applications closing April 2024²
 - **HAR1 projects** awarded approximately **£9.50 per kg of hydrogen** produced (HHV) for 15 years
- However, concerns around deliverability of projects have resulted in increasing focus on supply chains and innovation in clean hydrogen
- Industry is communicating that supply chains are already stretched, and crucial components require innovation

¹ [Cluster sequencing Phase-2: eligible projects \(power CCUS, hydrogen and ICC\), March 2022 - GOV.UK \(www.gov.uk\)](#)

² [Hydrogen net zero investment roadmap: leading the way to net zero - GOV.UK \(www.gov.uk\)](#)

³ [UK allocates more than £2bn of subsidies to 11 green hydrogen projects in first auction round | Hydrogen Insight](#)

What are the state of the art projects in Europe today?

HySynergy 1

Production: 20 MW Alkaline electrolyser

Demand: Refinery, Transport

Partners: everfuel, Nel, Crossbridge Energy

Operational? TBC (expected 2023)

Details: a 20MW electrolyser from Nel, will provide green hydrogen to decarbonise Crossbridge energy's refinery and provide fuel for everfuel's hydrogen refuelling station network.

everfuel.com/projects/hysynergy/

Puertollano

Production: 20 MW PEM electrolyser

Demand: Ammonia, 3,000 tpa

Partners: Iberdrola, Fertiberia, Nel,

Operational? 2022

Details: a 20MW electrolyser from Nel, is providing green hydrogen to decarbonise Fertiberias ammonia plant, reducing carbon emissions by 48,000 tCO₂/year and reduce natural gas consumption by 10%.

[Puertollano green hydrogen plant - Iberdrola](#)

[Shell to start building Europe's largest renewable hydrogen plant | Shell Global](#)

Holland Hydrogen 1

Production: 200 MW Alkaline electrolyser

Demand: Refinery, 60,000tpa

Partners: Shell, Worley, thyssenkrupp

Date started? FID made (2025)

Details: The largest European project to have final investment decision, a 200MW electrolyser from thyssenkrupp, will provide green hydrogen to decarbonise Shell's energy's Rotterdam refinery.

Thanks for listening

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