LCP Delta

European Green Hydrogen Market - 2025 Update

Hydrogen Intelligence (Report sample)

Powered by HYbase

APRIL 2025

Introduction

This report provides a review of the current and future electrolysis market in Europe.

It will help you:

- Understand the range of market factors, including policy changes, that are shaping the pace of development in the European green hydrogen market
- Get a clear picture of the planned electrolyser capacity across Europe, and break the project pipeline down to narrow in on the most investable project configurations and propositions
- Identify the key growth markets for electrolysis, and the leading players and end-use sectors mobilising this emerging sector
- Unpick emerging trends in power procurement strategy, investment, project size, and more to inform your clean hydrogen strategy

LCP Delta can help you make the best informed strategic and investment decisions in the emerging clean hydrogen market, using our market-leading data and insights.

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What is the scope and methodology of this report?

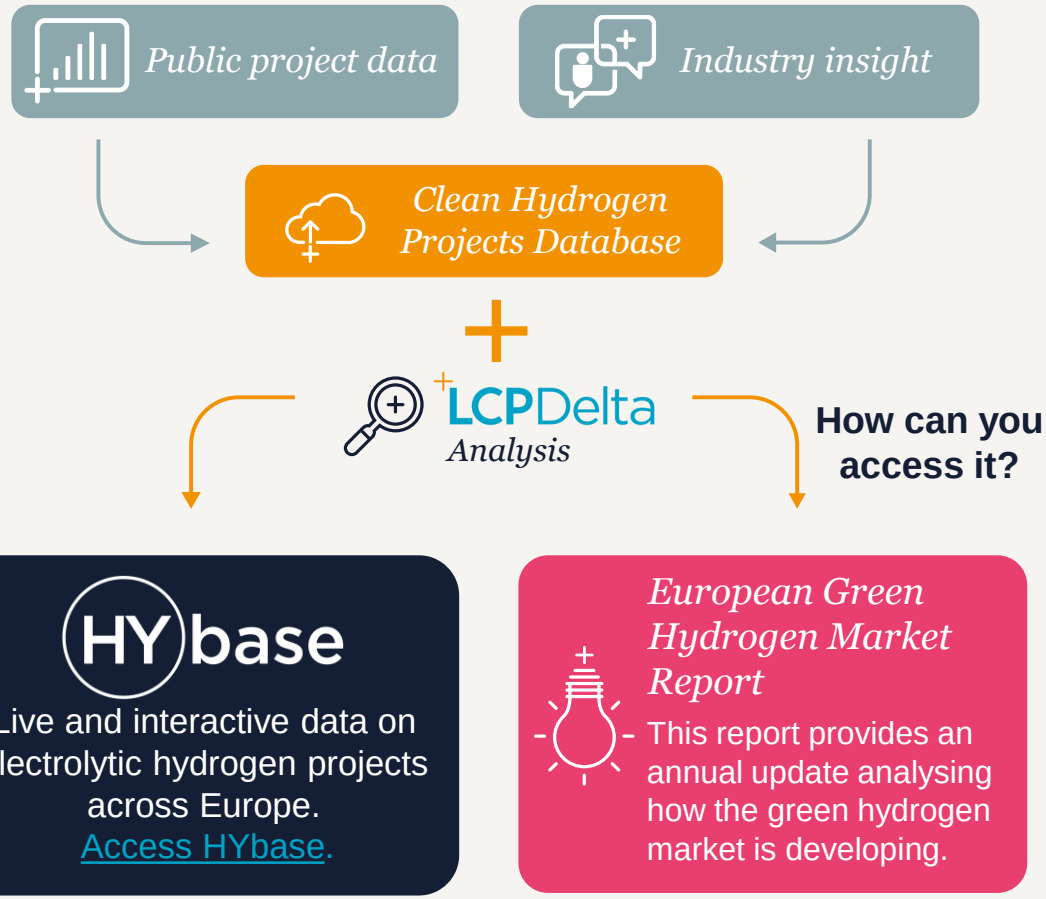
This report provides a narrative summary of the activity in the emerging electrolysis market in Europe, today and future, backed by our projects database.

The report uses aggregated project data from LCP Delta's clean hydrogen projects database that captures granular data on electrolysis projects planned across Europe out to 2030. This report is complemented by HYbase, our interactive platform where you can explore the data from this report in more detail.

The data that feeds our database and reports is from firm, clearly defined, publicly announced projects complemented by expert LCP Delta assumptions and insights.

At publication, our database contains over 900 projects. This amount of data gives us an effective view of Europe's market up to the end of 2024, and while assumptions are made where data is unavailable, these assumptions are built on discussions with industry experts and complemented by proprietary insight.

Where does our insight come from?



Contents

Our data is revealing trends in what makes for a successful clean hydrogen strategy

Focus of summary slides

Projects must anticipate policy changes and reduce their exposure to associated risks.

Policy and regulation isn't a factor, it's the foundation. In the past year, elections across Europe delayed or clouded national positions on clean hydrogen, while the ripple effects of U.S. policy shifts are still unfolding.

Regulatory volatility is real. Spain saw key hydrogen players threatening to cancel projects in early 2024 over a proposed permanent windfall tax, underscoring just how exposed the sector is.

On the upside, funding momentum is building. Key support schemes like H2Global, HPBM, and EHB have will mobilise ~$4bn, marking one of the most significant advances in the past year.

Bottom line: Projects must assess their policy exposure–timing and structure of regulation could make or break project feasibility.

Electrolyser OEMs seek strategic partnerships and public support to endure the tough market conditions.

Politics is a market shaper. The 25% cap on Chinese components to access EHB is a clear example. None of the top 10 OEMs by assigned capacity in the European market to 2030 are currently Chinese, though strategic partnerships with top players are emerging.

Consolidation is imminent. Even some top players face insolvency risks. The field remains wide open, but players may look outside of Europe to showcase early scalability.

Execution is the differentiator. Delivering a single project today signals capability. OEMs offering guarantees, servicing, and finance-readiness are best placed to lead.

Bottom line: In a volatile, still-unclaimed market, OEM success hinges on partnerships and positioning for funding to execute at scale.

The market is beginning to narrow in on the best offtaker applications and project configurations.

Long-term agreements remain a hurdle and risk removal through contracts is key. REDIII rollout, support schemes, and clear carbon pricing signals will start tipping offtake business cases, but real impact likely won't be felt until mid-2030s.

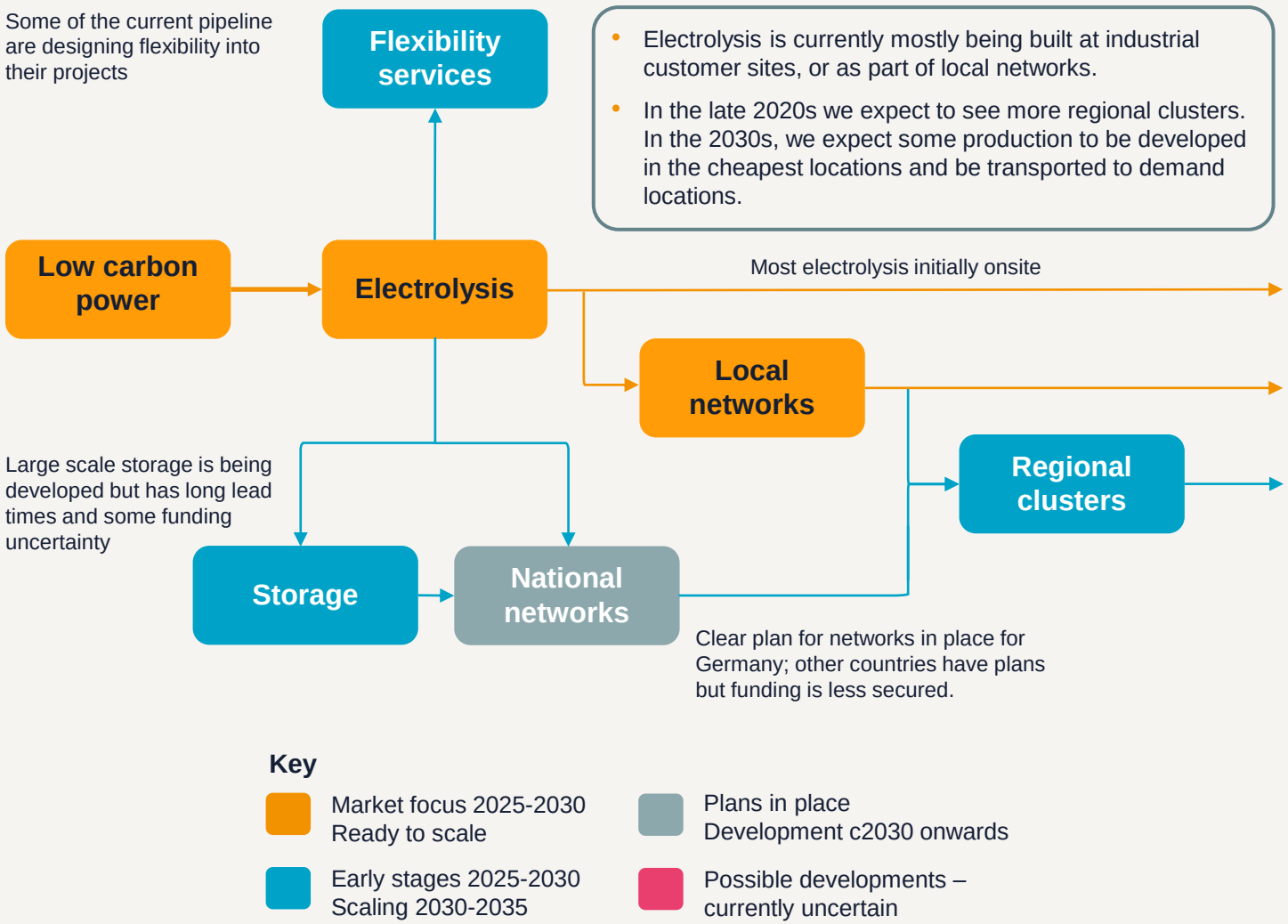
Existing users of grey H_2 are still best-placed in the near-term. We're seeing lots of ambition from new applications, but these sectors face more hurdles to justify the transition.

On the power side, we're seeing a prevalence of co-located renewables for first projects. It's initial days for PPAs, but these will play an increasingly important role. Large-scale projects at advanced stages plan for a grid connection.

Bottom line: Bigger projects need bankable players across the value chain to secure investment.

EHB – European Hydrogen Bank // HPBM – Hydrogen Production Business Model // OEM – Original Equipment Manufacturer // REDIII – Renewable Energy Directive III // PPA – Power purchase agreement

Electrolytic hydrogen could have several energy transition plays, but the short-term focus is decarbonising industry



Applications

Road mobility — Plenty of pilot and demonstration projects, but possible scale-up will generally be focused on long-range, heavy-duty vehicles.

SAF — Mandate for 1.2% RFNBO based Sustainable Aviation Fuel (SAF) in 2030 and 35% by 2050 in EU. In the UK this mandate is 0.2% in 2028 rising to 3.5% in 2040.

Maritime fuel — Maritime applications are being developed and €200m from the European Hydrogen Bank's second auction has been earmarked for maritime fuels.

Industry — Current focus on refineries, ammonia, methanol and iron & steel in Europe. The EU requires 42% of hydrogen in industry to be RFNBO by 2030 under REDIII.

Power — Significant plans for hydrogen power in the UK and Germany to operate during periods of low renewables. Expected first large-scale plants could be operational ~2030.

Buildings — Several pilot projects in the Netherlands and UK. The role of hydrogen will depend on decisions from governments; hydrogen unlikely to have a widespread role.

REDIII – Renewable Energy Directive // RFNBO – Renewable Fuel of Non-Biological Origin

European Electrolysis Pipeline

- **Changes in the electrolysis pipeline over the past 12 months**
- **Electrolysis pipeline risked and segmented by project status**
- **Electrolytic hydrogen demand in 2024 vs. 2030**

24% growth in the 2030 pipeline, but drop in capacity to 2027

What does our data show has changed over the last 12 months?

Announced investment in green H_2 projects in Europe

$169bn → **$170bn**

2024 data snapshot out to 2030 | 2025 data snapshot out to 2030

As the pipeline grows, so does the announced required investment. Announced **public funding** for projects has increased from $13bn to $15bn, but **over $125bn of the overall funding** needed for these projects **remains unallocated**.

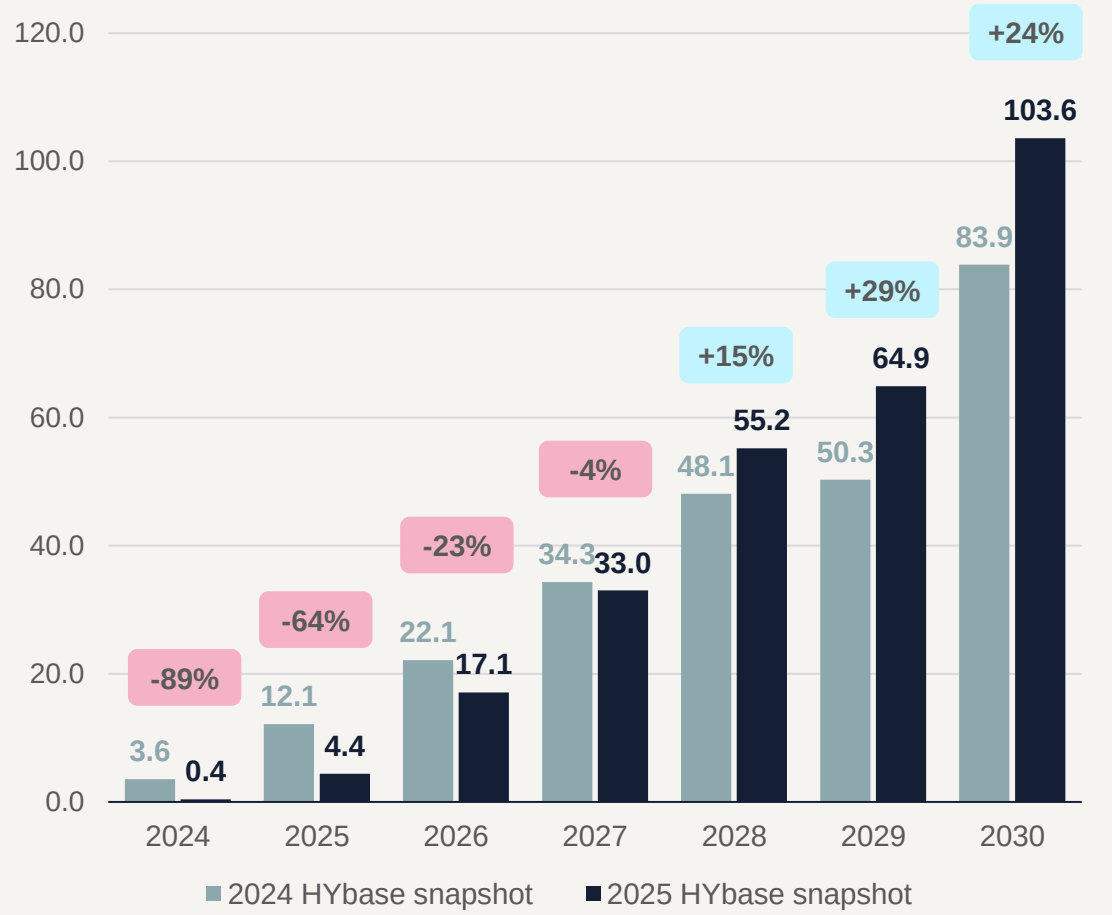
GW-scale projects as percentage of total pipeline capacity

46% → **38%**

2024 data snapshot out to 2030 | 2025 data snapshot out to 2030

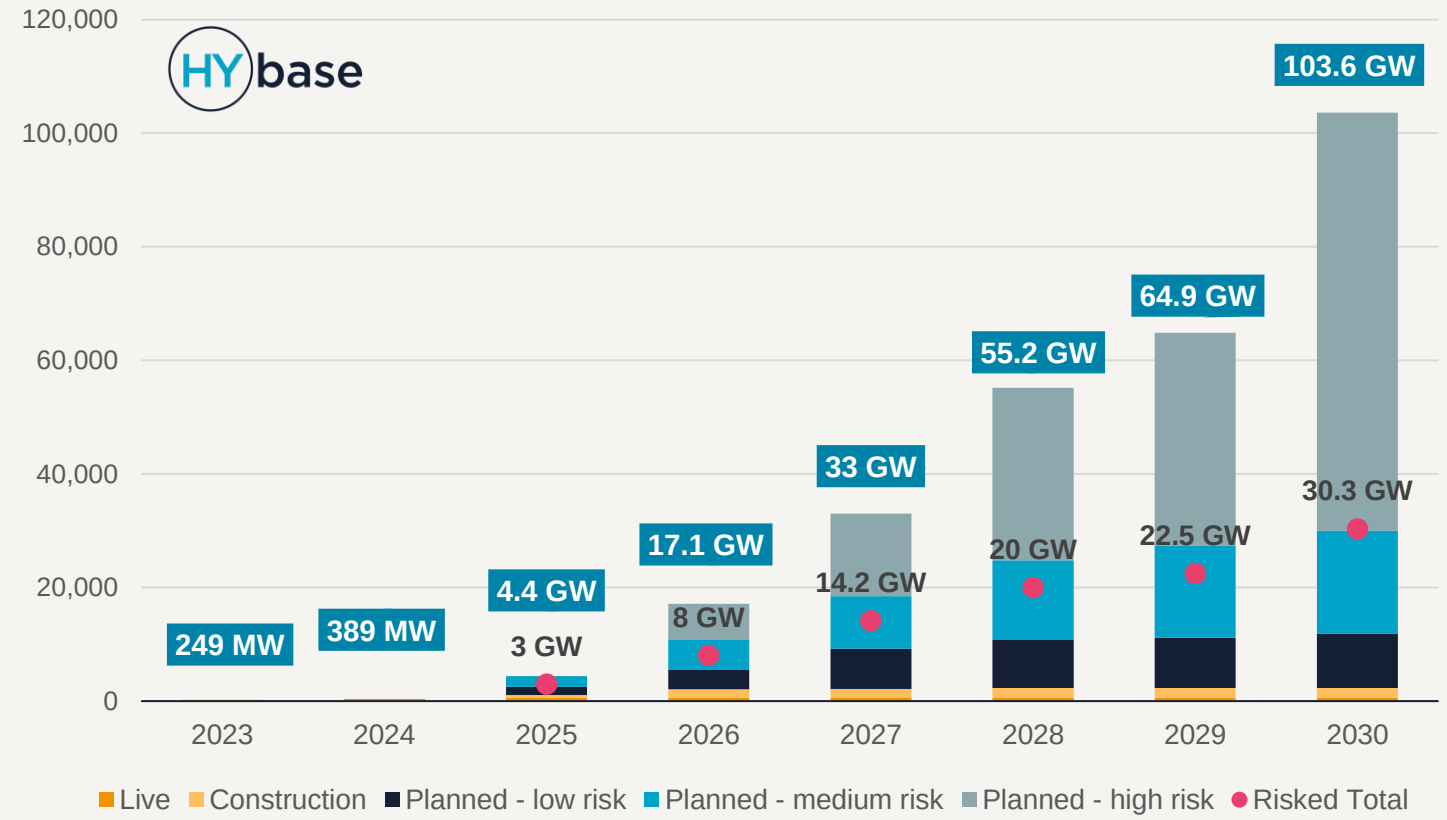
There is a trend toward planning projects in the 100-MWs scale. GW-scale projects are either being downsized (for example, to a smaller initial phase) or delayed beyond 2030. **67% of new capacity** added to the 2030 pipeline over the last 12 months is in the **100-MWs range**, compared to 13% for GW-scale projects.

European cumulative electrolysis pipeline to 2030 (GW_e)



We expect up to 30 GW of installed electrolysis capacity in Europe by 2030

By project status: LCP Delta's European electrolysis pipeline (MW_e)



Planned - low risk = Advanced plan, FID and/or public funding awarded
Risked Total = LCP Delta assessment on likely commissioning scenario, based on maturity of projects.

1.8 GW is currently under construction across Europe.

The EU missed its target of 6 GW electrolysis by 2024 by 93%. 517 MW is under construction with planned commissioning in 2025: If all of this comes online as scheduled, the market will pass the 1 GW mark in 2025.

Yet the project pipeline continues to delay due to increased production costs, uncertainty in regulation and funding, and slow demand. 70% of all 2030 planned capacity is high-risk, without details on funding and/or offtaker.

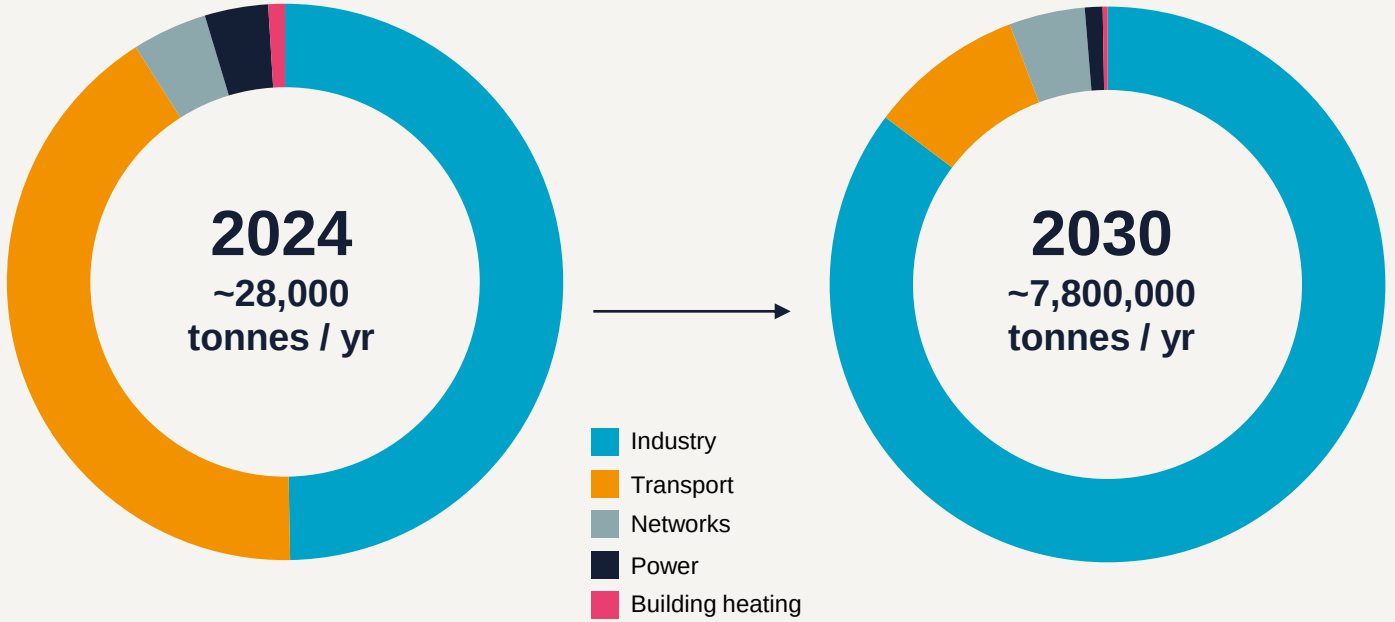
LCP Delta Risked hydrogen production (2030):
2.3 million tonnes of hydrogen / year

How much is 2.3 million tonnes?

Equivalent to **20% of existing hydrogen consumption** in all Europe (10.8 Mt per year in 2023), which is mainly grey hydrogen used in refineries and ammonia production.

85% of electrolytic hydrogen demand will come from industry

Planned European electrolysis production capacity by end-use sector (tonnes/yr)



Note: not to scale

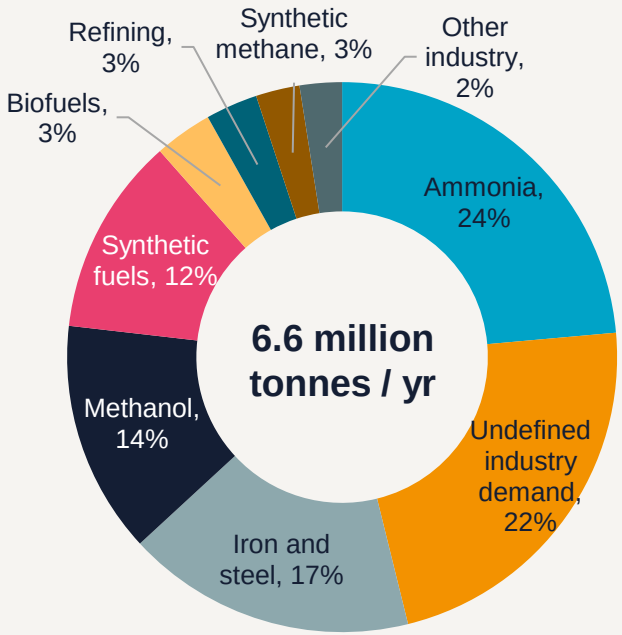
We define "transport" as direct use of hydrogen in mobility applications. Hydrogen used to produce transport fuels (e.g. synthetic aviation fuel) falls under "industry" demand. "Networks" captures projects with unassigned offtake that announce plan to inject into future grid.

Note: Electrolyser utilisation assumed 40% for production volumes

Industrial offtakers are the driving force behind scale in the market.

- Demand from transport and industry make up >90% of offtake for live electrolysis projects (2024).
- The use of electrolytic hydrogen in industry will consolidate its position as the main utilisation sector for electrolytic hydrogen in Europe by 2030, representing 85% of the demand.
- Out to 2030, projects with a combination of offtakers across multiple sectors (e.g. both transport and industry) will increase, accounting for one third of the total number of projects (from 20% in 2024) – 324 projects.
- As projects scale up, there will be a shift away from co-locating hydrogen on the demand site and towards a traded market. The development of hydrogen networks and storage is a key enabler for this transition.
- Building heat is a low priority offtaker for all European markets, while large-scale hydrogen to power will see relevance in a handful of markets (e.g. UK, Germany).

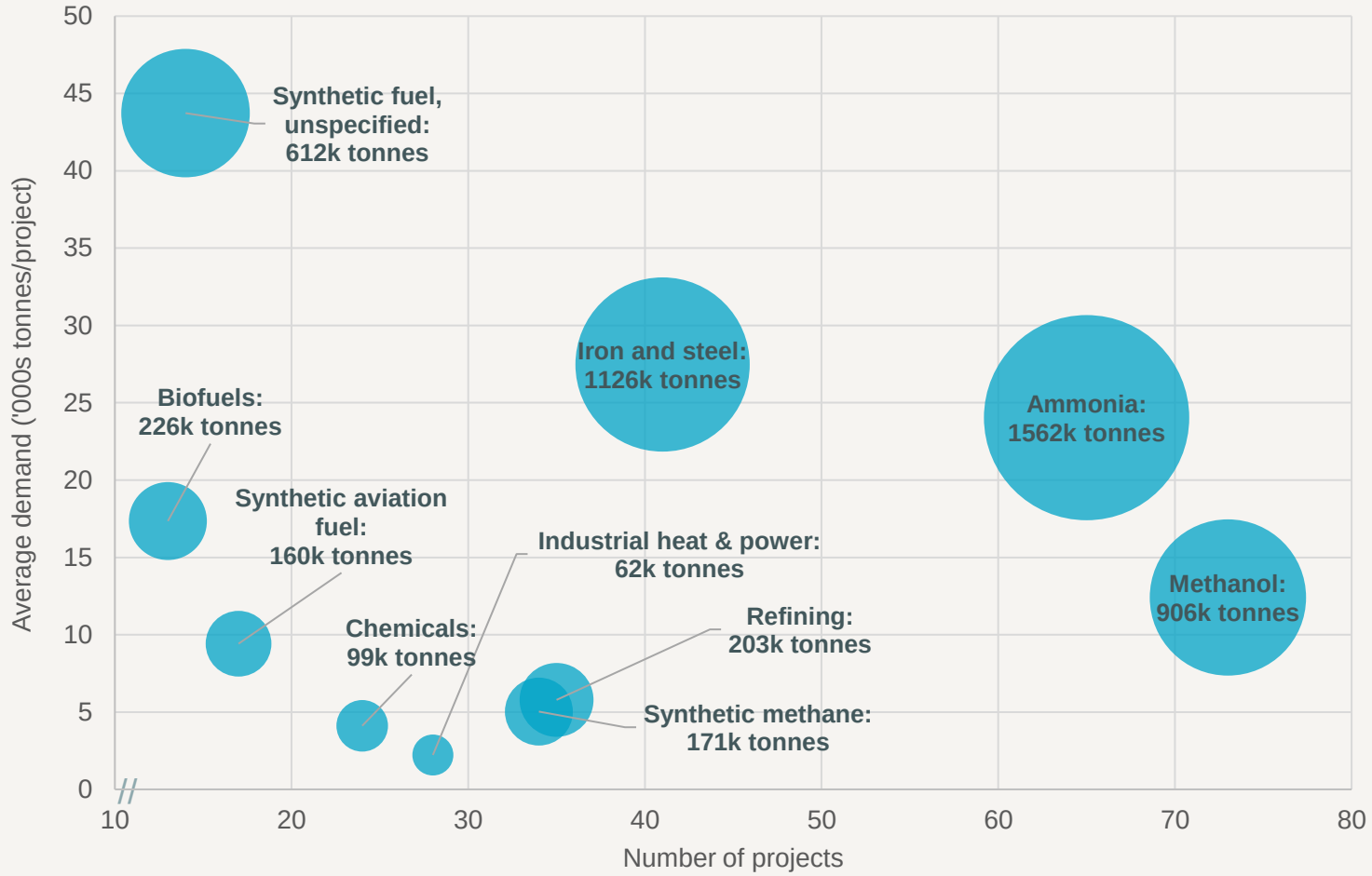
Ammonia is the largest industrial offtaker by quantity in 2030, while methanol leads largest number of projects



Ammonia, methanol, and iron & steel together account for **over half of industrial demand** linked to electrolytic projects (55%) in 2030.

Industrial hydrogen demand linked to European electrolysis projects, 2030

Size of circle = total demand size



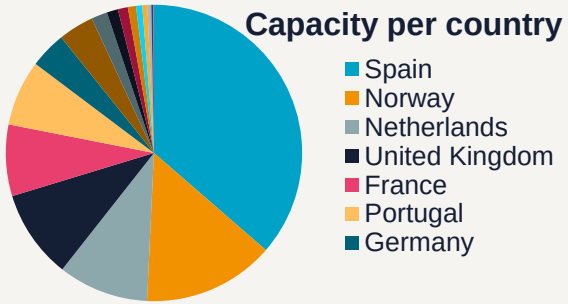
216 new projects were added to Europe's project pipeline over 2024, but at least 33 cancelled

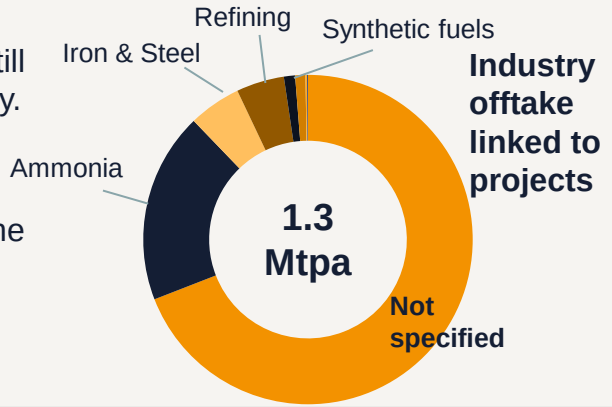
Newly announced projects

Number of projects added to HYbase over 2024 **216**

Electrolyser capacity added to HYbase over 2024 **22.8 GW**

- Newly announced projects are largely in Spain and Norway, with the two markets accounting for half of overall capacity added to the pipeline.
- New capacity is mainly targeting industry (86%) and transport (9%). 70% of the planned capacity for industrial use is still to specify a sector it will supply.
- The announced projects average at 115 MW in size – reflecting a growing scale in the market ambitions.





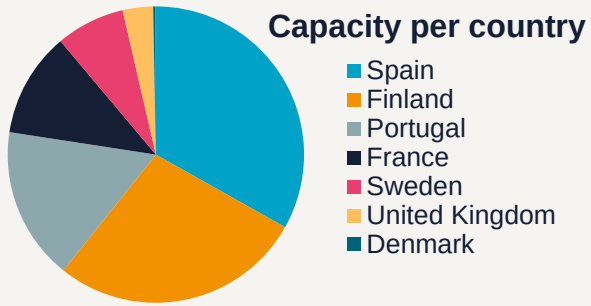
Scope is data changes from March 2024 to 2025
Mtpa – Million tonnes per annum

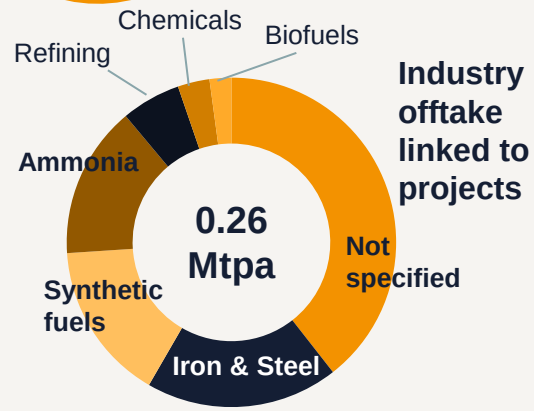
Halted and cancelled projects

Number of projects cancelled or halted over 2024 **33***

Electrolyser capacity cancelled or halted over 2024 **3.6 GW**

- 60% of this capacity is in Spain and Finland.
- Capacity was mainly targeting Industry (86% of demand): Iron & Steel accounts for 19%, Synthetic fuels and Ammonia each for 15%.
- Notable cancellations include FlagshipONE and BP's HyGreen Teesside. Main reasons for cancellations include failure to access public funding (e.g. Hygreen Teesside), and slow demand (e.g. FlagshipONE).





*At least, there are likely more. We are hearing some projects are "quietly dying", whereby they don't announce cancellation but discontinue announcements.

Electrolysis Investment & Project Trends

- **Announced funding for electrolytic hydrogen projects, with details on announced private and public investment**
- **Power procurement strategy of planned electrolysis projects**
- **Details on the size of projects supplying different demand sectors**

The current project pipeline remains reliant on public funding

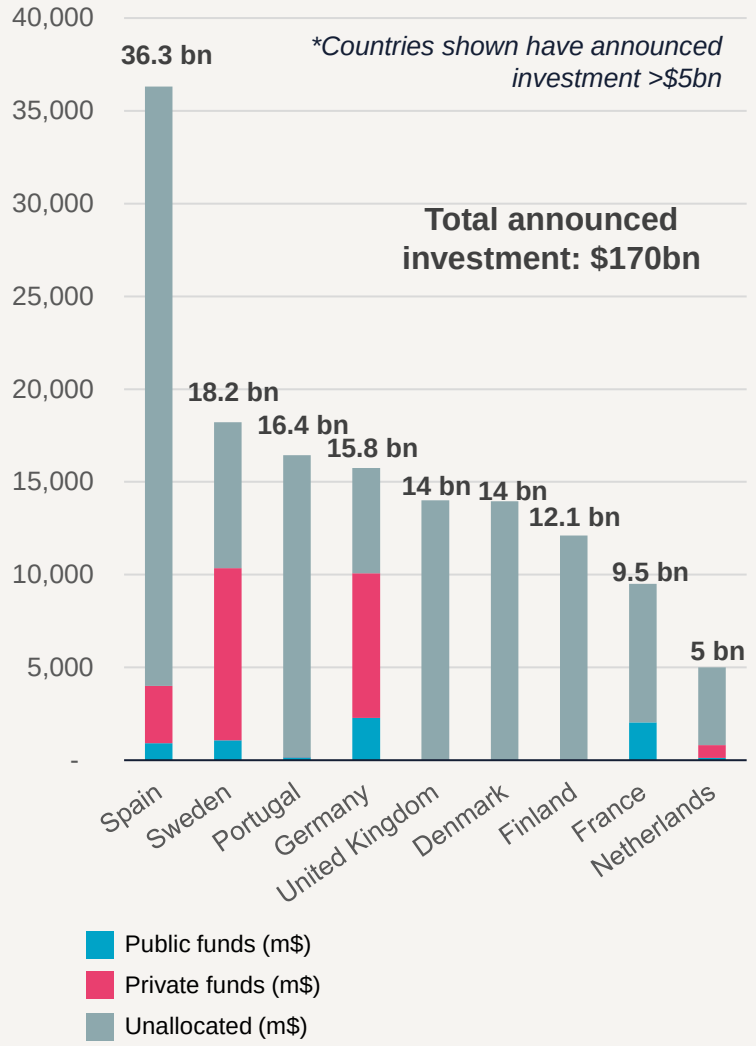
Announced investments in electrolytic hydrogen projects reaches $170bn by 2030, but ~75% of this value has yet to be allocated to public or private capital.

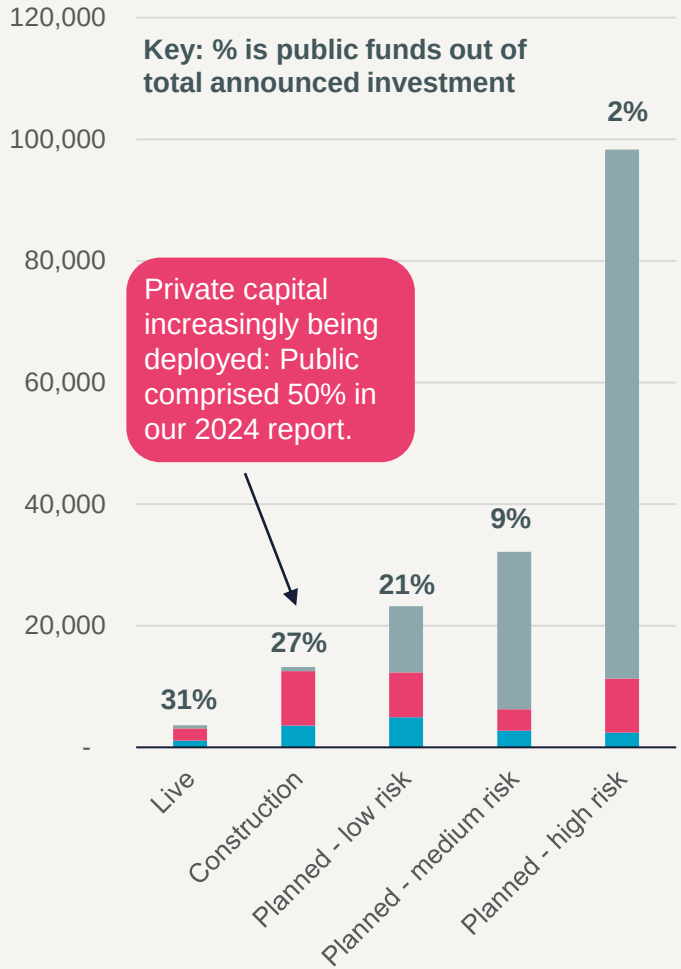
Public funding accounts for 31% of announced investment in live electrolysis projects, highlighting ongoing dependence on public support. While public funding helps to lower the price point for offtakers, it does not guarantee project success – as seen with recent project cancellations in 2024, including Ørsted's H2RES and SSE's GHB2 projects.

At the beginning of 2025, there is one European country where the **announced investment for the electrolytic hydrogen project pipeline exceeds $35bn: Spain**. However, the vast majority of this remains unallocated which signals significant risk in the projects.

Note: 60% of the projects in HYbase contain information on the investment details. Details provided represent only those with publicly announced investment details. "Public funds" does not include OPEX support schemes

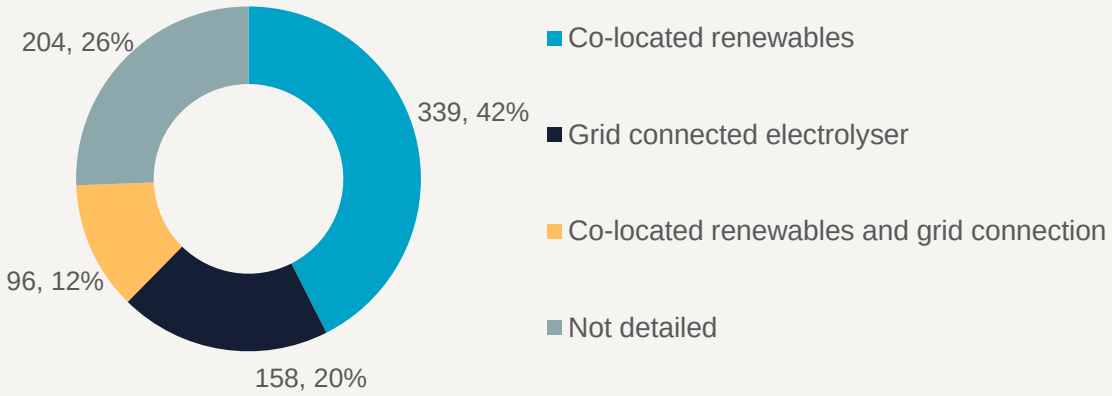
Announced investment in electrolytic projects in Europe by 2030 (million USD)



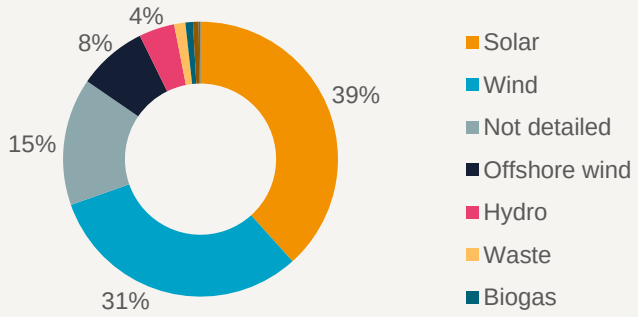


Co-located renewables, using solar or wind, is the most popular power sourcing archetype

Share of European electrolysis projects to 2030 by power procurement strategy



Share of projects with dedicated renewables by primary renewable source



Announced renewable generation capacity linked to planned electrolysis projects:

31 GW Solar

38 GW Onshore wind

35 GW Offshore wind

Projects using co-located renewables account for 42% of the project pipeline to 2030, but we expect a trend toward grid-connected archetypes.

Spain, Germany and the United Kingdom together account for 60% of hydrogen projects to 2030 in Europe that use co-located renewable energy sources. Spain leads in terms of the number of these projects, with most making use of the country's strong solar energy potential.

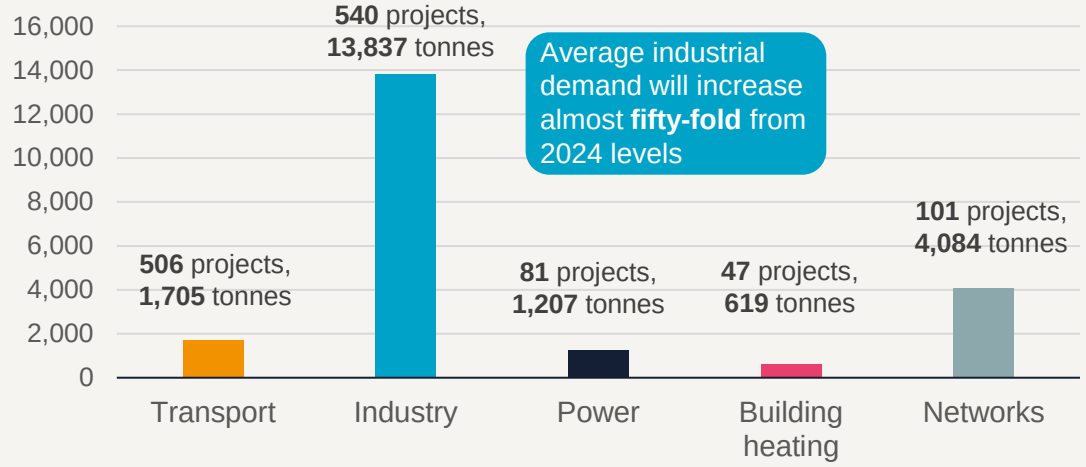
- 32% of planned hydrogen projects in Europe targeting operation by 2030 intend to use electricity from the grid (almost 40% by capacity). The relatively low share of grid-only connected projects reflects concerns around carbon intensity of the grid in some markets and uncertainty around evolving regulatory frameworks. **We expect this to change as grids decarbonise** and the utilisation factor for grid-connected electrolysers increases, lowering the levelised cost of hydrogen.

Solar is the most common primary renewable source for projects using dedicated renewables, making up 39% of such projects. Onshore wind follows with 31%, and offshore wind with 8%. However, when looking at electrolysis capacity, offshore wind accounts for 27% of the total, reflecting the large scale of these fewer projects.

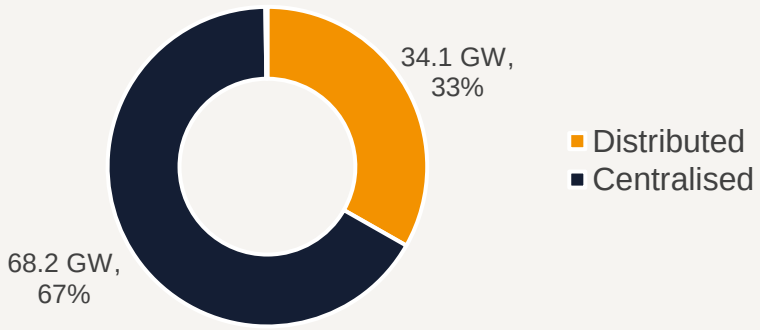
119 projects use a combination of multiple renewable asset types - the most common combination being onshore wind and solar (103 projects).

Average industrial demand per project will be 8x higher than transport demand in 2030

Average electrolytic hydrogen demand per project by end-use sector, Europe, 2030 (tonnes / yr)



Planned European electrolysis projects to 2030, by location type



Industrial demand projects in Denmark, Spain, and the Netherlands all have an average electrolyser size >250 MW. In these three markets, high industrial demand is driven by synthetic fuel projects - such as ammonia, methanol, SAF, and synthetic methane - as well as major green steel developments.

Transport projects show a far lower average hydrogen demand per project. On average, hydrogen refuelling stations use electrolysers <10 MW. France has the most transport projects, with an average 80% of their hydrogen demand dedicated to transport.

Networks / undefined offtake projects have a higher average demand compared to other sectors, reflecting the large scale of these projects that plan to inject in future networks and supply many end-use sectors.

Power and **building heating** projects will remain few and will have smaller hydrogen demand volumes than other sectors in Europe.

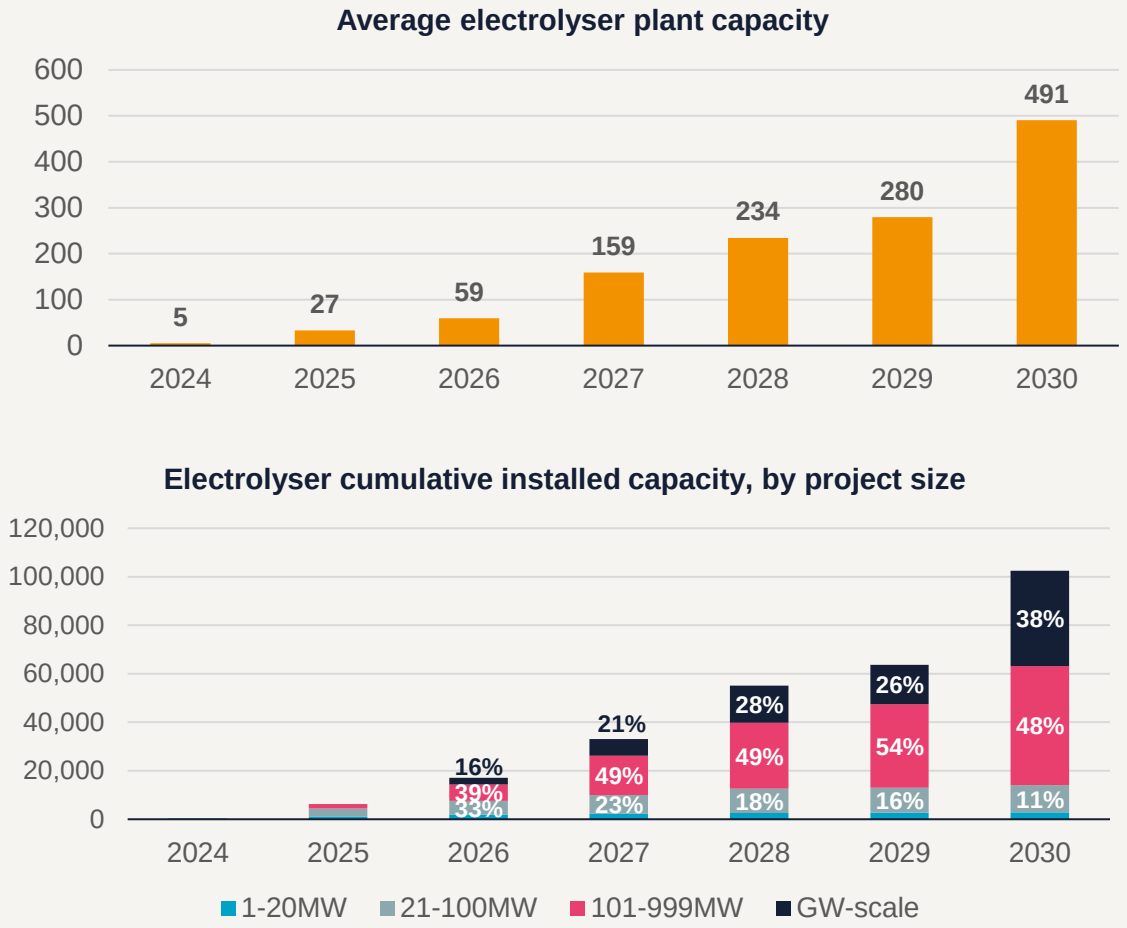
Projects are evenly split (~415 projects each) between: **centralised production** (supplied to offtake via grid/shipping/haul, or undefined offtake), and **distributed production** / "over the fence" offtake (on-site production and consumption).

However, **in terms of capacity**, a much **larger share of the pipeline follows a centralised approach** whereby offtake will not be co-located with production, or the plant will supply multiple dispersed customers. Networks will be critical to join up production and offtake for these projects.

We define "transport" as direct use of hydrogen in mobility applications. Hydrogen used to produce transport fuels (e.g. synthetic aviation fuel) falls under "industry" demand. "Networks" captures projects with unassigned offtake that announce plan to inject into future grid.

Projects in the 100s-MW scale make up almost half of the 2030 pipeline

Project size for European electrolysis projects to 2030 (MW_e)



The average electrolyser plant size is set to reach 27 MW in 2025, and 491 MW by 2030, driven by commercial industrial offtake and increasing economies of scale.

The average size of announced projects is rising rapidly. The average electrolyser capacity installed in 2024 was only 5 MW, but this is set to grow by a factor of 5 over 2025. However, as FIDs have been continuously pushed back, **some project developers continue to review their bullish project ambitions and downsize plans**.

Projects in Spain, Denmark, and the Netherlands have the largest average size in Europe, each exceeding 600 MW. Spain has the highest share of GW-scale projects in Europe's pipeline to 2030, with six projects accounting for ~27% of all planned GW-scale developments.

The focus of electrolytic hydrogen projects is changing:

- Over the past years, the primary aim of European projects has been to build experience in design, engineering, installation and operating best practice for electrolysers. These projects are typified by pilots using electrolysers below 10 MW, relying completely on national and EU funding.
- As we begin to look at the projects due to come online from 2025, not only are the planned projects increasing rapidly towards the 100 MW mark, but the drivers of these projects are becoming more commercially focussed. Building reliable value chains and securing partners will be a key target of these projects.

Six Key European Markets for Electrolysis

- **Country profiles for Germany, Spain, the Netherlands, France, Denmark, and the UK**

UK

Electrolysis market (2024)

4 MW + online in 2024

13 MW live

106 projects in pipeline

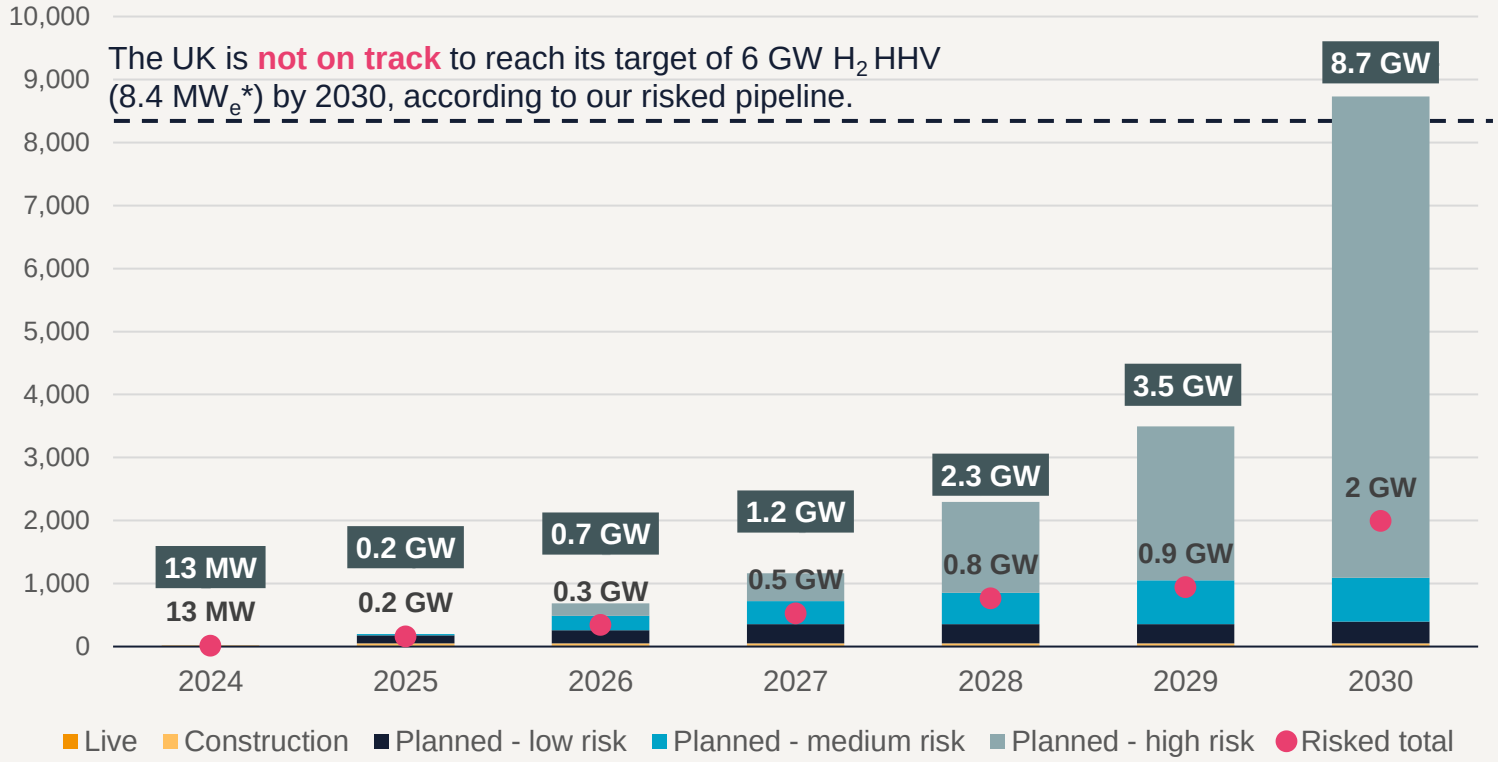
Electrolytic hydrogen demand by 2030

Overview

The UK remains supportive of both electrolytic and CCUS-enabled hydrogen investments. The Hydrogen Production Business Model is de-risking initial projects. The role of hydrogen for heat remains unclear until a strategic decision by 2026, but industry, power, and (to a lesser extent) transport will drive early electrolytic hydrogen demand – though the UK notably lacks the demand mandates emerging in Europe.

Clarity on projects receiving support under the Hydrogen Production Business Model gives the market a much-needed confidence boost going into 2025.

Electrolyser cumulative installations pipeline (MW_e)



*Assuming efficiency 54.95 kWh/kg

Risked Total = LCP Delta assessment on likely commissioning scenario, based on maturity of projects.

UK

Opportunity: Generous support scheme

The **HAR1 allocation round** clarified the weighted average strike price of £241/MWh (H_2 HHV) under the UK CfD scheme. Assuming H_2 is sold at current gas prices, this equates to a subsidy of ~€9.70/kg H_2. This is significantly higher than European support schemes; For example, the EU Hydrogen Bank first round offers an average of €0.46/kg H_2.

This support will take the sale price risk off developers but does little to address volume risk. Business models for hydrogen transport and storage, and power generation are currently being designed.

Barrier: Power markets uncertainty

The second consultation on the Review of Electricity Market Arrangements (REMA) was published in March 2024 and is expected to conclude by mid-2025. Projects will need to consider which zone of pricing they produce in to minimise their operational costs of producing hydrogen, as REMA could make hydrogen more attractive in regions with higher renewables deployment and lower electricity prices.

These potential changes require site selection for new projects to account for multiple possible outcomes, making it more difficult to accurately forecast long-term electricity costs

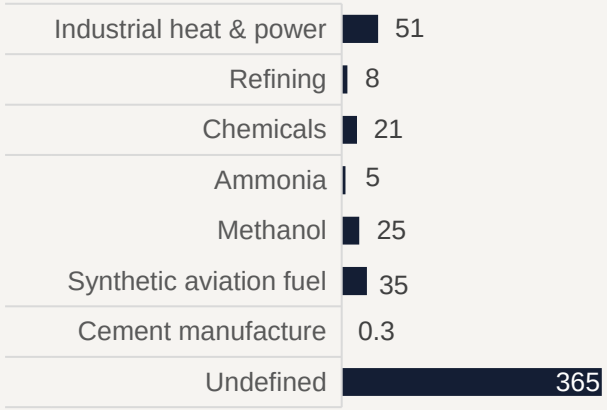
Policy and funding

In 2023, the UK Government **increased its green (and alternative routes) H_2 production target from 5 GW to 6 GW** (H_2 HHV), with 4 GW to come from blue.

The **HAR 1** allocation round awarded contracts to 11 projects (total 125 MW [H_2 HHV]) in December 2023, which will come online from 2025. Annual allocation rounds will run until 2030. HAR 2 shortlisted projects will produce a total of 765 MW (H_2 HHV).

Offtake

Industrial green H_2 demand *('000s tonnes)*



As of 2024, many projects in the UK have not explicitly defined which industrial process they will supply. Two large projects, both a mix of CCS-enabled and electrolytic H_2, account for refining and SAF demand.

We are seeing several early projects planning to displace natural gas for industrial heat.

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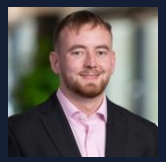

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