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ENERGY RESEARCH

European Hydrogen Market Report (HyMaR)

April 2025

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What's coming up in the European Hydrogen Market Service?

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Strategic Insights

- Short-term hydrogen demand: Who is buying renewable hydrogen?
- Designing for value: innovative power procurement strategies and upsides for electrolyser business models
- Closing the gap: offtakers' willingness to pay for low-carbon hydrogen
- Hype to HPA: crafting offtake strategies and purchase agreements
- Seas of opportunity: economics of hydrogen from offshore co-location
- A traded hydrogen market in Europe: what will prices and market structures look like?
- The economics of hydrogen imports: Better to stay local?

Country deep-dives

- The "13k mechanism" in Germany – price formation and its impact on hydrogen production
- Hydrogen in the NLD: From natural gas to green hydrogen hub
- The role of green hydrogen in the I-SEM
- Policies, regulation, and economics of green hydrogen in France
- The role of green hydrogen in Iberia
- Hydrogen for a Net Zero Great Britain
- Low carbon hydrogen in the Nordics
- Net Zero and the role of hydrogen for the Italian power system

Major deliverables of European Hydrogen Service in 2025

1) Existing reports are available in our EOS platform under the European Hydrogen Product

Source: Aurora Energy Research

Today's presenters and other key information

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Source: Aurora Energy Research

Our Hydrogen Market Report (HyMaR) offers a comprehensive view of the hydrogen value chain across Europe

HyMaR offers a complete overview of the European hydrogen market, covering four key areas:

Hydrogen Market Structure, Policy and Regulation

- Targets
- Policy frameworks
- Standardisation
- Supply support mechanism
- Demand support mechanism
- Infrastructure

Levelised Cost of Hydrogen (LCOH) for Electrolysers

- Overview
- European LCOH analysis

Aurora's Global Electrolyser Database

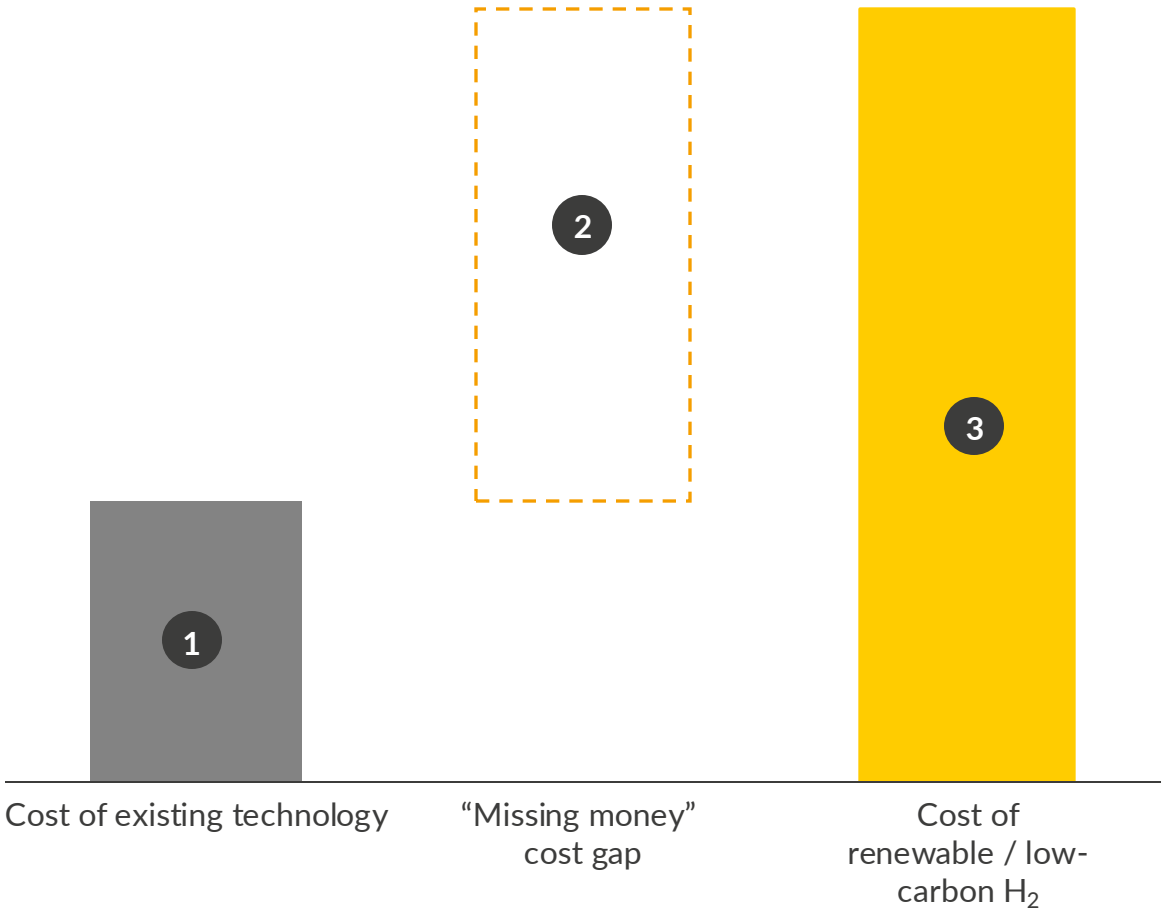
- Global overview
- European electrolyser overview

Hydrogen Market Outlook

- Hydrogen purchase agreements (HPAs)
- Willingness to pay
- Hydrogen price outlook

Closing the cost gap is essential to making sustainable hydrogen competitive; The HyMaR report examines all the key components that influence this

Illustrative graph displaying the "missing money" cost gap for sustainable[1] H_2



Our HyMaR report examines all components of the missing money chart, providing clients with a realistic and comprehensive view of the renewable and low-carbon hydrogen market, below are the related topics covered in the report:

1. **Cost of existing technology**
   - Willingness to pay for sectors
     - Ammonia, refineries, steel, and industrial process heat
   - Policy and regulation
2. **"Missing money" cost gap**
   - Policy and regulation
   - Hydrogen demand and supply mix
   - Power procurement strategies
3. **Cost of renewable / low-carbon H_2**
   - Levelised cost of hydrogen
     - 15 European countries, 10+ electrolyser business models
   - Hydrogen prices / market outlook

1) In this case "sustainable hydrogen" includes non-grey hydrogen, this includes, blue, renewable, low-carbon, etc.

Source: Aurora Energy Research

The HyMaR report includes a comprehensive policy and regulation section, looking across policy ecosystems at both European and national levels

Aurora subscribers have access to our comprehensive compilation of policy and regulatory insights, providing an in-depth overview of key developments and frameworks.

European hydrogen ecosystems

- Targets
- Policy frameworks
- Standardisation
- Supply support mechanisms
- Demand support mechanisms
- Infrastructure

Individual EU/EEA HyMaR countries

BEL | DNK | FIN | FRA | DEU | IRL | ITA | NLD | NOR[1] | POL | PRT | ROU | ESP | SWE

In addition to the EU hydrogen ecosystems that apply to all HyMaR countries (except GBR), they also have their own country-specific frameworks that are added on top of the EU frameworks to offer more support, targets, and regulation.

Great Britain

GBR

Great Britain has its own hydrogen ecosystems that vary from the EU's.

1) Norway is not an EU member state, but is a part of EEA (European economic area) and qualifies for many EU-specific hydrogen policy ecosystems;

Source: Aurora Energy Research

Our electrolyser database tracks hydrogen projects in various stages of development across the world

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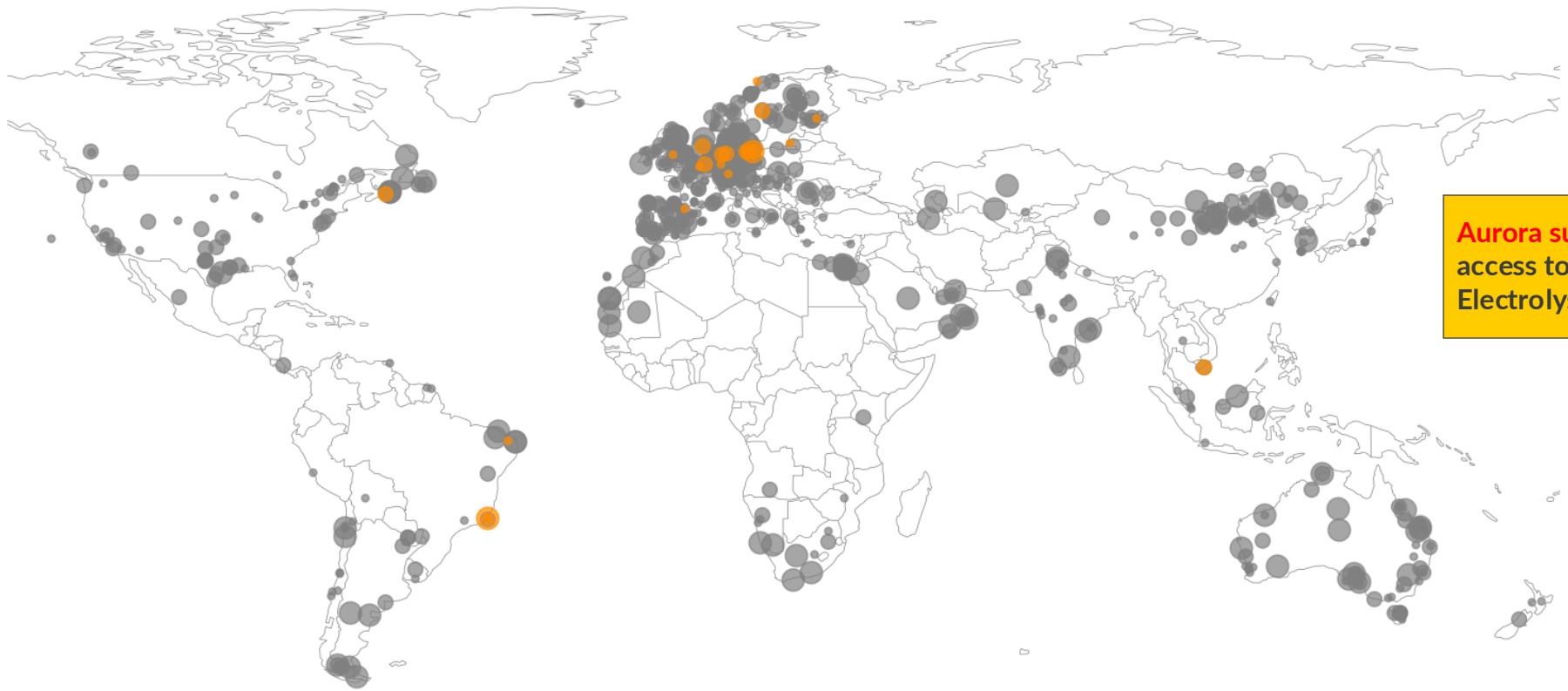
Demand for hydrogen continues to grow, with now over 1.3TW of electrolysers globally



Aurora subscribers receive access to Aurora's Global Electrolyser Database.

● Previously reported projects ● New projects (Since October 24) ○ < 100MW ○ 100 - 1000MW ○ > 1000MW

Source: Aurora Energy Research

Via the electrolyser database, Aurora tracks projects developments, FIDs, and cancellations to provide the most accurate view of the hydrogen market

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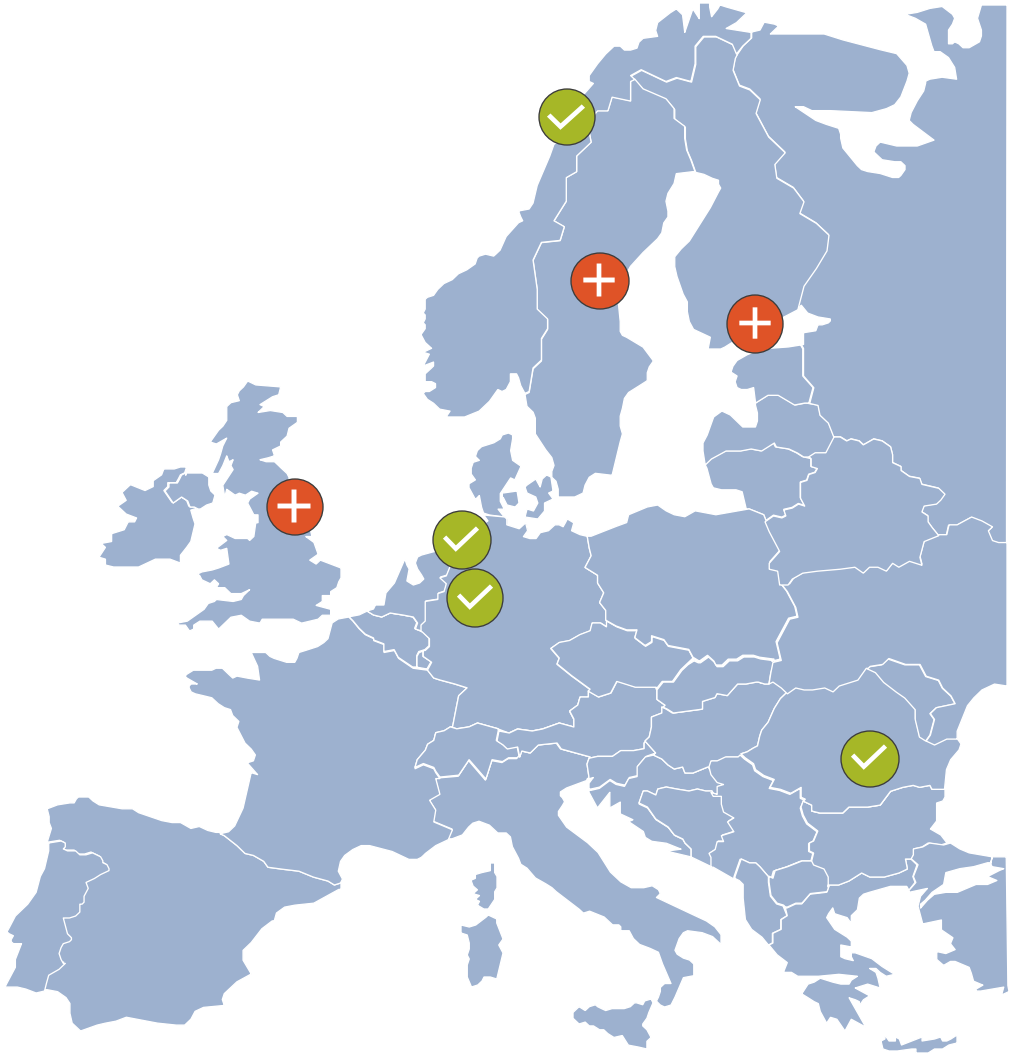
Key recent FIDs and cancelled electrolyser projects across Europe

Aurora subscribers gain access to our FID and cancellation tracker, along with exclusive market insights.



- Projects that have reached FID
- Projects that have been cancelled

Source: Aurora Energy Research

This HyMaR update refreshes our LCOH analysis, factoring in more power market structures and evaluating electrolyser business models across Europe

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Electrolyser business model / power procurement strategy

Power procurement agreement (PPAs)

- This approach is typically the preferred method for power procurement by developers as it offers price certainty and mitigates risks associated to the largest levelised cost of hydrogen (LCOH) component.

PPA structure		Description
Single-RES asset	Solar-only	PPAs sourced from solar PV assets
	Onshore wind-only	PPAs sourced from onshore wind assets
	Offshore wind-only	PPAs sourced from offshore wind assets
	Hydro-only	PPAs sourced from hydro assets
Hybrid		A combination of multiple PPAs from different RES technologies
Oversized		Drastically oversized PPAs relative to electrolyser capacity
PPA + grid		A combination of PPAs and imports from the day-ahead market

Grid-connected

- **Description:** Electrolyser leverages power from the wholesale market.
- **Market type:** Markets with a renewable or a low-carbon grid.

Co-located

- **Description:** Electrolyser is directly connected to a co-located renewable asset(s) owned by the same entity.
- **Market type:** Regions with ample land availability.

Electrolyser with BESS[2]

- **Description:** A battery asset is integrated into a co-located or a PPA-powered setup to improve electrolyser utilisation.
- **Market type:** Regions with promising solar load factors, and access to capacity and ancillary markets.

Aurora subscribers gain exclusive access to our comprehensive forecasts for the LCOHs across 15 European countries, covering more than 10 business models and key years. The report offers dynamic insights derived from these LCOH projections, complemented by detailed data available in our databook.

Source: Aurora Energy Research

In the latest HyMaR, we updated our demand forecast, looking into drivers of renewable /low carbon H_2 including which sectors will be near-term adopters

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Drivers of renewable/low carbon H_2 demand in Europe

- Hydrogen costs
- Access to infrastructure
- Pace of total decarbonisation
- Carbon Border Adjustment Mechanism (CBAM)
- Technology readiness level of alternatives
- Industrial growth and geopolitics
- Supply chains/skills

Aurora subscribers have access to the willingness to pay forecasts for Feedstocks, E-fuels, Steel, and industrial heat across key countries and years.

Sector	Description of hydrogen use	Role of H_2
Feedstock	Used in chemical industry such as ammonia, refineries	
E-fuels[1]	Synthesis of fuels e.g. e-ammonia and e-SAF	
Steel	Essential input in the DRI-EAF[2] process	
Industrial heat	Combustion of H_2 in furnaces for energetic purposes	
H_2 in power	Use in H_2 CCGTs/OCGTs to replace traditional thermal assets	
Road transport	Use in H2 ICEs[3]/fuel cells in HGVs/other road vehicles	
Rail transport	Use of H_2 to power trains in regions with limited electrification	
Space heating	Direct use of hydrogen in boilers for residential space heating	

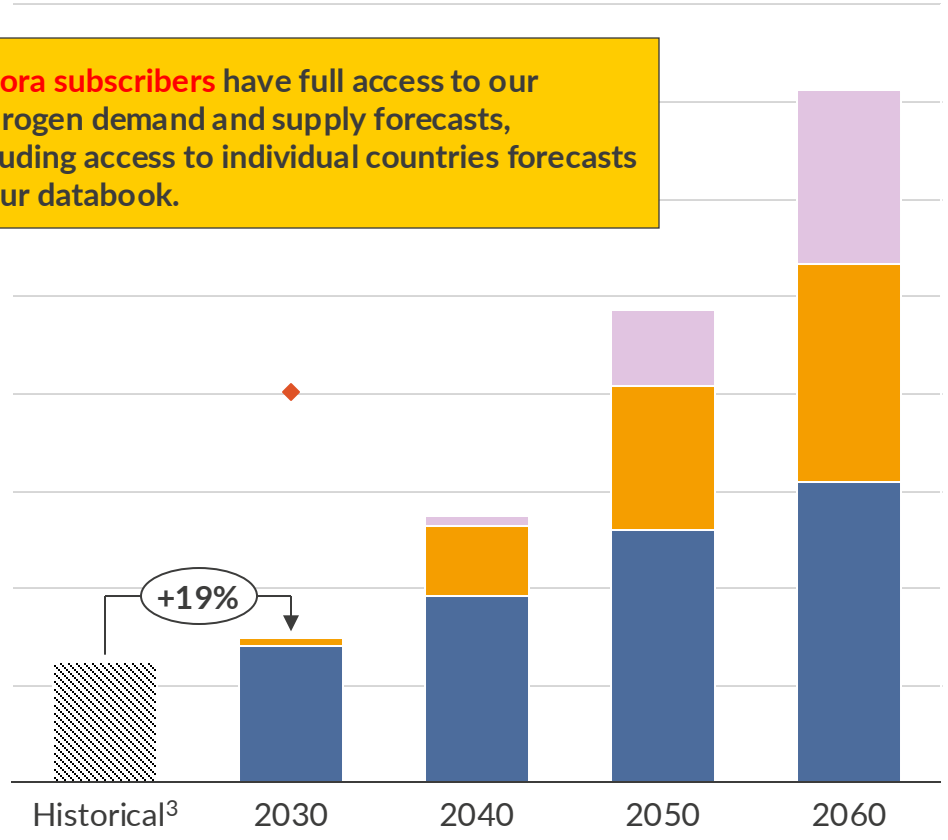
1) E-fuels include e-ammonia, e-kerosene, e-methanol, e-methane, etc., and are used in the maritime and aviation sectors; 2) DRI-EAF: Direct reduced iron–electric arc furnace; 3) ICE: Internal Combustion Engine

Source: Aurora Energy Research

We apply the hydrogen sectors drivers our demand and supply forecasts, in both the short and long term across Europe

Total demand for H_2 and derivatives[1] in Europe[2]
Mt H_2
TWh_{HHV} H_2

Aurora subscribers have full access to our hydrogen demand and supply forecasts, including access to individual countries forecasts in our databook.



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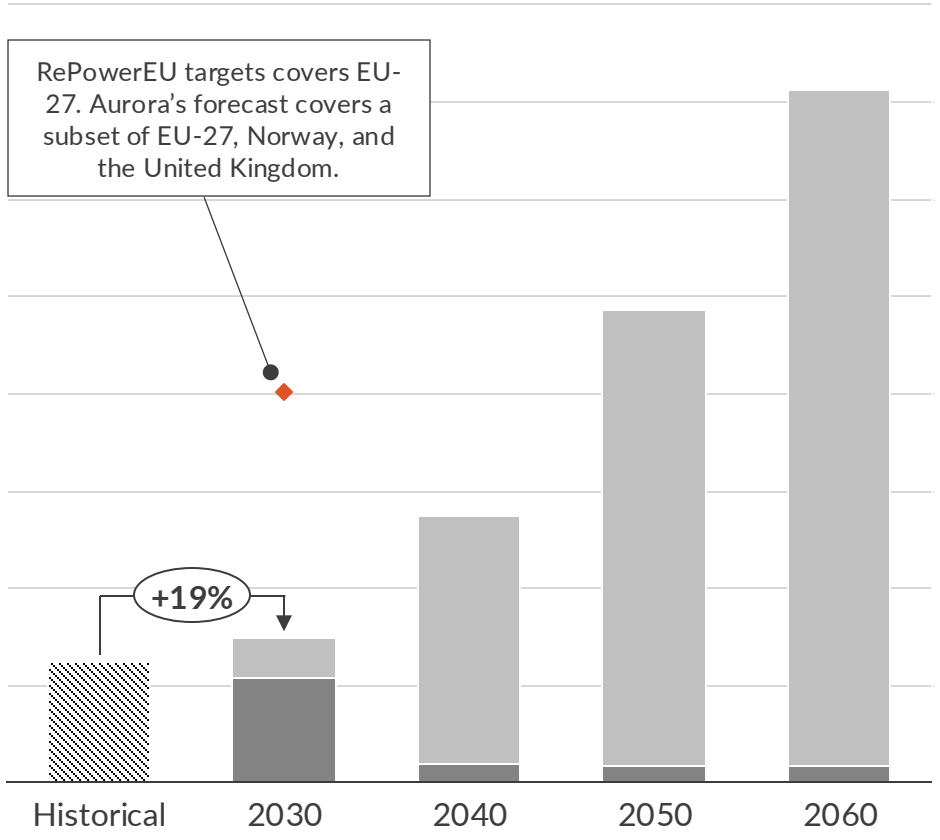

Power | Transport | Industry | Historical | RePowerEU Target[3] | Grey and by-product H_2 | Low-carbon H_2[4] | Historical | RePowerEU Target

1) Hydrogen derivatives considered in this analysis cover ammonia, methanol, synthetic diesel, and synthetic kerosene; 2) Only includes HyMaR countries; 3) Historic data from European Hydrogen Observatory; 4) This includes hydrogen produced through electrolysis, blue hydrogen, and imports, but excludes grey hydrogen;
Sources: Aurora Energy Research, European Hydrogen Observatory

Our updated European Hydrogen Market report is live!

HyMar, is a bi-annual update of the overview of **attractiveness of the hydrogen market**

Scan the QR code or go to: https://auroraer.com/sector/hydrogen/hy-mar/ to download the redacted slides

Details and disclaimer

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April 2025

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