The European hydrogen policy landscape

Extensive update of the January 2025 report

January 2026

Disclaimer

The aim of this report is to reflect the situation in the European and national policies, legislations, strategies and codes & standards which impact the deployment of hydrogen technologies and infrastructures, as of July 2025, unless stated otherwise. This report serves as an extensive update to the previous version published in January 2025, which covered data up to July 2024. It incorporates advancements and developments that occurred in the interim period, providing a comprehensive overview of the current landscape. The authors believe that this information comes from reliable sources, but do not guarantee the accuracy or completeness of this information.

The data of the European Hydrogen Observatory will continuously be updated. These updates will take place annually for most datasets, while for some it can also be done on a case by case basis. As a result, the information used as of writing of this report might differ from the updated data that is presented on the European Hydrogen Observatory.

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This report was prepared for the Clean Hydrogen JU as part of the European Hydrogen Observatory. Copies of this document can be downloaded from https://observatory.clean-hydrogen.europa.eu/.

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Clean Hydrogen Partnership

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Executive summary

This report summarises the status of the European hydrogen policy landscape. It is based on the information available at the European Hydrogen Observatory (EHO) platform, the leading source of data and information on hydrogen in Europe (EU27, EFTA and the UK). Building on the previous report published in January 2025, which reflected data as of July 2024, this report provides an extensive update, capturing advancements and developments over the past year. It offers a comprehensive overview of the European and national policies, legislations, strategies and, codes and standards which impact the deployment of hydrogen technologies and infrastructures.

The EHO database now includes 36 EU policies and legislations that directly or indirectly impact the development and deployment of hydrogen technologies, with an addition of 4 new EU policies compared to the previous report, now including the Affordable Energy Action Plan, the Automotive Action Plan, the Steel and Metals Action Plan and the Clean Industrial Deal. All of which were released or adopted in 2025. This expansion reflects the growing regulatory attention on the hydrogen sector. The growing number of implemented legislations and policies have an impact on the whole value chain of hydrogen including production, transport, storage and distribution, and end-uses. Other key changes to EU policies relevant to the hydrogen value chain reflect the Omnibus package, which will impact the Carbon Border Adjustment Mechanism as well as the Energy Performance of Buildings Directive to align with updated energy and climate objectives.

At the national level, as of June 2025, 25 out of 32 European countries have successfully published their national strategies in the hydrogen sector, while 3 countries are in the draft stage. Compared to May 2024, Italy, Iceland, Romania and Switzerland have now published their first hydrogen strategies, while Cyprus and Greece have progressed from no strategy to the draft stage.

Several European countries have strategically incorporated quantitative indicators within their national strategies outlining their targets and estimates across the hydrogen value chain. This deliberate approach reflects a commitment to providing clear and measurable goals within their hydrogen strategies.

A target often used in national strategies is electrolyser capacity, reflecting efforts to enhance domestic renewable hydrogen production. Germany maintains the highest goal, aiming for 10 GW of electrolyser capacity by 2030, consistent with the previous report. Denmark and the United Kingdom follow with targets of 5 GW of electrolyser capacity each, while France has revised its goal to 4.5 GW. Other targets that some of the countries use in their strategies are on the number of hydrogen refuelling stations, fuel cell electric vehicles and

total (renewable) hydrogen demand. A few countries also have targets on renewable hydrogen uptake in industry and hydrogen injection limit in the transmission grid.

To monitor the policies and legislation that are adopted on a national level across the hydrogen value chain, a survey was launched with national experts, which was validated by Hydrogen Europe. In total, 30 European countries have participated to the survey, consistent with the July 2024 survey round.

On production, the survey revealed that 22 country specialists (73%) report that their country provides support for capital expenditure (CAPEX) in the development of renewable or low-carbon hydrogen production plants (+2 countries since July 2024). Moreover, 12 countries (40%) also provide support for operational expenditure (OPEX) (+4 countries since July 2024). Furthermore, 15 countries have instituted official permitting guidelines for hydrogen production projects (+2 countries since July 2024), while 8 countries have enacted a legal act or established an agency serving as a single point of contact for hydrogen project developers, (+2 countries since July 2024). For transmission, since July 2024 one additional country has reported support schemes for hydrogen injection into the transmission grid, bringing the total to three: Ireland, Portugal, and Bulgaria. Several countries have policies in place that clearly define the hydrogen limit in their transmission grid for now and in the future. Since July 2024, the minimum hydrogen concentration has remained unchanged at 0.1%, while the maximum concentration continues to be 15%. 9 European countries define within their policies the operation of hydrogen storage facilities (+2 countries compared to July 2024).

On end-use, the questionnaire zoomed in on the different type of applications for clean hydrogen, i.e. mobility, heating, power and industry. For mobility, the majority of countries, totalling 20, (67%) reported to have implemented support schemes aimed at promoting the adoption of hydrogen (-3 countries since July 2024). Purchase subsidies stand out as the predominant form of support for fuel cell electric vehicles (FCEVs), with implementation observed in 18 countries. Since July 2024, the number of countries adopting support schemes for stationary fuel applications, including heating and power generation, has increased slightly from 4 to 5, remaining at a relatively low level. Similarly, the number of countries providing support for the deployment of hydrogen-based residential and commercial heating systems has increased from 2 to 3 since the previous year. For hydrogen end-use in industry, a total of 16 countries reported providing support schemes as of 2025, an increase of 4 countries since July 2024. The chemicals industry remains the primary focus, with support schemes in 15 countries (up from 11). Refineries and industrial heating have both risen sharply, now supported in 14 countries each (up from 9), surpassing ammonia production, which has increased to 13 countries (up from 11) but now ranks below refineries and industrial heating. On the topic of technology manufacturing, 10 countries reported having support schemes as of July 2025, an

increase of 3 countries since July 2024, with the addition of France, Latvia, and Poland.

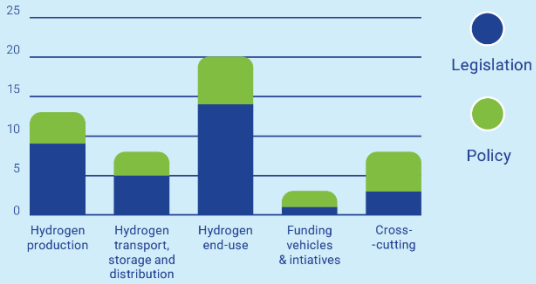
Exploring the latest advancements in European codes and standards relevant to the deployment of hydrogen technologies and infrastructures, a total of 14 standards have been revised and developed in 2025 (8 have been already captured in the EHO database). These standards cover various stages of the hydrogen value chain. Most standards focus on end-use applications and distribution & storage, while fewer address cross-cutting issues or production. Some standards cover more than one category. These standards mainly cover hydrogen fuel cell technologies, hydrogen refuelling stations, plastics pipes, fittings and valves for the transport of gases and cylinder gases.

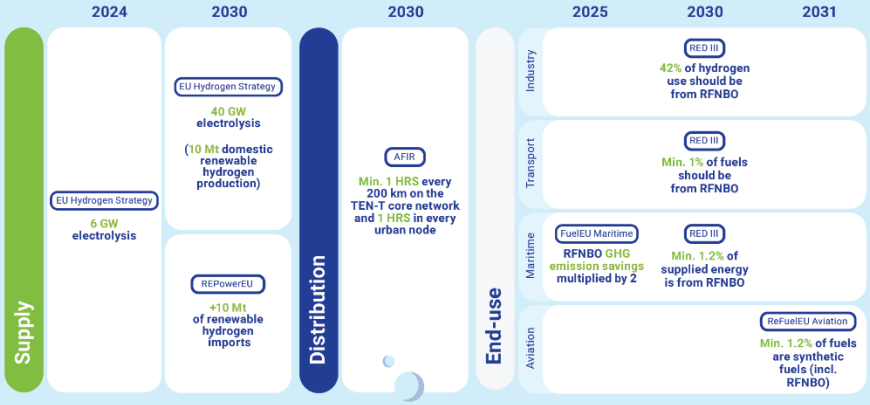
Key insights

EU Policies & Legislation

The EHO database now include 36 EU policies and legislations, with 4 new additions compared to the previous report, covering various categories across the hydrogen value chain.

The 4 additions specifically address hydrogen production, end-use, distribution and cross-cutting applications.

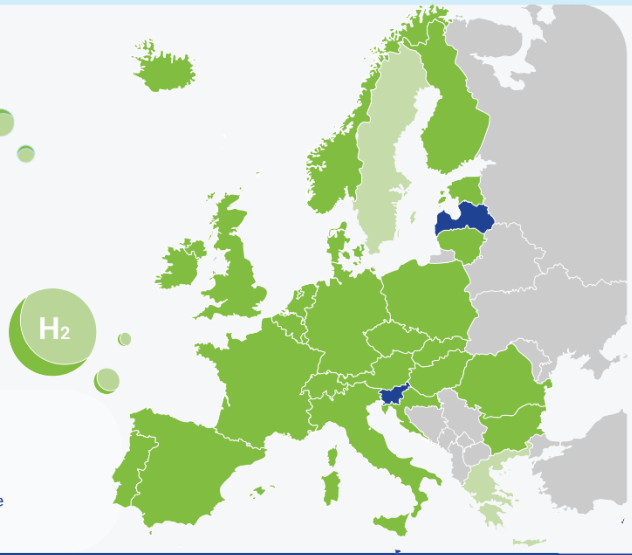




National Hydrogen Strategies

Strategy adoption status across European countries as of June 2025.

Since May 2024, Cyprus and Greece have advanced from having no strategy to the draft stage, while Italy, Iceland, Romania and Switzerland have published their first national hydrogen strategies.



Production

13 countries have targets on **electrolysis** capacity **ranging between 0.07 and 10 GW by 2030.**

Transmission

4 countries have targets on **hydrogen blending limits** in their **natural gas transmission** networks with a **hydrogen concentration of 2 to 15% by 2030.**

End-use

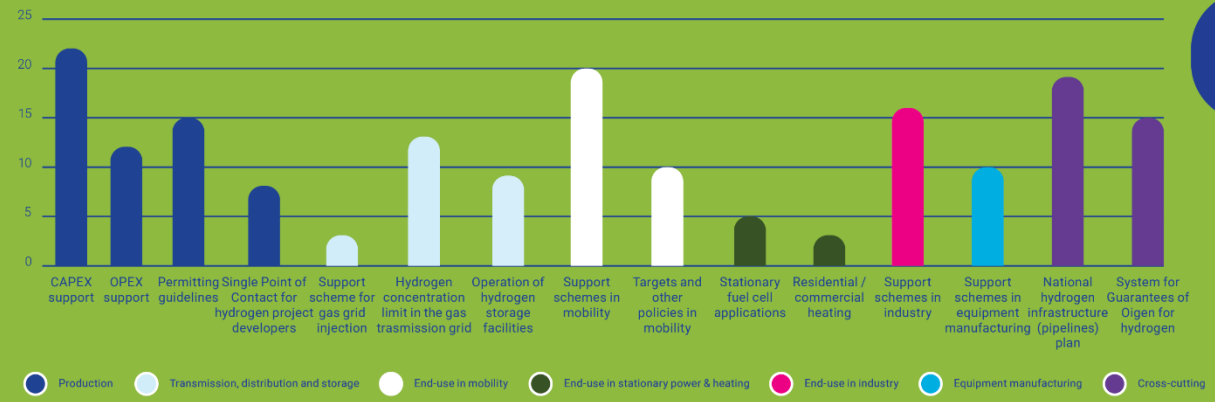
13 countries have estimated their future **hydrogen demand ranging from 0.16 to 130 TWh by 2030.**

8 countries have targets on the number of **HRS ranging** from **15 to 125 units by 2030.**

6 countries have targets on the number of **FCEV** with a major focus on **road transport.**

National Policies & Legislation

Number of countries with national policies and legislation relevant to hydrogen sector by topic in Europe



For **production** and **equipment manufacturing**, **support schemes** have a main focus on **electrolysers.**

Support schemes in **mobility** mainly focus **on road transport**.

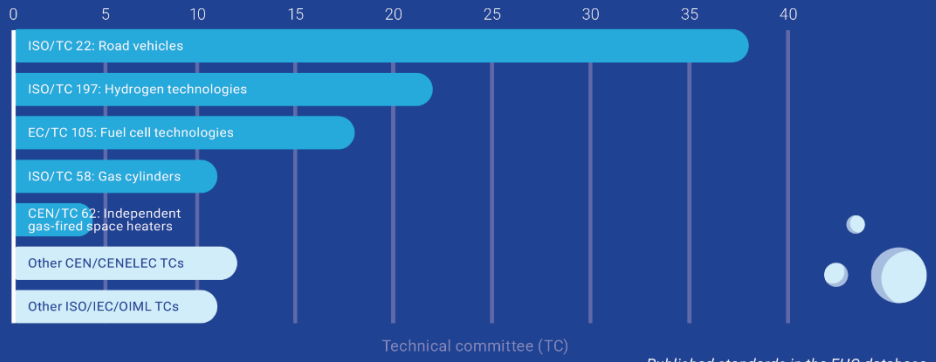
Codes & Standards

116
searchable standards on the EHO database

14
revised or newly developed standards in 2025 (8 already included in the EHO database)

23 **different technical committees of standardisation bodies, of which 5 are responsible for publishing around 75% of the standards.**

Most of the standards in the EHO database have focus on end-use (61%) and distribution & store (29%)



Published standards in the EHO database

Overview

A growing number of governments are acknowledging the importance of the hydrogen sector and are implementing policy support measures, which are required to ensure technology readiness, enhance market penetration, and stimulate market growth. Policies collectively shape the landscape for hydrogen technologies and infrastructures. They provide a regulatory framework, financial support, and strategic direction to promote the sustainable deployment of hydrogen across European countries.

This report aims to summarise the status of the European hydrogen policy landscape. It is based on the information available at the European Hydrogen Observatory (EHO) website, the leading source of data on hydrogen in Europe. The data presented in this report is based on research conducted by Hydrogen Europe until the end of July 2025, but also goes beyond this timeline for major policies, legislations or standards implemented recently. This report builds upon the previous version published in January 2025, which reflected data as of July 2024, providing updated insights on European policies and legislation, national strategies, national policies and legislation, and codes and standards. Interactive data dashboards can be accessed on the website: https://observatory.clean-hydrogen.europa.eu/

The EU policies and legislation section provides insights into the main European policies and legislation relevant to the hydrogen sector, which are briefly summarized on content and their potential impact to the sector.

The national hydrogen strategies chapter offers a comprehensive examination of the hydrogen strategies adopted in Europe. It summarizes the quantitative indicators that have been published (targets and estimates) and provides brief summaries of the different national strategies that have been adopted.

The section referring to national policies and legislation focuses on the policy framework, measures, incentives and targets in place that have an impact on the development of the respective national hydrogen markets within Europe.

The codes and standards section provides information on current European standards and initiatives developed by the standardisation bodies, including CEN, CENELEC, ISO, IEC, OIML The standards are categorised according to the different stages of the hydrogen value chain: production, distribution and storage, and end-use applications.

01

EU Policies and legislation

This chapter provides an overview of the current European policies and legislation relevant to the deployment of hydrogen technologies and infrastructure.

It provides a brief description of the policies and the main expected impacts for the sector.

The data on European policies and legislation presented on the European Hydrogen Observatory website are based on content analysis, publicly available information, and expert knowledge from Hydrogen Europe, and reflects the situation as of November 2025.

Interactive data dashboards on EU policies and legislation can be accessed on the European Hydrogen Observatory website.

1.1. Overview

The European Hydrogen Observatory (EHO) now covers a total of 36 policies, both of legislative and non-legislative nature enacted that directly or indirectly affect the development and deployment of hydrogen technologies at the EU level, with an addition of 4 new policies compared to the previous report (i.e. the Affordable Energy Action Plan, the Automotive Action Plan, the Steel and Metals Action Plan and the Clean Industrial Deal).

Legislative content typically involves a directive (e.g. Renewable Energy Directive) or a regulation (e.g. Regulation setting CO_2 emission performance standards for new passenger cars and light-duty vehicles). Non-legislative content involves a high-level political strategy, roadmap, or communication (e.g. EU Green Deal communication or the Hydrogen Strategy).

The EHO website provides more information on these policies based on their relevance and impact across various value chain levels of the clean hydrogen industry. The EU policies are broken down into the following categories: (1) cross-cutting, (2) hydrogen production, (3) hydrogen transport, storage and distribution, (4) hydrogen end-uses and (5) funding vehicles and initiatives.

In Figure 1 an analysis is made on the number of EU policies and legislations, that are available in the EHO database, applicable to different categories within the hydrogen value chain. Moreover, Table 1 gives a complete overview of the different policies and legislations that are presented in the EHO website. The content of these policies and legislations are summarized in the following subsections, broken down according to the different steps in the value chain.

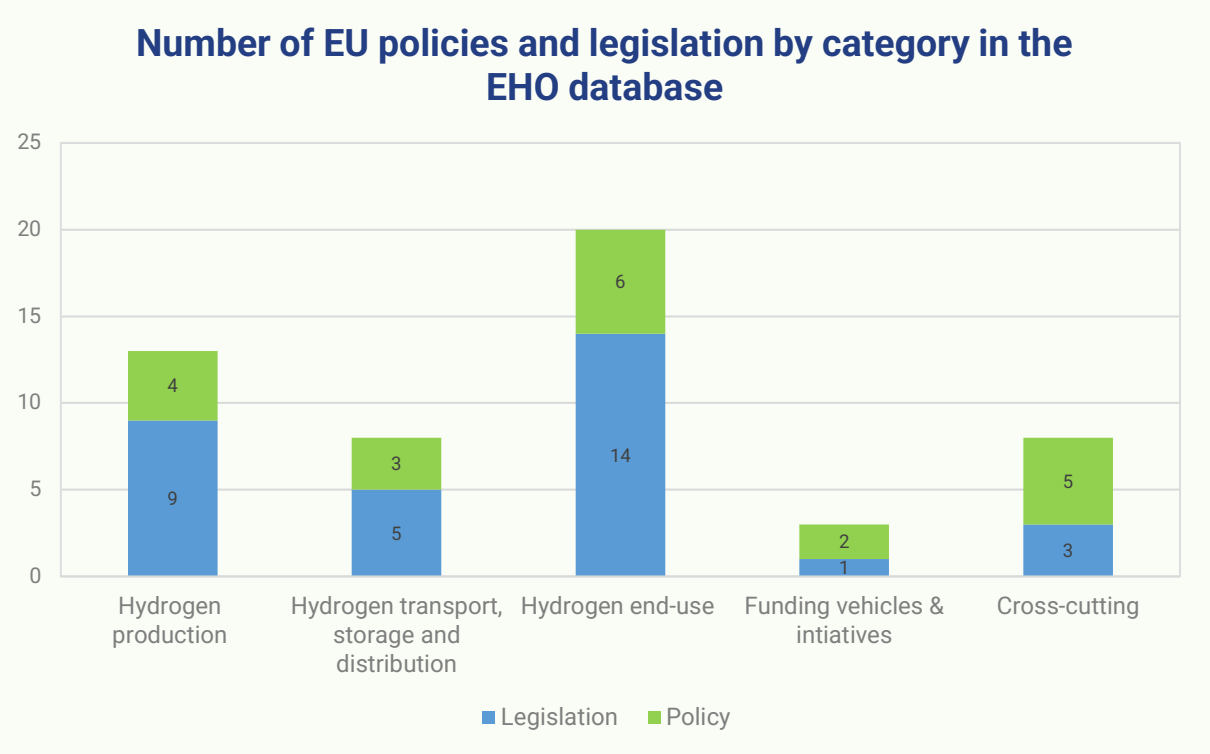


Figure 1. Number of EU policies and legislation in the EHO database by category.

Table 1. EU policies and legislations covered in the EHO database sorted by topic as explained in this report.

Cross-cutting	
EU Green Deal	European Climate Law
EU Energy System Integration Strategy	EU Hydrogen Strategy
Industrial Strategy	Sustainable finance
REPowerEU	Clean Industrial Deal Adopted in 2025
Production	
Energy Efficiency Directive	Carbon Border Adjustment Mechanism
EU Emissions Trading Scheme	Net Zero Industry Act
Hydrogen and Decarbonised Gas Market Package	Offshore Renewable Energy Strategy
Critical Raw Materials Act	Electricity Market Design Reform
Advanced Materials for Industrial Leadership Strategy	Affordable Energy Action Plan Adopted in 2025
Industrial Emissions Directive	Steel and Metals Action Plan Adopted in 2025
Renewable Energy Directive	
Transport, storage and distribution	
Sustainable and Smart Mobility Strategy	TEN-T Regulation
Alternative Fuels Infrastructure Regulation	FuelEU Maritime
REFuelEU Aviation	
End-use	
Energy Taxation Directive	CO_2 emission performance standards for passenger cars and light duty vehicles
Energy Performance of Buildings Directive	Public procurement for clean vehicles
CO_2 emission performance standards for heavy duty vehicles	Automotive Action Plan Adopted in 2025
Renovation wave	
Funding vehicles and initiatives	
State Aid	Innovation Fund
Hydrogen Bank	

Most of the policies and legislations presented in this chapter cover the broader energy transition topic that also directly or indirectly includes the deployment of hydrogen technologies. In some of the policies and legislations clear targets and commitments are set forward, specifically for hydrogen technologies deployment or hydrogen uptake. These targets and commitments are summarized in Figure 2, also broken down according to the different steps in the value chain.

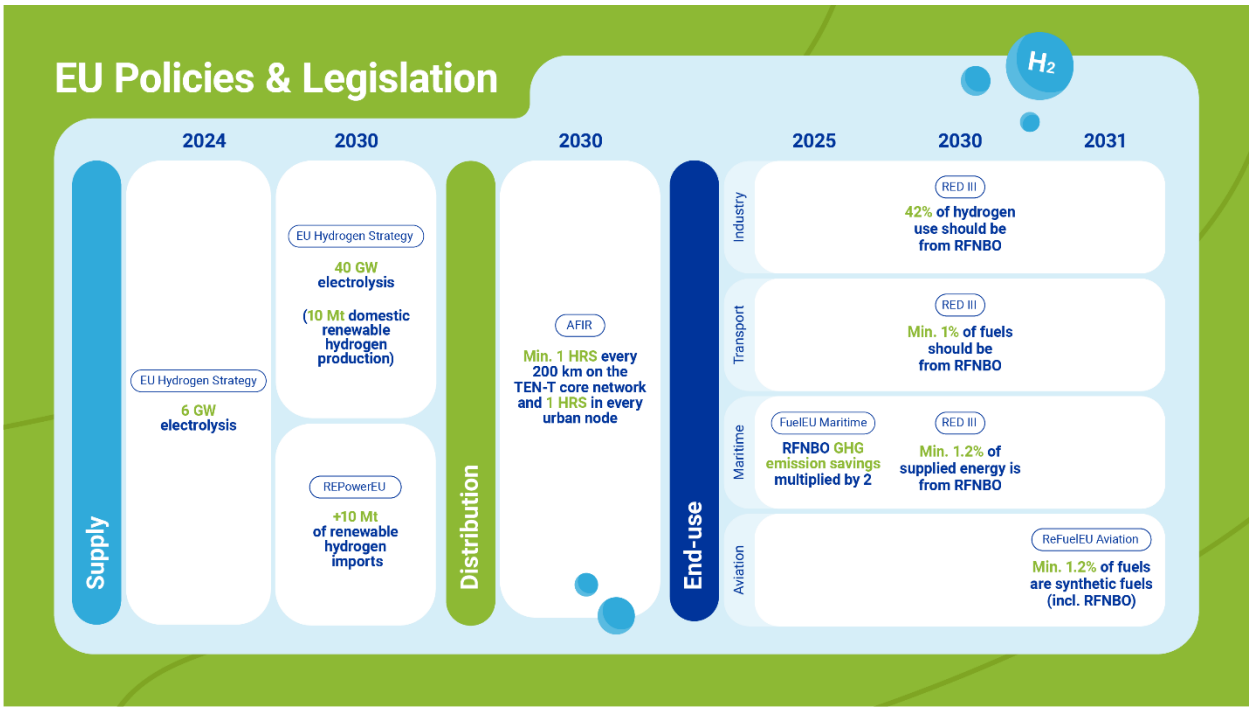


Figure 2. Direct targets and commitments by EU policies and legislations towards hydrogen technologies deployment and hydrogen uptake across the value chain.

1.2.

EU Policies and legislation by category

1.2.1.
Cross-cutting

The European energy and climate policy landscape is undergoing significant changes to create a framework that supports the transition to a climate-neutral economy. The main objectives are to enhance greenhouse gas reductions by encouraging the adoption of clean technologies like hydrogen. This section summarizes these major EU policies and legislations that have been implemented and that have an impact across all sectors, including hydrogen deployment.

European Green Deal [1] and Climate Law [2]

In late 2019, the newly elected European Commission presented its proposal for a European Green Deal. This policy roadmap is meant to be an EU's new growth strategy. It provides significantly stronger emphasis on the decarbonisation dimension of the Energy Union

[1] The European Green Deal-European Commission (europa.eu)
[2] European Climate Law-European Commission (europa.eu)

through a resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use. It also aims to protect, conserve and enhance the EU's natural capital, and protect the health and well-being of citizens from environment-related risks and impacts. The Green Deal objectives are now being executed in many legislative and non-legislative initiatives, aimed at implementing the increased level of ambition.

Most importantly, the European Climate Law, was adopted by EU institutions in June 2021 and it sets into EU law the binding target of net zero greenhouse gas emissions by 2050 (so-called 'carbon neutrality' or sometimes 'climate-neutrality') as well as a 55% greenhouse gas reduction target by 2030 for the EU. In 2025, the law was amended to introduce a binding 2040 target of 90% net emissions reduction, with flexibility mechanisms including high-quality international carbon credits and domestic permanent removals.

Fit for 55 package[3]

The European climate law turns reaching the EU's climate goal of reducing EU emissions by at least 55% by 2030 to a legal obligation. To meet this obligation, the EU countries have been working at new legislations with the Fit for 55 package. The legislations presented in Table 2, that are of relevance to hydrogen, were either adopted or revised as part of the Fit for 55 package. They will be explained in more detail in the following subsections based on their impact on the different steps of the value chain (production, distribution and storage or end-use). In 2025, many of the key Fit for 55 laws are being implemented by Member States, and developments continue, including the adoption of simplifications to the Carbon Border Adjustment Mechanism as part of an Omnibus package and ongoing negotiations on the Energy Taxation Directive.

Table 2. Legislative policies that were adopted or revised in the Fit for 55 package and are of relevance to hydrogen.

Hydrogen related legislations in Fit for 55 package	
EU Emissions Trading System (ETS)	Alternative Fuels Infrastructure Regulation (AFIR)
Effort Sharing Regulation	ReFuel EU Aviation Regulation
CO_2 emissions standards for cars and vans	FuelEU Maritime Regulation
Carbon Border Adjustment Mechanism (CBAM)	Energy Performance of Buildings Directive
Renewable Energy Directive	Energy Taxation Directive
Energy Efficiency Directive	Hydrogen and Decarbonised Gas Market Package

[3] Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality-European Commission (europa.eu)

Energy System Integration Strategy and the European Hydrogen Strategy[4]

Before the adoption of the new legislations from the Fit for 55 package, in 2020, the European Commission released two new major hydrogen relevant strategies, the Energy System Integration Strategy and the European Hydrogen Strategy, that show the importance of hydrogen in a decarbonised future economy, in applications such as high temperature industry (cement, etc.), feedstock in industry (steel, fertilisers), and heavy and long-haul transport (maritime, aviation, heavy duty vehicles, etc.). In these two strategies, hydrogen is identified as a crucial technology for integrating the components of the energy system. Its versatility and potential for energy storage make it an essential tool for decarbonizing sectors that are particularly difficult to transition to low-carbon alternatives. In the European Hydrogen Strategy, the Commission sets clean hydrogen production targets: they aimed for at least 6 GW of renewable hydrogen production capacity (i.e. electrolysers) by 2024 in the EU (resulting in the production of 1 million tonnes of renewable hydrogen) and for at least 40 GW by 2030. By 2050, the hydrogen strategy estimated a potential ¼ of the EU's renewable electricity production to be used for hydrogen production. Since some of the targets are no longer relevant, it is planned to update the European Hydrogen Strategy by the end of 2026.

EU Industrial Strategy[5]

In 2020, under its EU Green Deal, the Commission also proposed a brand-new EU Industrial Strategy to deliver on three key priorities: maintaining European industry's global competitiveness and a level playing field, making Europe climate-neutral by 2050 and shaping Europe's digital future. With the European Industrial Strategy as well as the European Hydrogen Strategy of 2020, the Commission acknowledged the potential of hydrogen in contributing to the energy transition and announced the creation of the European Clean Hydrogen Alliance (ECH2A) in July 2020. Its aim is to bring governmental, institutional and industrial partners together with investors, to identify and build up a pipeline of viable investment projects along the hydrogen value chain, in order to deliver the green transition and create a clean hydrogen market which contributes to growth and jobs and reduction of GHG emissions. Following the new European Parliament and College of Commissioners taking office in 2024, the Industrial Strategy can be considered outdated with the adoption of the Clean Industrial Deal to address new geopolitical and economic challenges. The 2020 EU Industrial Strategy now serves mainly as a background document.

Sustainable finance under the EU Green Deal[6]

To achieve the goals set by the European Green Deal, besides implementing legislations, the

[4] Powering a climate-neutral economy: An EU Strategy for Energy System Integration-European Commission (europa.eu)
[5] European industrial strategy - European Commission (europa.eu)
[6] Strategy for Financing the Transition to a Sustainable Economy-European Commission (europa.eu)

Commission also strives to channel finance to sustainable investment options, compatible with the climate neutrality objective. Concretely, the Commission wants to direct financial flows to green investment and avoid stranded assets, via increased available funds for sustainable investment and reviewed taxonomy. The Commission has put in place the European Green Deal Investment Plan (EGDIP), also referred to as Sustainable Europe Investment Plan (SEIP), as part of the Green Deal. This includes the Just Transition Mechanism, which focuses on ensuring a fair and just transition to a green economy. It is mobilising significant investments over the period 2021-2027 to support citizens of the regions most impacted by the transition.

REPowerEU[7]

In the more recent years, as a response to the energy market disruptions caused by the invasion of Russia in Ukraine, the Commission also presented the REPowerEU Plan on 18 May 2022. The Plan aimed to rapidly reduce the EU's dependency on Russian fossil fuels and proposed a series of amendments to increase the ambition of several files being revised under the Fit for 55 package. Within the section devoted to the hydrogen sector of the REPowerEU Plan, the Commission set the key, indicative target to achieve 10 million tonnes of domestic hydrogen production and 10 million tonnes of imported renewable hydrogen by 2030.

The Green Deal Industrial Plan[8]

As a further response to the challenges related to the pandemic, the unjustified aggression towards Ukraine and the rapid changes in the global geopolitical order, the European Commission published in February 2023 its Green Deal Industrial Plan. This plan updated the EU industrial strategies to enhance the competitiveness of Europe's net-zero industry and accelerate the transition to climate neutrality. It does so by creating a more supportive environment for scaling up the EU's manufacturing capacity for the net-zero technologies and products required to meet Europe's ambitious climate targets.

Clean Industrial Deal[9] *Adopted in 2025*

In 2024, the Antwerp Declaration set the stage for a stronger European industrial policy, calling for actions to enhance competitiveness, protect jobs, and accelerate the transition to climate neutrality. It emphasized simplified regulations, streamlined state aid, and investments in affordable low-carbon energy.

As a response to the Antwerp Declaration, in February 2025, the European Commission published the Clean Industrial Deal (CID), a comprehensive strategy to bolster industrial competitiveness while advancing decarbonisation. It focuses on affordable energy, lead markets, financing, circularity, global partnerships, and skills. The CID also promotes

[7] REPowerEU-European Commission (europa.eu)
[8] The Green Deal Industrial Plan-European Commission (europa.eu)
[9] https://commission.europa.eu/topics/eu-competitiveness/clean-industrial-deal_en

renewable and low-carbon hydrogen, supporting public and private investments and providing a clear regulatory framework for its production and uptake.

To accelerate hydrogen deployment, the Commission adopted a delegated act on low-carbon hydrogen in 2025 and launched the Hydrogen Mechanism under the European Hydrogen Bank, alongside the third Hydrogen Bank call with EUR 1.3 billion, to facilitate demand aggregation and investment in hard-to-decarbonise sectors such as maritime, aviation, and industry.

The CID, together with other initiatives like the competitiveness compass and green investment measures, positions hydrogen technologies, alongside other clean technologies, at the heart of Europe's industrial strategy for 2025-2029.

1.2.2. Production

Legislations that fall under the Fit for 55 package that can have an impact on hydrogen production include the Energy Efficiency Directive, the Renewable Energy Directive, the EU Emissions Trading Scheme, the Carbon Border Adjustment Mechanism and the Hydrogen and Gas Market Decarbonisation Package. Moreover, the Green Deal industrial plan will also have an impact on hydrogen production with the Net-Zero Industry Act, Critical Raw Materials Act and Electricity Market Design Reform legislations that entered into force in 2024. In addition, the new Industrial Emissions Directive and the communication on Advanced Materials for Industrial Leadership of 2024 also have a direct impact on hydrogen production. Finally, the new Affordable Energy Action Plan and the Steel and Metals Action Plan, both adopted in 2025 under the Clean Industrial Deal, will also have a direct impact on hydrogen production and, as well as its use for industrial decarbonisation. The following sections will briefly summarize these legislations and their potential impacts on the hydrogen sector.

Energy Efficiency Directive[10]

The Energy Efficiency Directive (EED) (EU/2023/1791) helps reduce overall energy consumption and is therefore central to achieving the EU's climate ambition, while enhancing present and future energy security and affordability. A substantial revision ('recast') of the EED came as part of the Fit for 55 legislative package in order to deliver on the increased climate ambition of the EU Green Deal. In the final agreement, member states must collectively ensure a reduction of final energy consumption of at least 11.7% by 2030, compared with the energy consumption forecasts for 2030 made in 2020. This translates into an upper limit to the EU's final energy consumption of 763 million tonnes of oil equivalent. The EED provides a regulatory framework that indirectly influences

[10] Energy Efficiency Directive-European Commission (europa.eu)

the hydrogen sector by promoting energy efficiency, sector integration, and building standards, among other measures.

Renewable Energy Directive[11]

The revised version of the Renewable Energy Directive (EU/2023/2413) that has entered into force in November 2023 sets a 42.5% target on the share of renewable energy in the EU's overall energy consumption by 2030, with an additional 2.5% indicative top up to allow the target of 45% to be achieved. All member states will contribute to achieving more ambitious sector-specific targets in transport, industry, buildings and district heating and cooling. These sector-specific targets also include targets directly relevant for hydrogen. In industry, 42% of the hydrogen used should come from renewable fuels of non-biological origin (RFNBOs) by 2030 and 60% by 2035. Moreover, there is also a minimum requirement of 1% of RFNBOs in the share of renewable energies supplied to the transport sector in 2030.

EU's Emission Trading Scheme[12]

The EU's Emission Trading Scheme (EU ETS), in addition to the new CBAM, is the EU's main policy for reducing greenhouse gas emissions. It applies to all EU countries plus Iceland, Liechtenstein and Norway and until now covered energy intensive installations (power stations & industrial plants) and airlines operating between these countries. With the revision that was adopted in 2023, as part of the Fit for 55 package, this list is now extended to the maritime sector, with a gradual phase-in starting in 2024 and increasing coverage from 70% of intra-EU emissions in 2025 to 100% from 2026, alongside partial coverage of EU–non-EU routes. In addition, a separate ETS for buildings and road transport (ETS2) is being introduced, with monitoring and reporting of emissions starting in 2025 and the start of allowance surrendering delayed to 2028, compared to the original 2027 timeline. The revised framework includes safeguards such as a price-stabilisation mechanism and support through the Social Climate Fund. The system is a cap-and-trade system, where a cap is set on the total amount of CO_2 that can be emitted by installations covered by the system. Within the cap, companies receive or buy emission allowances which they can trade with one another as needed. The cap is reduced over time, following a linear reduction factor (LRF). ETS1 will aim for a reduction in emissions of 62% by 2030 (compared to 2005) based on a LRF of 4.3-4.4%. ETS2 aims for a reduction in emissions of 42% by 2030 with a 5.1% LRF initially until 2027. The scope of the EU ETS corresponds in many aspects to GHG-emitting economic activities where hydrogen can act as a clean energy carrier substitute in a cost-effective and purpose-fit manner. With the revision of the system, it is expected that the impact for hydrogen could be even bigger, since the amount of allowances will be progressively reduced, which could raise their price, incentivising decarbonisation efforts. Furthermore, with the

[11] Renewable Energy Directive-European Commission (europa.eu)
[12] EU's Emission Trading System-European Commission (europa.eu)

revision, the ETS now includes the coverage of all hydrogen production methods exceeding 5 tonnes per day, including electrolysers, making renewable and low-carbon hydrogen facilities eligible for free allowances.

Carbon Border Adjustment Mechanism[13]

The Carbon Border Adjustment Mechanism (CBAM) is part of the European Union's Fit for 55 package and was presented on 14th July 2021 by the European Commission. CBAM aims to establish a mechanism which equalises the price of carbon between domestic products and imports in selected sectors. Under the scheme, EU importers will be subject to a carbon price (via a CBAM certificate) whose price level mirrors that of the ETS (i.e. the carbon price that would have been paid, had the production taken place in the EU).

The mechanism is being introduced gradually and first apply to selected products at high risk of carbon leakage: iron, steel, cement, fertiliser, aluminium, electricity generation and (non-renewable) hydrogen production. As for timing, the scheme has kicked off with a transition period of around 2 years, from October 2023 to the end of 2025, during which importers had to report emissions embedded in their goods. From 2026 onwards, a long phase-in of the CBAM will start, whereby it will gradually replace ETS free allowances until the complete phase in of the scheme in 2034. In practical terms, this implies that, by 2030, an EU-based ammonia producer will receive only approx. 50% of the free allowances it would have obtained without CBAM. At the same time, an ammonia importer will be required to cover approx. 50% of the total embedded emissions associated with their ammonia shipment.

In October 2025, co-legislators approved a simplification of the CBAM framework under an 'Omnibus' package. This exempts importers of less than 50 tonnes of CBAM goods per year from CBAM obligations, significantly reducing the administrative burden while still covering over 99% of emissions. The simplification also eases reporting, emissions calculation and financial management requirements for covered importers. In parallel, the Commission expedited the CBAM review to the end of 2025, assessing a possible extension to additional ETS sectors, certain downstream products and indirect emissions, as well as measures to safeguard the competitiveness of EU exporters.

In general, the mechanism is expected to accelerate decarbonisation efforts both in the EU and abroad, by equalising the carbon price of domestic products and imports. With the progressive phase-out of free allowances under the ETS, the industrial sectors covered by the mechanism will be subject to the full carbon price. This will create a stronger incentive to decarbonise industrial processes. Thus, the role of renewable hydrogen is expected to increase, especially in sectors where there are few other

[13] Carbon Border Adjustment Mechanism-European Commission (europa.eu)

alternatives, such as in steel and fertilisers production.

Hydrogen and Decarbonised Gas Market Package[14]

The EU adopted the Hydrogen and Decarbonised Gas Market Package in May 2024, comprising Directive EU/2024/1788 and Regulation EU/2024/1789. This package revises the 2009 Gas Directive and Regulation, introducing a new regulatory framework for hydrogen infrastructure. EU member states must transpose these rules by mid-2026 to promote renewable and low-carbon gases, including hydrogen, while ensuring energy security and affordability for citizens.

The package sets the common rules for the internal market in natural gas, and now also for renewable natural gas and hydrogen. Thereby aligning the existing legislation with the Clean Energy Package provisions on incentives for clean energy solutions, prosumer behaviour, easier switching of providers and clear certification for low carbon hydrogen.

The role of low-carbon hydrogen as an enabler of decarbonization in the short and medium term is foreseen, and this package supports the uptake of renewable fuels such as renewable hydrogen. A delegated act on low-carbon hydrogen, adopted in November 2025, further specifies the methodology and a 70% lifecycle greenhouse gas emission reduction threshold.

In general, the internal market rules set by this regulation for hydrogen are similar to the existing ones for the natural gas and electricity sectors. Yet, they also establish a degree of flexibility to ramp-up the development of the hydrogen market.

Net-Zero Industry Act[15]

The Net-Zero Industry Act that entered into force the 29th of June 2024, jointly with the Critical Raw Materials Act, are complementary pieces of legislation under the first pillar of the Green Deal Industrial Plan. This pillar aims to create a simpler, faster and more predictable regulatory framework, secure the volumes needed for raw materials, and ensure users are able to benefit from the low costs of renewables.

The objectives of the NZIA are to provide investment certainty, lower administrative burdens through facilitated permitting and access to information, and facilitate market access through public procurement, auctions, and schemes to support private demand by consumers. The Act also sets EU-wide manufacturing benchmarks for net-zero technologies, aiming to cover at least 40% of the EU's annual deployment needs by 2030 and 15% of global production by 2040. Additionally, the development of skills for quality job creation in these technological sectors is also addressed.

Under the NZIA, electrolysers and fuel cells are in the scope of the regulation, making them strategic technologies. Upstream components of

[14] Hydrogen and Gas Market Decarbonisation Package-European Commission (europa.eu)
[15] Net Zero Industry Act-European Commission (europa.eu)

electrolysers and fuel cells are also included within its scope. The granting of Net-Zero Strategic Project status can be awarded to those projects that contribute to an increase of production capacity of components or parts related to strategic technologies for which the EU heavily depends on imports, or to projects that provide a systemic benefit towards EU competitiveness, with spill-over effects on manufacturing capacities, sustainability performances, skilling and reskilling.

Critical Raw Materials Act[16]

The regulation, which entered into force on 23 May 2024, targets several issues related to critical raw materials, such as low diversification of EU supply sources, the untapped potential of local supply, weak monitoring and risk management capacity to anticipate and prevent supply disruptions of critical raw materials, adverse social and environmental impacts of production of CRMs, insufficient support for circularity and insufficient research and innovation. This regulation will also be important to hydrogen technologies, such as electrolysers and fuel cells, since they are dependent on CRMs. Their availability and future prices will be a crucial aspect affecting the speed at which the hydrogen market can grow.

Key targets by 2030 include EU extraction capacity covering at least 10%, processing 40%, and recycling 25% of strategic raw materials, while no third country should supply more than 65% of any strategic raw material. The Act introduces Strategic Projects, which are given priority treatment in Member States with expedited permitting, and a call for such projects identified 47 initiatives across 13 EU countries, including six focused on platinum group metals (PGMs). In June 2025, the European Commission launched the Raw Materials Mechanism to help industry diversify supply chains, support new projects, aggregate demand for strategic raw materials, and encourage stockpiling when needed.

Advanced Materials for Industrial Leadership Strategy[17]

The European Commission's Advanced Materials Strategy, published on 27 February 2024, is the communication that highlights the pivotal role of advanced materials in driving the EU's green and digital transitions. These materials, designed for superior performance and specific functions, are crucial for clean energy technologies, including hydrogen applications such as electrolysers and fuel cells.

Key benefits for the hydrogen sector stem from the strategy's focus on securing the supply of critical advanced materials like catalysts, ionomers, and graphite components, which are essential for hydrogen production and storage. By addressing supply chain challenges, the strategy aims to prevent disruptions and ensure cost stability, critical for scaling the hydrogen market. The establishment of a Technology

[16] Critical Raw Materials Act-European Commission (europa.eu)
[17] Advanced Materials for Industrial Leadership Strategy

Council for advanced materials and targeted investments through a €500 million public-private partnership under Horizon Europe (scheduled between 2025–2027) will foster innovation and accelerate the development of materials critical for hydrogen technologies. Furthermore, the strategy's emphasis on a value chain approach integrates hydrogen within broader industrial ecosystems, promoting collaboration and efficiency.

In essence, the strategy strengthens the EU's industrial leadership while directly supporting the hydrogen sector's growth by enhancing material availability, innovation, and investment frameworks. These efforts are vital for advancing clean energy solutions and achieving the EU's climate goals.

Electricity Market Design Reform[18]

The EU's updated Electricity Market Design (EMD), that entered into force in May 2024 focuses on decoupling electricity prices from volatile fossil fuels, enhancing renewable energy integration, and ensuring supply security. These changes have significant implications for hydrogen as a key enabler of the energy transition.

The reform prioritizes flexibility measures, establishing national targets across different timeframes. Clean hydrogen (particularly dispatchable hydrogen) emerges as a leading solution for seasonal flexibility, supporting congestion management and balancing renewable energy variability. Electrolysis and other hydrogen-based flexibility tools will play an essential role in meeting these objectives.

Non-fossil flexibility support schemes and capacity mechanisms, now integral to the market design, offer financial incentives for hydrogen-powered facilities. These include payments and investment signals specifically designed to support non-fossil flexible resources such as energy storage and demand response, helping Member States meet national flexibility targets. These measures strengthen hydrogen's role in energy storage, demand response, and capacity services during periods of low renewable output, such as "Dunkelflaute" events.

By promoting renewable power purchase agreements and integrating hydrogen into a more resilient market framework, the new EMD accelerates clean hydrogen production and use. This positions hydrogen as a cornerstone of Europe's sustainable, flexible, and decarbonized energy system, ensuring affordable and reliable energy for industries and citizens alike.

Revised Industrial Emission Directive[19]

The updated Industrial Emissions Directive (IED), that entered into force on the 4th of August 2024, introduces measures to align industrial emissions regulations with the EU's Green Deal and zero-pollution goals. Among its broader goals, the revision significantly benefits the hydrogen sector by addressing long-standing permitting challenges. Under the previous IED,

[18] Electricity Market Design Reform
[19] Revised Industrial Emission Directive

hydrogen production from electrolysis and emissions-intensive methods like steam methane reforming were treated equally, subjecting all technologies to the same regulatory burdens. This hindered the deployment of clean hydrogen solutions like electrolysers. The revised IED rectifies this by exempting electrolysers producing under 50 tons/day of hydrogen from its scope. This exemption reduces administrative and permitting obstacles, enabling faster deployment of small to medium electrolysers critical for the EU's clean energy transition.

These changes support the broader roll-out of renewable hydrogen by streamlining compliance and encouraging investment in clean technologies. The updated directive fosters an enabling environment for hydrogen innovation while maintaining robust environmental protections, accelerating the sector's contribution to decarbonization goals.

Affordable Energy Action Plan *Adopted in 2025*

The Affordable Energy Action Plan, published in February 2025, sets out the Commission's approach to lowering energy costs and strengthening the Energy Union as part of the EU's wider decarbonisation strategy. While the plan addresses broad challenges such as high electricity prices, system inefficiencies, and security of supply, several of its measures have direct implications for the scaling of clean hydrogen. The updated plan also includes targeted investment and delivery measures, such as an EIB PPA pilot to de-risk long-term offtake, a Clean Energy Investment Strategy (with an updated PINC) to mobilise private capital, and a European Grid Package to accelerate permitting and improve cross-border planning and cost-sharing, which further support investment and infrastructure needs across the energy system.

The plan highlights the importance of hydrogen in the EU's energy transition. It notes that new hydrogen networks are necessary to support the energy transition and industrial decarbonisation, highlights the role of flexibility and system integration to make energy affordable, and promotes security of supply. The Commission also plans to streamline permitting and licensing for renewables and new nuclear technologies (such as SMRs). Several measures target electricity affordability through reduced network charges, guidance on PPAs and contracts for difference, and new rules to develop forward markets and increase hedging opportunities.

Steel and Metals Action Plan *Adopted in 2025*

The European Steel and Metals Action Plan, published in March 2025, addresses challenges in the steel and metals sectors, including high energy costs, international competition, and decarbonisation investment needs, while promoting competitiveness and sustainability.

The plan highlights hydrogen as a key enabler of decarbonisation, particularly for primary steel production through direct reduction, and for providing high-temperature heat in other metals industries. It emphasises the need for an abundant and affordable supply of renewable

and low-carbon hydrogen to ensure a competitive transition. To support this, the Commission adopted the delegated act on low-carbon hydrogen to provide clarity for suppliers, off-takers, and investors. The third call under the European Hydrogen Bank in 2025 will continue to support hydrogen production and facilitate access for industrial off-takers, including the steel sector, while the European Clean Hydrogen Alliance will be reprioritised towards sectors where hydrogen is most relevant, with its project pipeline monitored and updated yearly to provide industrial actors with certainty for their decarbonisation plans.

1.2.3. Transport, storage and distribution

Besides the legislations that already have been mentioned, other legislations that fall under the Fit for 55 package that can have an impact on hydrogen transport, storage and distribution include the FuelEU Maritime, RefuelEU Aviation and the Alternative Fuels Infrastructure Regulation. Before the introduction of these legislations, the European Commission published in December 2020 its Sustainable and Smart Mobility Strategy that provides a vision on the European transport system and transport policies, not least in the perspective of the sector's decarbonisation.

Sustainable and Smart Mobility Strategy[20]

The main message of this 2020 strategy consists in the ambition of making mobility more sustainable, smarter and more resilient by 2030. In a nutshell, the Strategy adopts an integrated approach by looking at demand, supply, infrastructure, and fuels in the transport sector. Specifically for hydrogen, it will have an estimated share of 31-40% in road transport fuels in 2050, and e-fuels will account for 10-17%. In terms of infrastructure, the Strategy will aim to deploy 500 hydrogen refuelling stations by 2025 and 1,000 by 2030. By April 2024, over 90% of the 82 initiatives outlined in the Sustainable and Smart Mobility Strategy had been already addressed at different stages and for some completed.

Trans-European Network for Transport[21]

The Trans-European Transport Network (TEN-T) regulation sets the basis for the European's transport network policy and constitutes a key instrument for the development of coherent, efficient, multimodal, and high-quality transport infrastructure across the EU. First adopted in 2013, the revised regulation regarding EU guidelines for the development of the trans-European transport network (TEN-T) entered into force on 18 July 2024. This regulation will put the transport sector on track to cut its emissions by 90%, as stated in the Green Deal Plan and Smart and Sustainable Mobility Strategy. It aims to

[20] Sustainable and Smart Mobility Strategy-European Commission (europa.eu)
[21] Trans-European Network for Transport-European Commission (europa.eu)

increase connectivity in Europe, foster the resilience of the transport system, shift more passengers and freight to sustainable modes of transport and to focus more on sustainable urban mobility. The TEN-T regulation provides the basis for the implementation of other legislations, such as the Alternative Fuels Infrastructure Regulation and FuelEU Maritime. The TEN-T guidelines also determines the eligibility for funding under the CEF Transport programme.

Alternative Fuels Infrastructure Regulation[22]

The Alternative Fuels Infrastructure Regulation (AFIR), which entered into force on April 13th, 2024, establishes a common framework of measures for the deployment of alternative fuels infrastructure in the Union in order to minimize dependence on oil and to mitigate the environmental impact of transport by supporting the uptake of alternative fuels in the transport sector. By upgrading the previous directive into a regulation., makes its targets binding and directly applicable in all member states. This regulation recognises hydrogen as a key alternative fuel with a potential for long-term oil substitution. It further sets out the legal framework for hydrogen refuelling stations for road transport, the lack of which contributes to the limited penetration of hydrogen-powered vehicles in the EU market – namely the deployment of hydrogen refuelling infrastructure from 2030 onwards in all urban nodes and every 200 km along the TEN-T core network, to serve both cars and lorries. The framework ensures refuelling certainty and, as such, lays the foundation for the scale up of hydrogen powered mobility.

FuelEU Maritime[23]

FuelEU Maritime regulation adopted in July 2023 as part of the Commission's Fit for 55 legislative package, to steer the EU maritime sector towards decarbonisation via limiting the carbon intensity of the energy used on board ships, therefore indirectly supporting the uptake of sustainable maritime fuels. This Regulation establishes limits on the annual average GHG intensity of the energy used on board, increasing from 2% in 2025 to 80% in 2050. The Regulation also includes provisions incentivizing the use of renewable fuels from non-biological origin (RFNBOs) by ships. First, until 2033 a multiplier of 2 can be used on RFNBOs to reward their use by early movers. Additionally, an RFNBO 'sunrise clause' was introduced, which states that if in 2031 the share of RFNBOs in the yearly energy used on-board ships is less than 1%, a mandatory quota of 2% RFNBOs shall apply by 2034. This incentivizes the use of e-fuels and renewable hydrogen to decarbonize shipping as it falls into the scope of RFNBOs and will lead to an uptake of demand for hydrogen-based maritime e-fuels, as ammonia or methanol.

ReFuelEU Aviation[24]

The ReFuelEU Aviation regulation, adopted in October 2023, sets minimum obligations for all

[22] Alternative Fuels Infrastructure Regulation- European Commission (europa.eu)
[23] FuelEU Maritime- European Commission (europa.eu)
[24] ReFuelEU Aviation- European Commission (europa.eu)

fuel suppliers to gradually increase the share of SAFs (sustainable aviation fuels) in the fuel supplied to operators at EU airports. The SAF requirements increase from 2% by 2025 to 70% by 2050. Within this SAF requirements, a sub-obligation is also set for synthetic aviation fuels (RFNBOs complying with the lifecycle emissions saving threshold of 70%, thus including renewable hydrogen), increasing from 1.2% by 2030-2031 to 35% by 2050. Additional intermediate milestones are also established for these synthetic fuels: 2% (2032–34), 5% (2035), 10% (2040), and 15% (2045), providing a clear stepwise trajectory. Fuel suppliers may also use flexibility mechanisms, such as a weighted-average calculation across EU airports and book-and-claim arrangements, to comply with the targets from 2025–2034. This historic agreement, the first-of-a-kind mandate for green aviation fuel, will allow SAFs projects to be deployed at a larger scale, adding certainty on the definition of those fuels for investors and suppliers. The Commission will report on implementation by 2027 and every five years thereafter, potentially revising the mandates and definitions.

1.2.4. End-use

Besides the legislations that already have been mentioned in the earlier sections, other legislations that fall under the Fit for 55 package that can have an impact on hydrogen end-uses include the Energy Taxation Directive, the Energy Performance of Buildings Directive and CO_2 emissions standards for cars and light duty vehicles.

The Energy Taxation Directive could have an impact on all end-uses and aims to shift the tax burden from labour to pollution. For hydrogen end-use in buildings, the Energy Performance of Buildings Directive is of main importance to achieve zero emissions by 2050 in buildings, as a part of the Renovation Wave for Europe strategy. For hydrogen use in transport, in addition to the legislations mentioned in the previous section, the CO_2 emissions standards for cars and light duty vehicles and to the CO_2 emissions standards for heavy-duty vehicles regulations are of relevance. These regulations set ambitious targets for reducing the average emissions of new vehicles that could, together with the public procurement for clean vehicles, result in an increase of the fuel cell electric vehicles fleet. Additionally, the Industrial Action Plan for the European automotive sector (Automotive Action Plan) includes several hydrogen-related items aimed at supporting the transition to clean mobility and enhancing the competitiveness of the automotive industry, further reinforcing the policy framework for hydrogen adoption in transport. For industry, no additional legislations are covered in this section, as the main relevant legislation were already covered in the section of production, such as the EU emissions trading system, the Carbon Border Adjustment

Mechanism the Renewable Energy Directive, the Industrial Emissions Directive and the Steel and Metals Action Plan.

Energy Taxation Directive[25]

In its EU Green Deal, the European Commission clearly states that the tax burden should shift from labour to pollution. The Energy Taxation Directive sets minimum levels of taxation and lays down the conditions for applying tax exemptions and reductions. The Directive is currently being revised under the Fit for 55 legislative package. After the proposal in July 2021 has been put forward by the Commission, several compromise texts have been drafted afterwards, including the latest in November 2025 under the Danish Presidency of the Council, it has not yet reached the required unanimous support of Member States for it to be adopted. The main proposed change relates to the move to base taxation of energy products on their energy content (instead of volumes) and rank them with different minimum taxation rates depending on their environmental performance. Moreover, it also proposes to phase-out exemptions for certain products and home heating, and lastly, fuels for intra-EU air, maritime and fishing are no longer fully exempt from taxation.

Energy taxation will be a cornerstone to facilitate a prosperous future for hydrogen. As a sustainable alternative fuel and considering the uptake the Commission wants to provide them under the Fit for 55, hydrogen could benefit from financial incentives. Under the proposed revision of the directive, the switch to renewable and low-carbon fuels is heavily incentivised. Carbon-intensive fuels are to be taxed more, while preferential tax rates for renewable and low-carbon hydrogen will serve to stimulate their use in multiple applications.

Renovation Wave for Europe[26]

The European Commission published its Renovation Wave for Europe strategy in October 2020. The strategy aims to help improve the energy performance of buildings and deliver on the European Green Deal ambitions, as buildings are responsible for about 40% of the EU's energy consumption, and for 36% of greenhouse gas (GHG) emissions in the EU. The Strategy provides a roadmap of EU targets to be achieved by 2030 and is accompanied by a series of policy measures. Some of these policy measures include the revisions of the Renewable Energy Directive, the EU Emissions Trading System Directive and the Energy Performance of Buildings Directive as part of the Fit for 55 package.

Energy Performance of Buildings Directive[27]

The revised Energy Performance of Buildings Directive (EU/2024/1275), which came into effect across all EU countries on 28 May 2024, aims to boost renovation rates in the EU, focusing on the worst-performing buildings, while improving air

[25] Energy Taxation Directive--European Commission (europa.eu)
[26] Renovation Wave for Europe-European Commission (europa.eu)
[27] Energy Performance of Buildings Directive-European Commission (europa.eu)

quality, digitalizing energy systems, and supporting sustainable mobility infrastructure. The directive allows countries to tailor measures to their national context and exempts certain buildings, such as historical sites and holiday homes. The directive aims to cut building sector GHG emissions by at least 60% by 2030 (vs. 2015) and achieve zero-emission buildings by 2050. The revised Energy Performance of Buildings Directive introduces several measures, including minimum energy performance standards for non-residential buildings to encourage upgrades of the least efficient structures. It sets a binding target to improve the average energy performance of residential buildings by 16% by 2030 (compared to 2020) and by 20-22% by 2035. New buildings must meet zero-emission standards, with their whole life-cycle carbon accounted for. National Building Renovation Plans will replace long-term renovation strategies, and Energy Performance Certificates will be improved with standardized criteria, greater reliability, and enhanced digitalization. The Directive will also help the EU to gradually phase out boilers powered by fossil fuels and will also enable hydrogen-based heating solutions to contribute to this important objective. In addition, the EPBD is among the legislative acts being considered under the European Commission's Omnibus simplification initiative, which aims to streamline and simplify implementation requirements without altering the Directive's core climate ambition.

CO_2 emissions performance standards for cars and light duty vehicles[28]

The revised regulation for setting CO_2 emission performance standards for new passenger cars and light commercial vehicles was published in April 2023. The regulation incentivises manufacturers to integrate an increasing share of low- and zero-emission vehicles in their fleet to meet their average CO_2 emission reduction targets. The average allowed emissions reduce over time with a final target in January 2035, when all new passenger cars and new light commercial vehicles should have zero emissions. However, as part of its Automotive Package in December 2025, the Commission is providing more flexibility to manufacturers carmakers, who will now need to comply with a 90% tailpipe emissions reduction target, while the remaining 10% emissions will need to be compensated through the use of low-carbon steel Made in the Union, or from e-fuels and biofuels.

CO_2 emissions performance standards for heavy-duty vehicles[29]

This legislation was adopted in May 2024. Similar to the CO_2 emission performance standards for new passenger cars and light commercial vehicles, the regulation sets targets for reducing the average (fleet-wide) emissions from new trucks and other heavy goods vehicles for 2025 and 2030. The updated proposed targets retain the 15% CO2 reduction goal for 2025, increase the 2030 target to 45%, and introduce new

[28] CO_2 emissions performance standards for cars and light duty vehicles-European Commission (europa.eu)
[29] CO2 emissions performance standards for heavy-duty vehicles-European Commission (europa.eu)

reduction targets of 65% for 2035 and 90% for 2040. The revision expands the range of covered vehicles to encompass additional truck types, buses, coaches, trailers, and vocational vehicles, while also modifying the compliance flexibilities available to manufacturers. Due to the many incentives this regulation gives and the characteristics of hydrogen, it is expected that hydrogen fuel cell technology will benefit and expand in HDV fleet.

Public procurement for clean vehicles[30]

Public procurement refers to the process by which public authorities, such as government departments or local authorities, purchase work, goods or services from companies. In the context to a transition to carbon-neutral economy, public procurement is seen as an important tool to stimulate innovation and promote competitiveness and growth of industries, as public procurement accounts for a significant part of national GDP. Through public procurement, demand for sustainable technologies is increased, triggering effects across the product's value-chain, thereby supporting the development of economies of scale and innovation. The Clean Vehicle Directive, that sets public procurement targets for clean vehicles, together with the Green Public Procurement instrument, which is a voluntary instrument to help public authorities use their purchasing power to choose environmentally friendly goods, are expected to boost demand for clean vehicles (including FCEVs) and the deployment of infrastructure for the distribution of clean transport fuels like hydrogen.

Automotive Action Plan[31] *Adopted in 2025*

In March 2025, following the Clean Industrial Deal, the European Commission published the Industrial Action Plan for the European automotive sector, setting out measures to support the industry's transition towards zero-emission, connected and automated vehicles. The plan confirms the strategic importance of the sector for the EU economy and structures action around clean mobility, innovation, competitiveness, skills and a level playing field.

The Action Plan includes several measures relevant to the deployment of hydrogen mobility, particularly in heavy-duty transport. It foresees €570 million under the Alternative Fuels Infrastructure Facility (AFIF) in 2025–2026 to support the rollout of hydrogen refuelling infrastructure, with a specific focus on heavy-duty vehicles. A legislative initiative on corporate fleets, presented at the end of 2025, further supports the uptake of zero-emission vehicles, including hydrogen.

The Plan also supports the finalisation of the revision of the Weights and Dimensions Directive, enabling hydrogen heavy-duty vehicles to benefit from additional payload to compensate for heavier drivetrains. In addition, it included the Sustainable Transport Investment Plan, adopted in November 2025, which serves as a roadmap to enhance the energy transition in the aviation and

[30] Public procurement for clean vehicles-European Commission (europa.eu)
[31] Automotive Action Plan

waterborne transport sectors. The plan addresses the urgent need for substantial investments to scale up the production of renewable and low-carbon fuels.

Further measures include support for a UNECE regulation on retrofitting conventional heavy-duty vehicles and actions to foster the uptake of clean buses manufactured in Europe, including through fleet and depot conversion support.

1.2.5. Funding vehicles & initiatives

In response to ongoing economic and environmental challenges, the European Union continues to prioritise sustainable growth and innovation through its evolving financial framework. Building on the success of the 2021-2027 Multiannual Financial Framework (MFF) and the NextGenerationEU recovery instrument, the EU is preparing its next stimulus package to further accelerate the green and digital transitions across member states.

The upcoming stimulus package aims to reinforce and complement existing programmes by providing additional targeted funding to support key priorities such as climate neutrality, energy security, and technological leadership. This new financial boost will enhance the EU's capacity to invest in strategic sectors, including clean energy technologies like hydrogen, which are critical to achieving the European Green Deal objectives.

Key EU programmes under the MFF, such as cohesion policy and InvestEU, will continue to play a central role in driving regional development and sustainable investments, but might be integrated in bigger instruments for making it easier for users to find the right instrument. In addition, support provided by the European Climate, Infrastructure and Environment Executive Agency (CINEA) via programmes including the Connecting Europe Facility, Innovation Fund, Horizon Europe, and LIFE programme, will also continue but in an overarching umbrella of the European competitiveness fund. These instruments will keep on providing support to accelerate research, infrastructure deployment, and market uptake of hydrogen technologies.

The European Investment Bank (EIB) remains a vital partner, providing loans and financial instruments to back sustainable projects, also including hydrogen infrastructure and innovation. Furthermore, the revised state aid framework and the Important Projects of Common European Interest (IPCEI) mechanism will continue to incentivise cross-border collaboration and investment in hydrogen technologies, ensuring a coordinated and impactful approach to Europe's energy transition.

Recovery and Resilience Facility [32]

The Recovery and Resilience Facility (RRF) is the centrepiece of the EU's NextGenerationEU recovery plan. Its goal is to make EU economies and societies greener, digital and resilient. The RRF will provide 650 billion EUR between 2020 and 2026 to invest in reforms and projects at 2022 prices, of which 359 billion EUR in grants and 291 billion EUR in loans. Project financing depends on what each EU country has included in its plan. The funds under the RRF are distributed according to national recovery and resilience plans prepared by each Member State, in cooperation with the European Commission. While the RRF is a temporary instrument, it is expected to serve as an inspiration for the design of future EU funding programs.

InvestEU[33]

The InvestEU programme consists of three components: the InvestEU Fund, the InvestEU Advisory Hub and the InvestEU Portal. The InvestEU Fund is expected to mobilise more than 372 billion EUR of public and private investment through an EU budget guarantee of 26.2 billion EUR that backs the investment of financial partners such as the European Investment Bank (EIB) Group and others. The InvestEU fund provides for an EU guarantee to support financing and investment operations, carried out by implementing partners that contribute to objectives of the EU's policies. Implementing partners and other financial intermediaries will provide finance as guarantees, loans, risk-sharing or equity. The EIB Group will have access to 75% of this guarantee and will act as the main implementing partner for the fund. The InvestEU Advisory Hub provides advisory support for the development of investable projects and access to financing. The InvestEU Portal boosts the project's visibility to a large network of international investors. In the next MFF of 2028-2034, it is expected that the InvestEU programme will be integrated into the new European competitiveness fund.

Cohesion Policy[34]

The EU Cohesion Policy contributes to strengthening economic, social and territorial cohesion in the European Union. The European Regional Development Fund (ERDF), Cohesion Fund (CF) and the Just Transition Fund (JTF) are part of the EU's Cohesion Policy. ERDF and CF support innovation and entrepreneurship in the transition to a climate-neutral economy. Some regions may allocate ERDF funds to hydrogen projects as part of their clean energy strategies. JTF aims to reduce the social and economic impact resulting from the transition to climate neutrality in the most affected regions, given their dependence on fossil fuels or on carbon-intensive industries. The Commission provides grants that are disbursed to the member states in line with their territorial just transition plans. These plans identify the eligible territories, i.e. those expected to be the most negatively

[32] Recovery and Resilience Facility-European Commission (europa.eu)
[33] InvestEU-European Commission (europa.eu)
[34] Cohesion Policy-European Commission (europa.eu)

impacted by the green transition. In the next MFF, it is expected that the cohesion policy, along with agriculture and fisheries funds will be brought together under one coherent strategy, implemented through national and regional partnership plans.

Modernisation Fund[35]

The Modernisation Fund is a fund supporting 10 lower-income EU countries' transition to climate neutrality through the modernisation of their energy systems and improved energy efficiency. It supports investments in the production and use of renewable hydrogen; hydrogen fuelled trains, trucks and cars, high-efficiency hydrogen CHP. In the next MFF, it is likely that the Modernisation Fund will be integrated in the European Competitiveness Fund.

Connecting Europe Facility[36]

The Connecting Europe Facility (CEF) is a key EU funding instrument in delivering the European Green Deal and an important enabler towards the Union's decarbonisation objectives for 2030 and 2050. It supports the development of high performing, sustainable and efficiently interconnected trans-European networks in the fields of transport, energy and digital services. In addition to grants, the CEF offers financial support to projects through innovative financial instruments such as guarantees and project bonds. The Connecting Europe Facility for Energy (CEF-E) is a funding instrument that supports the implementation of the Regulation on Trans-European Networks for Energy (TEN-E), which is focused on linking the energy infrastructure of EU countries. It may fund cross-border hydrogen transmission & distribution projects, storage and large-scale electrolysers (>100 MW of capacity). The Connecting Europe Facility for Transport (CEF-T) contributes to the implementation of the Trans-European Transport Network (TEN-T) and finances projects that upgrade infrastructure and remove bottlenecks while promoting sustainable and innovative mobility solutions. These projects cover all EU countries and all transport modes (road, rail, maritime, inland waterways). In the next MFF, the CEF will continue to provide support with an expected increase of the budget by more than twofold.

Innovation Fund[37]

Innovation Fund is one of the world's largest funding programmes for the demonstration of innovative low-carbon technologies. The Fund is highly relevant as a tool to deploy clean hydrogen technologies, as its project eligibility scope covers areas where, in each of them, clean hydrogen technologies could have significant potential (energy-intensive industries decarbonisation, energy storage, and innovative renewable energy generation) or be positively impacted (CCS/U). The Fund may amount to 40 billion EUR for the 2020-2030 period (based on a carbon price of 75 EUR/ tonne). The Innovation Fund supports up to 60% of relevant costs of

[35] Modernisation Fund-European Commission (europa.eu)
[36] Connecting Europe Facility-European Commission (europa.eu)
[37] Innovation Fund-European Commission (europa.eu)

projects in case of regular grants, while it can support up to 100% in case of competitive bidding procedures. Additional support via blending is also possible, through the InvestEU programme. In the next MFF, the Innovation Fund will be closely linked to the new European Competitiveness Fund.

European Hydrogen Bank[38]

Under the umbrella of the European Hydrogen Bank funded by the Innovation Fund, the Commission has launched in November 2023 its first domestic auction (i.e., competitive bid) for supporting the production of renewable hydrogen. Funding has been awarded as a fixed premium in the range 0.37 and 0.48 €/kg of verified and certified RFNBO hydrogen, produced by 7 renewable hydrogen production projects, amounting to 1.5 GW of capacity. The second domestic auction to produce renewable hydrogen closed on 20 February 2025. 15 renewable hydrogen production projects were selected to receive €992 million in EU funding. A third auction has opened on 4 December 2025 with a budget of up to 1.3 billion EUR. Moreover, the mechanism, called Auctions-as-a-Service (AaaS), will continue enabling countries of the EEA to use their national budget resources to support projects located on their territory while relying on an EU-wide auction mechanism to identify the most competitive projects. Next to the domestic auctions, the Commission is also developing the design of the international part of the European Hydrogen Bank that would attract imports of renewable hydrogen into the EU market.

Horizon Europe[39]

Horizon Europe 2021-2027 is the EU's key funding programme for research and innovation, with a budget of 95.5 billion EUR. Pillar II and III of Horizon Europe are focused on the deployment of low-carbon industry applications and breakthrough technologies, including hydrogen. It must involve the research and innovation element. The Clean Hydrogen Partnership is a public-private initiative under Horizon Europe that aims to accelerate the development of a clean hydrogen economy in Europe. It may involve funding opportunities and collaboration with industry stakeholders. For the next MFF, Horizon Europe aims to be twice as big (budget of 175 billion EUR), simpler, faster, and more focused on boosting European competitiveness, with closer links to the new European Competitiveness Fund.

LIFE programme [40]

LIFE 2021-2027 is the only EU funding programme entirely dedicated to environment, climate and energy. It includes the Clean Energy Transition sub-programme. It is oriented to projects in early phase demonstration, in governance, and in catalyst projects for large-scale deployment solutions. In the next MFF, the LIFE programme activities are likely to be

[38] European Hydrogen Bank - European Commission
[39] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R0695
[40] LIFE programme-European Commission (europa.eu)

absorbed in the new European Competitiveness Fund.

The Clean Energy Transition Partnership [41]

The Clean Energy Transition Partnership is an initiative co-funded by the European Union that brings together public and private stakeholders in the research and innovation ecosystems in European Member States and Associated Countries. Its aim is to boost and accelerate the energy transition and to support the implementation of the European Strategic Energy Technology Plan (SET Plan). The Clean Energy Transition Partnership has 7 Transition Initiatives (TRIs) focusing on the R&D challenges described in the Strategic Research and Innovation Agenda (SRIA), which also include R&D challenges for clean hydrogen technologies.

State aid[42]

The Commission is continuously revising the rules on state aid in a number of priority areas, including climate, energy and environment. Currently, three documents compose the EU framework for state aid, which is pivotal for hydrogen, plus a fourth one that refers to the compatibility of state aid with the Important Projects of Common European Interest (IPCEIs):

- Guidelines on State aid for climate, environmental protection and energy (CEEAG);
- General Block Exemption Regulation (GBER), revised in 2023;
- Clean Industrial Deal State Aid Framework (CISAF), replacing the Temporary Crisis and Transition Framework (TCTF) as of mid 2025, which will be in place until 2030, giving businesses certainty to green investments;
- the Communication on Criteria for the analysis of the compatibility with the internal market of State aid to promote the execution of important projects of common European interest (2021);

The revisions of the state aid rules are facilitating public support to the development of key industrial sectors and innovative value chains and can give leverage to the deployment of hydrogen and fuel cell technologies and their role in steering the energy transition, via potential increased funding channels and amounts. This is especially the case under the revised GBER, where different categories of state aid measures can directly or indirectly support the hydrogen sector in a wide range of activities, operative costs needs may be considered, and aid intensities may reach 100% in case of competitive bidding processes.

Important Projects of Common European Interest[43]

Where private initiatives supporting breakthrough innovation and infrastructure fail to materialise because of the significant risks such projects entail, EU state aid rules enable EU countries to jointly fill the gap to overcome these market failures with an IPCEI. IPCEIs are ambitious,

[41] Clean Energy Transition Partnership (cetpartnership.eu)
[42] State aid-European Commission (europa.eu)
[43] Important Projects of Common European Interest-European Commission (europa.eu)

cross-border, integrated projects, important due to their contribution to EU objectives while limiting potential competition distortions and ensuring positive spill-over effects for the internal market and the Union. The Hy2Tech (2022) and Hy2Use (2023) IPCEI's were specifically focused on hydrogen technologies for which > 10 billion EUR of state aid has been approved. On 15 February 2024, the commission approved the IPCEI Hy2infra, which concerns infrastructure investments not covered by the first two IPCEIs. In May 2024 another important IPCEI was approved, namely the Hy2Move, for which the Member States will provide up to €1.4 billion in public funding, which is expected to unlock additional €3.3 billion in private investments. In the next MFF, a significant change could be the introduction of direct EU co-financing for IPCEIs through the new European Competitiveness Fund.

02

National hydrogen strategies

Introduction

This chapter provides an overview of the national hydrogen strategies adopted in EU27, UK and EFTA countries. For each strategy, quantitative indicators (i.e. targets or estimates) have been identified. A qualitative summary of the strategy's content is also provided, describing and classifying the main priorities and corresponding measures along the hydrogen value chain. It is important to note that the information is sourced from the European Hydrogen Observatory based on data gathered by Hydrogen Europe until June 2025. Therefore, there may be additional strategies for some countries, released after June 2025, that are not captured in this report.

Interactive data dashboards on national hydrogen strategies can be accessed on the European Hydrogen Observatory website.

2.1.
Overview

European countries have developed national hydrogen strategies to support the transition to a low-carbon economy and achieve their climate targets. Hydrogen is seen as a key component of this transition, as it can be produced from renewable sources and used as a clean energy carrier in various sectors, such as industry, transport and energy. These strategies aim to scale up renewable hydrogen production and utilization while supporting the development of associated infrastructure and technologies, with targets set for hydrogen deployment across sectors and plans in place to foster innovation and create economic opportunities within the hydrogen sector.

In addition, national hydrogen strategies aim to promote international cooperation and coordination, as hydrogen is a global commodity that requires international collaboration to ensure its safe and efficient production, transport, and use. Overall, national hydrogen strategies are an important tool for countries to achieve their climate targets and support the transition to a low-carbon economy, while also promoting innovation and economic growth.

Some European countries, including Germany, France, Netherlands, Portugal, Spain, Austria, and Italy, have developed hydrogen roadmaps in addition to their national hydrogen strategies. These roadmaps are an important tool for countries to provide a more detailed plan for the deployment of hydrogen technologies and infrastructure in the country, including specific targets and timelines, to ensure that they are on

track to meet their national and international climate targets. However, it is important to note that the current focus of the EHO database is primarily on hydrogen strategies rather than specific roadmaps.

Figure 3 gives an overview of the adoption status of national strategies in European countries, relevant to the deployment of hydrogen technologies and infrastructures. As of June 2025, 78% of the European countries (25 out of 32), have already published such strategies, while in 9% of the countries (3 out of 32), national hydrogen strategies are at a draft stage and have not yet been officially adopted. The remaining counties, 13% (4 out of 32), have no official national hydrogen strategy adopted yet.

Compared to the previous report, which included data up until May 2024, the percentage of countries with published strategies has increased by 12%, while the number in draft has remained unchanged. Conversely, the percentage of countries without an adopted strategy has decreased by 12%. More specifically, in 2025, Italy, Iceland, Romania and Switzerland have released their first national hydrogen strategies, marking a significant step forward. Additionally, Cyprus and Greece have made progress by advancing from having no strategy to reaching the draft stage.

These trends indicate a growing commitment among European nations to establish national hydrogen strategies, highlighting their recognition of the importance of hydrogen in achieving climate goals and enhancing energy security.

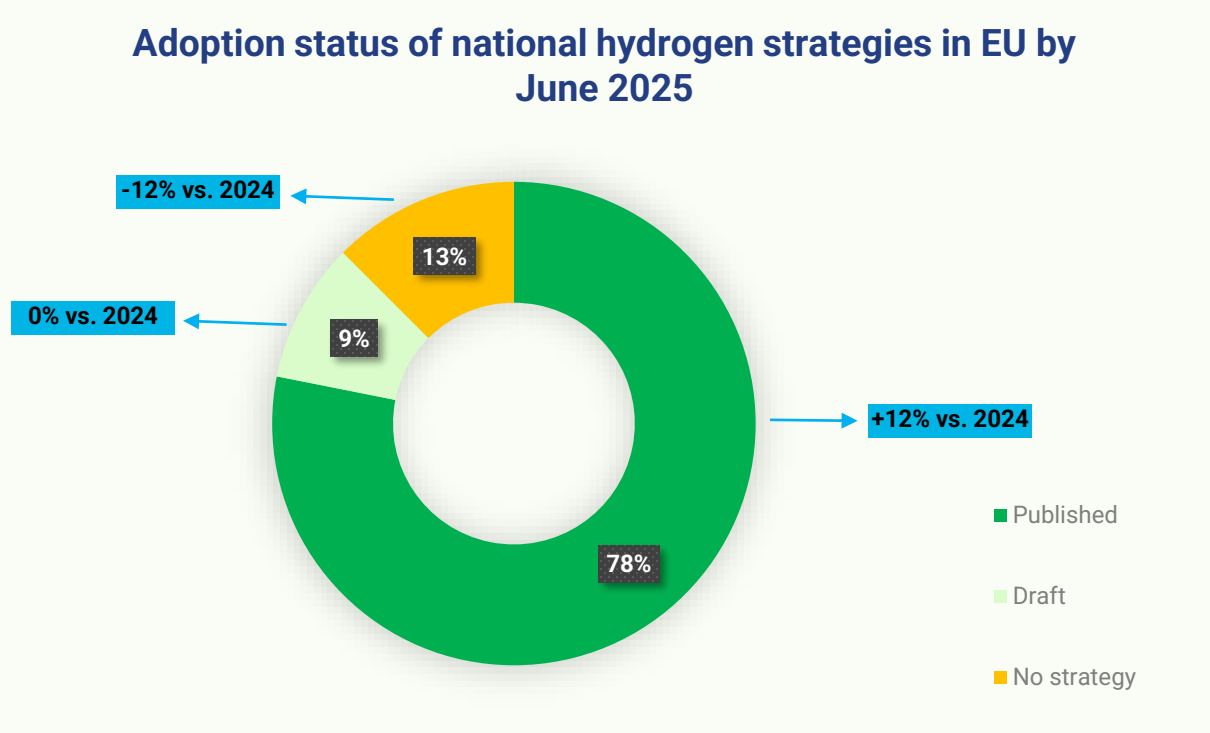


Figure 3. Adoption status of national hydrogen strategies in Europe by June 2025.

Figure 4 provides a geographical representation of the current adoption status of national hydrogen strategies across European countries. A table is also added in the Appendix A1 providing a comprehensive overview of the national hydrogen strategies published across Europe, categorized by country and year of publication. Additionally, it includes direct links to the respective strategy documents, offering easy access for further reference.

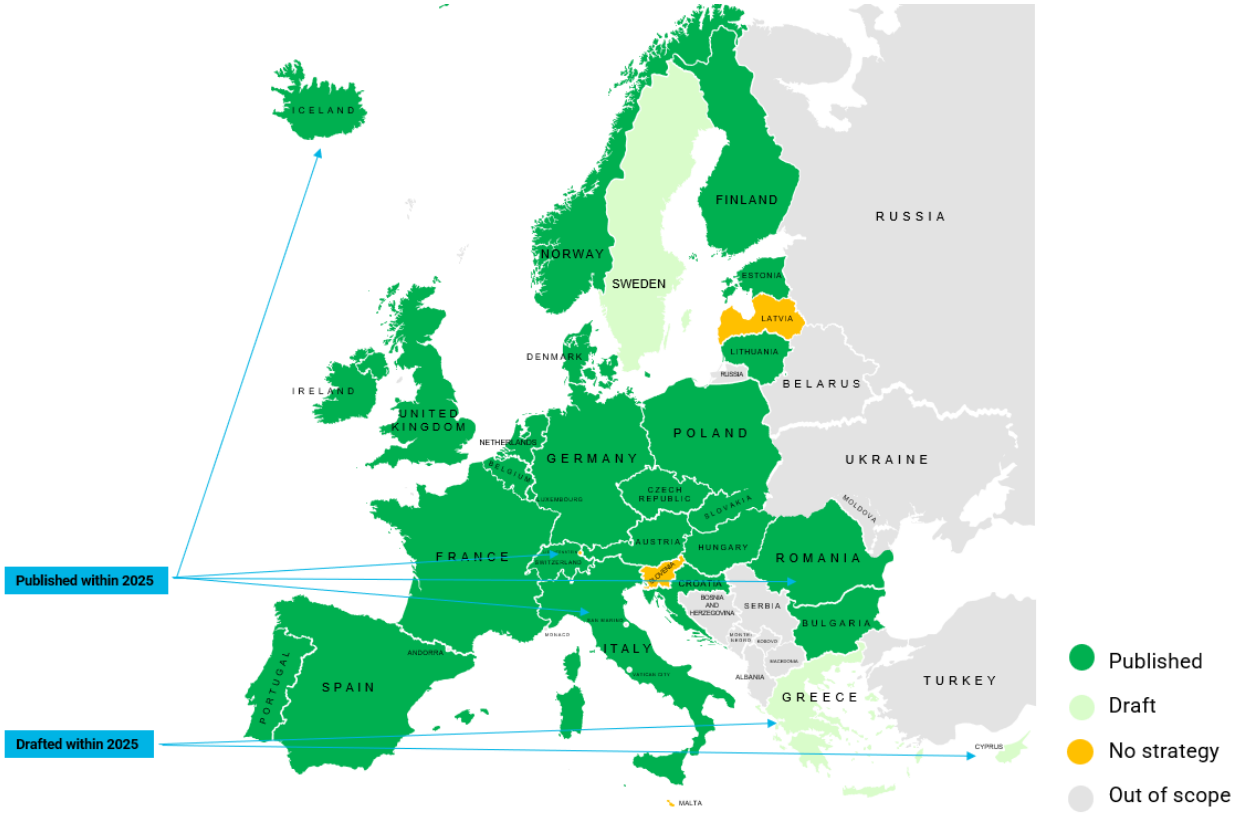


Figure 4. Map of strategies adoption status across European countries.

Figure 5 shows which topics are covered by European national strategies, based on the summaries made on the European Hydrogen Observatory. The figure illustrates the distribution and adoption of hydrogen strategies within distinct stages of the value chain by European nations as of June 2025.

Hydrogen production remains the foundation of national strategies, with all countries including it. Coverage increased further from 21 strategies in 2024 to 25 in 2025, reinforcing its central role in the value chain. Mobility continues to be one of the most prominent end-use sectors, rising from 20 to 24 countries, while industrial applications expand from 17 to 20 strategies.

Infrastructure development also gains momentum, with hydrogen distribution and storage increasing from 18 to 23 countries. Education and research initiatives show similar growth, appearing in 18 strategies in 2025, up from 15 in 2024.

Other end-use categories remain less widely prioritised but continue to grow. Heating rises from 10 to 13 countries, and energy and backup power from 11 to 15. Manufacturing shows a smaller increase, from 8 to 9 strategies.

Strategies that focus on hydrogen import and export routes also show expanding interest, increasing from 8 countries in 2024 to 11 in 2025.

A table is also added in the Appendix A2 that categorizes and summarizes the main measures (qualitative representation) within the hydrogen value chain for each European country that has published strategies.

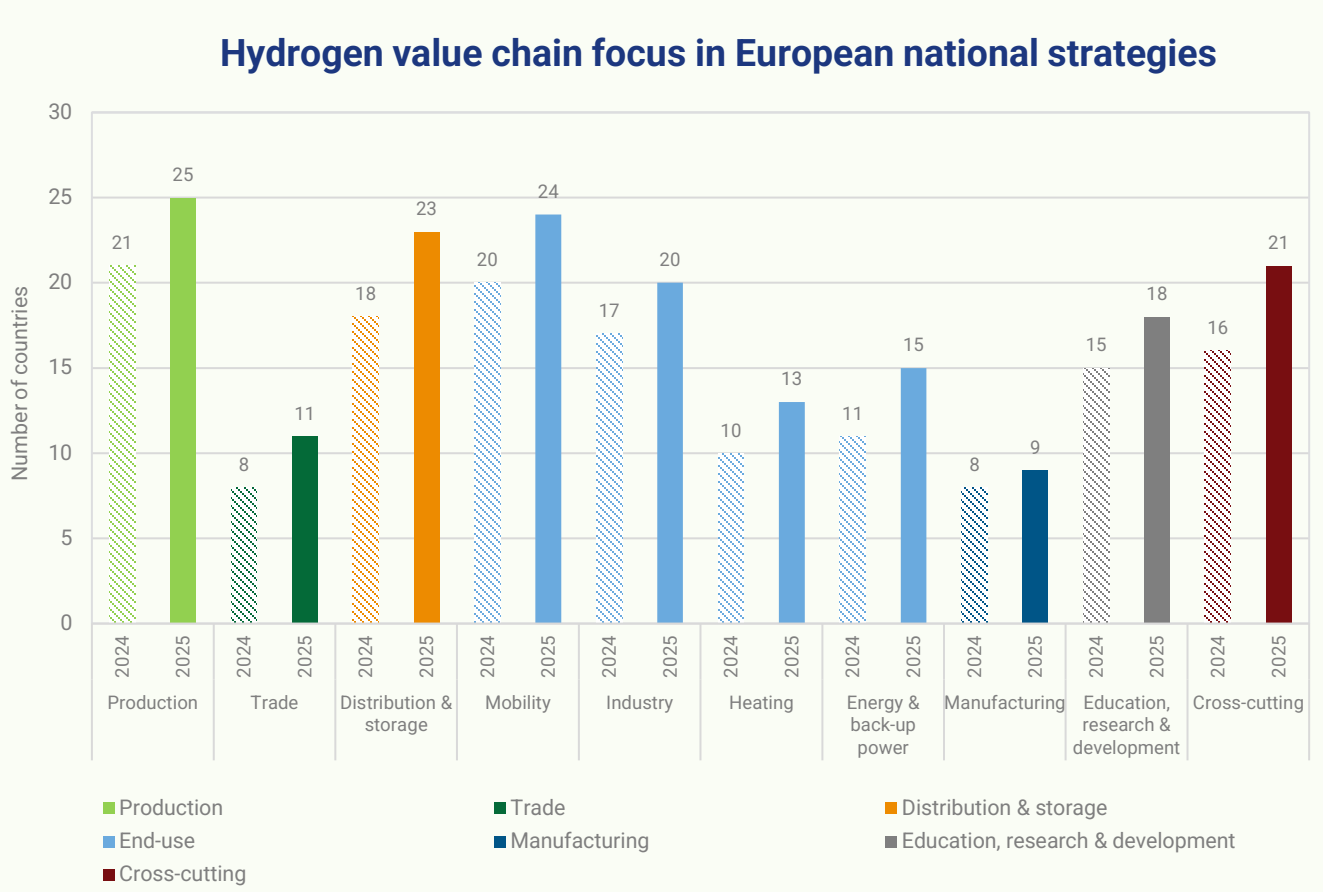


Figure 5. Hydrogen value chain focus across European national strategies.

2.2.

Qualitative summary by country

This section provides a qualitative summary for each European national hydrogen strategy. This summary aims to describe and classify the principal measures undertaken along the hydrogen value chain, offering insights into the diverse approaches and key initiatives adopted by each nation.

Austria

Austria's hydrogen strategy prioritizes renewable hydrogen production, achieved through water electrolysis with renewable energy or sustainably sourced biomass, and climate-neutral hydrogen, produced from methane with carbon capture, utilization, and storage (CCUS) or pyrolysis. This climate-neutral approach requires zero greenhouse gas emissions and excludes nuclear energy. To stimulate production, Austria offers investment subsidies, green electricity allocations, and renewable gas quotas. The strategy also emphasizes building a dedicated hydrogen infrastructure, repurposing existing gas pipelines to transport pure hydrogen, especially to industrial clusters, while hydrogen blending is generally discouraged. For storage, the strategy includes short- and medium-term solutions, with plans for long-term underground storage pending further research and regulatory updates.

In terms of end-use, Austria envisions hydrogen as crucial for sectors like heavy-duty transport (buses, freight) and plans to use it alongside battery-electric trains to decarbonize rail networks. Hydrogen is also seen as essential in aviation and water transport. Industrial applications focus on replacing fossil-based hydrogen in chemical processes, using hydrogen as a reducing agent in steel production, and supporting high-temperature processes in cement and glass industries where electrification isn't viable. Through these targeted applications, Austria's strategy aims to integrate hydrogen across major sectors to support national decarbonization goals.

Belgium

Belgium's hydrogen strategy prioritizes full decarbonization by 2050 through renewable energy, given the nation's limited domestic renewable resources. Recognizing the need for external energy, Belgium aims to establish itself as a European hub for importing and distributing renewable hydrogen and its derivatives. The strategy emphasizes a phased approach to production: while the long-term target is a fully renewable hydrogen mix by 2050, Belgium supports transitional solutions in the short term, including steam methane reforming (SMR) and autothermal reforming (ATR)with carbon capture and storage (CCS), as well as pyrolysis, to bridge the gap as renewable capacity is developed.

To enable this transition, Belgium is focusing on establishing critical import routes and a national

hydrogen transport network, leveraging existing infrastructure and building cross-border connections. Industrial applications, particularly in high-temperature sectors like chemicals and steel, are a key focus, along with aviation, maritime transport, and strategic support for hydrogen research and development to foster local expertise. Conversely, hydrogen use in residential heating and passenger cars is deprioritized in favour of electrification and other renewable solutions.

Bulgaria

Bulgaria's hydrogen strategy focuses on establishing green hydrogen production, with pilot projects funded through the national recovery plan and the development of hydrogen valleys. The country will assess renewable hydrogen production zones and explore opportunities for hydrogen storage. In terms of transmission and distribution, Bulgaria will evaluate its hydrogen export potential, the future role of natural gas infrastructure, and identify potential storage sites. Regulatory frameworks for access to the grid will be adapted to integrate both biogas and hydrogen.

For end-uses, mobility will be prioritized through financial incentives for fuel-switching and the establishment of the first 20 hydrogen refuelling stations (HRS), with the regulatory regime on hydrogen transport and alternative fuels to be updated accordingly. Industry will be encouraged to transition to renewable hydrogen through a quota system aligned with European legislation. The energy sector will also be adjusted by modifying electricity market rules to support the integration of power-to-x (PtX) technologies. Alongside these actions, Bulgaria will strengthen its administrative capacity, raise public awareness, and foster international cooperation through participation in European-funded projects. Research and development will focus on hydrogen's integration across energy systems, mobility, storage, and industry, alongside advancing synthetic fuel technologies.

Croatia

The Croatian hydrogen strategy focuses on renewable hydrogen production to replace fossil fuels and enhance the integration of renewable energy into the electricity system. Initially, hydrogen production will be concentrated in mobility and industry sectors, primarily for refineries and petrochemical plants, with the goal of meeting industrial feedstock needs by 2030. After 2030, the strategy aims to scale up production to meet increasing national demand.

In terms of transmission and distribution, the strategy envisions limited infrastructure in the early stages, with hydrogen production located near demand areas. In the second phase, hydrogen infrastructure will expand to support industrial applications, mobility, heating, and electricity system balancing. For end-uses, hydrogen mobility is a priority, starting with public procurement and the development of a network of hydrogen refuelling stations, with 10 stations planned initially. The industrial sector will focus on replacing fossil fuels with green hydrogen, particularly for high-temperature heating needs.

Hydrogen will also play a role in heating systems once distribution networks are in place, and it is envisioned for use in backup power systems for both civilian and military applications.

Education and research will focus on improving production efficiency, developing new production methods, and integrating hydrogen technologies into educational programmes to build knowledge across society.

Czech Republic

The Czech Republic's hydrogen strategy places renewable hydrogen at the centre of its decarbonisation efforts, supported by low-carbon hydrogen from nuclear energy to address the country's limited renewable potential. The strategy unfolds in stages, beginning with local production, early infrastructure and the establishment of hydrogen valleys, then moving toward enabling imports and reducing hydrogen costs, and later focusing on new production technologies.

Domestic renewable hydrogen development is encouraged through simplified permitting and faster deployment of renewables, with nuclear-based hydrogen remaining an important complementary source. Infrastructure planning concentrates on gradually repurposing the gas network for future hydrogen imports, preparing distribution systems and creating the conditions for seasonal storage.

Research priorities expand to include hydrogen production from waste and carbon capture, as well as innovations in storage materials, compressors and mobility technologies. Broader efforts support ecosystem development, cogeneration solutions, end-use technologies and the internationalisation of Czech hydrogen companies.

On the demand side, mobility remains the main early application, supported by the rollout of refuelling infrastructure, as well as limited use of renewable fuels in refining. Industry is expected to adopt renewable and low-carbon hydrogen progressively as regulatory frameworks mature, while hydrogen use in high-temperature heat, seasonal cogeneration and electricity system balancing is considered in the longer term.

Denmark

The Danish hydrogen strategy puts forward a target of increasing electrolysis capacity. A key emphasis point is that hydrogen must be of renewable electricity origin following EU methodology. The strategy puts focus on using PtX technology, (converts electricity into other forms of energy, such as hydrogen, synthetic fuels, or chemicals), for difficult-to-abate sectors such as shipping, aviation, agriculture, parts of industry and parts of heavy-road transport. The government will initiate dialogue with neighbouring countries on hydrogen infrastructure development and present an energy and supply package with a proposal for regulating ownership, financing, and operation of hydrogen infrastructure.

Estonia

The Estonia's hydrogen strategy focuses on expanding production through EU and national funding, along with establishing legal frameworks and enhancing renewable energy capacity. It aims to secure sustainable water and CO_2 sources for hydrogen production.

Education and R&D efforts center on training specialists and supporting research in hydrogen production technologies, with particular emphasis on solid oxide electrolysers and fuel cells.

The strategy includes setting up a legislative framework for hydrogen transmission and distribution, exploring the integration of hydrogen into the natural gas system. Short-term transport will rely on cylinders, with pipelines considered for longer distances. Hydrogen storage solutions are being explored, including the Incukalns facility in Latvia.

Manufacturing of hydrogen technologies will be strengthened by national investments, supporting both production and deployment of hydrogen technologies.

In mobility, the strategy focuses on developing hydrogen refuelling stations and exploring fuel-cell powered ferries. Additionally, hydrogen will be considered for national energy security, including crisis reserves, while regional cooperation is pursued to leverage renewable energy potential for hydrogen production.

Finland

The Finnish hydrogen strategy emphasizes the promotion of all emission-free hydrogen production technologies, fostering a technology-neutral approach, while also supporting the development of a regulatory framework for CCS/CCU at the EU level.

For transmission and distribution, Finland focuses on the coordinated development of a national hydrogen network, with Gasgrid Finland leading efforts in infrastructure development and international cooperation, along with the establishment of market regulations.

Research and development activities are supported through funding for hydrogen technologies and solutions, including CCS and system integration. The strategy also emphasizes fostering cooperation between authorities and stakeholders.

In terms of end-uses, the strategy focuses on using hydrogen for heavy-duty transport, including road, maritime, and offroad machines. It also promotes the integration of e-fuels into the fuel distribution obligation to meet future renewable energy targets.

France

France’s updated hydrogen strategy strengthens domestic production using low-carbon electricity, particularly integrating nuclear energy, and promotes a range of electrolyser technologies to meet local demand without relying on imports. Compared with the previous plan, it places greater emphasis on large-scale deployment in

industrial zones to achieve efficiency and scale, supported by financial incentives for production and infrastructure.

Hydrogen infrastructure is now a clear priority. Industrial hydrogen hubs are central to connecting producers and consumers, while the strategy also focuses on developing a national hydrogen pipeline network and large-scale underground storage. Regulatory oversight is reinforced to ensure market stability, aligned with EU frameworks, and a national study on geological hydrogen is expected to guide future storage development.

Transport priorities expand beyond heavy-duty road vehicles to include aviation and maritime, with support for sustainable aviation fuels and hydrogen-derived maritime fuels. Industry continues to be a key focus, with hydrogen supporting decarbonisation in refining, chemicals, and steel.

Research, innovation, and workforce development are strengthened, including initiatives to create international technical expert positions and promote education and skills for the hydrogen sector. France also reinforces its ambition to become a leader in electrolyser manufacturing and technology exports. Territorial hydrogen hubs remain central to coordinating demand, with imports of hydrogen-derived fuels expected only if domestic production cannot meet future needs.

Germany

The German hydrogen strategy centers on green hydrogen, aiming for a long-term, reliable supply while using other hydrogen types temporarily. The strategy focuses on integrating electrolysis with the energy system, reducing regulatory barriers, and ensuring sustainability in production, especially concerning water usage.

For transmission, Germany plans significant pipeline development and interconnections with neighbouring countries, supporting the European Hydrogen Backbone. Hydrogen infrastructure, including LNG terminals, will be adapted to ensure stability in supply.

The country aims to lead in hydrogen technology manufacturing, with a focus on electrolysers, and develop international partnerships. The strategy targets decarbonization in heavy-duty transport, industry, and energy, with a focus on hydrogen's role in hard-to-abate sectors like steel and chemicals and supports hydrogen-ready power plants.

Germany also plans to use hydrogen in energy production and specific heating applications, particularly in areas not connected to heating networks.

Hungary

The Hungarian hydrogen strategy focuses on low-carbon production capacities for industry and mobility, with a target of increasing electrolysis capacity by 2030, through licensing and international cooperation, with a focus on supporting SMEs and accessing external

markets. Domestic automotive manufacturers will also cooperate in the field of hydrogen technologies. Green hydrogen will be produced using solar PV, nuclear energy, and grid electricity, in addition to promoting CCS technologies by establishing a regulatory framework. There is a focus on using natural gas infrastructure for storage, starting with a pilot project, but with the target of hydrogen blending. The strategy promotes heavy-duty vehicles in the mobility sector, low-carbon hydrogen consumption in the petrochemical and chemical industries and meeting industrial heat demand with hydrogen in the cement, iron, and steel industries. The energy sector will pilot co-firing natural gas with hydrogen and introduce hydrogen applications in the electricity market for flexibility services. Cross-cutting measures include the establishment of a National Hydrogen Technology Laboratory and dissemination of information among the general public to increase public acceptance of hydrogen technologies.

Ireland

The Irish hydrogen strategy includes hydrogen production from grid-connected electrolysers during periods of high wind and curtailment. Low-carbon hydrogen production is not expected to have a major role. The main obstacle is the development of a new hydrogen industry. Hydrogen transport will first take place via compressed tanks, with infrastructure development in clusters and an overall plan to transit from natural gas to hydrogen over time. Infrastructure development will be integrated and consider energy systems, networks, storage, and ports. Hydrogen use in mobility focuses on freight, HDV, aviation, and maritime transport. The national policy framework on alternative fuels infrastructure will be updated to include hydrogen considerations. Hydrogen will have a role in medium and high-grade heat applications in industry, and in enabling flexible power generation in the energy sector. Further assessments will be carried out to understand the actual quantities of hydrogen needed in a net-zero integrated energy system. The development of hydrogen clusters will be promoted. Specific attention is paid to safety issues and therefore a safety roadmap will be developed. On standardisation and certification, the establishment of a certification scheme for hydrogen is foreseen, with the integration of electricity guarantees of origin to avoid double counting.

Italy

Italy's hydrogen strategy builds on the National Energy and Climate Plan and focuses on decarbonizing hard-to-electrify end-uses, integrating hydrogen into the energy system, and strengthening the supply chain.

Production promotes RFNBO and bio-hydrogen in suitable locations, with demand supported through competitive supply mechanisms and import auctions. Within transmission and distribution, Italy plans to further develop hydrogen blending in the gas grid, ports as energy hubs, private networks, liquid hydrogen infrastructure, refueling stations, and the Southern Hydrogen Corridor.

Research and innovation cover electrolysers, emerging production technologies, blending and storage, fuel cells, intelligent systems, and sector-coupling, supported by training initiatives and international cooperation.

Mobility priorities include freight, rail, maritime, and aviation, with hydrogen refueling infrastructure and incentives. In industry, the strategy supports competitive-supply mechanisms, decarbonization pilot projects, changes in industrial processes, low-emission products, and creation of hydrogen demand. Energy measures promote sector-coupling, power-to-gas projects, and a liquid hydrogen market to reduce electricity costs and improve system flexibility.

Lithuania

Lithuania's hydrogen strategy focuses on developing a renewable hydrogen ecosystem to reduce energy dependence and emissions, with an emphasis on domestic production. Key production targets include electrolytic capacity expansion and pilot projects for synthetic methane, alongside safety standards and simplified regulations.

Transmission and distribution plans leverage the Finland-Germany pipeline for export and storage, aiming to position Lithuania as a transit hub. Hydrogen blending into natural gas infrastructure will be pursued as a transitional measure, while synthetic methane is explored as a long-term storage solution.

Cross-cutting initiatives prioritize a legal framework for hydrogen infrastructure, the establishment of hydrogen valleys, and public education on hydrogen safety and applications. International cooperation will be directed toward building a robust regional hydrogen network and attracting high-value equipment manufacturers.

For mobility, the strategy promotes hydrogen-powered vehicles and fuelling infrastructure, with plans to introduce hydrogen in public transportation across multiple cities and at key ports. Industrial applications focus on the fertilizer sector, particularly green ammonia, with secondary uses in refining and high-temperature processes like glass and cement production.

In the energy sector, Lithuania aims to use green hydrogen to enhance grid flexibility, creating a framework for power-to-gas and gas-to-power projects and leveraging surplus renewable electricity.

Luxembourg

The hydrogen strategy in Luxembourg targets hydrogen demand by 2050, with limited green hydrogen production and most hydrogen being imported or produced locally with imported renewable electricity, and participation in cross-border mechanisms for renewable hydrogen production. Instruments to guide economic actors, such as quota systems for SAF in aviation, cross-border tenders for hydrogen production support, and obligations for development of refuelling infrastructure for heavy-duty vehicles will be set. There is a focus on participation in European initiatives and development of

European rules for hydrogen infrastructure, with priority given to granting projects of common interest status to projects exclusively dedicated to hydrogen and derivatives. The strategy includes measures on decarbonizing mobility with renewable fuels, substitution of grey hydrogen with green in industry, and using hydrogen as an alternative to decarbonize heat networks and in high-efficiency cogeneration plants. Several research priorities in the strategy are special materials used for photoelectrolysis of water, fuel cells, hydrogen storage and optimal use of rare resources. The strategy envisions active participation in the definition of rules at the EU level, focusing on certification of renewable hydrogen.

Netherlands

The updated Dutch hydrogen strategy published in 2021 (NWP), builds on the previous strategy by setting a stronger foundation for scaling up green hydrogen production and infrastructure. Central to the update is the acceleration of production capacity goals, aiming for a robust renewable hydrogen output linked to offshore wind energy. This expanded focus on domestic production is complemented by a decentralized approach, allowing local hydrogen generation to ease grid congestion and support urban and logistics needs. Alongside continued support through DEI+ and SDE++ programmes, the NWP now emphasizes GroenvermogenNL's role in driving research and development to reduce costs and advance electrolysis technology.

Infrastructure efforts are reinforced by prioritizing the integration of the hydrogen system within existing natural gas infrastructure. The programme also highlights the Netherlands' evolving role as an international hydrogen trade hub, establishing frameworks to support imports and exports, including ammonia and other derivatives, within a North-Western European hydrogen market. Safety and public awareness campaigns have been intensified to build societal acceptance of hydrogen, particularly in urban mobility and the transport sectors.

The NWP update enhances goals for hydrogen-powered transport and sustainable aviation fuel (SAF) deployment, extending support for heavy-duty vehicles and hydrogen refuelling infrastructure. The Netherlands also continues to collaborate with European partners on regulatory standards, guarantees of origin, and targeted electrolyser locations. These refinements aim to position the Netherlands as a key player in the hydrogen economy while strengthening infrastructure, enhancing energy security, and supporting long-term sustainability objectives in alignment with European climate goal.

Norway

The Norwegian hydrogen strategy supports hydrogen production mainly through development and demonstration projects, researching more efficient ways to produce hydrogen. On the topic of hydrogen exports, both pipeline and ship exports to Europe are considered. An alternative to be investigated is the export of natural gas towards Europe, with

hydrogen production on site with CCS and import of CO_2. The strategy includes support for equal rules in FCEV and BEV mobility, public procurement, zero emissions solutions in shipping, and funding for hydrogen technology development in industry. Research activities will focus on achieving low-emissions society, but specifically more efficient electrolysis plants are highlighted.

Poland

The Polish hydrogen strategy considers integrating hydrogen production in locations closer to consumption and available energy sources, while also setting the legal regime to produce hydrogen from nuclear energy. The strategy prioritizes safety in transmission, distribution, and storage, adapting energy legislation, conducting a feasibility study for a "Hydrogen Highway," and foresees blending hydrogen in the natural gas system. For mobility, priority is given to construction of refuelling stations in densely populated areas for buses and rail transport, as well as on TEN-T corridors. For the industry, the focus is on the use of low-carbon hydrogen in the petrochemical, chemical and fertiliser industries, through industrial hydrogen valleys. In the heating and power sectors, there is a focus on research and development mainly in co-firing of hydrogen in gas turbines, co-generation and poly-generation systems, and hydrogen storage. The strategy intends to foster the development of manufacturing capacities for the entire hydrogen value-chain. Research, development and commissioning pilot projects will be carried out in relation to co-generation and poly-generation plants where hydrogen is the primary fuel, as well as low-carbon hydrogen production technologies. To implement the strategy, the ministry of energy will conclude a polish hydrogen agreement with industrial interested parties.

Portugal

The Portuguese hydrogen strategy includes legislative changes to allow licensing of hydrogen production plants, promotion of hydrogen production in waste-water treatment plants, and development of a support mechanism for sale of renewable hydrogen. In subsequent stages of development of the sector, Portugal can become an exporter of green energy products through the Sines port or through pipelines connecting the Iberian Peninsula with the rest of Europe. Hydrogen is a way to increase the value of existing pipelines and reduce their amortisation. Consequently, a legal framework for hydrogen blending will be developed. The focus for hydrogen use in mobility is mainly on buses, heavy-duty vehicles, captive fleets, trains, and maritime transport. In industry, it focuses on cement, glass, ceramics, refining, and chemicals, in addition to power-to-gas technologies for energy. The strategy includes ambitions for legislative changes, support for refuelling stations, production of synthetic fuels, replacement of grey with green hydrogen, development of quality and safety standards, and support for hydrogen pilot projects. Cross-cutting measures focus on international cooperation multilateral and bilateral cooperation,

development of guarantees of origin for hydrogen and the promotion of sector-coupling.

Romania

Romania's hydrogen strategy aims to develop a sustainable hydrogen economy by 2030, focusing on renewable hydrogen, decarbonization, energy security, and technological innovation.

Production is set to transition from conventional hydrogen to renewable hydrogen via electrolysis, supported by suitable infrastructure and investment in competitive technologies. Transmission and distribution leverage existing gas networks and establish hydrogen valleys to integrate production, storage, and consumption, while the country's position along the HI East corridor supports future imports.

Research and innovation target improvements in electrolysis, hydrogen storage, new applications, and workforce skills. Mobility initiatives include hydrogen-powered vehicles, buses, trains, and airport operations, supported by refuelling infrastructure. Industry seeks to replace conventional hydrogen with renewable hydrogen in existing processes and enable new low-carbon industrial applications. Hydrogen will also be blended in heating networks and used for energy storage and grid balancing, enhancing the flexibility and resilience of the energy system.

Slovakia

The Slovakian hydrogen strategy considers all low-carbon methods to produce hydrogen, including electrolysers using electricity from nuclear power plants, high temperature pyrolysis and gasification of non-recyclable waste. The strategy includes a technical analysis on repurposing natural gas infrastructure, establishment of safety regulations, and expansion and connection of the national grid with neighbouring countries. The focus for hydrogen use in mobility is mainly on public transportation, freight, planes, boats, and machinery in various sectors. For end-use in industry, the strategy targets low-carbon hydrogen in the chemical, petrochemical, and steel industries. A network of hydrogen refuelling stations will be developed, and a study on replacing natural gas with hydrogen will be carried out. The development and production of materials for transport and storage of hydrogen is considered. Emphasis is placed on harmonisation of standards and regulatory measures, specifically on the low-carbon hydrogen value-chain and guarantees of origin. International cooperation will be also fostered.

Spain

The Spanish hydrogen strategy supports the production of renewable hydrogen by establishing a regulatory framework for Power-to-X (PtX) technologies. For infrastructure, the regulatory requirements for hydrogen blending and storage will be revised. Evaluations will be carried for the need to modify end-use equipment both for industrial users and domestic ones. In mobility, there will be hydrogen-specific legislation for green hydrogen production and refuelling stations, plans for vehicle purchase and infrastructure deployment, a study on FCEV

locomotives, and measures for hydrogen technologies and refuelling stations in ports. In industry, there will be financial support for the transition to renewable hydrogen. For energy, there will be a change in the regulatory framework to allow PtX facilities in the energy market and promotion of green hydrogen in generation and co-generation plants. Research and development will be supported across the entire value-chain for hydrogen, but focus will be given on hydrogen use in cogeneration, recycling of components, and hydrogen turbines. An analysis will be carried on indirect taxation impact on renewable hydrogen. On certification, the strategy foresees participation in international standardisation bodies and development of a guarantee of origin system within the EU.

Switzerland

Switzerland's hydrogen strategy emphasizes carbon-neutral hydrogen from renewable or nuclear sources and its derivatives from sustainable biomass, focusing on uses that are economically and ecologically efficient while enhancing energy security and integrating the domestic market with Europe.

Production is guided by market principles and local generation, supported by incentives for electrolysis and storage, with planning and permitting streamlined to facilitate facility deployment. Transmission and distribution rely on a gradual development of networks connecting industrial hubs and multi-energy sites, with integration into the European hydrogen backbone and an emphasis on storage, including underground and cross-border options.

Research and innovation are supported through national funding and Horizon Europe participation. Hydrogen is targeted primarily for high-temperature industrial processes, combined heat and power plants, heat networks, reserve power, and selected transport sectors such as aviation, maritime, and heavy goods, while infrastructure for refuelling stations and CO_2-based tax incentives support mobility. Sector coupling, legal frameworks, certifications, and international cooperation underpin the overall strategy, ensuring safety, market transparency, and workforce development.

Iceland

Iceland's hydrogen strategy, emerging from action 4 of the national Energy Policy Action Plan, aims to support research and development of hydrogen and e-fuels, with a focus on heavy-duty transport and maritime applications. The strategy is structured in two phases: from 2020 to 2030, laying the foundational building blocks, and from 2030 to 2040, enabling more focused development.

Domestic production will expand through new power stations, while feasibility studies will explore the potential for hydrogen exports as national decarbonization progresses. The strategy highlights the importance of developing local expertise and training highly skilled hydrogen technicians and researchers. In mobility, initial efforts focus on pilot projects for e-fuels in maritime and aviation sectors, with

hydrogen use for heavy-duty vehicles expected to mature post-2030. Complementary measures include creating a taskforce for energy transition in heavy-duty transport, incentives for low-emission vehicles, support for state-owned vessels' energy transition, accelerated depreciation for cleaner vehicles, and removal of excise duties for electric vehicles.

United Kingdom

The United Kingdom's updated hydrogen strategy maintains its dual focus on electrolytic and low-carbon hydrogen while strengthening the delivery framework introduced in earlier updates. The 2024 revision places greater emphasis on advancing early commercial projects and aligning UK certification and export ambitions with international markets.

Hydrogen production continues to follow a mixed-pathway approach, with progress on bringing the first supported projects toward construction and preparing the next allocation rounds. Infrastructure planning becomes more coordinated under the new National Energy System Operator, which will take responsibility for hydrogen transport and storage planning from 2026. Large-scale pipeline development, geological storage and future options for blending remain central elements of the approach.

On trade, the UK broadens its export orientation, engaging not only with Europe but also the US and emerging hydrogen markets, and working to ensure compatibility of its low-carbon hydrogen certification with international schemes.

Research and innovation efforts continue across production technologies, aviation and maritime applications, industrial use cases and system integration, accompanied by initiatives to develop regional skills and hydrogen ecosystems, although the dedicated Hydrogen Skills Strategy is still pending.

End-uses remain focused on hard-to-electrify sectors. Heavy-duty mobility, shipping, aviation and rail continue to be supported through demonstration projects and regulatory developments such as the Sustainable Aviation Fuel mandate. Industrial demand is encouraged particularly within industrial clusters, where early access to hydrogen supply can accelerate adoption. Hydrogen-to-power remains part of the long-term system flexibility strategy. The role of hydrogen in heating is still under review, with a new consultation planned.

2.3.
Quantitative targets

Several European countries have incorporated quantitative indicators within their national strategies, outlining targets and estimates across the hydrogen value chain. This deliberate

approach reflects a commitment to providing clear and measurable goals within their hydrogen strategies. These quantifiable indicators serve as robust tools for assessing the ambitions of each country's hydrogen strategy. By setting specific targets these nations are advancing their commitment to the development and integration of hydrogen within their energy landscapes.

The following sections summarize, the quantitative indicators that were set forward in the national hydrogen strategies of European countries according to the different steps of the value chain.

2.3.1. Production and trade

One of the key areas of focus for the deployment of hydrogen, is hydrogen production, as this is a critical step in the development of a sustainable hydrogen economy. This section presents the main targets that have been set by various countries for hydrogen production.

One of the strategies employed to enhance domestic renewable hydrogen production involves efforts to increase electrolyser capacity. Figure 6 illustrates the 2030 targets for electrolyser capacity, established by various European countries.

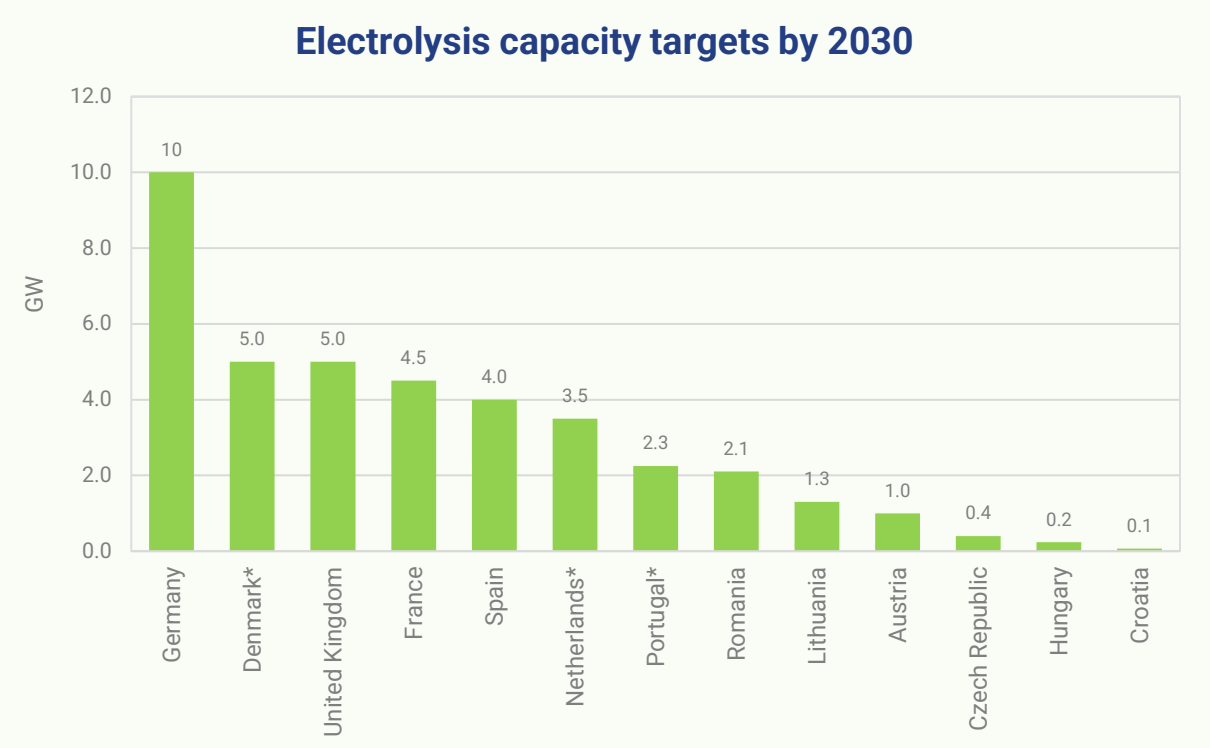


*Figure 6. Targets on electrolysis capacity set by European countries by 2030. *Average values were used for Denmark, the Netherlands and Portugal.*

Germany continues to hold the most ambitious target, aiming for 10 GW of electrolyser capacity by 2030. Denmark and the United Kingdom follow with targets of 5 GW of electrolyser capacity each, while France has revised its goal to 4.5 GW. Spain, the Netherlands and Portugal have set targets between 2 and 4 GW, and Romania's newly published strategy establishes a target of 2.1 GW by 2030. The remaining countries, including Lithuania, Austria, Czechia, Hungary and Croatia, have all set targets below 2 GW of electrolyser capacity.

Not all countries have set targets for the year 2030. Belgium, for example, only has a target for 2026, aiming to have 0.15 GW installed.

Some other European countries have committed to scaling up both renewable and low-carbon hydrogen production as part of their hydrogen production targets. For example, Romania aims to reach 4.2 GW of additional renewable energy capacity by 2030, while Hungary targets 16 kt/year and 20 kt/year of renewable and low-carbon hydrogen production, respectively. Estonia and Lithuania expect to increase the renewable hydrogen production to 2-40 kt/year and 129 kt/year by 2030, respectively. Additionally, countries such as the United Kingdom aim to increase low-carbon hydrogen production capacity, with a target of 10 GW, at least half of which will be electrolytic, while Poland has set a target of 2 GW of low-carbon hydrogen production capacity, with a focus on integrating production closer to consumption and available energy sources.

The trade of hydrogen is interconnected with production and reflects a combination of economic, environmental, and strategic considerations. The nature of hydrogen trade allows European countries to leverage their strengths, address domestic shortages, and contribute to a more sustainable and diversified hydrogen economy.

Some countries have included into their strategy targets related to trade. As an example, Belgium aims to import 20 TWh of hydrogen and its derivatives by 2030, and 200-350 TWh by 2050, partially intended for transit (mainly to Germany). Hungary is another example, with ambitions to ensure that all new liquefied natural gas (LNG) terminals are equipped to handle hydrogen or its derivatives. Germany expects to meet most of its hydrogen demand through imports. Until 2030, these will mainly arrive as ship-based ammonia, with other carriers becoming relevant over time. After 2030, pipeline-based green hydrogen from Europe and neighbouring regions is expected to grow, following a diversified approach to reduce supply risks.

2.3.2. Transmission

Currently, hydrogen use, mainly as a feedstock, is confined to local industrial clusters, but it is envisaged that it will also become a main energy vector transporting energy over longer distances across Europe and storing it over longer periods of time. Hydrogen, as an energy carrier, could be transported in pipelines across Europe either by blending hydrogen with natural gas and transporting the resulting mixture using the current gas network or transporting hydrogen as such in a dedicated separate network, part of which might be provided by refitted existing infrastructure.

It is clear that the blending strategy, while already contributing to the reduction of carbon dioxide emissions, can only have a transitional role, since full decarbonisation of the EU economy requires a much greater penetration of hydrogen in the EU energy mix than what could be accommodated through blending. The ambition of Germany in their national hydrogen strategy is to establish a hydrogen network spanning approximately 1,800 km by 2030. This network will be constructed either through new infrastructure or by repurposing existing networks to facilitate the transportation of hydrogen.

Blending of minor shares of hydrogen into natural gas does not create particular technical problems in the transportation and usage of the resulting mixture. At present, European countries impose different limits on hydrogen blending in natural gas networks. Figure 7 gives an overview on the targets set by European countries on limits on hydrogen blending in natural gas networks. In Portugal, a legal framework for hydrogen blending will be developed, setting a target of 10 - 15% hydrogen injection in natural gas grid. Regarding Austria, hydrogen blending is not seen as a viable option, considering the scarcity of renewable hydrogen, although an increase of the current limit of 10% of hydrogen in the natural gas grid will be examined. In Poland, the strategy also foresees 10% blending of hydrogen in the natural gas system. In the case of Hungary, based on the lack of hydrogen storage potential, the strategy focuses on the use of natural gas infrastructure for storage, starting with a pilot project, but with the target of minimum of 2% of blending.

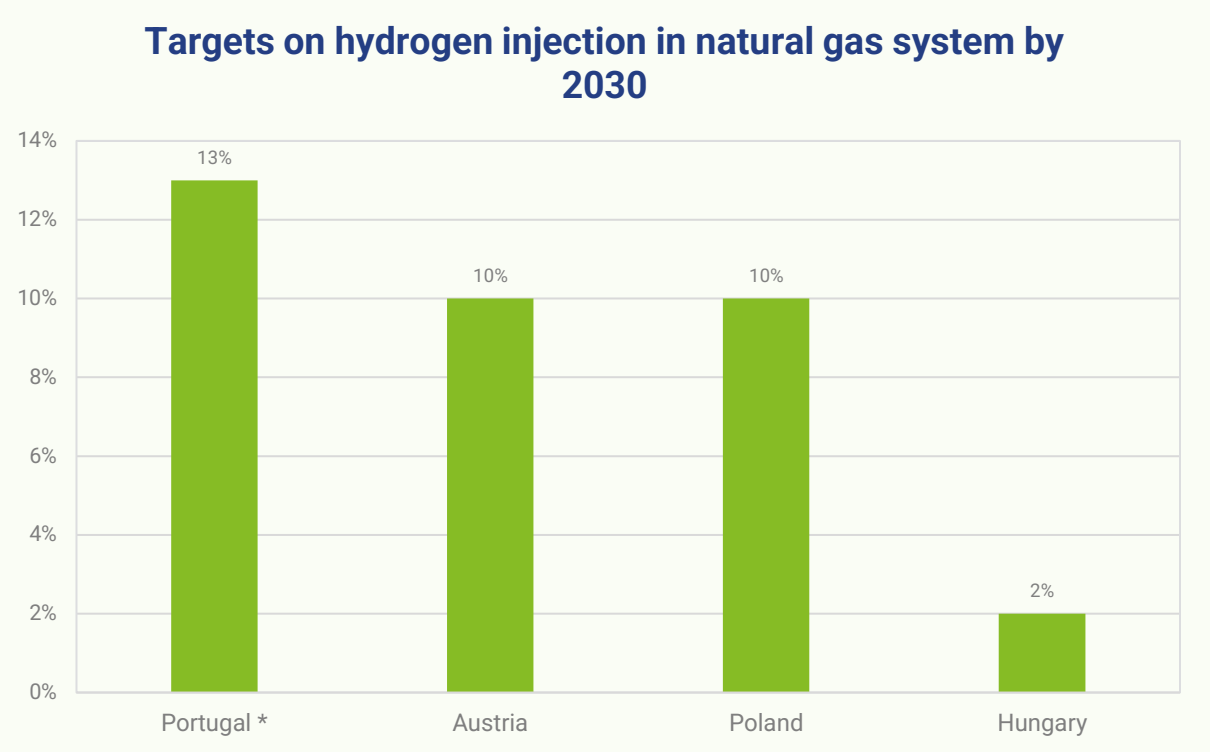


*Figure 7. Targets on hydrogen injection limit (%) in the natural gas network by 2030 set by European countries. *For Portugal, an average value (13%) was used, calculated as the midpoint of the target range of 10%-15%..*

2.3.3. End-use

Demand

Table 3 gives an overview of the expected total hydrogen demand in the European countries by 2030, 2040 and 2050. In Belgium the use of renewable hydrogen as a feedstock and for high-temperature heating in industry is a priority (chemical, steel industries) with demand for renewable molecules expected to rise to 125-200 TWh by 2050.

A total hydrogen demand of 95 to 130 TWh is forecasted in Germany for the year 2030. This includes the projected demand for hydrogen derivatives such as ammonia, methanol, or synthetic fuels. In addition, hydrogen demand in the industrial sector alone is projected to reach approximately 290 to 440 TWh by 2050.

The demand for gaseous energy carriers (methane and hydrogen) in relevant sectors in Austria in the year 2040 is estimated to range between 89 and 138 TWh, according to calculations. The range is derived from a scenario analysis, where on the one hand, assuming application-specific efficiency maximization and extensive electrification yields lower the demand value of 89 TWh (energy efficiency). On the other hand, assuming a comparatively higher but less efficient utilization

of existing technological infrastructure and processes results in the upper demand value of 138 TWh.

Table 3. Expected total hydrogen demand in European countries. by 2030, 2040 and 2050. [44][45]

Country	Target year	Target value	
		TWh	kton
Austria	2040	89-138	2,670-4,140
Belgium	2050	125-200	3,750-6,001
Croatia	2030	0.16	4.8
Czech Republic	2030	1.3	40
France	2030	20-30	600-900
Germany	2030	95-130	2,850-3,900
	2050	290-440	8,700-13,200
Ireland	2050	19.8-74.6	594-2,238
Italy	2030	8.4	252
Luxembourg	2050	4-10	120-300
Portugal	2030	3.3	99
Romania	2030	53	1,590
	2040	179	5,370
	2050	260	7,800
Slovakia	2030	6.7	200
	2050	13.3-20	400-600
Switzerland	2030	0.8-1.8	24-54

The total estimated hydrogen demand in Ireland for 2050 is 19.8-74.6 TWh, distributed across various sectors as follows: 3.6-13.3 TWh in flexible power generation or integrated energy parks for large energy users, 0-1.5 TWh in commercial and residential, 0-14.9 TWh in industry and processing, 1-9.3 TWh in road and rail transport, 13-26 TWh in aviation, 2.2-2.6 TWh in maritime and 0-7 TWh in other potential non-energy uses.

In 2030, Italy is expected to consume 252 kton of renewable hydrogen, with the industrial sector using 115 kton, transport 137 kton, and aviation and navigation 13 kton. This distribution

[44] Conversion factor: kton=(TWh*1000)/33.33
[45] For Croatia and Portugal, the total demand was estimated, using data from Eurostat

underscores Italy's focus on decarbonizing both industry and transport.

By 2030, Romania's hydrogen demand is estimated at 53 TWh, increasing to 179 TWh by 2040 and 260 TWh by 2050. In 2030, renewable hydrogen consumption is expected to reach 72.4 kton in transport, supporting cleaner public transport, heavy-duty trucks, and rail, while the industrial sector will use 57 kton in existing processes and 23.7 kton in new applications, including steel production via Direct Reduced Iron (DRI) and Electric Arc Furnace (EAF) technologies.

In Switzerland, total hydrogen demand in 2030 is expected to range between 0.8 and 1.8 TWh, with the industrial sector accounting for 0.25 to 1 TWh. These estimates serve as scenario-based indicators to guide the development of production, storage, and distribution infrastructure under the national hydrogen strategy.

In Luxembourg the goal of achieving a hydrogen demand of 4-10 TWh by 2050 (1-4 TWh in industry, 2-4 TWh in road, air, water, rail transport, and 1-2 TWh in integrated energy system) would require doubling of the national electricity consumption, therefore renewable hydrogen production will be limited, with most of the hydrogen being imported or produced locally with imported renewable electricity.

Based on the existing utilization of hydrogen, it can be assumed that in Slovakia, the annual consumption of hydrogen will reach 200 kilotons by 2030. Intensive use of hydrogen anticipates a total consumption increase by 2050 to a range of 400 to 600 kilotons.

In Portugal, the projected total demand for 2030 is estimated to be 3.3 TWh, with 2-5% allocated in the industry, 3-5% in road transport, and 3-5% in domestic maritime transport. Meanwhile, in Czech Republic, the estimated total demand for the same period is 3.2 TWh.

Mobility

Hydrogen may be a realistic alternative to gasoline, accelerating the transition to clean modes of transportation. The key to making this shift is the widespread availability of hydrogen refuelling stations (HRS).

Figure 8 gives an overview on the targets set by European countries on the number of hydrogen refuelling stations by 2025 and 2030.

Netherlands has set a target of 50 refuelling stations by 2025, while in Poland the strategy on mobility includes the construction of 25 refuelling stations by 2025 in densely populated areas for buses and rail transport, as well as on TEN-T corridors. Specific actions include the development of hydrogen refuelling and bunkering infrastructure, replacement of diesel locomotives with hydrogen-powered ones and change of applicable legislation to enable construction of HRS and use of hydrogen in transport.

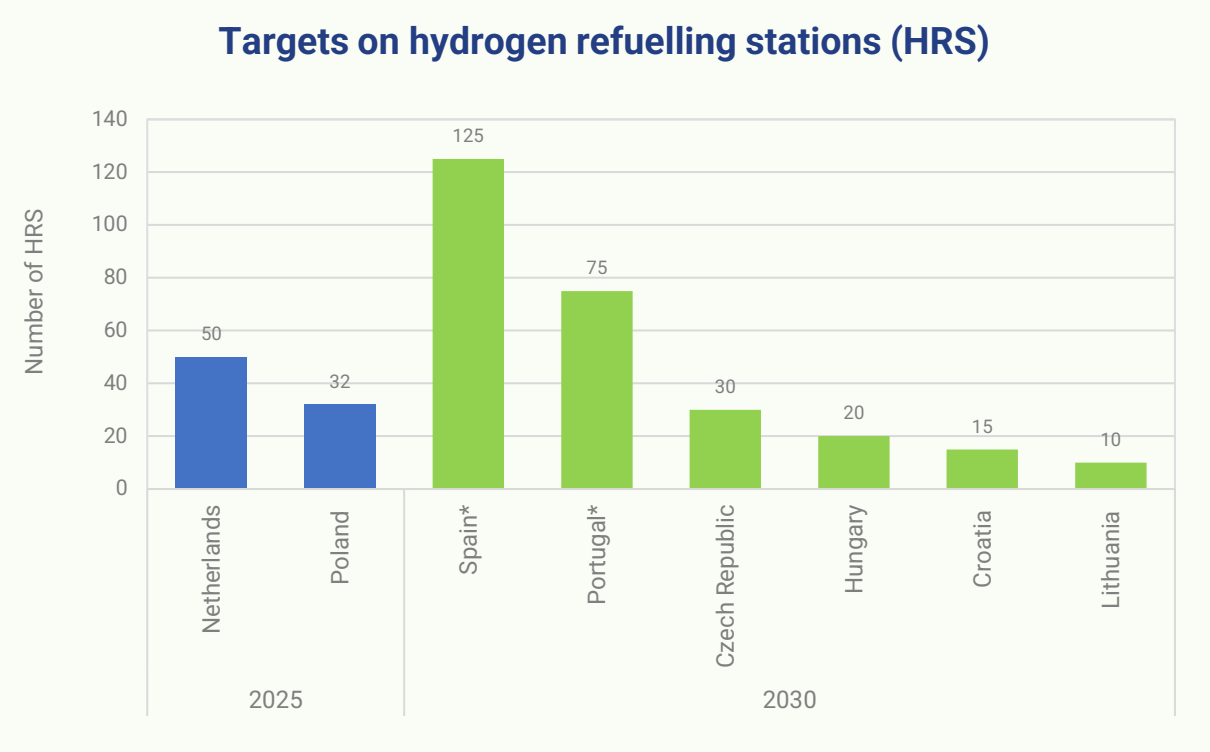


*Figure 8. Targets on the number of hydrogen refuelling stations set by European countries. * Average value was used for Portugal and Spain.*

Spain has set the highest goals for 2030, aiming a network of at least 100-150 publicly accessible hydrogen stations. These should be located in easily accessible places, distributed throughout the territory with a maximum distance of 250 km between each hydrogen station and the nearest one. Following closely behind is Portugal with the objective to create 50 to 100 hydrogen refuelling stations. Czech Republic plans to deploy 30 public hydrogen stations in city hubs with up to 300 kg/day capacity by 2030, of which 10 are expected to be AFIR-compliant, focusing on introducing hydrogen directly to the market via HRS.

In contrast, Hungary and Croatia has set lower targets, with the establishment of at least 20 hydrogen refuelling stations (with two refuelling points per refuelling station) and a network of 10 refuelling stations linked to large city centres, respectively. Lithuania plans to establish a minimum of 10 hydrogen refuelling stations, including at least one dedicated to the maritime sector. The country has already initiated its first green hydrogen production project, which includes setting up a refuelling station for loading equipment and vessels at the Klaipėda State Seaport.

Figure 9 shows the targets set by European countries on the deployment of different types of fuel cell electric vehicles by 2025 and 2030. For a more comprehensive explanation of the vehicle types according to EU classification please refer to Table 4.

Table 4. Outline of the terminology employed in this chapter to describe different types of FCEV fleet.

M1	Vehicles used for the carriage of passengers and comprising not more than eight seats in addition to the driver's seat
M2	Vehicles used for the carriage of passengers, comprising more than eight seats in addition to the driver's seat, and having a maximum mass not exceeding 5 tonnes
M3	Vehicles used for the carriage of passengers, comprising more than eight seats in addition to the driver's seat, and having a maximum mass exceeding 5 tonnes
N1	Vehicles used for the carriage of goods and having a maximum mass not exceeding 3.5 tonnes
N2	Vehicles used for the carriage of goods and having a maximum mass exceeding 3.5 tonnes but not exceeding 12 tonnes
N3	Vehicles used for the carriage of goods and having a maximum mass exceeding 12 tonnes

In 2025, the Netherlands has established the highest goals in the deployment of fuel cell electric vehicles (FCEVs), targeting 15,000 passenger cars (M1) and 3,000 trucks (N2 & N3). Similarly, Portugal aims to deploy 400-500 FCEV passenger cars (M1) and 20-50 trucks (N2 & N3). Conversely, Poland's priority lies in increasing the number of FCEV buses (M2 & M3) to 100-250.

Looking towards the long term, many countries have outlined more comprehensive targets for the deployment of FCEVs by 2030. Specifically, there is a notable emphasis on passenger cars. The Netherlands aims to double its passenger cars (M1) deployment compared to 2025, targeting 30,000, Czech Republic aspires to reach 3,000 FCEV passenger cars (M1) and Portugal has a more conservative goal of 750-1,000.

Moving on FCEV (N2 & N3) Spain, Czech Republic, and Portugal aim to deploy 380, 5,000-7,000, and 250-400 FCEVs, respectively. Regarding buses (M2 & M3), Czech Republic, Spain and Poland have set their sights on reaching 200, 150-200 and 800-1,000 FCEV buses, respectively. Czech Republic also aims to deploy 800 FCEV vans (N1) by 2030, while Spain has set goals for 2 FCEV trains. In contrast, Hungary has taken a holistic approach, setting a target for the total number of FCEVs across all vehicle types, with a goal of reaching 4,800 units.

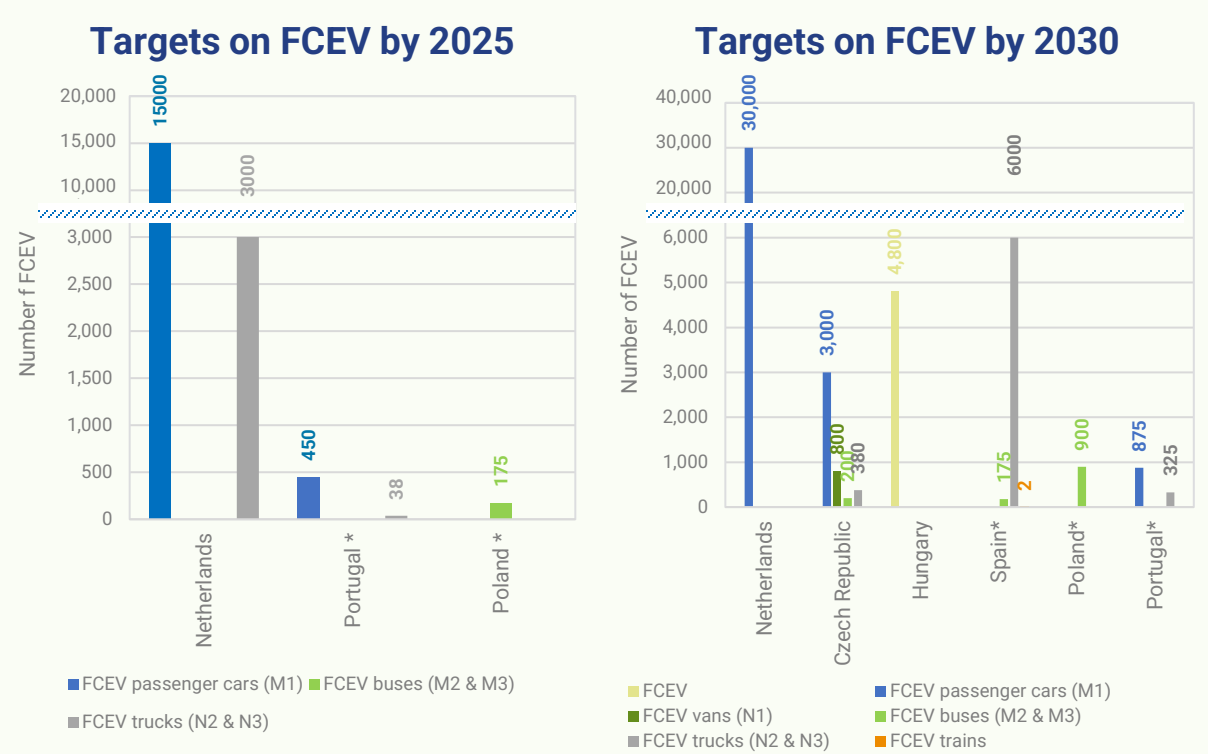


*Figure 9. Targets on the number of hydrogen fuel cell electric vehicles by 2025 and 2030 set by European countries. * Average value was used for Poland, Portugal and Spain.*

Industry

Recognized as a cornerstone of economic activity, industries hold significant potential to drive the transition towards sustainable energy practices. As major consumers of energy, industries have the capacity to both benefit from and contribute to the widespread adoption of hydrogen technologies. This section delves into targets set by European countries on the replacement of fossil-based gases with renewable hydrogen in their industries.

In several European countries, there is a concerted effort for the transition from fossil-based to renewable hydrogen within the industrial sector, with the establishment of specific targets in place. Austria aims to replace fossil-based hydrogen with climate neutral hydrogen in energy intensive industries by 80 % until 2030.

Regarding Czech Republic, the updated hydrogen strategy of 2024 emphasizes the gradual decarbonization of industrial hydrogen use, particularly in the chemical and refining sectors where grey hydrogen is currently dominant. Unlike the 2021 strategy, which projected only a 5 % replacement of grey hydrogen and natural gas by low-carbon gases in the chemical industry by 2030, the updated strategy focuses on a more structured and ambitious pathway. It aligns with EU-level targets for renewable hydrogen consumption, outlines phased implementation for industrial deployment, and highlights the challenges and costs associated with scaling up low-carbon hydrogen in industry, without

specifying a fixed percentage for replacement by 2030.

Portugal promotes the hydrogen production near consumption, 75-100% replacement of grey ammonia with green ammonia produced from renewable hydrogen by 2030 and the development of quality and safety standards for hydrogen equipment are priorities in industry. Additionally, support for hydrogen pilot projects in industry will be developed.

Spain targets a minimum contribution of renewable hydrogen of 25% of the total hydrogen consumed in 2030. It is expected to contribute in all industries that consume hydrogen both as a feedstock and as an energy source, such as refineries and the chemical industry

In Lithuania, the primary hydrogen offtake will be from the fertiliser industry, with at least 41% of ammonia needed for fertilizer production to come from green hydrogen by 2030. Following that is refining. Hydrogen could potentially also be used in other industrial processes requiring high and stable temperatures (glass, cement production, etc.) to replace natural gas.

In Romania hydrogen will play a significant role in decarbonising existing industrial processes and introducing new applications. The strategy aims to replace grey hydrogen with renewable hydrogen in sectors like refining, chemical production, and steel manufacturing. By 2030, the goal is to consume 57,000 tons of renewable hydrogen in existing industries and 23,700 tons in new industrial processes, such as steel production using Direct Reduced Iron (DRI) and Electric Arc Furnace (EAF) technologies.

2.3.4. Education, research and development

In the European context, the majority of countries have incorporated hydrogen into their strategic initiatives concerning education and research for the advancement of hydrogen technologies. These strategies emphasize the training of specialists, experts, and engineers to facilitate the development of hydrogen-related technologies. Additionally, they highlight ongoing research and development (R&D) initiatives undertaken by universities and companies, as well as funding and programme activities in this domain.

Croatia shows a good example, having set quantitative targets for research and development in hydrogen technologies. The country aims to attain five patents related to the hydrogen economy by the year 2030 and 50 patents by 2050. This commitment reflects Croatia's dedication to measurable outcomes in the pivotal field of hydrogen technology.

03 National Policies and legislation

This chapter provides an overview of the main national policies and legislation relevant to the hydrogen sector in EU Member States, EFTA countries and the UK, excluding Liechtenstein.

The data is collected by means of a comprehensive questionnaire completed by country specialists. The questionnaire focuses on the policy framework, measures, incentives and targets in place that have an impact on the development of the respective national hydrogen markets.

The information reflects the situation as of July 2025.

Interactive data dashboards on national policies and legislation can be accessed on the European Hydrogen Observatory website.

3.1. Overview

A total of 30 countries participated in the survey, the same number as in the previous report, which covered data up to July 2024. Comprehensive questionnaires were completed by country specialists. The responses from each country were evaluated, covering both cross-cutting questions about national policies and legislation, as well as specific questions related to the hydrogen value chain.

Figure 10 summarizes the countries' responses to cross-cutting questions on national policies and legislations. Appendix A3 offers a detailed overview of the responses from each country. The questions included:

- Has a dedicated national roadmap/strategy for the hydrogen sector been adopted?
- If not, is such a document under development?
- Is there a national hydrogen infrastructure (pipelines) plan?
- Is a system for Guarantees of Origin for hydrogen in place in your country?

In total, 24 countries have reported having a dedicated national roadmap or strategy for the hydrogen sector, with 3 countries adopting it within 2025, namely Cyprus, Italy, and Switzerland, while the remaining countries that have not yet adopted a roadmap continue to report it as under development. 19 countries have reported having a national hydrogen infrastructure plan, with 6 countries implementing a plan within 2025, including Denmark, Estonia, Ireland, Latvia, Lithuania, and Switzerland.

For Guarantees of Origin for hydrogen, 15 countries have reported having a system in place, with 5 countries implementing a system within 2025, namely Belgium, Bulgaria, Denmark, Hungary, and Switzerland.

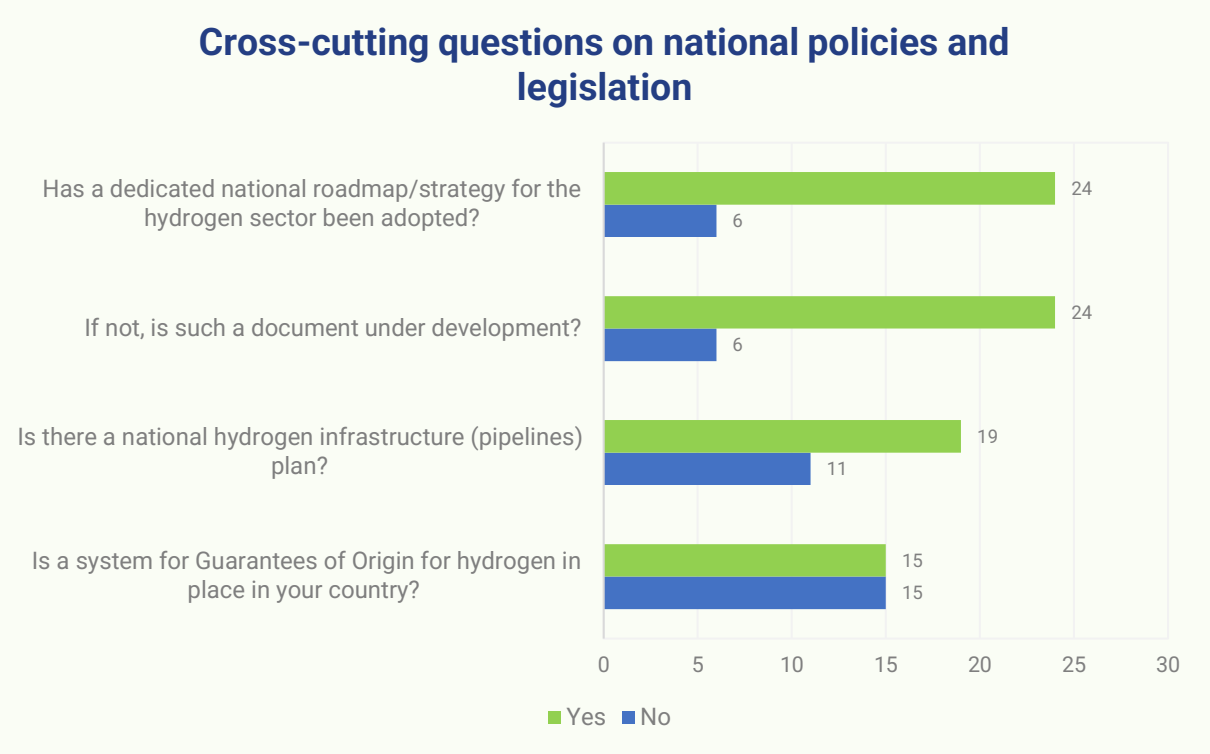


Figure 10. Overview of countries' responses to general questions on national policies and legislation.

Figure 11 gives an overview of the total number of European countries that have adopted policies and legislation relevant to the hydrogen sector across various stages of the value chain, including:

- Production
- Transmission, distribution and storage
- End-uses for
  - Mobility
  - Stationary power and heating
  - Industrial use (including as a feedstock)
- Equipment manufacturing.

It is evident, that a significant proportion of European countries have implemented policies and legislation related to various aspects of hydrogen production. More specifically, as of July 2025, 22 country specialists (73%) have indicated that their country has adopted a policy or legislation offering support for capital expenditure (CAPEX) in the development of renewable or low-carbon hydrogen production plants, 12 countries (40%) have implemented policies and legislation providing operational expenditure (OPEX) support and 15 countries (50%) official permitting guidelines specifically tailored to hydrogen production projects, while 8 countries (27%) have established policies and legislation designating a Single Point of Contact for hydrogen project developers, streamlining the communication and coordination process.

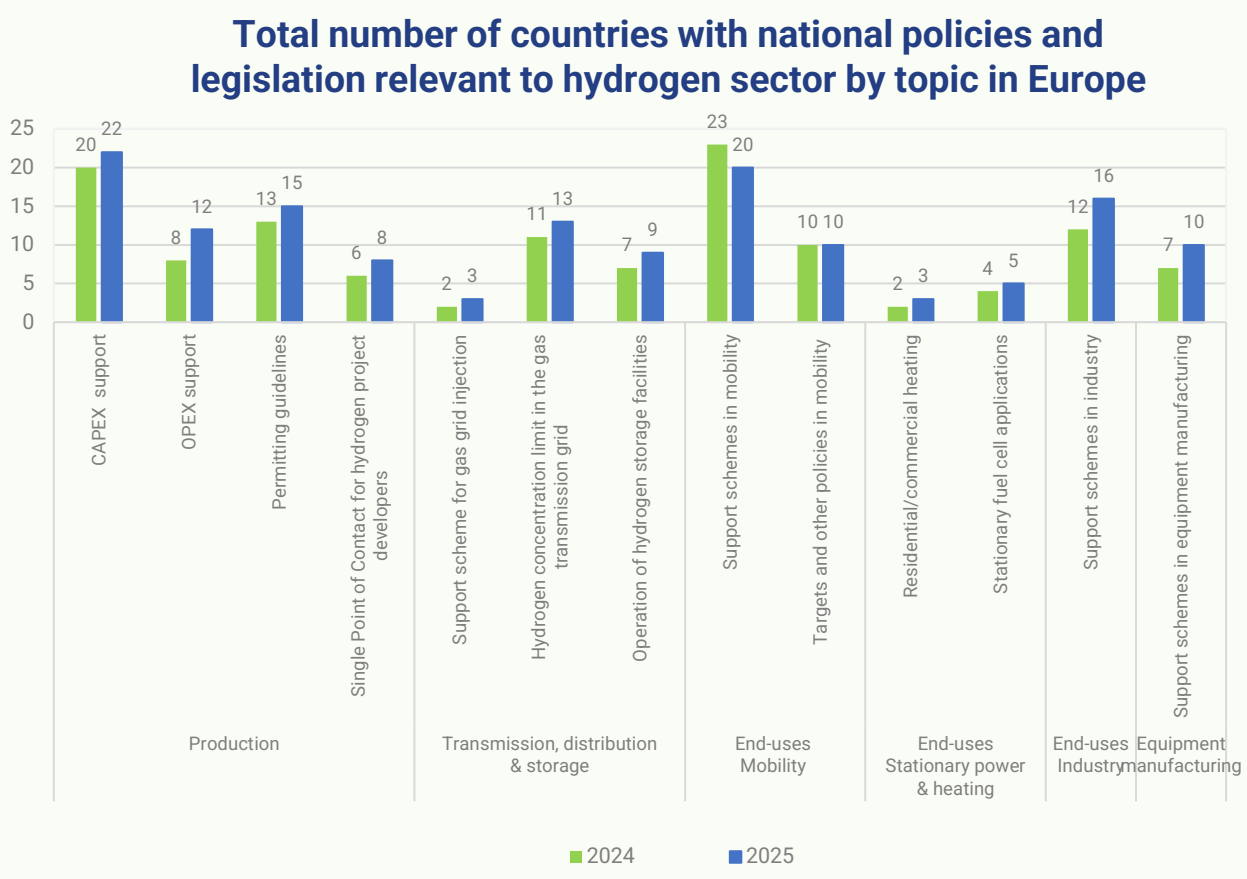


Figure 11. Total number of countries adopted national policies and legislation relevant to the hydrogen sector by topic in Europe.

Based on the questions asking about policies and legislation related to the transmission, distribution, and storage of hydrogen in Europe, 3 countries (10%) were found to have adopted support schemes for gas grid injection. Policies and legislations that have installed a legal hydrogen concentration limit into the gas transmission grid have been adopted by 13 countries (43%), while those addressing the operational aspects of hydrogen storage facilities, have been implemented by 9 countries (30%).

In the context of hydrogen end-use, the questionnaire revealed that, 20 in total (67%), have proactively implemented support schemes to encourage the adoption of hydrogen in the mobility sector. 10 countries (33%) have also established targets and policies to promote the use of hydrogen in the mobility sector. 5 countries (17%) have incorporated applications for stationary fuel cells into their regulatory frameworks. 3 countries (10%) have developed policies offering support for the deployment of hydrogen in residential and commercial heating applications, while 16 countries (53%) have implemented support schemes aimed at promoting the use of renewable or low-carbon hydrogen in industrial processes. Finally, 10 countries (33%) have established support schemes specifically focused on the

manufacturing of electrolysers and related components.

Across most stages of the hydrogen value chain, policy activity increased between 2024 and 2025, particularly in areas such as production, transmission and storage, stationary applications, industrial uses, and equipment manufacturing. The mobility end-use segment is the main exception: the number of countries with support schemes declined by three, while targets and other mobility-related policies remained unchanged. This indicates that, in contrast to other parts of the value chain, policy development in the mobility sector has shown limited progression over the past year.

These findings underscore the diverse strategies and priorities adopted by countries in promoting the use of hydrogen across various parts of the value chain, reflecting an evolving landscape of national policy initiatives.

3.2.
National policies and legislation by topic

3.2.1.
Production

This section covers the questions answered by country specialists related to national policies and legislations on hydrogen production.

The questionnaire sought to answer whether policies are in place, their economic value (in EUR or as % of total investments), their application (electrolysers, low-carbon hydrogen, etc.), and any other relevant details about the policy.

The main questions covered in the questionnaire related to policies and legislation related to hydrogen production included:

- Is there any CAPEX support for renewable/low-carbon hydrogen production plants?
- Is there any OPEX support for renewable/low-carbon hydrogen production plants?
- Are there official permitting guidelines in place for H_2 production projects?
- Is there a Single Point of Contact for hydrogen project developers?

CAPEX support

Figure 13 gives an overview of the countries reported to provide CAPEX support for renewable and low-carbon hydrogen production plants. In total, 22 countries have reported to provide CAPEX support as of July 2025 (+2 countries compared to July 2024). CAPEX support is predominantly allocated to electrolysers, which account for approximately 82% of countries with support schemes. The remaining support is

distributed among broader demonstration and innovation projects (9%), low-carbon hydrogen production (5%), and indirect or non-specific environmental support (5%) (Figure 12). Some countries apply support to m ultiple application areas; for the purpose of this analysis, each country has been assigned to its primary area of focus. The focus and conditions of CAPEX support vary from country to country, reflecting different national strategies for promoting hydrogen deployment.

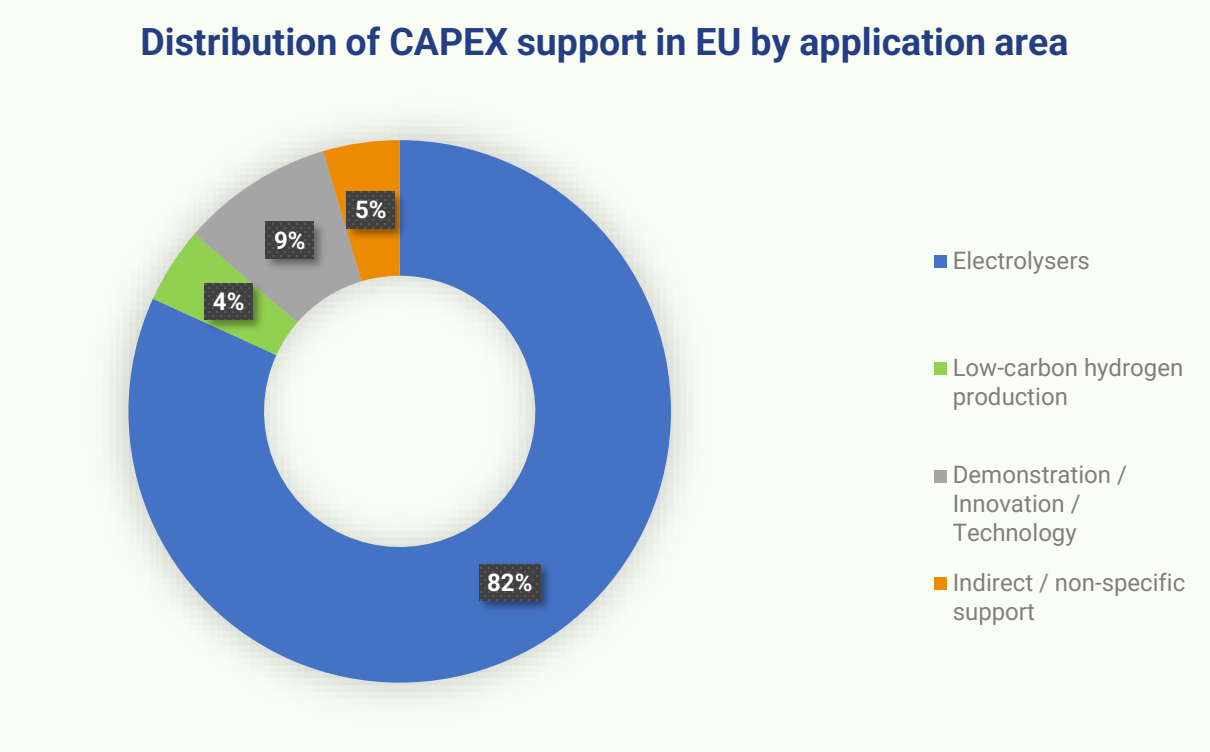


Figure 12. Breakdown of CAPEX support in the EU by application area.

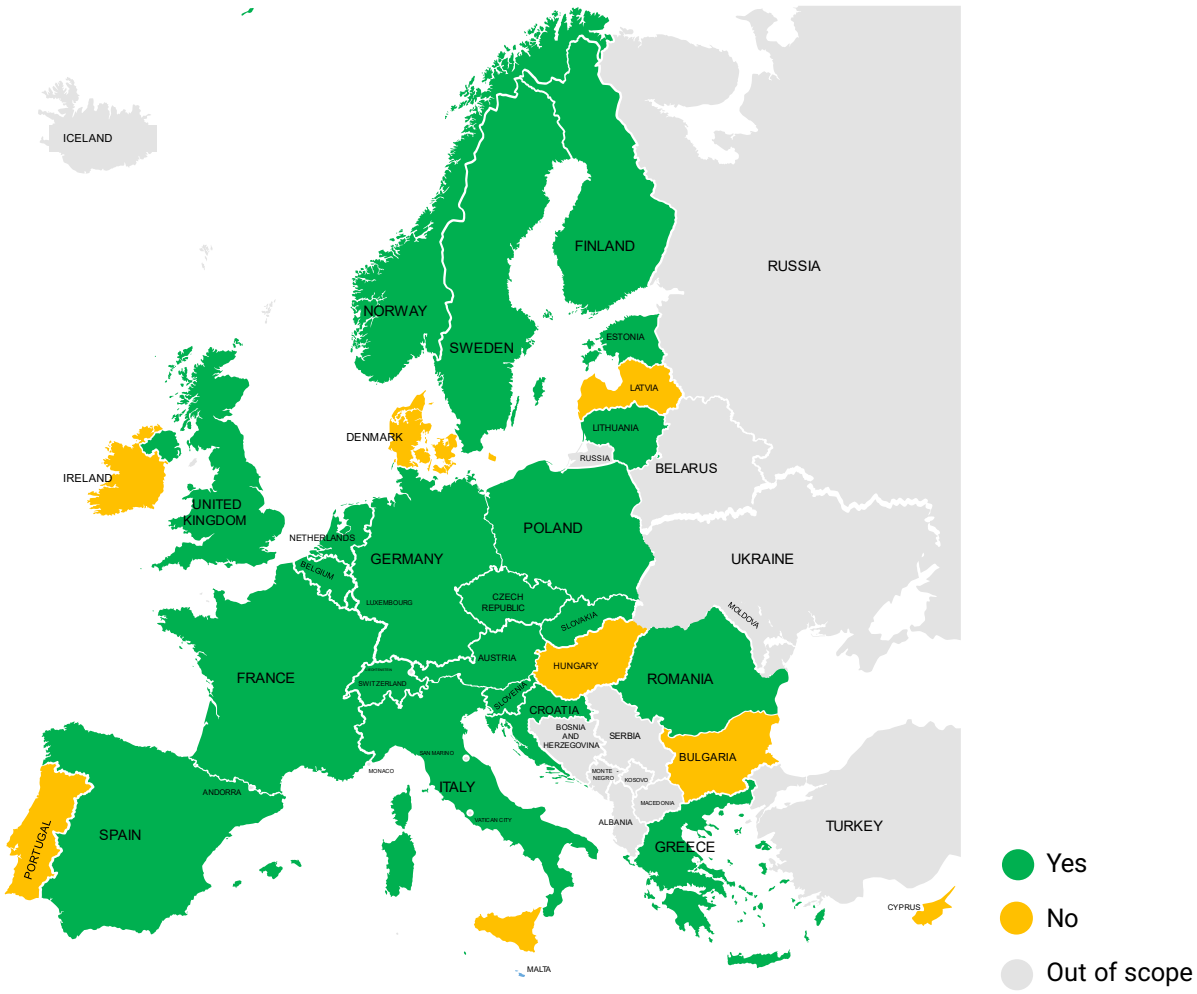


Figure 13. Map of countries reported to provide CAPEX support applications for renewable and low-carbon hydrogen production plants by country.

The following section provides an overview of the value of CAPEX support schemes for renewable and low-carbon hydrogen production plants across selected European countries. While the focus and conditions of these schemes vary, support is generally offered either as a subsidy tied to investment costs or as part of a programme with a defined budget.

Austria offers CAPEX support for electrolysers, covering 20% of investment costs for 0.5–1 MW projects and up to 45% for larger plants. The annual budget for this support is 40 MEUR.

Belgium provides CAPEX support for electrolysers under the Ecologiepremie+ scheme, covering 9–27% of additional investment costs. Support applies to electrolysers linked to hydrogen refuelling stations, with a maximum eligible investment of 2 MEUR per station.

Croatia provides CAPEX support for electrolysers under the Recovery and Resilience Fund, e.g. covering 40–60% of capital expenditure for a 10 MW project at INA's Rijeka refinery, with a total budget of 15 MEUR.

Czech Republic provides CAPEX support for electrolysers through the GREENGAS scheme, covering projects producing exclusively renewable hydrogen with a total budget of ~123 MEUR[46], and through the RES+ scheme, supporting electrolysers combined with renewable energy storage with a total budget of ~41 MEUR[43].

Estonia provides CAPEX support for electrolysers through two initiatives: a 5 MEUR pilot project for deploying green hydrogen in public transport, and a 50 MEUR program supporting the use of green hydrogen in transport and as chemical feedstock.

Finland provides CAPEX support for electrolysers through its Energy Aid program, covering 15–25% of the investment depending on whether the applicant has an energy efficiency agreement or uses an ESCO.

France provides CAPEX support for hydrogen projects through the Briques technologiques et démonstrateurs hydrogène program with 350 MEUR for innovation and demonstration projects, and through the Écosystèmes territoriaux hydrogène (EcosysH_2) initiative with over 500 MEUR supporting low-carbon hydrogen production, distribution, and use at the regional level.

Germany provides CAPEX support for electrolysers through multiple programs, covering up to 45% of costs, with project-specific limits of ~8–10 MEUR for SMEs and larger projects, supporting regional hydrogen hubs and renewable hydrogen production.

Greece provides CAPEX support for electrolysers under the Just Transition Programme, covering up to 50% of eligible investment costs in designated transition areas.

Italy provides CAPEX support for electrolysers under the PNRR, with 450 MEUR available for green hydrogen production plants on brownfield sites.

Lithuania provides CAPEX support for electrolysers through several initiatives, including 4.8 MEUR for green hydrogen production at the Port of Klaipėda and 7 MEUR for a public transport project in Vilnius. A previously planned 122 MEUR aid for fertiliser decarbonisation is no longer being used.

Luxembourg provides CAPEX support for electrolysers through a 110 MEUR call for projects, offering up to 45% of eligible investment costs and additional operational support for 10 years.

The Netherlands provides CAPEX support for electrolysers through multiple schemes, including OWE (998 MEUR) for fully renewable hydrogen production, DEI+ (175 MEUR) for innovative hydrogen projects, VEKI (€30 MEUR) for industrial CO_2-reducing investments, and MOOI (~61 MEUR) for hydrogen R&D, totalling ~1,364 MEUR.

[46] Conversion factor: 1 CZK = 0.04136 EUR

Norway provides CAPEX support for hydrogen electrolysers, including 777 million NOK (~67.5 MEUR[47]) for maritime hydrogen production projects and additional funding for low-carbon hydrogen under various schemes, such as the Barents Blue and CCB Energy Park projects.

Poland provides CAPEX support for electrolysers under its National Recovery and Resilience Plan, offering non-repayable grants for hydrogen production, storage, and transport, with the required own contribution and aid intensity determined by national regulations and European Commission approval.

Romania provides CAPEX support for electrolysers under the National Recovery and Resilience Plan – Component C6, with a total budget of ~149 MEUR to support renewable hydrogen production and distribution infrastructure.

Slovakia provides CAPEX support for electrolysers through the K1 RES call, with a total budget of ~13.6 MEUR, offering up to 70% of eligible costs per project for renewable energy-powered hydrogen production and storage facilities.

Slovenia provides support for environmental and demonstration projects, including investments in new technologies, through low-interest loans up to €2 M per project, with a total program budget of €2.5 M.

Spain provides CAPEX support for electrolysers through multiple programs, including the H2 Valleys Program (1,200 MEUR), IPCEI Hy2Use (794 MEUR), Industrial Value Chain of Renewable Energies and Energy Storage (750 MEUR), H2 Pioneers II (150 MEUR), and H2 Value Chain (100 MEUR), totalling ~2,994 MEUR.

Sweden provides CAPEX support for hydrogen projects through the Industriklivet (~4,582 M SEK) and Klimatklivet (~1,519 M SEK) programs, totaling ~6,101 M SEK (~526 MEUR[48]), supporting industrial and fossil-free technology investments.

Switzerland provides indirect support for innovative low-emission technologies, including hydrogen, through the Klima- und Innovationsgesetz (KIG), covering up to 50% of eligible CAPEX and OPEX, based on CO_2 savings and innovation level.

The UK's Net Zero Hydrogen Fund (NZHF) provided CAPEX support of up to 30% for low-carbon electrolyser projects (past rounds), with earlier 2022 allocations offering 20% of CAPEX under joint NZHF and Hydrogen Business Model funding. Additional hydrogen-related support, including for reforming with CCS or BECCS, was project-specific, with earlier BECCS phases totaling approximately £31 M (~36 MEUR[49]).

[47] Conversion factor: 1 NOK = 0.086 EUR
[48] Conversion factor: 1 SEK ≈ 0.086 EUR
[49] Conversion factor: 1 GBP ≈ 1.16 EUR.

OPEX support

Figure 14 gives an overview of the European countries reported to provide OPEX support for renewable and low-carbon hydrogen production plants. In total 12 out of the 30 countries (40%) provide OPEX support as of July 2025 (+4 countries compared to July 2024). The primary focus of OPEX investments is also directed towards supporting the production of hydrogen with electrolysers.

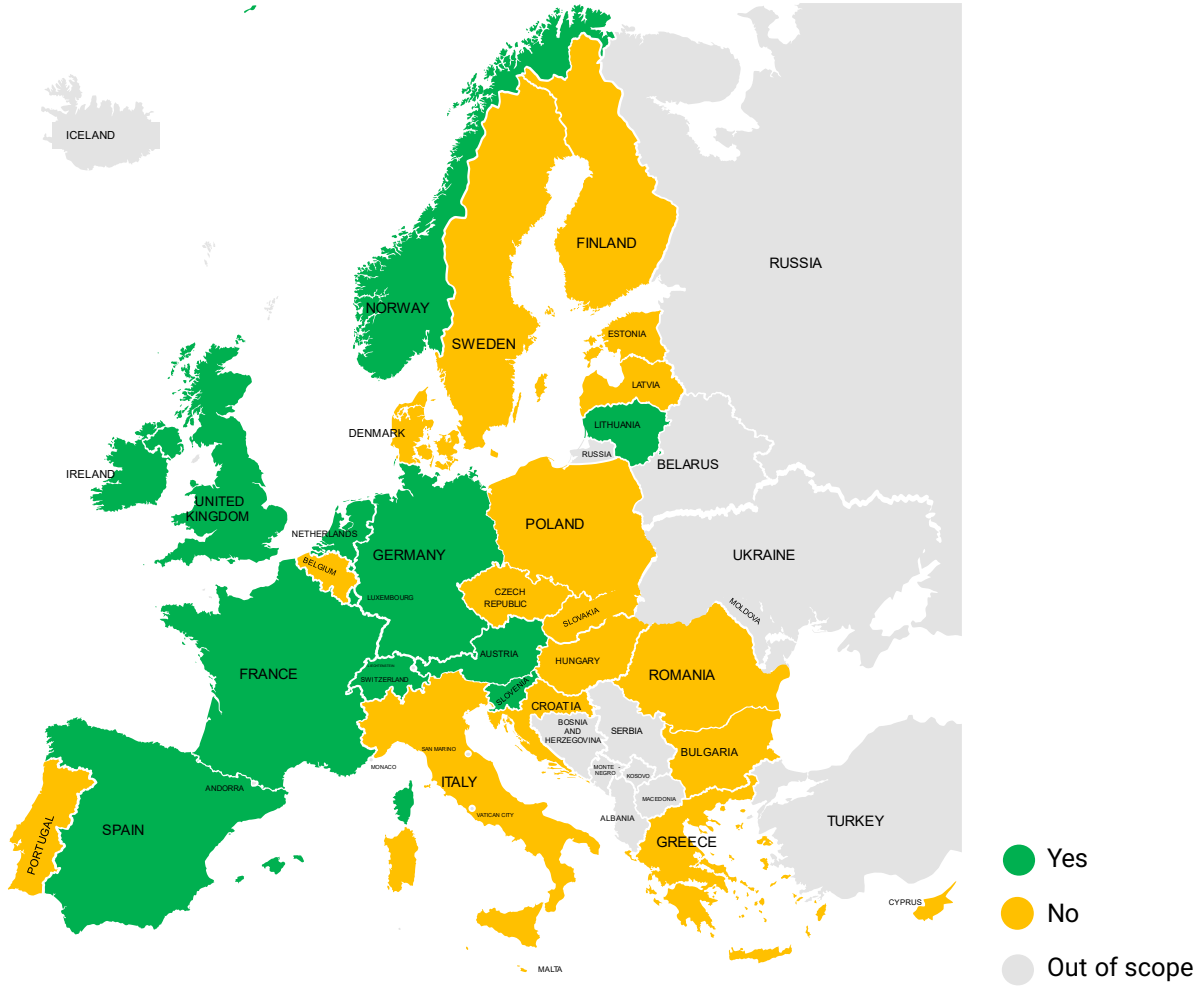


Figure 14. Map of countries reported to provide OPEX support for renewable and low-carbon hydrogen production plants.

Austria's Hydrogen Promotion Act, passed on June 12, 2024, supports the construction and operation of electrolysers for converting electricity into renewable hydrogen (non-biological origin). A total of 820 MEUR is allocated for RFNBO subsidies between 2024 and 2026. Subsidies will be provided through competitive auctions, offering a fixed premium per unit produced for ten years. Auctions may be conducted under the EU Innovation Fund, with award decisions based on bid rankings.

France provides OPEX support for renewable and low-carbon hydrogen production through the

Mécanisme de soutien à la production d'hydrogène décarboné under the France 2030 programme. The mechanism, with a total budget of 4 billion EUR, supports hydrogen produced via electrolysis and will operate over a 15-year period. Support will be allocated through competitive calls for tenders.

Germany offers OPEX support for electrolysers and reforming with CCS through contracts for difference, based on avoided carbon emissions. A budget of up to 4 billion EUR has been allocated for the initial bidding process, with projects eligible if they achieve at least a 10-kiloton annual CO2 reduction and meet stringent EU requirements for green or low-carbon hydrogen. Funded projects must reach a 60% greenhouse gas reduction by the third year of the agreement and 90% by its end, ensuring significant climate benefits over the 15-year contract term.

Ireland offers OPEX support through the Renewable Transport Fuel Obligation (RTFO), which requires fuel suppliers to ensure that 21% of motor fuel energy content is renewable. While not a direct subsidy, RTFO account holders receive certificates for renewable fuels, with additional incentives for renewable fuels of non-biological origin (RFNBOs) used in transport sectors. Suppliers earn three extra certificates per megajoule of RFNBOs, and failure to meet the obligation results in a buy-out charge, encouraging compliance and promoting renewable energy adoption.

Lithuania provides OPEX support for renewable hydrogen production through the Lithuanian Renewable Hydrogen State Aid Scheme, with a budget of 36 MEUR. The scheme supports electrolyser-based hydrogen production and is implemented via the European Hydrogen Bank's "Auctions-as-a-Service" mechanism, enabling companies to compete for funding through a competitive bidding process.

The Netherlands supports OPEX for electrolysers through the OWE and SDE++ schemes. OWE provides 5–10 years of operational support for renewable hydrogen, with a 2024 budget of 998.3 MEUR. SDE++ subsidizes the unprofitable top for CO_2-reducing technologies, including hydrogen production, over 12–15 years, with the next round budgeted at 8 billion EUR.

Norway offers OPEX support for hydrogen production through CO2 Compensation, providing 7 billion NOK (approximately 619 MEUR) annually to industries impacted by high electricity prices due to the EU Emissions Trading System (ETS). Additionally, Norway participates in European Hydrogen Bank auctions to further support hydrogen initiatives.

Slovenia provides OPEX support for renewable energy production, including small-scale hydrogen-related RES plants, through guaranteed electricity purchase and operating premium schemes managed by Borzen, d.o.o. These mechanisms ensure stable revenue by either guaranteeing a fixed purchase price for electricity or compensating the difference between market and reference prices. Recent public calls for support have been valued at around 10 MEUR.

Spain provides OPEX support for electrolysers through the National Auction Scheme for Renewable Hydrogen under the European Hydrogen Bank, with a budget of 400 MEUR. The scheme, implemented via competitive auctions over seven years, targets the production of renewable hydrogen and complements existing national programs that focus on CAPEX. Support may partially cover operating costs, ensuring financing during the production phase.

In the United Kingdom, OPEX support for hydrogen production is provided through the Hydrogen Production Business Model – Hydrogen Allocation Rounds, targeting electrolysers, biomass gasification/pyrolysis, and methane splitting with solid carbon. Support is allocated per unit of hydrogen produced over a 15-year period under Low Carbon Hydrogen Agreements. Revenue support is also planned for CCUS-enabled hydrogen projects through the Phase-2 Cluster Sequencing process, with funding negotiated case by case.

Permitting guidelines

Figure 15 provides a geographical representation of the European countries reported to have in place official permitting guidelines for hydrogen production projects. Among the 30 European countries examined, 15 were reported to have established such guidelines as of July 2025 (+2 countries compared to July 2024). These nations include Austria, Denmark, Finland, France, Germany, Greece, Luxembourg, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland and the United Kingdom. Table 5 provides a detailed breakdown of the titles and explanations of the guidelines for each country.

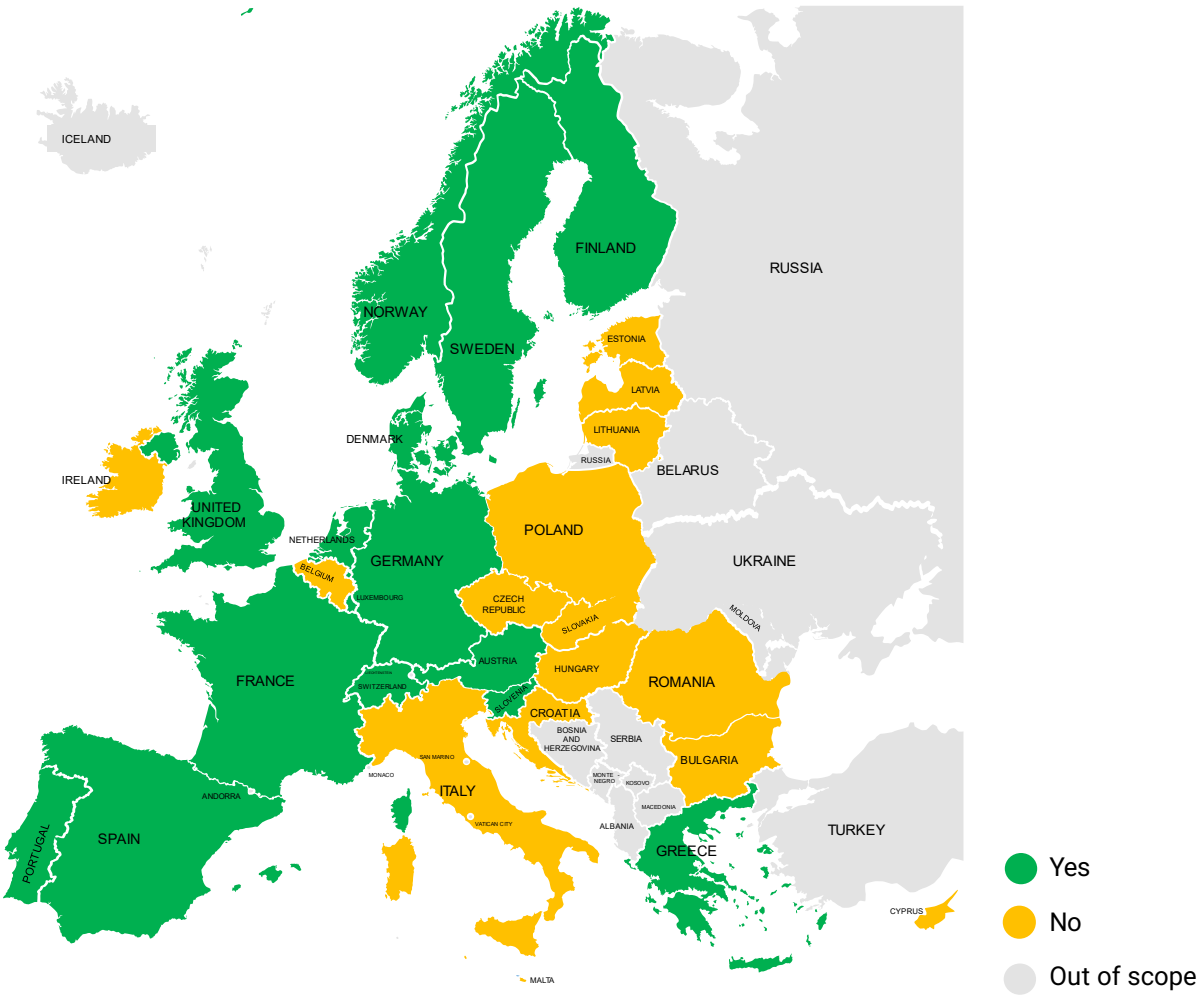


Figure 15. Map of countries reported to have in place official permitting guidelines for hydrogen production projects.

Table 5. Titles and explanation of official permitting guidelines for hydrogen production projects per country.

Country	Title/name	Explanation
Austria	H E100 guideline "Rule of ÖVGW" H_2-production plants	The ÖVGW guideline, put together by industry professionals and reviewed by authorities, covers planning, construction, approval, and initial testing, referencing key national and international norms for gas and water systems.
Denmark	Establishing Power-to-X plants: A Regulatory Guide	The Danish Energy Agency's PtX Secretariat provides a step-by-step regulatory guide, "Establishing Power-to-X plants: a regulatory guide", detailing the legal requirements for onshore PtX projects. The guidance, updated in February 2025, covers electrolyser and synthesis units, storage of hydrogen, oxygen, and other fuels (excluding underground storage), gas stations, and pipelines for PtX products, but does not apply to offshore installations.
Finland	Safety of hydrogen handling and storage	The guideline released by Tukes, the Finnish Safety and Chemicals Agency, provides safety instructions for plant operators on the use and handling of hydrogen across the entire hydrogen value chain, covering key safety practices and summarizing relevant Finnish legislation. Additionally, ELY (Centre for Economic Development, Transport and the Environment) provides guidance on permitting aspects for hydrogen projects to support developers during the permitting process.
France	Installations Classées pour la Protection de l'Environnement (ICPE)	In France, different installations will be classified under the ICPE nomenclature based on their potential impact on the environment. They will have to obtain a permit based on their ICPE category.
Germany	Approval and monitoring of electrolysers for hydrogen production in Baden-Württemberg	The establishment and operation of electrolysers for hydrogen production are subject to environmental and safety regulations. In Baden-Württemberg, the Approval and Monitoring of Electrolysers for Hydrogen Production framework requires industrial-scale electrolysers to obtain emission control permits. The local government presidencies serve as the permitting and supervisory authorities, ensuring compliance with laws on emissions, hazardous substances, and operational safety.
Greece	MINISTERIAL DECISION: No. A.P. B 10451/929/88	Terms for the establishment and operation of compressed gas filling stations, acetylene production units, as well as terms for the transportation, storage, and inspection of their container cylinders.
Luxembourg	Procedures for permitting request	The "Permitting Procedures" authorize requests related to technology implementation, renewable energies, electricity, hydrogen, heat, cold, and more. Priority is given to renewable hydrogen production, consumption technologies, and construction projects.

Netherlands	Permitting framework for hydrogen projects	Hydrogen production facilities are subject to the Permitting Framework for Hydrogen Projects, which includes environmental permits under the Environmental Permitting (General Provisions) Act, often requiring a Quantitative Risk Assessment, building permits for new or modified structures, and, when applicable, Water Act permits for projects affecting water systems.
Norway	Hydrogen and ammonia	Companies planning hydrogen facilities under the Major Accident Law must obtain approval from the Norwegian Directorate for Civil Protection (DSB). This applies to those with bunkering plans for hydrogen and ammonia use in ships as well.
Portugal	Guia do promotor "Legislação e regulação para a Economia do Hidrogénio"	The guidelines are regularly updated to outline permitting requirements for hydrogen production, listing relevant standards and legislation. They also offer guidance on submitting permitting requests and outline the overall process
Slovenia	Handbook guide to setting up small power plants for the production of electricity from renewable energy sources and cogeneration of heat and power	The guide is designed for investors in small-scale RES and high-efficiency CHP installations. It provides an overview of installation technologies, procedures for siting, construction, grid connection, and operation, along with methods for integrating installations into the grid. It covers legal, tax, and financial aspects, defines categories for small, self-supplying, and large installations, and includes procedures for refurbishment, financing, sales, and grants.
Spain	Royal Decree 815/2013, of 18 October, approving the Regulation on industrial emissions and implementing Law 16/2002, of 1 July, on integrated pollution prevention and control.	Hydrogen production, whether through chemical processes or renewable energy electrolysis, is currently regulated under industrial chemical activity regulations (RD 815/2013).
Sweden	Guidelines for H_2 production projects	H2-TSA 2023 provides guidance for hydrogen refueling stations, aligned with the international standard SS-ISO 19880-1, while a 2024 guidance from Länsstyrelsen Skåne supports permitting of hydrogen production facilities under the Environmental Code, including environmental assessment, risk management, and relevant legal requirements.
Switzerland	Approval guidelines for the construction and operation of H_2 production plants	Approval guidelines for the construction and operation of H2 production plants.

United Kingdom	Hydrogen production by electrolysis of water: emerging techniques and Emerging techniques for hydrogen production with carbon capture	1.Guidance on emerging techniques on how to prevent or minimise the environmental impacts of hydrogen production by electrolysis of water. 2.Guidance on preventing or minimising environmental impacts of industrial hydrogen production from methane or refinery fuel gas with carbon capture for storage.

Single point of contact for hydrogen project developers

Figure 16 provides a geographical representation of the European countries reported to have in place a legal act or agency as a single point of contact for hydrogen project developers. Among the 30 European countries examined, 8 reported to have established such legal acts or agencies as of July 2025 (+2 countries compared to July 2024). These nations include Croatia, Denmark, Finland, Germany, Ireland, Portugal, Slovenia and Spain. Table 6 provides a detailed breakdown of the name and explanations of the legal acts or agencies operating as a single point of contact for hydrogen project developers for each country.

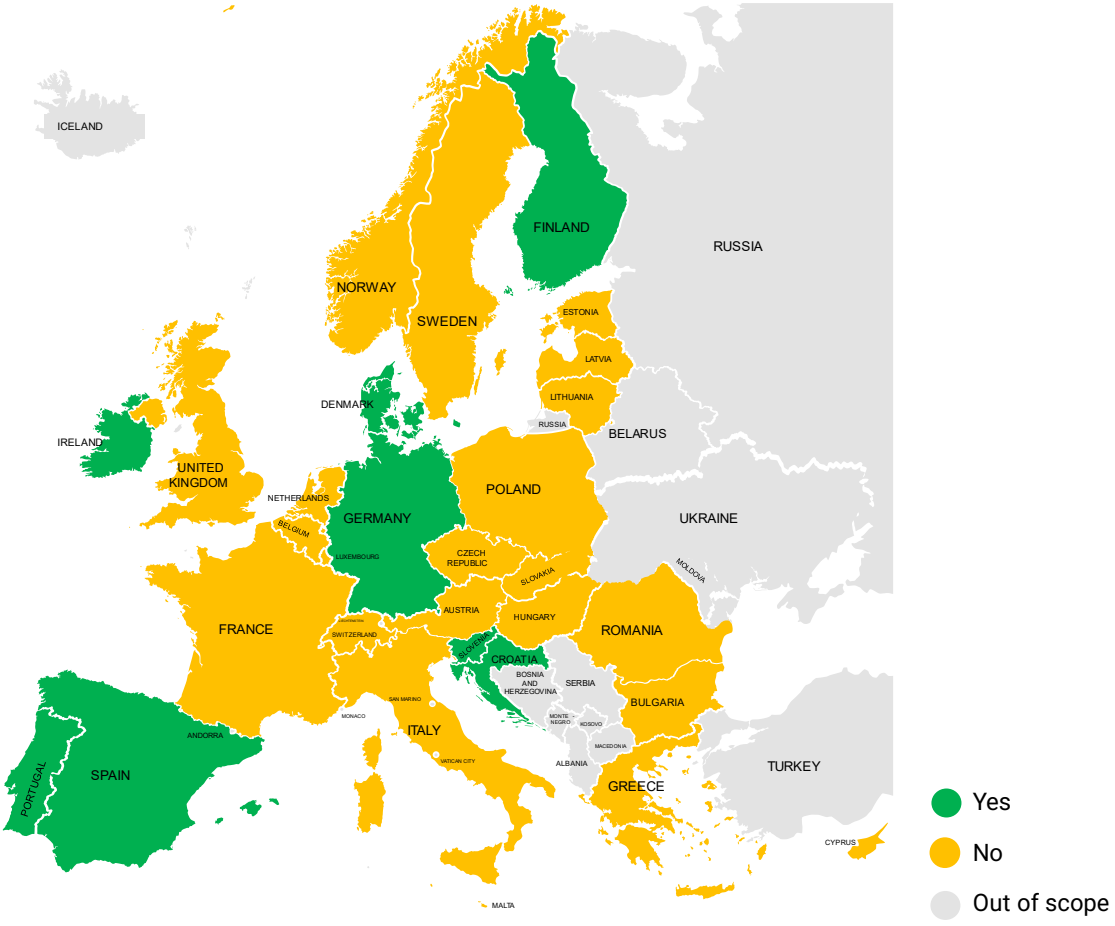


Figure 16. Map of countries reported to have in place a legal act or agency as a Single Point of Contact for hydrogen project developers.

Table 6. Titles and explanation of the legal acts or agencies operating as a single point of contact for hydrogen project developers per country.

Country	Title/name	Explanation
Croatia	Croatian Hydrocarbon Agency	Croatian Hydrocarbon Agency according to RES Law in Croatia become a National Coordinating Body for hydrogen (Article 58.a).
Denmark	The PtX Secretariat	The Danish Energy Agency has established a PtX Secretariat as part of the PtX Taskforce outlined in the PtX Strategy.The purpose is to provide a formal contact point for advising PtX stakeholders, including private actors and authorities, on permitting and approval processes.
Finland	Strategic net zero technology status	Finland has adopted the EU's Net Zero Technology Decree, and projects eligible for the Strategic Net Zero Technology Project status benefit from a dedicated point of contact to assist with the permitting process. Hydrogen projects can apply for this status, along with other renewable energy projects.
Germany	Förderberatung – Lotsenstelle Wasserstoff	The federal government has launched a central hydrogen website as a "one-stop shop" offering information on hydrogen, the National Hydrogen Strategy, and funding opportunities to support the adoption of hydrogen technologies at national, European, and international levels.
Ireland	Sustainable Energy Authority Ireland	SEAI is the single point of contact for consenting in Ireland in general. Although at the moment the current licence and permits finder does not list licences for hydrogen.
Portugal	E.Portugal	E.Portugal portal streamlines industrial tasks, including hydrogen production permits. Simulate requirements and submit formal requests on the same platform.
Slovenia	RES Contact Point	The RES Contact Point helps public and private applicants with permits and approvals for constructing and operating generating installations, connecting them to the grid, and accessing support programmes for renewable energy production, biofuels, cogeneration, and excess heat utilization. It operates under BORZEN, a state-owned enterprise.
Spain	Institute for Energy Diversification and Saving	This is the body in charge of managing the IDAE aid within the framework of the recovery, transition and resilience plan (PRTR)

3.2.2.

Transmission, distribution & storage

This section covers the questions answered by country specialists related to national policies and legislations on hydrogen transmission, distribution and storage.

The questionnaire sought to answer whether policies are in place and any other relevant details about the policy.

The main questions covered in the questionnaire concerning policies and legislation related to hydrogen transmission, distribution and storage included:

- Is there any support scheme for hydrogen when injected into the gas grid?
- Is there a legal hydrogen concentration limit into the transmission gas grid?
- What is the acceptable limit of H_2 into the transmission gas grid?
- Is there a legal framework for the operation of hydrogen storage facilities within national energy law?

Support scheme for gas grid injection

The number of countries reported to provide support schemes for hydrogen injection into the gas grid increased to 3 as of July 2025, including Bulgaria, Ireland, and Portugal, up from 2 in July 2024.

Bulgaria provides support for renewable hydrogen injection into the gas grid under Article 18 of the Law on Renewable Energy. The law guarantees priority access to the gas transmission and distribution networks for green hydrogen, where technically and safely feasible. Currently, injection at the transmission level is not possible, and feasibility at the distribution level remains uncertain.

In Ireland, current legislation allows renewable hydrogen to be eligible for Guarantees of Origin (GOs) when injected into the gas grid. However, the existing registry is currently operational only for biomethane, as no hydrogen production is currently taking place in Ireland. The processes for issuing Guarantees of Origin specifically for renewable hydrogen have not been developed yet. At the moment the national regulator is consulting on the issue.

Portugal supports renewable hydrogen injection into the gas grid under its National Hydrogen Strategy (EN-H2) and the Renewable Hydrogen and Biomethane Auction Scheme. Producers may benefit from partial or full exemptions from network access tariffs during an initial period, reducing operational costs and encouraging green hydrogen integration. In 2024, the auction scheme allocated 119,280 MWh/year of renewable hydrogen at €127 per MWh.

Hydrogen concentration limit in the gas transmission grid

Legal hydrogen concentration limits are set in order to ensure the safe and efficient integration of hydrogen into the transmission gas grid, while maintaining the stability and integrity of the existing infrastructure. Of the 30 countries examined, 13 reported to have established legal limits on hydrogen concentrations in their gas grids as of July 2025 (+2 countries compared to July 2024).

The maximum concentration of hydrogen (as a percentage) allowed in the gas transmission grid per country in Europe is presented in Figure 17.

Ireland, Estonia and United Kingdom, impose the most stringent limits on hydrogen (H_2) integration into the transmission gas grid, with acceptable thresholds set at <0.1 mol%, 0.1 vol%, and 0.1% respectively.

The Netherlands, Lithuania Italy and Belgium have set a more progressive approach, allowing 2% of hydrogen (H_2) integration into the transmission gas grid, while Spain follows with a threshold of 5% blending of hydrogen.

Portugal has set one of the highest acceptance limits, with regulation stating that the maximum quota for the blending of other gases in the national gas transmission network is 5% until 2025 and 10-15% until 2030. Austria also sets one of the highest acceptance limits with a 10% maximum concentration of hydrogen within the natural gas grid. In Slovenia, while no legally binding limit exists, distribution network operators typically allow up to 10% hydrogen in the gas network, reflecting common operational practice.

In Germany, due to the different requirements of end-use components no generally applicable limit value for hydrogen was specified in the current set of rules. The limit values result from the application areas of the gas infrastructure. In Slovenia, the share of hydrogen or any other gas that may be injected into the existing gas network is not nationally regulated. The rules can be found in the Gas Supply Act.

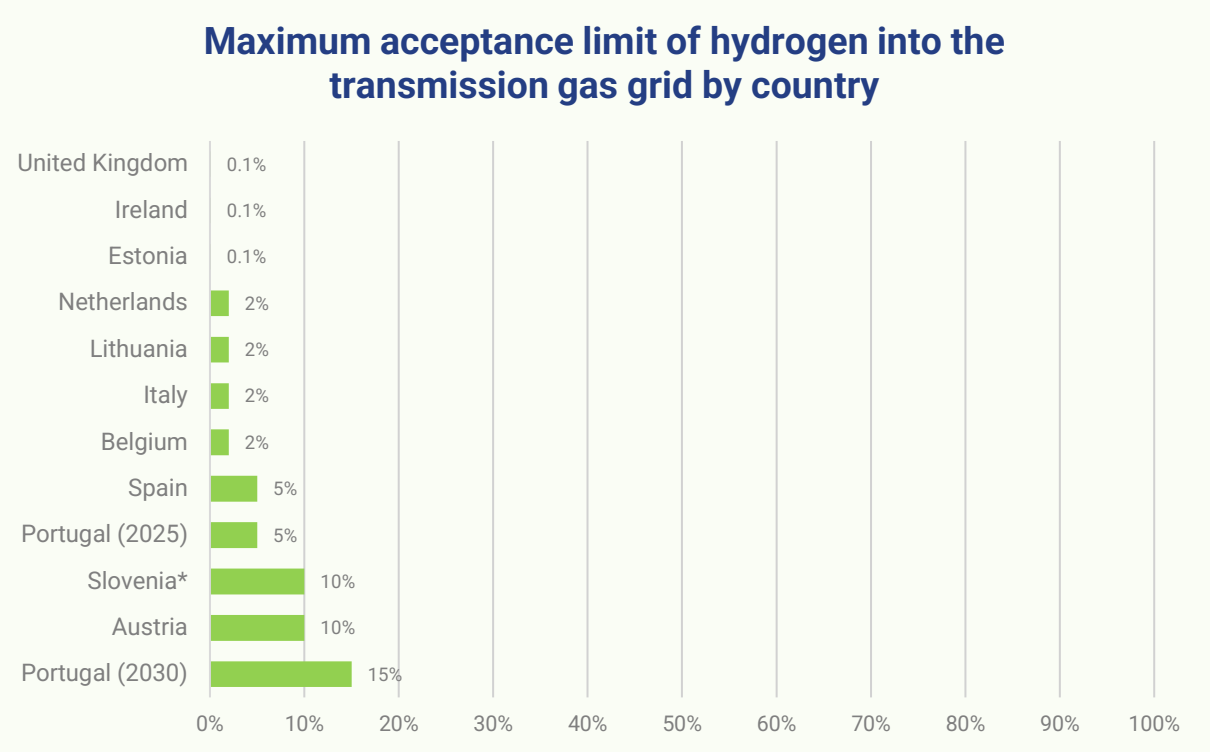


*Figure 17. Acceptance limit of hydrogen (%) into the transmission gas grid by country. *For Slovenia, no legally binding hydrogen limit exists; the 10% value shown reflects typical operational limits set by distribution network operators.*

Operation of hydrogen storage facilities

The development of policies and legislation for hydrogen storage operations play a pivotal role in ensuring safety, environmental protection, infrastructure development, market confidence, standardization, innovation, and energy integration. By providing a clear regulatory framework, governments create an enabling environment for the growth of the hydrogen economy. 9 European countries have been identified as having established legal frameworks for the operation of hydrogen storage as of July 2025 (+2 countries compared to July 2024). These countries are Austria, Finland, France, Germany, Greece, Norway, Romania, Spain, and Sweden.

In Austria, hydrogen storage facilities fall under the Austrian Gas Act (GWG 2011), which regulates access and operation of all gas storage sites, including hydrogen. §104 governs storage operation, while §133a enables the government to set hydrogen limits in the gas grid (currently 10 vol%). Storage facilities must be connected to the public gas network and follow “use-it-or-lose-it” rules. Technical standards from the ÖVGW H-series and standard permitting procedures, including EIAs where applicable, provide the detailed framework for safe implementation.

Finland has established a legal framework for the operation of hydrogen storage facilities under national energy law. Hydrogen storage is categorized as minor if its capacity is less than two tonnes, in which case it only requires reporting to the local rescue department.

Additionally, all hydrogen storage facilities exceeding a pressure of 0.5 bar are regulated under Finland's pressure equipment and vessel legislation to ensure safety and compliance.

In France, hydrogen storage is regulated under the régime légal des stockages souterrains, combining provisions from the Energy Code, Mining Code, and Environmental Code. Facilities must also meet ICPE safety requirements and comply with applicable EU directives.

In Germany, hydrogen storage is governed by the Wasserstoffbeschleunigungsgesetz (Hydrogen Acceleration Act), which accelerates planning and permitting for hydrogen production, storage, and import infrastructure. The law defines both underground and above-ground hydrogen storage facilities and introduces fast-track procedures across related legislation, including the Water Resources Act, the Energy Industry Act, the Federal Immission Control Act, and administrative court processes, reflecting the national priority placed on rapid hydrogen infrastructure deployment.

Greece has established a legal framework for the operation of hydrogen storage facilities under Ministerial Decision No. A.P. B 10451/929/88, which sets the terms for the establishment and operation of compressed gas filling stations, acetylene production units, as well as terms for the transportation, storage, and inspection of their container cylinders.

Norway has several laws and regulations under the authority of the Norwegian Directorate for Civil Protection (DSB), a leading Standard Norway's committee for hydrogen technology, "SN/K 182 Hydrogenteknologi". Hydrogen and ammonia handling, including its equipment and installations used in the handling, is regulated in the “Law on handling of flammable and reactionary and pressurized substances”. If a company stores minimum 5 tons hydrogen or minimum 50 tons ammonia, the Major Accident Law (Storulykkeforskriften) will apply. This law is based on the EU Seveso III Directive (2012/18/EU). Norway has also implemented the EU ATEX user directive (1999/92/EC) and the EU Pressure Directive (2014/68/EU).

Romania has a legal framework for hydrogen storage through ANRE’s “Hydrogen Code,” established by Order No. 63/2023. This framework follows amendments to the Energy Law (Law 155/2020), which introduced specific provisions on hydrogen production and mandated ANRE to develop the general regulatory rules for hydrogen, including storage.

In Spain a working group is currently engaged in the development of regulations relating to hydrogen refuelling stations, professional qualifications, hydrogen production, storage and transport, as well as the homologation of hydrogen vehicles, fuel cells and their possible uses.

The Swedish policy law includes a handling regulation for flammable gas and flammable aerosols (MSBFS 2020:1) with requirements for, among other things, tightness, materials, signage, and ventilation, but also requirements for pipelines, loose containers, tanks, etc.

3.2.3.
End-uses: mobility

This section covers the questions answered by country specialists related to national policies and legislations on hydrogen end-use in mobility.

The questionnaire sought to answer whether policies are in place, their economic value (in EUR or as % of the vehicle cost or tax due), the type of support schemes (e.g. purchase subsidy, tax benefits etc.), which modes of transport they apply to (heavy-duty vehicles, passenger cars, boats etc.), and any other relevant details about the policy.

The main questions covered in the questionnaire concerning policies and legislation related to hydrogen end-use in mobility included:

- Are there any support schemes offered to FCEVs?
- Are there any national FCEV deployment targets?
- Is there any support offered for HRS deployment in your country?
- Is hydrogen used as fuel taxed in your country?
- Are there any national HRS deployment targets?
- Are there official guidelines in place that cover permitting of HRS?

FCEVs

Figure 18 presents the number of countries reported to offer support schemes for Fuel Cell Electric Vehicles (FCEVs) across various types of support. A total of 20 countries are identified as providing such schemes, representing an decrease of 3 countries compared to the previous report, reflecting the situation as of July 2024.

Purchase subsidies are the most widely used support mechanism for FCEVs, with 18 countries implementing this form of assistance. Additionally, tax benefits are provided by 11 countries, while 2 countries offer other financial incentives and rely on non-economic benefits as a means of support. An overview of the types of support schemes offered to FCEVs by country is given in Table 7.

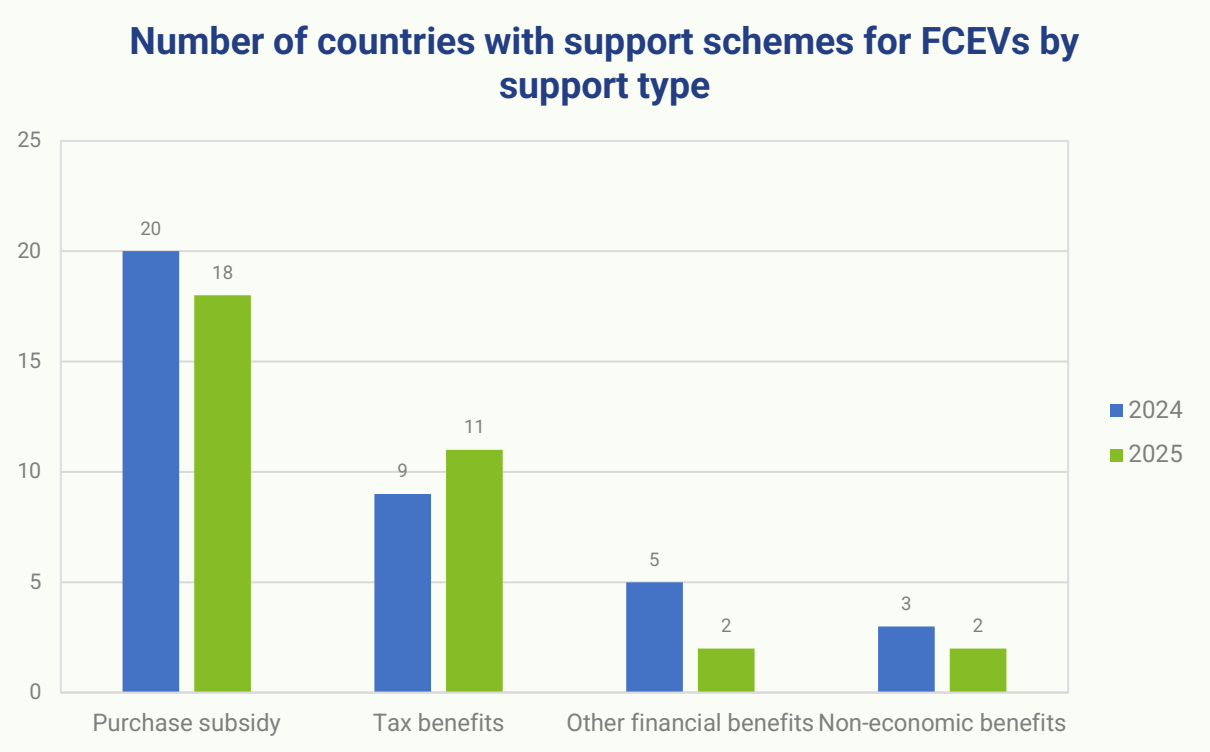


Figure 18. Number of countries reported to provide support schemes offered to FCEVs by support type.

Table 7. Overview of the types of support schemes offered to FCEVs by country.

Country	Purchase subsidy	Tax benefits	Other financial benefits	Non-economic benefits
Austria	√	√		√
Belgium	√	√		√
Croatia	√			
Czech Republic	√			
Denmark	√	√		
France	√			
Hungary	√			
Ireland	√	√		
Latvia	√			
Lithuania	√			
Luxembourg	√			
Malta		√		
Netherlands	√	√`	√	
Norway	√	√	√	
Poland	√			
Portugal	√	√		
Slovakia	√			
Slovenia	√	√		
Spain	√	√		√
Switzerland		√		

Figure 19 illustrates the distribution of support schemes for FCEVs across various vehicle types. The data for July 2025 highlights that passenger cars/vans (M1, N1) continue to be the primary focus of support schemes, implemented in 16 European countries, a decrease from 21 countries in July 2024.

Light-duty vehicles (M2, N2) are supported in 12 countries, down from 15, reflecting a slight reduction in coverage. Support for heavy-duty vehicles (N3) and buses (M3) remains stable, each supported in 16 countries, unchanged compared to July 2024. Boats and ships continue to receive support in 4 countries, slightly lower than 5 in the previous period. Non-road mobile machinery is now supported in 2 countries, down from 4, while support for trains and light rail remains limited to 2 countries, unchanged from July 2024. Overall, the trend in 2025 indicates a narrowing of support across some vehicle categories, while the focus on the more heavy-duty road vehicles remains consistent.

Table 8 gives an overview of the different vehicle type applications of support schemes offered to FCEVs by country.

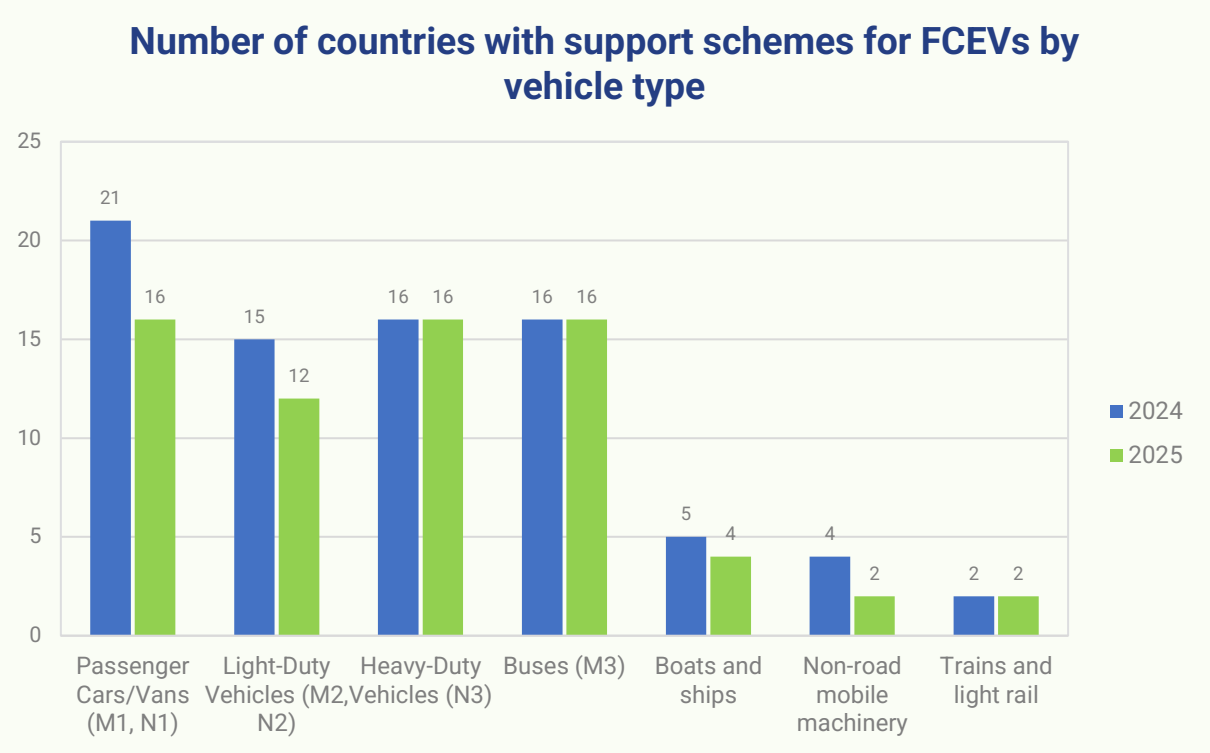


Figure 19. Number of countries with FCEVs support by vehicle type.

Table 8. Overview of the different vehicle type applications of support schemes offered to FCEVs by country.

Country	Passenger Cars/Vans (M1, N1)	Light-Duty Vehicles (M2, N2)	Heavy-Duty Vehicles (N3)	Buses (M3)	Boats and ships	Non-road mobile machinery	Trains and light rail
Austria	√	√	√	√	√		
Belgium	√	√	√	√			
Croatia	√						
Czech Republic			√	√			
Denmark	√	√	√	√			
France	√	√					
Hungary			√	√			
Ireland	√	√	√	√			
Latvia	√						
Lithuania	√	√	√	√			
Luxembourg	√	√					
Malta		√	√	√			
Netherlands	√	√	√	√	√	√	√
Norway	√		√	√	√		
Poland	√		√	√			
Portugal	√	√	√	√	√		
Slovakia			√	√			
Slovenia	√	√	√	√	√		
Spain	√		√	√	√	√	√
Switzerland	√	√	√	√			

HRS

Figure 20 shows the responses from the EU countries regarding policies and legislation for hydrogen refuelling stations (HRS) deployment as of July 2025. 15 countries reported to offer support for HRS deployment, representing a decline of 6% compared to July 2024. Additionally, 14 countries have established national targets for HRS deployment, reflecting a rise of 27% over the same period. Meanwhile, 6 countries impose taxes on hydrogen fuel usage, an increase of 50% compared to July 2024, and 16 countries have issued official guidelines for HRS permitting, marking a 33% increase from August 2023.

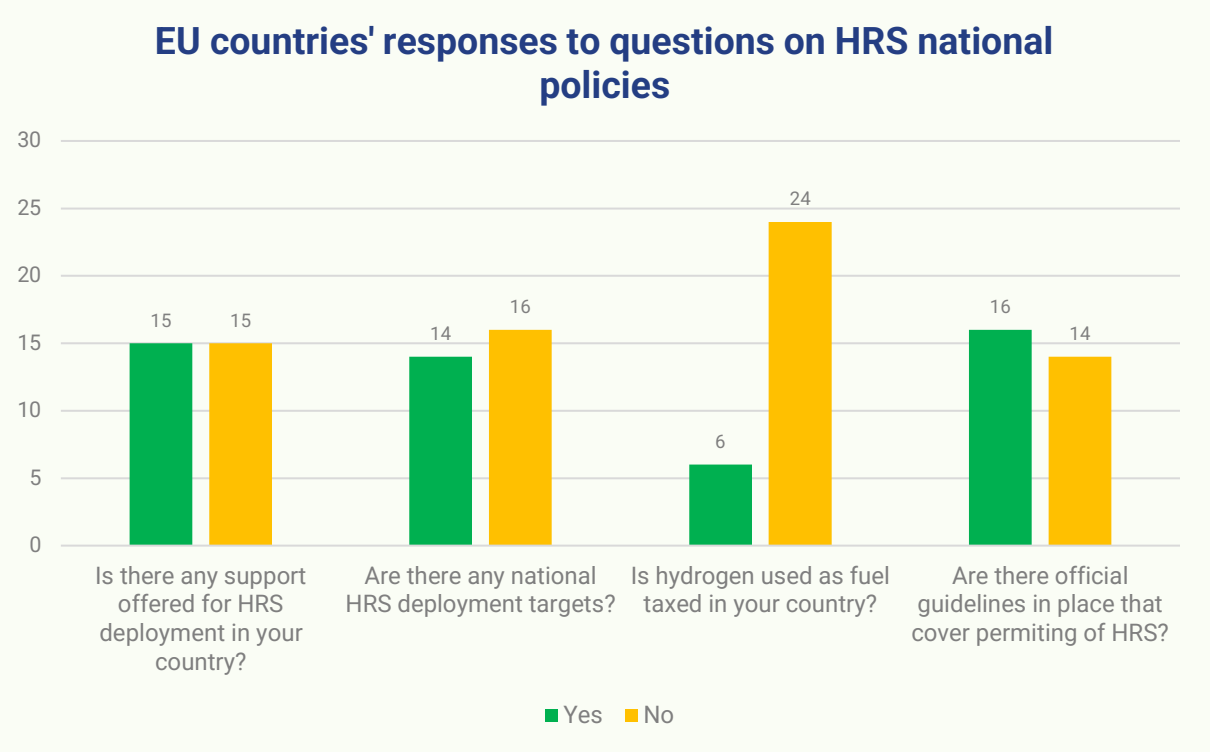


Figure 20. EU countries' responses to key questions on hydrogen refuelling station (HRS) policies.

3.2.4.

End-uses: stationary power & heating

This section covers the questions answered by country specialists related to national policies and legislations support for stationary fuel cells providing electricity and/or heat.

The questionnaire sought to answer whether the policies are in place, their economic value (in EUR or as % of the investment or tax due), and any other relevant details about the policy.

The main questions covered in the questionnaire concerning policies and legislation related to support for stationary fuel cells providing electricity and/or heat included:

- Is there any support offered to stationary fuel cell applications?
- Is there any support offered to deployment of residential/commercial heating with hydrogen?

Stationary fuel cell applications

Figure 21 presents the share of countries reported to provide support for stationary fuel cell applications. Only 5 countries out of 30, Belgium, Finland, the Netherlands, Norway and Sweden, reported to offer support to stationary fuel cell applications as of July 2025 (+1 country compared to July 2024).

Belgium offers support for stationary fuel cell applications through CHP certificates (Warmte-krachtcertificaten). This is a generic measure applicable to all types of combined heat and power (CHP) installations, including fuel cells.

Finland offers support to stationary fuel cell applications through the Energy aid provided by the Ministry of Economic Affairs and Employment. This support applies to fuel cell projects that use new technology with higher risk levels.

In the Netherlands, stationary fuel cell applications receive indirect support through state aid under IPCEI Hy2Tech projects and programmes by the Netherlands Enterprise Agency (RVO), such as SH2IPDRIVE and the DEI+ scheme. The level of support varies depending on the system.

In Norway, stationary fuel cell applications receive indirect support through Enova, which has funded projects utilizing hydrogen to achieve zero emissions at construction sites. However, there are no specific programmes exclusively dedicated to stationary fuel cells.

In the case of Sweden, from 1 January 2021, individuals can receive support when investing in renewable technology such as stationary fuel cell applications. The support is a maximum 50% tax reduction for individuals on the cost of labour and materials. The tax reduction is solely for individuals.

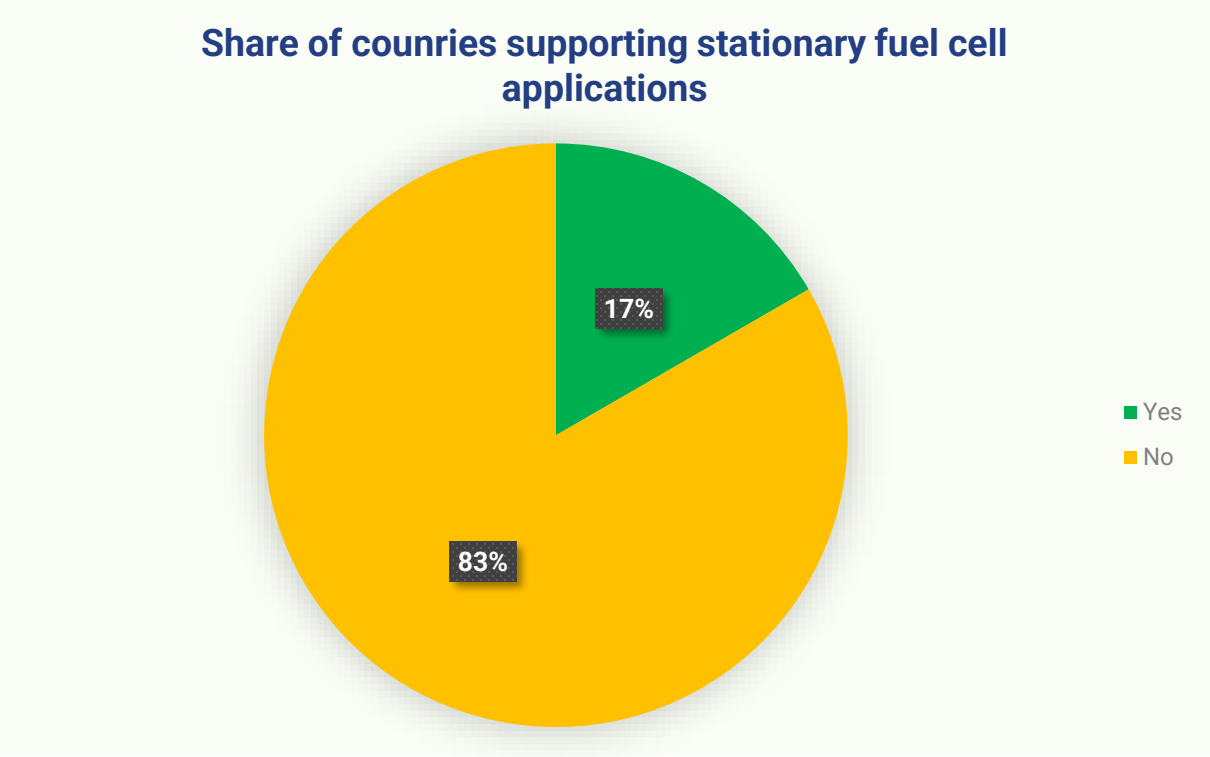


Figure 21. Share of countries reported to offer support for stationary fuel cell applications.

Residential/commercial heating

Figure 22 presents the share of countries reported to offer support for the deployment of residential/commercial heating with hydrogen. As of July 2025, 3 countries reported to provide support for the deployment of residential and commercial hydrogen heating, a decrease of 3 countries compared to July 2024. This includes Belgium, Germany and Slovenia.

Belgium offers support for the deployment of residential and commercial heating with hydrogen through Warmte-krachtcertificaten (CHP certificates). This is a generic support measure that applies to all types of combined heat and power (CHP) installations, including those using fuel cells.

In Germany, the BEG EM programme provides support for residential and commercial hydrogen heating with grants of up to 30%, which can be combined with bonuses. These include a 20% Climate Speed Bonus for replacing old heating systems and a 30% Income Bonus for households earning up to 40,000 EUR. Total funding can reach up to 70%. Additionally, recipients can apply for loans of up to 120,000 EUR per residential unit, with favourable terms for households earning up to 90,000 EUR.

In Slovenia, the "Call for tenders for the co-financing of the restructuring of RES district heating systems" offers subsidies of up to 45% of investment costs for projects involving renewable energy-based heat generators including hydrogen-based heating systems. The funding, totalling 11 MEUR, is provided by the European Union under the "NextGenerationEU" Recovery and Resilience Fund, and is available to companies, sole traders, and cooperatives.

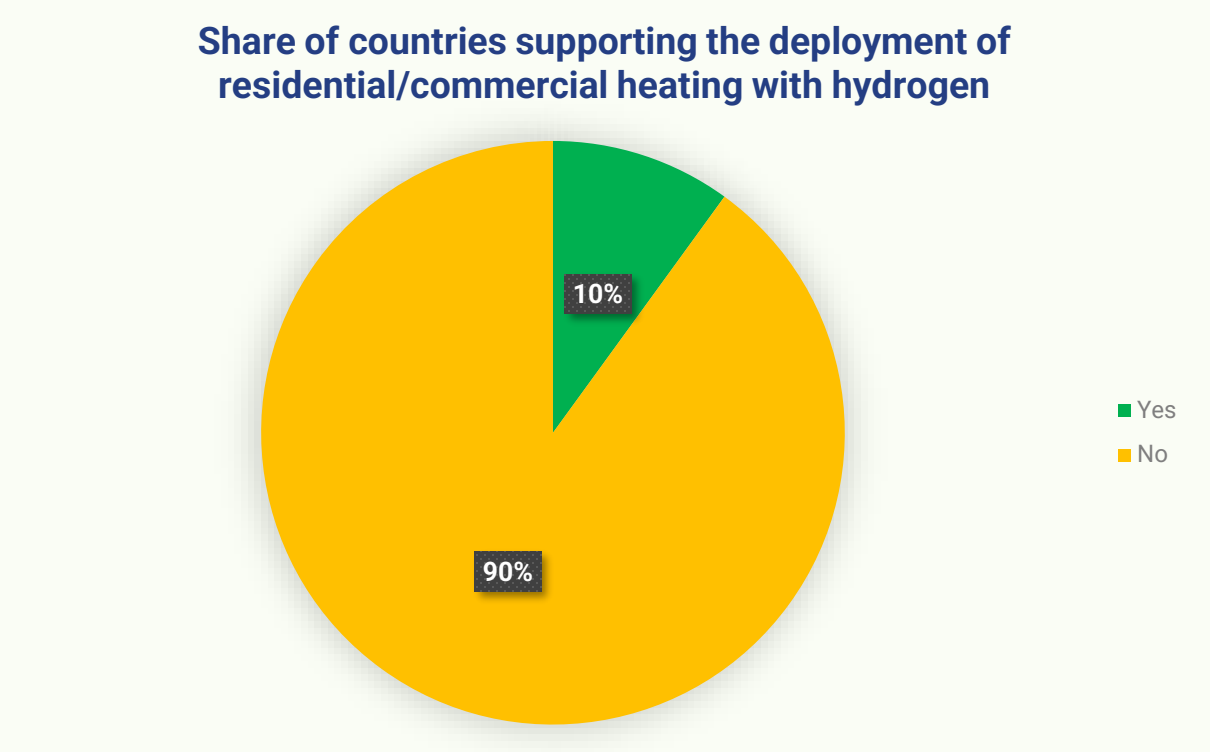


Figure 22. Share of countries reported to support the deployment of residential/commercial heating with hydrogen.

3.2.5.

End-uses: industry

Even though hydrogen has been used in the industry for decades, the future use of renewable or low-carbon hydrogen for heat, as a feedstock, or as a chemical agent are some of its most promising use cases. This section explores policies supporting increased usage of clean hydrogen in industry.

The questionnaire sought to answer whether the policies are in place, what is their economic value, what industries they cover, and any other relevant details about the policy.

The main question covered in the questionnaire concerning policies and legislation related to the hydrogen industry included:

- Are there any deployment support schemes for the use of renewable/low-carbon hydrogen in industry?

Support schemes in Industry

Figure 23 presents the share of countries reported to offer support schemes for the use of renewable/low-carbon hydrogen in industry. As of July 2025, 16 countries (Austria, Croatia, Czech Republic, Estonia, France, Germany, Ireland, Italy, Netherlands, Norway, Poland,

Slovenia, Spain, Sweden, Switzerland and the United Kingdom) now provide deployment support schemes for the use of renewable/low-carbon hydrogen in industry.

This represents an increase of 4 countries compared to July 2024. The new additions to the list are Czech Republic, France, Germany, Poland and Switzerland while Slovakia no longer appears among the countries offering these schemes.

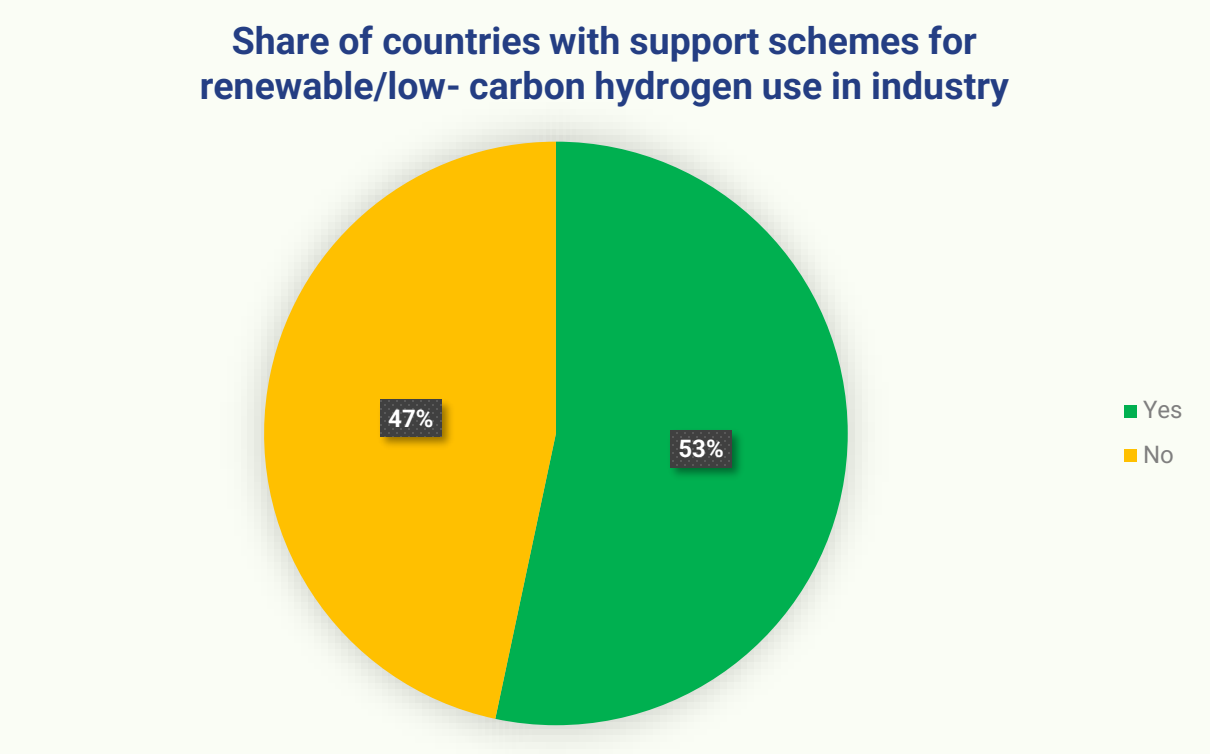


Figure 23. Share of countries reported to provide support schemes for renewable/low-carbon hydrogen use in industry.

The country-by-country overview below summarizes the support schemes as reported in the questionnaires, indicating the scale or value of financial support available for the deployment of renewable and low-carbon hydrogen in industry.

Austria's "Transformation of the industry" scheme under the Environmental Support Act (UFG) provides funding of up to 80% of project costs, with a maximum of 30 MEUR per project. In 2024, €85 million is specifically allocated for projects supporting greenhouse gas reduction, including hydrogen production facilities.

Croatia provides support for the deployment of renewable/low-carbon hydrogen in industry through the Recovery and Resilience Fund. A total of 13.5 MEUR has been allocated to back projects implementing hydrogen technologies, with funding available for eligible industry stakeholders to submit proposals.

In the Czech Republic, the ENERGETS scheme provides funding of 15 billion CZK (approximately

620 MEUR[50]) for industrial projects. The call, funded under the Modernisation Fund, targets assets covered by the EU Emissions Trading System (EU ETS) and supports modernization of heat sources, fuel switching, and reconfiguration of processing assets to reduce CO_2 emissions.

Estonia provides 50 MEUR in funding through an initiative launched by the Ministry of Climate and the Environmental Investment Centre (EIC) to support projects using green hydrogen. The scheme, financed by the EU Recovery and Resilience Facility, allocates 49.1 MEUR to projects across the hydrogen value chain, including electrolysis, with completion required by May 2026.

France has allocated 350 MEUR through the Briques technologiques et démonstrateurs hydrogène programme to support innovative hydrogen projects. The scheme funds activities ranging from the development of new hydrogen components and systems to industrial pilots, vehicle design, and large-scale electrolysis demonstrators, targeting the advancement and early deployment of hydrogen technologies.

Germany provides support through the Federal Funding Programme for Decarbonisation of Industry and Carbon Management, offering up to 200 MEUR per organisation. The scheme funds investment projects that reduce industrial greenhouse-gas emissions, including technologies enabling electrification or a switch to hydrogen. Funding intensity can reach up to 60% of eligible costs for hydrogen-related projects.

Ireland offers support through the Capital Investment for Decarbonisation Processes scheme, providing up to 1 MEUR per project. Funded under the Enterprise Emissions Reduction Investment Fund, it can include hydrogen-related projects if they demonstrate suitability for reducing emissions in manufacturing processes.

Italy has allocated 550 MEUR, funded through the Italian National Recovery and Resilience Plan (PNRR). This funding aims to help companies reduce greenhouse gas emissions by at least 40% or energy consumption by 20% by transitioning from fossil fuels to renewable hydrogen, with a target of 100% hydrogen use by 2036.

The Netherlands provides support through two main schemes. The DEI+ programme, with a 2025 budget of 175 MEUR, funds innovative projects, including those involving renewable hydrogen, across pilot, demonstration, and experimental infrastructure activities aimed at reducing CO_2 emissions. In addition, the VEKI scheme, with a recent budget of 130 MEUR, supports market-ready industrial investments that deliver CO_2 reductions, with renewable hydrogen eligible where it contributes to emissions abatement.

Norway's Industry 2050 – Point Source Emissions Programme allocates 300 MNOK for hydrogen production projects and 300 MNOK for

[50] Conversion factor used: 1 CZK = 0.04136 EUR

hydrogen use, equivalent to approximately 12.4 MEUR each[51]. This funding supports technologies that can deliver substantial reductions in industrial greenhouse gas emissions.

Poland's B2.1.1. Investments in hydrogen technologies program supports the development of RFNBO and low-emission hydrogen production, storage, and transport, with funding intensity determined by national regulations and European Commission guidelines.

Slovenia offers the Loan 77PP024 program, providing favorable loans for demonstration projects and new technologies, including hydrogen. The total available funds amount to 2.5 MEUR, with loans covering up to 85% of eligible costs and a maximum of 2 MEUR per project.

In Spain, two main programs provide support: the H2 Valleys Program (1.2 billion euros) for large-scale renewable hydrogen clusters, and the H2 Pioneers Programme (150 MEUR) for pioneering projects replacing fossil fuels with renewable hydrogen in industry.

In Sweden, two main programs support the deployment of green hydrogen in industry. Klimatklivet provides 1.519 billion SEK (131 MEUR[52], 2015–2024) to enable investments in fossil-free technologies and the green transition across companies, municipalities, and organizations. Industriklivet offers 4.582 billion SEK (394 MEUR[45], 2018–2024) to support industrial projects aiming at greener and more sustainable practices.

In Switzerland, support for renewable and low-carbon hydrogen in industry is provided through a scheme that grants funding as a percentage of costs (OPEX and CAPEX), with the level of support depending on the achieved CO_2 reduction and the degree of innovation.

In the United Kingdom, support is available through the Industrial Energy Transformation Fund (IETF), which provides funding for industrial manufacturers to implement decarbonisation projects, including hydrogen fuel switching. The value of the subsidy is determined on an individual project basis.

In summary, the questionnaire responses highlight that European countries have implemented a diverse range of support schemes for renewable and low-carbon hydrogen in industry, varying in scale, funding structure, and allocation methods. Countries such as Italy, Spain, and France provide substantial centrally managed budgets, while Austria, Slovenia, and Ireland offer project-specific grants or loans. Overall, the data illustrate a growing commitment across Europe to foster hydrogen deployment, with a mix of mechanisms supporting both innovative pilot projects and larger industrial applications.

Figure 24 gives an overview on the number of countries that reported to offer support schemes

[51] Conversion factor: 1 NOK = 0.04136 EUR
[52] Conversion factor: 1 SEK ≈ 0.086 EUR

for the deployment of renewable/low-carbon hydrogen, categorized by the industry they target. A detailed country-by-country overview of the industry categories covered by these support schemes is provided in Table 9.

As of July 2025, the deployment of support schemes for renewable and low-carbon hydrogen across industrial sectors continues to expand compared to July 2024. The chemicals industry remains the most widely supported sector, increasing from 11 countries in 2024 to 15 in 2025, maintaining its leading position. Ammonia production has also grown, rising from 10 to 13 countries, and continues to be one of the key areas of focus.

Support for refineries and industrial heating has broadened as well, with both sectors increasing from 9 countries in 2024 to 14 in 2025, indicating a wider application of hydrogen in processing and heat-related activities. Steel production, while still somewhat less prevalent, has also expanded from 8 countries in 2024 to 13 in 2025.

Overall, all five industrial categories show an increase in the number of countries offering support schemes. This steady growth reflects an ongoing and more diversified deployment of renewable/low-carbon hydrogen across industrial sectors in 2025.

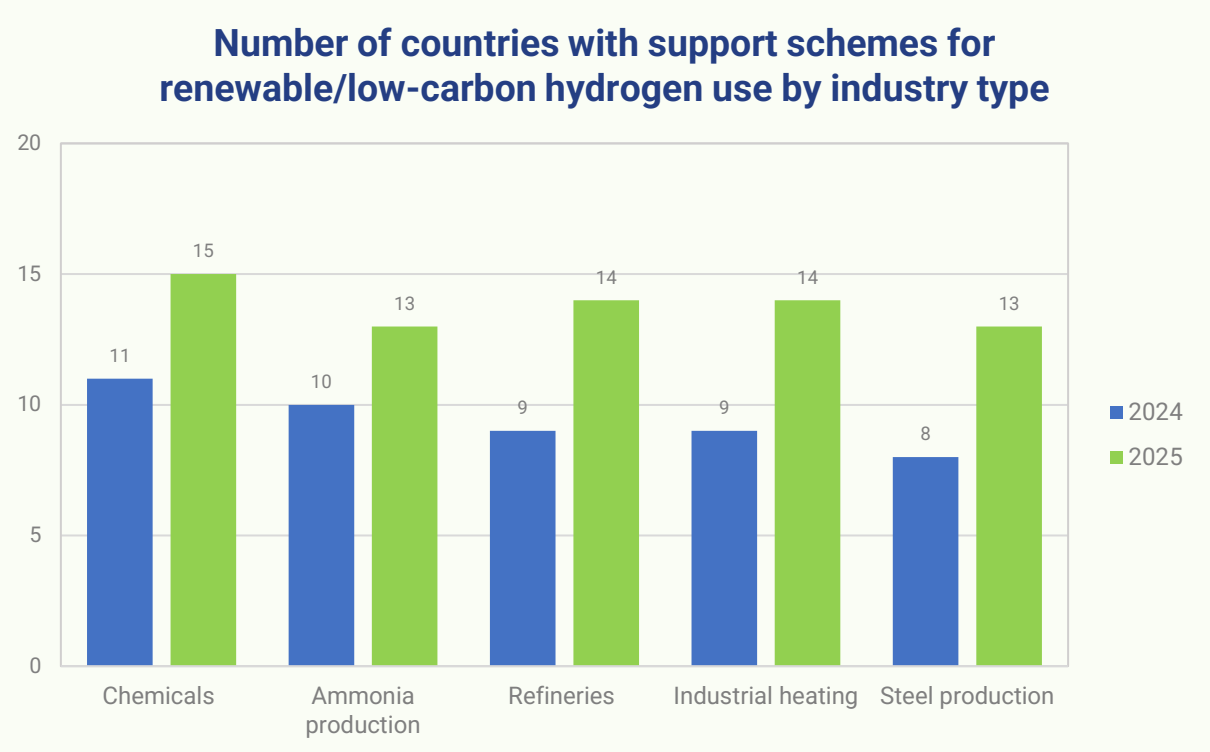


Figure 24. Number of countries with support schemes for the use of renewable/low-carbon hydrogen in industry.

Table 9. Overview of industries targeted by support schemes for renewable/low carbon hydrogen deployment by country.

Country	Chemicals	Ammonia production	Refineries	Industrial heating	Steel production
Austria	√	√	√	√	√
Croatia	√			√	
Czech Republic	√	√	√	√	√
Estonia	√	√	√		
France	√	√	√	√	√
Germany	√		√		√
Ireland				√	
Italy	√	√	√	√	√
Netherlands	√	√	√	√	√
Norway	√	√	√	√	√
Poland	√	√	√	√	√
Slovenia	√	√	√	√	√
Spain	√	√	√	√	√
Sweden	√	√	√	√	√
Switzerland	√	√	√	√	√
United Kingdom	√	√	√	√	√

3.2.6. Equipment manufacturing

This section covers the questions answered by country specialists related to national policies and legislations for electrolyser (and components) manufacturing.

The questionnaire sought to answer whether the policies are in place, their economic value (in EUR or as %), the type of support schemes (e.g. grant, tax benefits etc.), and any other relevant details about the policy.

The main question covered in the questionnaire related to policies and legislation supporting electrolyser (and components) manufacturing was:

- Are there any support schemes for electrolyser (and components) manufacturing?

Figure 25 illustrates the share of countries that reported to offer support schemes for electrolyser (and components) manufacturing. By July 2025, the number of countries offering such support schemes increased to 10, up from 7 in July 2024. France, Latvia, and Poland were added, while Belgium, Greece, Italy, the Netherlands, Norway, Spain, and Sweden continued to provide support.

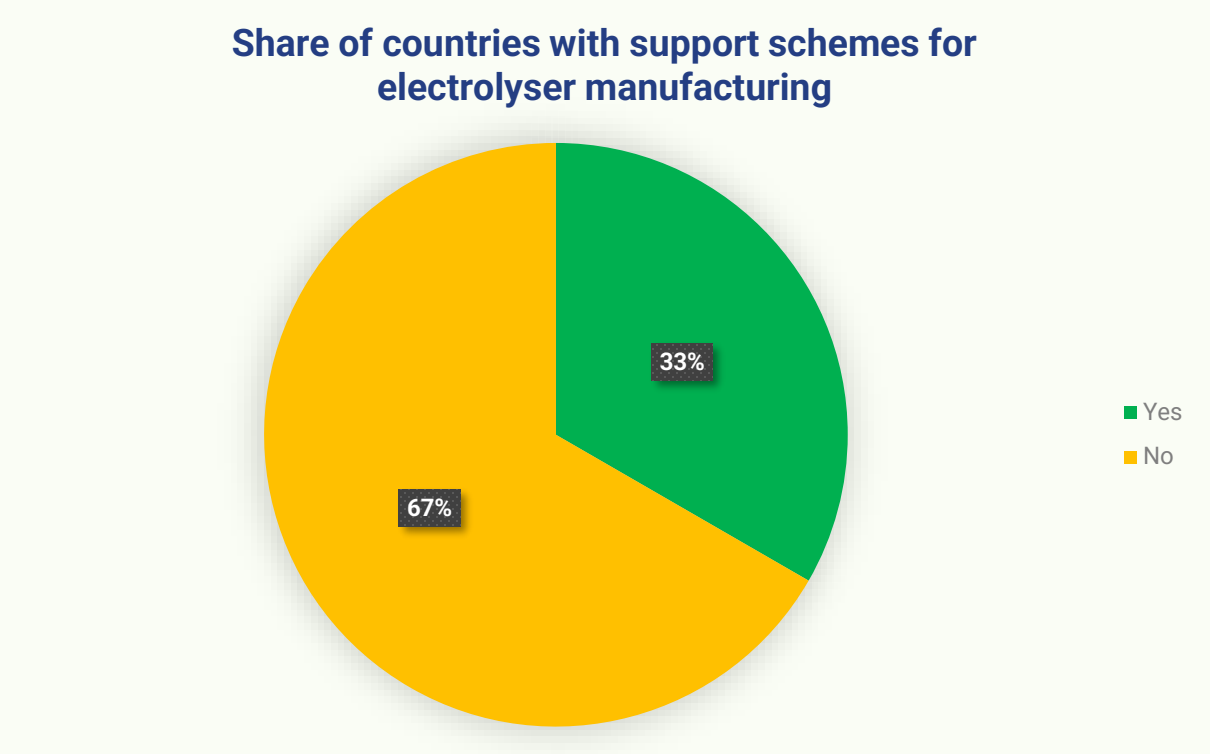


Figure 25. Share of countries with support schemes for electrolyser (and components) manufacturing.

Figure 26 presents the number of support schemes reported for electrolyser (and components) manufacturing in European countries. Latvia, Spain and Sweden reported having two support schemes in place for electrolyser manufacturing, while Belgium, France, Greece, Italy, the Netherlands, Norway, and Poland, each reported having one support scheme.

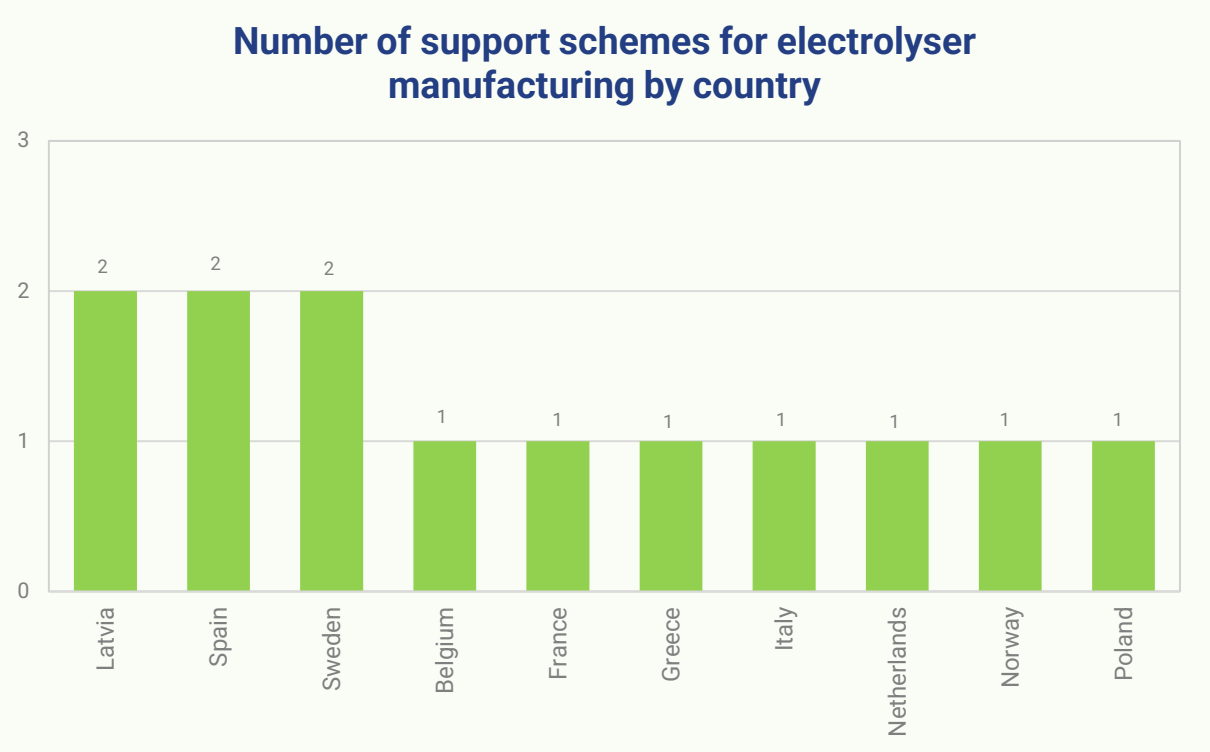


Figure 26. Number of support schemes for electrolyser manufacturing by country.

04 Codes and standards

Introduction

This chapter provides an overview of the key European standards that are relevant for the facilitation of the emerging clean hydrogen market.

The dataset of the European Hydrogen Observatory builds on the data that was included in the previous Fuel Cells and Hydrogen Observatory. This dataset has been updated with new standards that were published between January 2022 and June 2025, which were identified by searching the activities of key standardisation technical committees.

This chapter provides an overview of the standards that are included in the database, how they are categorised, and which new standards have been added in 2025. Moreover, it also gives some context, explaining the importance of standards in facilitating the large-scale deployment of hydrogen and fuel cells.

Interactive data dashboards on codes and standards can be accessed on the European Hydrogen Observatory website.

4.1.
Overview

The EHO includes a searchable database including 116 standards that are relevant to the facilitation of the emerging clean hydrogen sector. This is not a full exhaustive list of relevant standards, but rather an overview of some of the most important and directly relevant standards in place covering key components of the hydrogen value chain. The database includes 8 new or updated standards that were published between January 2025 and June 2025.

The standards included in the database were published by 21 different technical committees of standardisation bodies, which are explained in more detail in the next section. Of these 21 technical committees, 5 are responsible for publishing around 80% of the standards included in the database, as illustrated in Figure 27. These technical committees cover the following topic areas:

- Road vehicles (ISO/TC 22)
- Hydrogen technologies (ISO/TC 197)
- Fuel cell technologies (IEC/TC 105)
- Gas cylinders (ISO/TC 58)
- Independent gas-fired space heaters (CEN/TC 62)

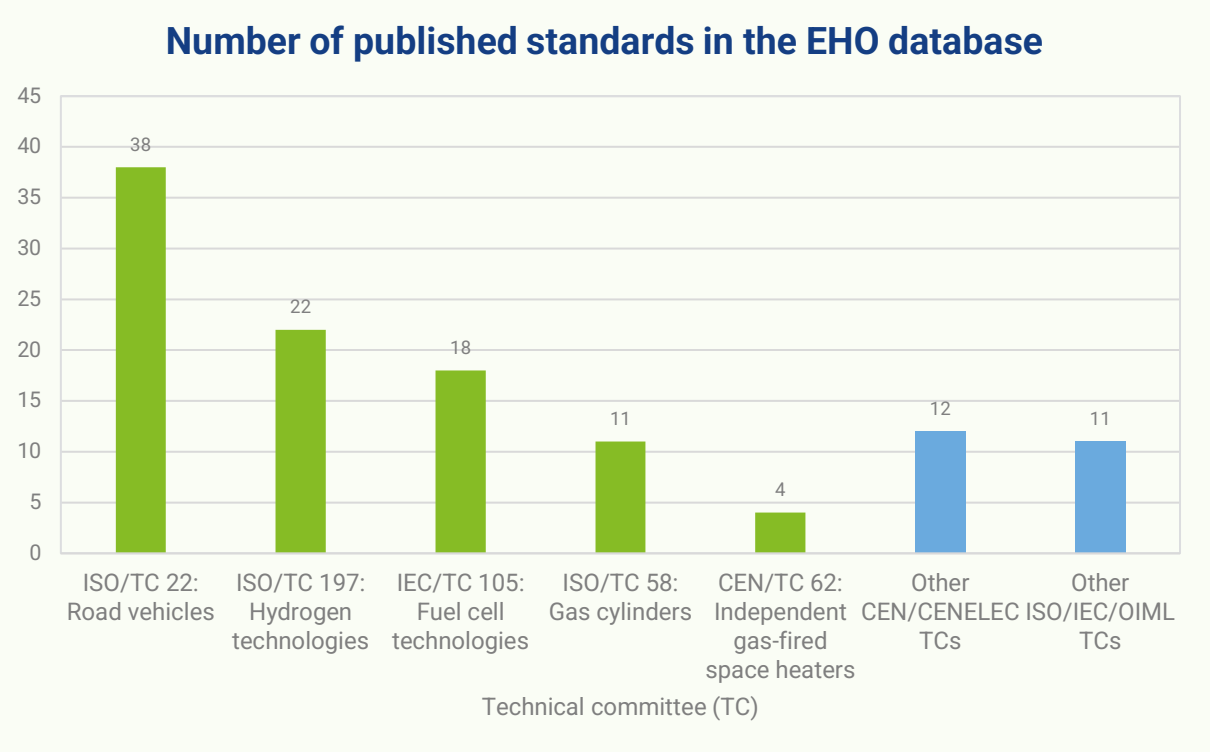


Figure 27. Number of published standards in the EHO per technical committee.

The standards are categorised in the EHO according to the different stages of the hydrogen value chain, as shown in Figure 28. This is a new categorisation structure compared with the previous observatory, which is also aligned with the categories used in other EHO datasets.

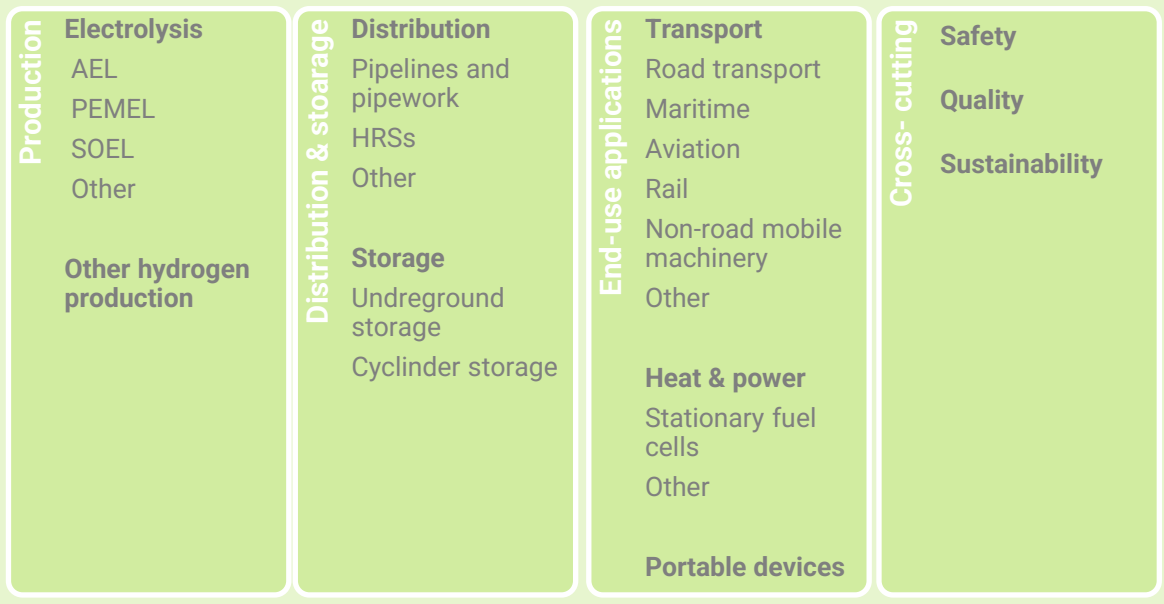


Figure 28. Categorization of standards in the EHO according to the different stages of the hydrogen value chain.

Figure 29 illustrates the number of standards included in the EHO database related to the different stages of the hydrogen value chain (production, distribution & storage, end-use applications, and cross-cutting). It is important to note that only the latest applicable standards are included, and older standards that have been updated are not listed in the database. Additionally, as some standards are relevant to multiple stages, the aggregated total in the figure exceeds 116.

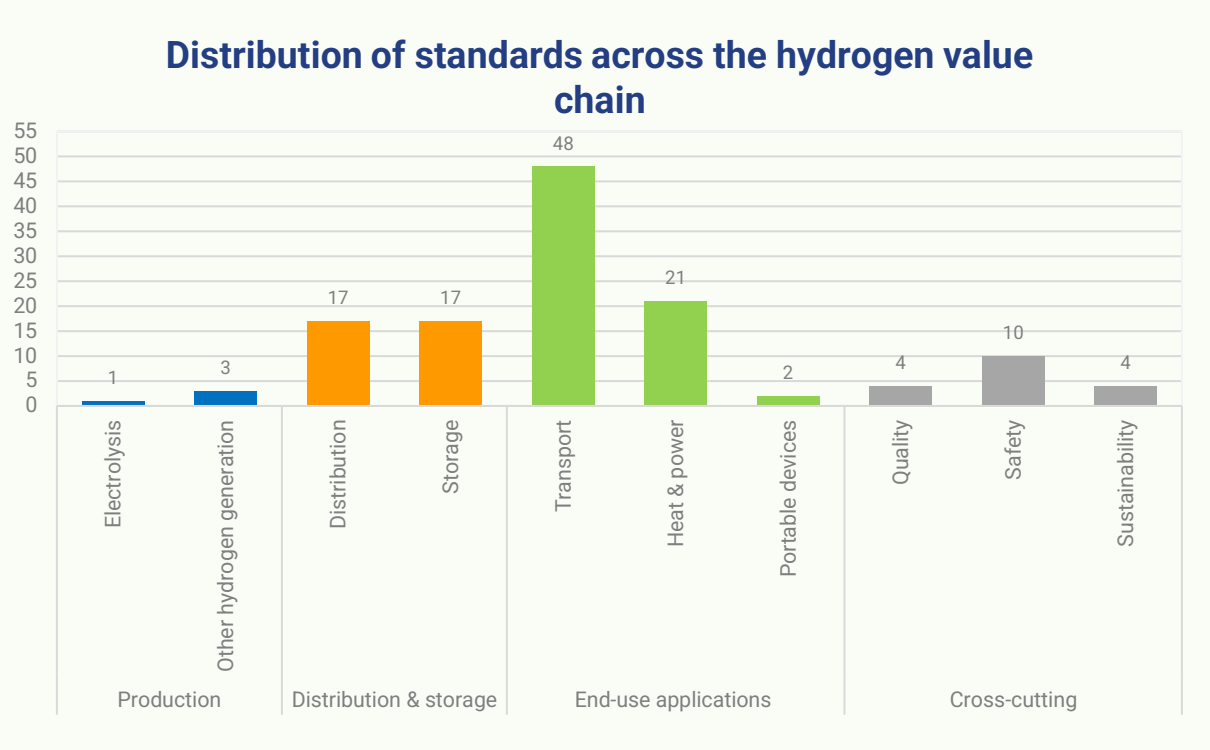


Figure 29. Distribution of standards included in the EHO database across different stages of the hydrogen value chain.

The largest category of standards included in the EHO database is end-use applications, which comprises 71 standards. These standards address the utilization of hydrogen across various sectors, ensuring its effective application in diverse contexts. Within this category, the majority of the standards focus on transport (48), reflecting the significant effort to ensure the safe design, operation, and deployment of hydrogen technologies in mobility. Additionally, 21 standards are dedicated to heat and power, highlighting the importance of safety, performance and integration of hydrogen within existing energy systems, while 2 standards are related to portable devices, highlighting niche applications for portable hydrogen-based technology.

The second largest standards category is distribution & storage, with a total of 34 standards. This stage of the hydrogen value chain focuses on the transportation and storage of hydrogen to ensure its safe and efficient delivery to end-users. The standards are equally distributed between distribution (17), which covers pipelines, HRSs, and other methods of

transport, and storage (17), which involves hydrogen containment technologies such as cylinder and underground storage.

Cross-cutting standards, which apply across multiple stages of the hydrogen value chain, account for 18 entries in the database. These are categorized into safety (10), emphasizing critical protocols to mitigate risks; quality (4), ensuring hydrogen purity and consistency; and sustainability (4), addressing environmental and long-term viability considerations.

Lastly, the production stage includes 4 standards, which cover the initial generation of hydrogen. This includes 1 standard for electrolysis, a key technology for producing green hydrogen, and 3 standards for other hydrogen generation methods, such as those based on fossil fuel reforming or biomass.

4.2.

Standardisation in the hydrogen sector

4.2.1.

Context

A 'standard' is a technical document, developed by consensus, that can be used as a rule, guideline or definition. It should define a repeatable way of doing something[53]. Within the European Union, standards are a core component that enable the functioning of the single market. For example, harmonised standards enable companies to demonstrate EU law compliance. Standards also give consumers confidence in relation to safety and quality and enable interoperability and cross-border trade.

Standards have already played an important role in facilitating research and innovation in hydrogen generation and applications. However, standardisation activities will need to be accelerated to facilitate the rapid development of the hydrogen market[54]. This fits into a wider challenge, addressed in the EU's Strategy on Standardisation, to respond to an increasingly rapid innovation pace whilst maintaining quality, and also to ensure that the EU can influence global standardisation.[55].

The need to keep pace with the constantly developing policy and technological developments is illustrated in Figure 30. This figure shows the expected pace of change of the

[53] European Standards - CEN-CENELEC (cencenelec.eu)
[54] 20230301_ech2a_roadmaphydrogenstandardisation.pdf (cencenelec.eu)
[55] 20230301_ech2a_roadmaphydrogenstandardisation.pdf (cencenelec.eu)

European renewable hydrogen market in the top arrow, with targets to accelerate production over the next decade and to 2050. This will be underpinned by policy and legal frameworks and technological developments, illustrated in the second arrow in the figure. Finally, as illustrated in the bottom arrow, in order for hydrogen technologies to be deployed on the market, standards need to be developed, to facilitate safety, quality and compliance. Standards can then also be used to certify products as safe and fit to be placed on the European market.

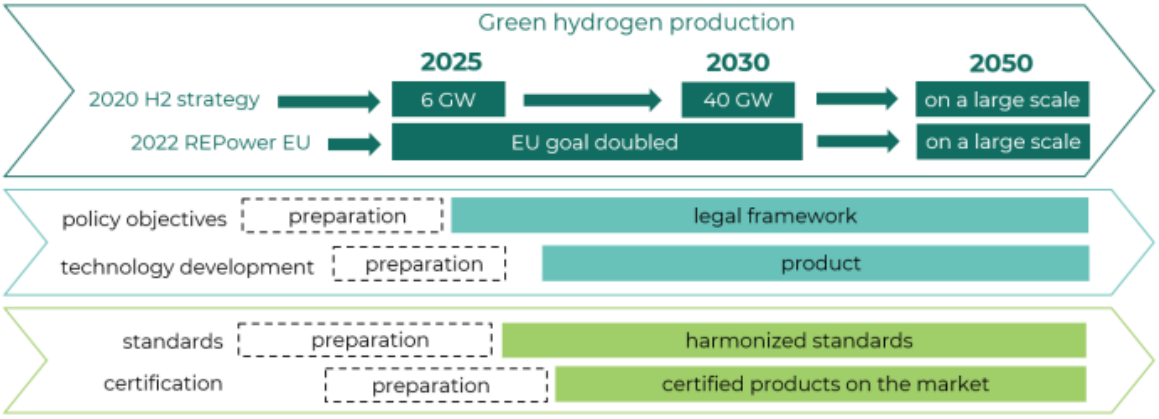


Figure 30. Interlinkages between policy objectives, technology development, standard-setting, and certification[56]

4.2.2.
Standardisation bodies

The codes and standards module covers hydrogen standards developed by the following bodies: ISO, IEC, OIML, CEN, CENELEC. These are described in more detail in this section. Within each organisation, technical committees bring together key stakeholders to develop standards.

Global bodies: ISO, IEC and OIML

ISO (the International Standardisation Organisation) and IEC (the International Electrotechnical Commission) bring together experts from approximately 170 countries globally to develop voluntary, consensus-based standards.

One of the key ISO Technical Committees that deals with Hydrogen is ISO/TC 197: Hydrogen Technologies. The scope of this committee is standardisation in the field of systems and devices for the production, storage, transport, measurement and use of hydrogen. The committee has recently established a sub-committee: (ISO/TC 197/ SC1), focused on standardization of large-scale hydrogen energy systems and applications including aspects of

[56] 20230301_ech2a_roadmaphydrogenstandardisation.pdf (cencenelec.eu)

testing, certification, sustainability and placement, and coordination with other relevant standardisation bodies and stakeholders[57]. This will help to facilitate, for example, applications where overlap or blending with other fuels and energy carriers and systems is considered.

One of the key IEC Technical Committees that deals with Hydrogen is TC 105: Fuel Cell Technologies. The scope of this committee is to prepare international standards regarding fuel cell (FC) technologies for all FC types and various associated applications such as stationary FC power systems for distributed power generators and combined heat and power systems, FCs for transportation such as propulsion systems (excluding road vehicles, coordinated by ISO/TC 22 which have also published several relevant standards, range extenders, auxiliary power units, portable FC power systems, micro FC power systems, reverse operating FC power systems, and general electrochemical flow systems and processes[58]. This committee is currently developing many standardisation projects, including in the emerging applications of electrically powered industrial trucks, unmanned aircraft systems, and railways.

The EHO also includes some standards from the OIML (International Organisation for Legal Metrology). This is an international standard-setting body linked to the World Trade Organization's Technical Barriers to Trade Agreement. OIML standards should therefore be applied, when appropriate, by all signatories of the WTO Technical Barriers to Trade (TBT) Agreement when developing technical regulations, in application of Article 2.4 of that Agreement.

European bodies: CEN and CENELEC

CEN (The European Committee for Standardization) and CENELEC (European Committee for Electrotechnical Standardization) are two organisations that bring together members from 34 countries to develop European standards and are able to work on standardisation requests issued by the European Commission.

Both organisations have the goal to pursue one standard, one test, accepted everywhere[59]. In support of this, they actively support the activities of ISO and IEC, including through technical cooperation facilitated by the Vienna Agreement (between CEN and ISO) and the Frankfurt Agreement (between CENELEC and IEC).

CEN and CENELEC have recently established the CEN-CENELEC Joint Technical Committee 6: Hydrogen in energy systems, which is looking into standardisation in devices and connections for the production, storage, transport and distribution, measurement and use of hydrogen from renewable energy sources and other sources[60]. In addition, the two organisations have established a Joint Task Force on hydrogen in

[57] ISO/TC 197/SC 1 - Hydrogen at scale and horizontal energy systems
[58] IEC - TC 105 Dashboard> Scope
[59] CEN and CENELEC - CEN-CENELEC (cencenelec.eu)
[60] Hydrogen - CEN-CENELEC (cencenelec.eu)

natural gas systems with the intention to support the timely provision of coherent deliverables in the different CEN and CENELEC Technical Committees, which will allow a safe and reliable use of hydrogen in a decarbonizing energy system[61]. The EHO also includes relevant standards from technical committees that have a broader topic focus. For example, there are 8 standards in the database that were published by CEN/TC 62, which sets standards for independent gas-fired space heaters.

Figure 31 shows an illustration developed for the European Clean Hydrogen Alliance roadmap on standardisation of the known technical committees that are dealing with hydrogen topics across the hydrogen value chain, with global standards in the outer circle and European standards in the inner circle. This includes some committees that have been set up specifically to tackle hydrogen topics, such as the 'ISO/TC 197: Hydrogen Technologies', as well as broader technical committees that cover some standardisation topics that are also relevant to hydrogen deployment, such as 'CEN/TC 15: Inland navigation vessels'. The figure illustrates the fact that many technical committees cover topics across the hydrogen value chain. It is expected that this landscape will continue to develop over coming years, with additional technical committees being set up to tackle specific issues. Against this backdrop, it will be increasingly important to coordinate efforts between standardisation bodies and committees.

[61] Ibid.

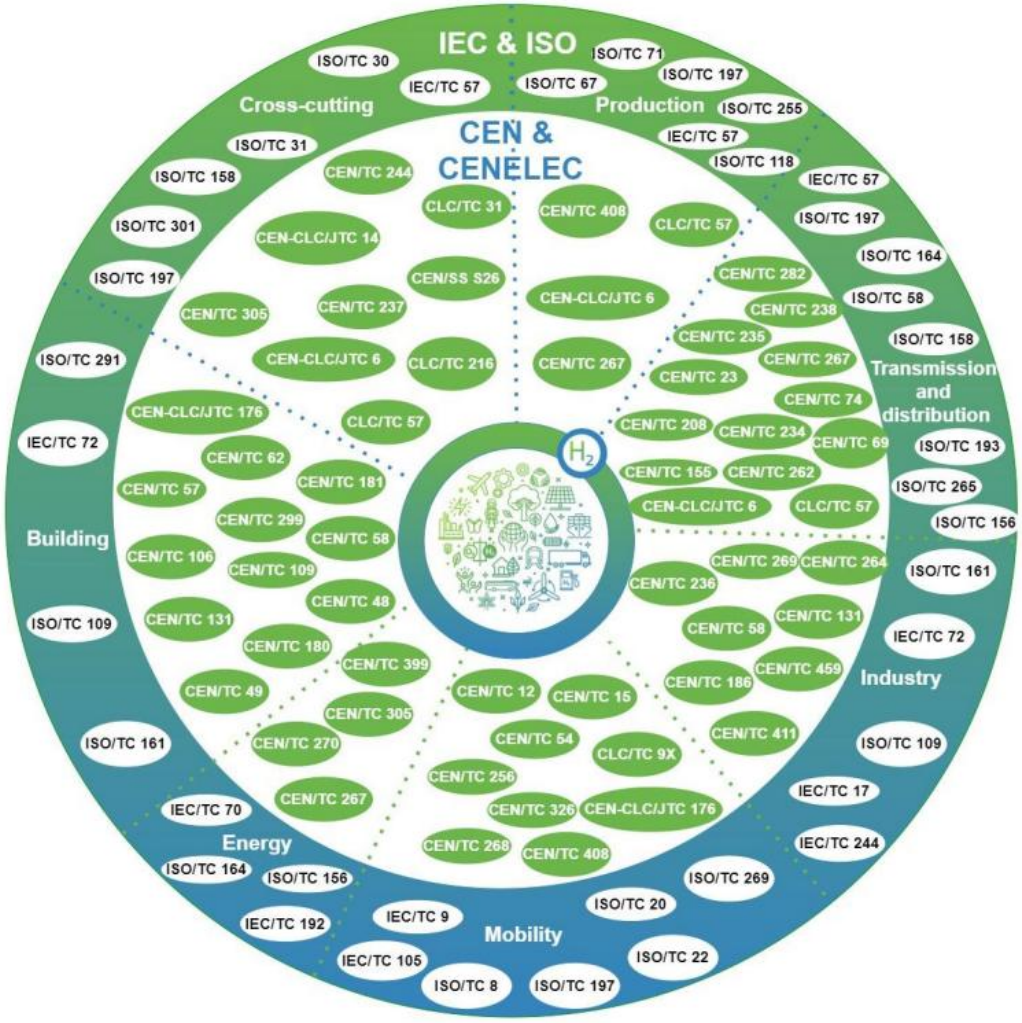


Figure 31. European and International hydrogen standardisation landscape.[62]

4.2.3.

Other standardisation initiatives

There are several standardisation initiatives that have been established to assess the state of standardisation development and recommend priorities going forward. These initiatives will be increasingly important as the development of the hydrogen market, and associated standardisation needs accelerates. This section gives a brief overview of some of the key initiatives that have emerged in recent years.

[62] 20230301_ech2a_roadmaphydrogenstandardisation.pdf (cencenelec.eu)

European Clean Hydrogen Alliance (ECH2A) Standards Roadmap

The ECH2A brings together industry, public authorities, civil society, and other stakeholders with the mission to support the large-scale deployment of clean hydrogen technologies by 2030. In support of this, it established a working group on standardisation in February 2022, which published a 'Roadmap on Hydrogen Standardisation' in March 2023[63]. This roadmap includes a comprehensive analysis of current global and European hydrogen standardisation activities, an analysis of the key gaps that need to be addressed, and recommendations to support the streamlining and consolidation of activities going forwards. This roadmap was – and will continue to be - a key data source for the EHO standards database, given its detailed overview of the key technical committees that are developing relevant standards.

Other organisations assessing standardisation activities

The **Hydrogen Council** is a global CEO-led initiative that was established with the mission to advance the role of hydrogen in the energy transition globally. Regarding the topic of standards, the Hydrogen Council is particularly involved with supporting the development of safety standards. As part of this work, the Council previously performed a gap analysis, identifying 400 standards gaps that need to be filled. This included technical areas such as a systemic approach to interface design in refuelling stations, as well as 'safety culture' topics. As these topics were all rated as highly critical, the Hydrogen Council has also been tracking progress in each topic.

The **International Partnership for hydrogen and fuel cells in the economy (IPHE)** is an inter-governmental partnership that was established with the mission to facilitate and accelerate the transition to clean and efficient energy and mobility systems using hydrogen and fuel cell technologies across applications and sectors. The IPHE has a working group on regulations, codes, standards, and safety, which assesses progress on standardisation, for example through the high-level regulatory gap analysis that it conducted in 2021[64]. While no new gap analyses have been published since then, the IPHE continues to support international dialogue, share best practices, and promote alignment on regulatory and safety approaches. This analysis is helpful to understand the regulatory priorities that will drive future standards development but is not as detailed as the analysis conducted by the ECH2A and Hydrogen Council.

The **International Renewable Energy Agency (IRENA)** – the lead global intergovernmental agency for energy transformation – has conducted projects on hydrogen standardisation, including the following project: "Quality Infrastructure (QI) for Renewable Hydrogen: technical standards and quality control for the production and trade of renewable hydrogen". Projects like this also have the aim of developing

[63] 20230301_ech2a_roadmaphydrogenstandardisation.pdf (cencenelec.eu)
[64] IPHE RCSSWG Regulatory Areas for Action Compendium A4FINAL (usrfiles.com)

roadmaps to be followed by global standard makers in the development of new hydrogen standards.

The results from these initiatives were already used to inform the mapping for the current EHO database. The gap analysis and roadmaps will also support the future development of the database, as it shows in which areas standards are likely to be developed. Since then, IRENA has continued to engage in quality infrastructure and standards-related work, including the publication of the "Quality Infrastructure Roadmap for Green Hydrogen" in November 2024 and participation in international dialogue on standardisation and metrology, reinforcing the role of technical standards and conformity assessment in enabling global hydrogen markets[65].

4.3.
Recent standards (2025)

As set out in the next section, a few standards have been revised and developed in 2025 across all different stages of the hydrogen value chain, including production, distribution & storage, end-use applications, and cross-cutting areas. These standards cover mainly the following areas:

- Gas cylinders (ISO/TC 58)
- Hydrogen technologies (ISO/TC 197)
- Fuel cell technologies (IEC/TC 105)
- Plastics pipes, fittings and valves for the transport of fluids protocols (ISO/TC 138)

4.3.1.
Newly published standards of 2025 included in the EHO database

This section provides an overview of the standards reviewed or developed within 2025, included in the EHO database. The standards are categorized according to the specific stages of the hydrogen value chain they are related to (as shown in Appendix A.4). During this period, the revised and newly developed standards covered distribution and storage, end-use applications, and cross-cutting areas. However, no standards related to production were reviewed or developed during this time frame.

ISO 19882:2025 Gaseous hydrogen -- Thermally activated pressure relief devices for compressed hydrogen vehicle fuel containers[66]

Publication date: February 2025 (Update)

[65] A Quality Infrastructure Roadmap for green hydrogen
[66] ISO 19882:2025 Gaseous hydrogen -- Thermally activated pressure relief devices for compressed hydrogen vehicle fuel containers

Category:

- Distribution & storage → Storage → Cylinder storage
- End-use applications→ Transport → Road transport→ Heavy duty vehicles, Light duty vehicles

Technical Committee: ISO/TC 197: Hydrogen technologies
ICS Code: ICS 27.075 | 43.060.40 : Hydrogen technologies | Fuel systems

Description: This standard establishes minimum requirements for pressure relief devices intended for use on hydrogen fuelled vehicle fuel containers that comply with ISO 19881, IEC 62282-4-101, ANSI HGV 2, CSA B51 Part 2, EC79/EU406, SAE J2579, or the UN GTR No. 13.

ISO 19880-2:2025 Gaseous hydrogen -- Fuelling stations--Part 2: Dispensers and dispensing systems[67]

Publication date: February 2025 (New)

Category:

- Distribution & storage → Distribution → HRSs
- Cross-cutting→ Safety

Technical Committee: ISO/TC 197: Hydrogen technologies
ICS Code: ICS 71.100.20 | ICS 43.060.40 : Gases for industrial application-Including compressed air and hydrogen | Fuel systems

Description: This standard specifies safety requirements and test methods for the components and systems that enable the transfer of compressed hydrogen to a hydrogen vehicle, as addressed in ISO 19880-1, by a hydrogen dispenser with dispensing pressures up to the H70 pressure class designation.

ISO 14687:2025 Hydrogen fuel quality -- Product specification[68]

Publication date: February 2025 (Update)

Category: Cross-cutting→ Quality

Technical Committee: ISO/TC 197 : Hydrogen technologies
ICS Code: ICS 71.100.20 | ICS 27.075 : Gases for industrial application-Including compressed air and hydrogen | Hydrogen technologies

Description: This standard specifies the minimum quality characteristics of hydrogen fuel intended for use in a range of applications including residential, commercial, industrial, vehicular, and stationary. It outlines the requirements to ensure hydrogen fuel meets necessary safety and performance standards, particularly in the context of its growing role in energy systems as a means to reduce greenhouse gas emissions.

IEC TR 62282-7-3:2025 Fuel cell technologies -- Part 7-3: Test methods - Status of accelerated tests for fuel cell stacks and components and perspectives for standardization[69]

Publication date: March 2025 (New)

Category: End-use applications

- Heat & power → Stationary fuel cells

[67] ISO 19880-2:2025 Gaseous hydrogen -- Fuelling stations--Part 2: Dispensers and dispensing systems
[68] ISO 14687:2025 Hydrogen fuel quality -- Product specification
[69] IEC TR 62282-7-3:2025 Fuel cell technologies -- Part 7-3: Test methods - Status of accelerated tests for fuel cell stacks and components and perspectives for standardization

- Transport → Road transport→ Heavy duty vehicles, Light duty vehicles/

Technical Committee: IEC/TC 105 : Fuel cells technologies
ICS Code: ICS 27.070 : Fuel cells

Description: This standard is a generic assessment of the feasibility of standardizing accelerated test procedures (both proton exchange membrane (PEM) and oxide ion-conducting solid oxide cell (SOC) technologies) for fuel cell stacks that have been engineered for a specific system application. This document comprises a review of literature and projects, a discussion of the main physical phenomena of interest in accelerated testing campaigns (focusing on the cell and stack levels, not looking at the system as a black box), a compendium of measurement techniques that are applicable, and it suggests a macroscopic approach to the formulation of a representative accelerated testing campaign.

IEC 62282-7-2:2025 RLV Fuel cell technologies -- Part 7-2: Test methods - Single cell and stack performance tests for solid oxide fuel cells (SOFCs)[70]

Publication date: March 2025 (Update)

Category: End-use applications

- Heat & power → Stationary fuel cells
- Transport → Road transport→ Heavy duty vehicles, Light duty vehicles

Technical Committee: IEC/TC 105 : Fuel cells technologies
ICS Code: ICS 27.070 : Fuel cells

Description: This standard contains both the official IEC International Standard and its Redline version. The Redline version is available in English only and provides you with a quick and easy way to compare all the changes between the official IEC Standard and its previous edition.

IEC 62282-7-2:2025 Fuel cell technologies -- Part 7-2: Test methods - Single cell and stack performance tests for solid oxide fuel cells (SOFCs)[71]

Publication date: March 2025 (Update)

Category: End-use applications

- Heat & power → Stationary fuel cells
- Transport → Road transport→ Heavy duty vehicles, Light duty vehicles

Technical Committee: IEC/TC 105 : Fuel cells technologies
ICS Code: ICS 27.070 : Fuel cells

Description: This standard applies to SOFC cell/stack assembly units, testing systems, instruments and measuring methods, and specifies test methods to test the performance of SOFC cells and stacks.

IEC 62282-3-202:2025 Fuel cell technologies -- Part 3-202: Stationary fuel cell power systems - Performance test methods for small fuel cell power systems for multiple units operation[72]

[70] IEC 62282-7-2:2025 RLV Fuel cell technologies -- Part 7-2: Test methods - Single cell and stack performance tests for solid oxide fuel cells (SOFCs)
[71] IEC 62282-7-2:2025 Fuel cell technologies -- Part 7-2: Test methods - Single cell and stack performance tests for solid oxide fuel cells (SOFCs)
[72] IEC 62282-3-202:2025 Fuel cell technologies -- Part 3-202: Stationary fuel cell power systems - Performance test methods for small fuel cell power systems for multiple units operation

Publication date: March 2025 (Update)

Category: End-use applications → Heat & power → Stationary fuel cells

Technical Committee: IEC/TC 105 : Fuel cells technologies
ICS Code: ICS 27.070 : Fuel cells

Description: This standard provides performance test methods specialized for the thermal and electrical characteristics of an energy management system to effectively share the heat and power of networked small stationary fuel cell power systems.

ISO 19881:2025 Gaseous hydrogen -- Land vehicle fuel containers[73]

Publication date: June 2025 (Update)

Category:

- Distribution & storage → Storage → Cylinder storage
- End-use applications→ Transport → Non-road mobile machinery/Road transport→ Heavy duty vehicles, Light duty vehicles

Technical Committee: ISO/TC 197: Hydrogen technologies
ICS Code: 43.060.40 | 71.100.20 : Fuel systems | Gases for industrial application-Including compressed air and hydrogen

Description: This standard specifies requirements for the material, design, manufacture, marking and testing of serially produced, refillable containers intended only for the storage of compressed hydrogen gas for land vehicle operation.

4.3.2.

Newly published standards of 2025 not yet included in the EHO database

This section includes a summary of standards that have been revised or published within 2025 that have not yet been incorporated into the EHO database. These standards will be included in the next update. The standards are categorized according to the specific stages of the hydrogen value chain they are related to (as shown in Appendix A.4).

ISO 16486-3:2025 Plastics piping systems for the supply of gaseous fuels -- Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing -- Part 3: Fittings[74]

[73] ISO 19881:2025 Gaseous hydrogen -- Land vehicle fuel containers
[74] ISO 16486-3:2025 Plastics piping systems for the supply of gaseous fuels -- Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing -- Part 3: Fittings

Publication date: January 2025 (Update)

Category: Distrubution & storage → Distribution→ Pipelines and pipework

Technical Committee: ISO/TC 138/SC 4: Plastics pipes and fittings for the supply of gaseous fuels
ICS Code: 75.200 | 83.140.30: Petroleum products and natural gas handling equipment | Plastics pipes and fittings for non fluid use

Description: This standard – which replaces ISO 16486-3:2020–specifies the requirements for fittings made from unplasticized polyamide (PA-U) used in buried piping systems for the supply of gaseous fuels, including their properties, dimensions, jointing methods, and test parameters.

ISO 13341:2025 Gas cylinders -- Fitting of valves to gas cylinders[75]

Publication date: July 2025 (Update)

Category: Distribution & storage → Storage → Cylinder storage

Technical Committee: ISO/TC 58: Gas cylinders
ICS Code: ICS 23.020.35: Gas cylinders

Description: This standard – which replaces ISO 13341:2010/Amd 1:2015–specifies procedures for connecting valves to gas cylinders with ISO screw threads (taper and parallel), including inspection and preparation steps. Provides torque values for steel, aluminium, and composite cylinders, and offers guidance applicable to other valve-to-cylinder thread systems worldwide.

ISO 19880-5:2025 Gaseous hydrogen -- Fuelling stations--Part 5: Dispenser hoses and hose assemblies[76]

Publication date: July 2025 (Update)

Category: Distribution & storage → Distribution → HRSs

Technical Committee: ISO/TC 197: Hydrogen technologies
ICS Code: 71.100.20 | 43.060.40: Gases for industrial application | Fuel systems

Description: This standard – which replaces ISO 19880-5:2019–specifies requirements for the design, materials, manufacture, and testing of wire- or textile-reinforced hoses and hose assemblies used to dispense high-pressure hydrogen (up to 70 MPa) at hydrogen refuelling stations, ensuring safe and reliable fuel delivery from dispensers to vehicles.

ISO 22734-1:2025 Hydrogen generators using water electrolysis -- Part 1: Safety[77]

Publication date: July 2025 (Update)

Category: Production → Electrolysis → AEL, PEMEL, SOEL, Other electrolysis

Technical Committee: ISO/TC 197: Hydrogen technologies
ICS Code: 71.100.20 | 71.120.99: Gases for industrial application | Other equipment for the chemical industry

Description: This standard – which replaces ISO 22734:2019–specifies the safety requirements of hydrogen gas generation appliances or systems that use electrochemical reactions to

[75] ISO 13341:2025 Gas cylinders -- Fitting of valves to gas cylinders
[76] ISO 19880-5:2025 Gaseous hydrogen -- Fuelling stations--Part 5: Dispenser hoses and hose assemblies
[77] ISO 22734-1:2025 Hydrogen generators using water electrolysis -- Part 1: Safety

electrolyse water to produce hydrogen, herein referred to as hydrogen generators.

ISO 17268-1:2025 Gaseous hydrogen land vehicle refuelling connection devices--Part 1: Flow capacities up to and including 120 g/s[78]

Publication date: August 2025 (Update)

Category:

- Distribution & storage → Distribution → HRSs
- End-use applications→ Transport → Road transport→ Heavy duty vehicles, Light duty vehicles

Technical Committee: ISO/TC 197: Hydrogen technologies
ICS Code: 27.075 | 43.060.40: Hydrogen technologies | Fuel systems

Description: This standard – which replaces ISO 17268:2020–specifies the design, safety, and operational requirements of gaseous hydrogen vehicle refuelling connectors for pressures up to 70 MPa and flow rates up to 120 g/s.

ISO 19880-7:2025 Gaseous hydrogen --Fuelling stations--Part 7: Rubber O-rings[79]

Publication date: August 2025 (New)

Category: Distribution & storage → Distribution → HRSs

Technical Committee: ISO/TC 197: Hydrogen technologies
ICS Code: 71.100.20 | 43.060.40: Gases for industrial application | Fuel systems

Description: This standard specifies the requirements for rubber O-rings and their housings used to seal high-pressure hydrogen in components of fuelling stations (valves, filters, joints, breakaways, etc.). Covers design, compound, dimensions, and test methods for O-rings operating up to 70 MPa and −40 °C to 65 °C. Ensures safe and reliable sealing in hydrogen refuelling systems.

[78] ISO 17268-1:2025 Gaseous hydrogen land vehicle refuelling connection devices--Part 1: Flow capacities up to and including 120 g/s
[79] ISO 19880-7:2025 Gaseous hydrogen --Fuelling stations--Part 7: Rubber O-rings

Conclusions

This report provides an overview on the latest advancements of the European hydrogen policies and standards covering the whole value chain of hydrogen.

EU policies and legislation

On the EU level, a large number of EU legislations following the EU Green Deal, Fit for 55 package and Green Deal Industrial Plan, impacting the hydrogen value chain, were already adopted before 2025, including, under the Fit for 55 package, the Renewable Energy Directive, EU Emission Trading System, Alternative Fuels Infrastructure Regulation, FuelEU Maritime, ReFuelEU Aviation, Hydrogen and Decarbonized Gas Market Package, Energy Performance of Buildings Directive, CO_2 emission performance standards for new heavy-duty vehicles and CO_2 emissions performance standards for cars and light duty vehicles. Under the Green Deal Industrial Plan, this includes the Net Zero Industrial Act, Critical Raw Material Act and the Electricity Market Design Reform. All these policies are playing a crucial role in promoting hydrogen use and expanding its infrastructure network across Europe.

In 2025, following the appointment of the new EU Commission and the release of the Clean Industrial Deal, the core focus is to make the EU industry more competitive, whilst still committing to the climate targets, for which, among others, the Affordable Energy Action Plan, as well as the Steel and Metals Action Plan was adopted, also positively impacting the hydrogen value chain. Moreover, the EU is also reducing the red tape for companies with their Omnibus packages.

The EU also continues to invest in hydrogen technologies and infrastructure, based on their broad range of funding instruments, such as, among many others, the Connecting Europe Facility, the Innovation Fund and the European Hydrogen Bank. The latter has launched the third hydrogen auction round in December 2025 with a budget of 1.3 billion. For stimulating the market, the EU has also developed its Hydrogen Mechanism in 2025, which is bringing off-takers and suppliers more closely together, also internationally, by aggregating their volumes. These initiatives are reflecting the EU's commitment to fostering innovation and driving the hydrogen market as part of its commitments to reach their climate targets.

National hydrogen strategies

As of 2025, 25 European countries have adopted national hydrogen strategies, up from 21 in 2024, with Italy, Iceland, Romania and Switzerland introducing their first national hydrogen strategy. Additionally, Cyprus and Greece have made progress by advancing from having no strategy to reaching the draft stage.

European national hydrogen strategies continue to incentivize hydrogen production as a core element of their plans, featured in 25 countries, while also placing significant emphasis on end-

use applications. Within end-use, mobility (24 countries) and industry (20 countries) are often targeted, underscoring their growing importance in the hydrogen value chain. In contrast, heating and energy backup power gain less attention in 13 and 15 countries, respectively. Most strategies also have a focus on distribution & storage (23) and cross-cutting (21) initiatives, supporting innovation and broader integration, while education, research and development is focus in 18 strategies. Hydrogen trade, featured in 11 countries, indicating a major focus on domestic value chains, while the focus on manufacturing remained limited to 9 countries.

National policies and legislation

In 2025, an exhaustive survey was completed across 30 European countries, the same number as in the previous report, which covered data up to July 2024, to collect the key national policies and legislations developed covering both cross-cutting questions and specific questions related to the hydrogen value chain. More than half of the countries questioned have reported to have in place a national hydrogen infrastructure plan and a system for Guarantees of Origin.

The survey shows uneven but overall positive progress across the hydrogen value chain between 2024 and 2025. Notable advances are evident in production, with an increase in the number of countries providing CAPEX and OPEX support, alongside broader adoption of permitting guidelines and single points of contact for project developers. Progress is also observed in transmission, distribution, and storage, including modest growth in support for hydrogen grid injection, higher hydrogen concentration limits, and clearer rules for storage operations.

Across end-use applications, policy support for mobility remains broadly stable but shows a slight decline, suggesting consolidation rather than expansion of existing measures, while stationary power and heating continue to receive limited but gradually increasing attention. In contrast, industrial end uses show clear momentum, with a growing number of countries expanding support schemes. Support for equipment manufacturing has also increased, indicating strengthening attention to supply-chain development, although this area remains less developed than upstream production policies.

Codes and standards

The EHO database now includes 116 searchable standards that are relevant to the emerging clean hydrogen sector, categorised according to the different stages of the hydrogen value chain. On a European level, there has been considerable progress, with 14 published standards that were either revised or newly developed between January 2025 and August 2025.

The standards included in the database were published by 21 different technical committees of standardisation bodies. Of these 21 technical committees, 5 are responsible for publishing around 80% of the standards.

Appendix

A.1.

Overview of published national hydrogen strategies in Europe

Country	Publication year	Original text	English translation
Austria	2022	Wasserstoffstrategie für Österreich	Executive summary
Belgium	2022	Update of Belgian Federal Hydrogen Strategy 2022	
Bulgaria	2023	Водородно бъдеще за България	
Croatia	2022	Hrvatska Strategija za Vodik do 2050. godine	Hydrogen Strategy of the Republic of Croatia until 2050
Czech Republic	2021	Vodíkova strategie České republiky	The Czech Republic's Hydrogen Strategy
	2024*	Vodíkova strategie actualizace 2024	
Denmark	2022	Udvikling og fremme af brint og grønne brændstoffer (Power-to-X strategi)	The Government's strategy for Power to X
	2024*	Økonomiske rammevilkår for brintinfrastruktur	
Estonia	2023	Eesti vesiniku teekaart	Estonian Hydrogen Roadmap
Finland	2023	Valtioneuvoston Periaatepäätös Vedystä	
France	2018	Plan de déploiement de l'hydrogène pour la transition énergétique	
	2020	Stratégie nationale pour le développement de l'hydrogène décarboné en France	National strategy for the development of decarbonized and renewable hydrogen in France
	2023*	Stratégie nationale pour le développement de l'hydrogène décarboné en France	
	2025	Strategie_nationale_hydrogene_decarbone_2025.pdf	

Country	Publication year	Original text	English translation
Germany	2020	Die Nationale Wasserstoffstrategie	The National Hydrogen Strategy
	2022	Fortschrittsbericht zur Umsetzung der Nationalen Wasserstoffstrategie	
	2023	Fortschreibung der Nationalen Wasserstoffstrategie	
Hungary	2021	Magyarország Nemzeti Hidrogénstratégiája	Hungary's National Hydrogen Strategy
Ireland	2023	National Hydrogen Strategy	
Italy	2024	Strategia Nazionale Idrogeno	
Lithuania	2024	Vandenilio plėtros Lietuvoje 2024–2050 m. gairės	
Luxembourg	2021	Stratégie hydrogène du Luxembourg	Stratégie hydrogène du Luxembourg (Executive Summary)
Netherlands	2020	Kamerbrief over Kabinetsvisie waterstof	
	2021*	Werkplan Nationaal Waterstof Programma 2022-2025	
Norway	2020	Regjeringens hydrogenstrategi på vei mot lavutslippssamfunnet	The Norwegian Governments hydrogen strategy
Poland	2021	Polska Strategia Wodorowa do Roku 2030 z Perspektywą do Roku 2040	Polish Hydrogen Strategy until 2030 (Summary)
Portugal	2020	Estratégia Nacional para o Hidrogénio (EN-H2)	
Romania	2025	Strategia Nationala a Hidrogenului	
Slovakia	2021	Národná vodíková stratégia: Pripravení na budúcnosť	National Hydrogen Strategy: Ready for the Future
Spain	2020	Hoja de Ruta del Hidrógeno: Una apuesta por el Hidrógeno Renovable	
Switzerland	2024	Stratégie hydrogène pour la Suisse	
Iceland	2024	Hydrogen and E-fuels Roadmap for Iceland	
United Kingdom	2022	Hydrogen Strategy update to the market: December 2022	
	2023	Hydrogen Strategy update to the market: August 2023	
	2023	Hydrogen Strategy update to the market: December 2023	
	2024	Hydrogen Strategy update to the market: December 2024	

A.2.

Qualitative summary of national strategies content along the hydrogen value chain

Country	Production	Trade	Distribution and storage	End-use				Manufacturing	Education, research & development	Cross-cutting
				Mobility	Industry	Heating	Energy & back-up power			
Austria	√		√	√	√					
Belgium	√	√	√	√	√	√		√		
Bulgaria	√		√	√	√		√		√	√
Croatia	√		√	√	√	√	√		√	
Czech Republic	√	√	√	√	√	√	√		√	√
Denmark	√		√							
Estonia	√		√	√				√	√	√
Finland	√		√	√					√	√
France	√		√	√	√			√	√	√
Germany	√	√	√	√	√	√	√	√	√	√
Hungary	√		√	√	√		√	√		√

Country	Production	Trade	Distribution and storage	End-use				Manufacturing	Education, research & development	Cross-cutting
				Mobility	Industry	Heating	Energy & back-up power			
Ireland	√	√	√	√	√		√		√	√
Italy	√		√	√	√		√		√	√
Lithuania	√		√	√	√	√	√		√	√
Luxembourg	√	√	√	√	√	√			√	√
Netherlands	√	√	√	√		√				√
Norway	√	√		√	√				√	√
Poland	√		√	√	√	√	√	√	√	√
Portugal	√	√	√	√	√	√	√	√	√	√
Romania	√	√	√	√	√	√	√		√	√
Slovakia	√		√	√	√	√	√	√		√
Spain	√		√	√	√		√	√	√	√
Switzerland	√		√	√	√		√		√	√
Iceland	√	√		√						√
United Kingdom	√	√	√	√	√	√	√		√	√

A.3.

Country-specific responses to general questions on national policies and legislation

Country	Has a dedicated national roadmap/strategy for the hydrogen sector been adopted?	If not, is such a document under development?	Is there a national hydrogen infrastructure (pipelines) plan?	Is a system for Guarantees of Origin for hydrogen in place in your country?
Austria	Yes		Yes	Yes
Belgium	Yes		Yes	Yes
Bulgaria	Yes		No	Yes
Croatia	Yes		No	No
Cyprus	Yes		No	No
Czech Republic	Yes		Yes	Yes
Denmark	Yes		Yes	Yes
Estonia	Yes		Yes	No
Finland	No	Yes	Yes	Yes
France	Yes		No	Yes
Germany	Yes		Yes	Yes
Greece	No	Yes	Yes	No
Hungary	Yes		No	Yes
Ireland	Yes		Yes	Yes

Country	Has a dedicated national roadmap/strategy for the hydrogen sector been adopted?	If not, is such a document under development?	Is there a national hydrogen infrastructure (pipelines) plan?	Is a system for Guarantees of Origin for hydrogen in place in your country?
Italy	Yes		Yes	Yes
Latvia	No	Yes	Yes	No
Lithuania	Yes		Yes	No
Luxembourg	Yes		Yes	No
Malta	No	Yes	No	No
Netherlands	Yes		Yes	Yes
Norway	Yes		Yes	No
Poland	Yes		No	No
Portugal	Yes		Yes	Yes
Romania	No	Yes	No	No
Slovakia	Yes		No	No
Slovenia	No	Yes	No	No
Spain	Yes		Yes	Yes
Sweden	Yes		No	No
Switzerland	Yes		Yes	Yes
United Kingdom	Yes		Yes	No

A.4.

Overview of new hydrogen standards in 2025 and their distribution across the value chain

Relevant Standard	Title	Production		Distribution & Storage		End-use applications			Cross-cutting		
		Electrolysis	Other hydrogen generation	Distribution	Storage	Transport	Heat & power	Portable devices	Safety	Quality	Sustainability
ISO 19882:2025	Gaseous hydrogen -- Thermally activated pressure relief devices for compressed hydrogen vehicle fuel containers				✓	✓					
ISO 19880-2:2025	Gaseous hydrogen -- Fuelling stations--Part 2: Dispensers and dispensing systems			✓					✓		
ISO 14687:2025	Hydrogen fuel quality -- Product specification									✓	
IEC TR 62282-7-3:2025	Fuel cell technologies -- Part 7-3: Test methods - Status of accelerated tests for fuel cell stacks and components and perspectives for standardization					✓	✓				
IEC 62282-7-2:2025 RLV	Fuel cell technologies -- Part 7-2: Test methods - Single cell and stack performance tests for solid oxide fuel cells (SOFCs)					✓	✓				
IEC 62282-7-2:2025	Fuel cell technologies -- Part 7-2: Test methods - Single cell and stack performance tests for solid oxide fuel cells (SOFCs)					✓	✓				
IEC 62282-3-202:2025	Fuel cell technologies -- Part 3-202: Stationary fuel cell power systems - Performance test methods for small fuel cell power systems for multiple units operation						✓				

Relevant Standard	Title	Production		Distribution & Storage		End-use applications			Cross-cutting		
		Electrolysis	Other hydrogen generation	Distribution	Storage	Transport	Heat & power	Portable devices	Safety	Quality	Sustainability
ISO 19881:2025	Gaseous hydrogen -- Land vehicle fuel containers				✓	✓					
ISO 16486-3:2025	Plastics piping systems for the supply of gaseous fuels -- Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing -- Part 3: Fittings			✓							
ISO 13341:2025	Gas cylinders -- Fitting of valves to gas cylinders				✓						
ISO 19880-5:2025	Gaseous hydrogen -- Fuelling stations--Part 5: Dispenser hoses and hose assemblies			✓							
ISO 22734-1:2025	Hydrogen generators using water electrolysis -- Part 1: Safety	✓									
ISO 17268-1:2025	Gaseous hydrogen land vehicle refuelling connection devices--Part 1: Flow capacities up to and including 120 g/s			✓		✓					
ISO 19880-7:2025	Gaseous hydrogen --Fuelling stations--Part 7: Rubber O-rings			✓							