

Delegated act on low-carbon hydrogen

SUMMARY

Hydrogen is a versatile energy carrier and feedstock with potential to anchor a climate-neutral economy, driving decarbonisation in key sectors such as heavy industry (iron and steel), chemicals (plastics and fertilisers), and transportation (aviation and maritime), while supporting the EU's climate and energy objectives. Beyond this, hydrogen can serve as a reliable form of energy storage.

Low-carbon hydrogen can be produced from natural gas using carbon capture and storage technology, through electrolysis powered by low-carbon grid electricity, or through methane pyrolysis. Expanding it is key to scaling up the hydrogen market and driving the European Union's (EU) energy transition. The 2022 REPowerEU strategy set a goal: by 2030, the EU should produce 10 million tonnes of hydrogen and import an equal amount. Renewable hydrogen alone is expected to supply around 10 % of the EU's total energy demand.

On 8 July 2025, the European Commission published a delegated act on low-carbon hydrogen, ahead of the 5 August 2025 deadline set by the Gas and Hydrogen Markets Directive. The act lays down the methodology for calculating greenhouse gas emissions across different hydrogen production pathways. Its provisions carry major consequences for investment in low-carbon hydrogen technology, the cost of producing hydrogen in the EU, and the climate integrity of the EU's hydrogen economy. The delegated act is now under scrutiny in the European Parliament and the Council of the EU, which may only accept or reject it in full. The scrutiny period for the delegated act runs until 10 November 2025.



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Introduction

While hydrogen itself does not emit any greenhouse gases (GHG), its production process often does, sometimes even exceeding the GHG emissions of fossil fuels. Depending on the production methods used, hydrogen can be classified into different types: renewable or clean hydrogen, low-carbon hydrogen (produced from natural gas with the use of CCS technology or from low-carbon electricity), and fossil-based hydrogen.

Table 1 – EU definitions of hydrogen and other definitions based on colour

Hydrogen by new definitions	Hydrogen by colour	
Renewable hydrogen (sometimes referred to as clean hydrogen)	Green hydrogen (produced through electrolysis using renewable electricity)	Electricity from the grid (electrolysis)
Low-carbon hydrogen	Blue hydrogen (natural gas with CCS)	
Fossil-based hydrogen (without CCS)	Grey hydrogen (from natural gas), brown hydrogen (from lignite, i.e. brown coal), black hydrogen (from hard coal, i.e. black coal)	

Source: G. Erbach with S. Svensson, [EU rules for renewable hydrogen](#), EPRS, April 2024.

The EU hydrogen market is still in its nascent phase. In 2023, hydrogen consumption in the EU stood at nearly [7.3 million tonnes](#), or about 2 % of total EU energy consumption. The 2022 [REPowerEU strategy](#) set the goal of producing 10 million tonnes of renewable hydrogen and importing 10 million tonnes by 2030. However, 96 % of total hydrogen currently produced in the EU is fossil-based, resulting in significant GHG emissions that are subject to carbon pricing under the EU's emissions trading system. Hydrogen production contributes to around [70-100 million tonnes of CO₂](#) emissions in the EU annually.

The production of renewable and low-carbon hydrogen in the EU needs to grow substantially if the EU is to achieve its climate objectives. The Commission projects that, by 2050, around [10 %](#) of the EU's energy needs will be met by renewable hydrogen. In addition, the EU will need to expand its electricity grids to deliver an additional 500 terawatt-hours of renewable electricity for renewable hydrogen production.¹

Given that the most cost-competitive method of producing hydrogen currently involves the use of fossil fuels, it is crucial to scale up the markets for producing low-carbon and renewable hydrogen. A credible certification system is essential in this respect. In February 2023, the Commission adopted two delegated acts on renewable hydrogen: [Commission Delegated Regulation \(EU\) 2023/1184](#) establishing a Union methodology setting out detailed rules for the production of renewable liquid and gaseous transport fuels of non-biological origin and [Commission Delegated Regulation \(EU\) 2023/1185](#) for assessing GHG-emissions savings from renewable fuels of non-biological origin (RFNBOs) and recycled carbon fuels. The former will be up for review in 2028.

The [Delegated Regulation establishing the methodology for assessing greenhouse gas emissions savings from low-carbon fuels](#) – currently the final crucial missing piece for the completion of the regulatory framework on hydrogen production in the EU – was adopted by the Commission on 8 July 2025, pending scrutiny by the Parliament and the Council. This delegated act is a key step towards enabling the deployment of low-carbon fuels because it provides regulatory and legal certainty, as well as a transparent methodology that is technically consistent across the EU. The delegated act is not, by itself, an economic driver: it does not create financial incentives or set production targets. Rather, it provides regulatory clarity on what qualifies as low-carbon hydrogen in the EU, which should facilitate cross-border trade and investment and help develop a single EU hydrogen market.

The delegated act on low-carbon hydrogen

Article 2 of the [Gas and Hydrogen Market Directive](#) (EU) 2024/1788 defines low-carbon hydrogen as hydrogen whose 'GHG emissions savings from the use of low-carbon fuels are at least **70 %**' of the standardised fossil fuel comparator, set at **94 gCO₂eq/MJ** according to Annexes V and VI of the [Renewable Energy Directive](#). This definition is further operationalised by the delegated act on GHG emissions savings. This effectively sets a maximum threshold of **28.2 gCO₂eq/MJ** for total life-cycle emissions, including upstream and midstream emissions, as well as methane leakage and indirect emissions.

The delegated act on low-carbon hydrogen (the delegated act) operationalises the formal definition of low-carbon hydrogen and explains how to calculate the required 70 % GHG emissions savings compared to the use of unabated fossil fuels. The methodology is **aligned** with the one already established in Commission Delegated Regulation (EU) 2023/1185, as required under Article 9 of the Gas and Hydrogen Markets Directive.

The 70 % emissions savings threshold applies to **blue hydrogen** produced from natural gas using CCS technology, **low-carbon electrolytic hydrogen** produced by electrolysis using electricity from the grid, and hydrogen produced from [methane pyrolysis](#). The delegated act aims to standardise the calculation of emissions savings by accounting for the **full life-cycle emissions** from producing low-carbon fuels, including indirect emissions, as well as upstream methane emissions and actual carbon capture rates.

Low-carbon electrolytic hydrogen

Low-carbon hydrogen can be produced through electrolysis using electricity drawn from the national grid, provided that the grid's average national GHG emissions are low enough. The delegated act recognises four calculation methods for determining GHG savings, including considering low-carbon electricity from nuclear energy. Currently, only three EU Member States – France, Sweden and Finland – have grid-related GHG emissions averages low enough to enable hydrogen production that meets the 70 % GHG emissions saving criterion (see Table 5, p. 17 of the Annex to the delegated act). These cases illustrate that the average grid-related GHG emissions in other Member States will gradually decline as the energy transition advances and the share of renewable or other low-carbon energy sources increases in their respective energy mixes. In the meantime, producers in Member States with higher average grid-related GHG emissions could use power purchasing agreements (PPAs) with electricity providers to ensure direct supply of low-carbon electricity for the production of low-carbon hydrogen.

Low carbon hydrogen produced by nuclear power

The delegated act does not include a specific methodology for producing low-carbon hydrogen from nuclear power plants, i.e. for sourcing of low-carbon electricity through PPAs for the purpose of producing low-carbon nuclear electrolytic hydrogen (also known as pink hydrogen). The Commission plans to launch a public consultation on a draft methodology for this production method in 2026, in line with Article 3 of the delegated act. The assessment will take into account the impact of the use of this production method on the energy system and emissions savings, as well as the need to maintain a level playing field in sourcing fully renewable electricity.

Blue hydrogen

Blue hydrogen is produced from natural gas with the use of CCS technology, which traps the CO₂ emitted during the process and stores it permanently. The delegated act sets a **default life-cycle GHG emissions value for natural gas**, i.e. the amount of upstream and midstream emissions per average natural gas energy content, based on which it can be determined how much CO₂ needs to be captured to reach the 70 % emissions savings threshold. The default value is set at **10.32 gCO₂eq/MJ²**.

Due to **liquefied natural gas** (LNG) having higher life-cycle emissions due to liquefaction and methane losses during transport and transfer, the Commission excluded it from the default emissions value of natural gas in the delegated act. Producers of blue hydrogen will be required to calculate the share of emissions associated with LNG – covering shipping, liquefaction and gasification – using a methane intensity methodology to be established in a delegated act, which, pursuant to Article 29(4) of the Methane Regulation, should be adopted by August 2027. Under this delegated act, natural gas importers, including LNG importers, will have a legal obligation to report value chain emissions starting from August 2028. However, there is a risk of underreporting and regulatory uncertainty until then, as reporting will be based on estimated data and literature, not a standardised and objective approach.

There are relevant and recent estimates on emissions in the LNG supply chain, such as the International Energy Agency (IEA) [report](#) from June 2025. According to the report, total average emissions from LNG stand at 19.5 gCO₂eq/MJ, substantially more than the 12 gCO₂eq/MJ emitted by natural gas via pipelines. Liquefaction accounts for around 6 gCO₂eq/MJ, shipping for about 3.5 gCO₂eq/MJ and regasification for around 1.5 gCO₂eq/MJ. These findings have significant implications for the production of blue hydrogen as, in some low-carbon hydrogen systems, LNG emissions could be high enough to make meeting the 70 % emissions savings threshold very difficult.

Production costs

Low-carbon hydrogen produced from natural gas using CCS is likely to have the lowest costs in the near term, although this is directly dependent on volatile gas prices. The costs of producing electrolytic hydrogen will gradually go down as electrolyser costs fall and the deployment of renewable energy picks up. However, producing hydrogen via electrolysis remains costlier with the current relatively high electricity prices in the EU.

Hydrogen's global warming potential (GWP)

Hydrogen itself is not a GHG, but it does have an impact on other gasses in the atmosphere. It is more reactive and has a smaller size than methane and is therefore prone to [leakage](#). The delegated act does not specify the value for the GWP of hydrogen itself, as there is currently insufficient scientific evidence on the matter. However, Recital 4 of the delegated act calls for the GWP of hydrogen to be included in the life-cycle assessment as soon as credible scientific consensus emerges. This inclusion could significantly affect the overall GHG impact of low-carbon hydrogen production. Recent scientific [studies](#) estimate that hydrogen's GWP is around 30-40 times higher than that of CO₂ over a 20-year period, and around 10 times higher over a 100-year period. However, it is important to note that the precise value has not yet been determined.

Imports

The criteria for establishing which fuels qualify as low-carbon in the delegated act resolution will apply to both domestic and non-EU producers seeking to export hydrogen to the EU. In addition, by 1 July 2028 the Commission will assess the potential introduction of a country- or region-specific approach for standard values of GHG emissions' intensities of inputs, as outlined in part B of the Annex.

Regulatory benefits and financial aid for low-carbon hydrogen

If hydrogen meets the criteria for either the renewable or low-carbon category, producers in the EU may be eligible for certain benefits. For instance, renewable and low-carbon gases are privileged under the Hydrogen and Decarbonised Gas Market Package of legislative proposals and amendments, with significant network tariff discounts. Furthermore, the [Clean Industrial Deal State Aid Framework](#) (CISAF) allows EU Member States to support renewable and low-carbon hydrogen with state aid in a simplified way, as opposed to the regular state aid notification process.

Following the publication of the delegated act, the European Parliament's Committee on Industry, Research and Energy (ITRE) commissioned an external [study](#) on the **Methodology for assessing greenhouse gas emissions savings from low-carbon fuels**, which was published on 11 September 2025. The study aims to answer a number of questions:

- Which production pathways are included and which are excluded by the methodology provided in the delegated act?
- Does the delegated act support the hydrogen economy by incentivising the production or import of sufficient volumes of hydrogen in/to the EU?
- Does the delegated act adequately address fossil fuel emissions?
- What are the price and cost expectations of hydrogen under this methodology?

Crucially, the study finds that:

The Delegated Act is a step forward in assessing emissions across the whole hydrogen supply chain. However, relying on reasonable but non-conservative CH₄ and CO₂ defaults [default values], and the omission of LNG-specific default values, risks underestimating methane emissions where actual data is lacking. Its effectiveness will depend on strict enforcement and accurate reporting under the methane regulation (p. 10).

Stakeholders' views

During the stakeholder consultation procedure, members of various sectors of the economy, including the energy, utilities and heavy industry, called for greater flexibility in meeting the 70 % GHG emissions threshold, while also arguing for delaying the inclusion of leakage detection in the delegated act. In general, this view has been shared by industry associations such as [Gas Infrastructure Europe](#) (GIE), [Eurogas](#), the [European Steel Association](#) (Eurofer), [FuelsEurope](#), and [Hydrogen Europe](#).

[Hydrogen Europe](#) welcomed the adoption of the delegated act, stating that it should 'provide legal certainty to hydrogen project developers'. Specifically, it welcomed the introduction of the 4.9 gCO₂/MJ default value for upstream CO₂ emissions of natural gas (down from 8.4 gCO₂/MJ in an earlier draft delegated act). It also welcomed the introduction of country- or region-specific default values for upstream emissions in the 2028 review of the delegated act.

The think-tank [Agora Energiewende](#) welcomed the Commission delegated act and supported, in particular, the requirement for full life-cycle GHG emissions assessment. However, it called for clarification of the concept of 'upstream emissions' and the introduction of a more realistic default value for upstream methane emissions. It also argued that hydrogen leakage should be addressed in the 2028 review, while also introducing the obligation for the use of the best available technology. Finally, it wanted to set a gradually decreasing GHG threshold for low-carbon hydrogen and fuels.

Environmental organisations have criticised the industry's position in general, as it could potentially increase the risk that low-carbon hydrogen production leads to higher overall GHG emissions due to resulting new fossil gas infrastructure, hydrogen and methane leakage, and poor carbon capture rates. A coalition of environmental organisations, including [Transport & Environment](#), [Climate Action Network](#) and [Bellona](#), has specifically [criticised](#) the default methane emissions value set by the Commission at 5.2 gCO₂ eq/MJ. They argued that it 'remains too low and fails to reflect actual average upstream emissions'. In particular, they highlighted the fact that, for calculating the GHG emissions contribution of methane (CH₄), the Commission uses the latest International Panel on Climate Change (IPCC) GWP [factor](#) of 28 (applied to a 100-year period). However, these organisations argue that this could potentially underestimate methane's immediate GHG impact, particularly in the context of [climate tipping points](#), as its GWP factor over 20 years is set much higher at 84-87. Consequently, concerns have been raised as to whether the default emissions value for natural gas should not be set higher. The NGO coalition argued that, based on the latter IPCC GWP factor as well as average global methane leakage rates, the default methane emissions value should be set at a minimum of 16.4 gCO₂ eq/MJ.

Parliament's position

In its 2021 [resolution](#) on 'A European Strategy for Hydrogen', Parliament underlined that regulatory barriers need to be overcome and a coherent, integrated and comprehensive regulatory framework for a hydrogen market must be put in place. In particular, Parliament recognised that, in the energy transition, low-carbon hydrogen is a 'bridging technology in the short and medium term'. Moreover, it called on the Commission to ensure that a 'distinction between renewable and low-carbon hydrogen is absolutely clear'.

Parliament and the Council have a right of scrutiny regarding delegated acts, but they cannot amend their content. They can object to Commission proposals within two months of their publication. In this case, the two-month period was extended by another two months, that is, until 10 November, due to the summer recess.

The ITRE committee is Parliament's leading committee on the file. ITRE held a [topical debate](#) on the subject on 4 September.

MAIN REFERENCES

[Commission delegated regulation \(EU\) specifying a methodology for assessing greenhouse gas emissions savings from low-carbon fuels](#), European Commission, 8 July 2025.

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[The potential of hydrogen for decarbonising EU industry](#), EPRS, European Parliament, 2021.

[Global hydrogen review 2025](#), International Energy Agency, September 2025.

[The future of hydrogen: seizing today's opportunities](#), International Energy Agency, 2019.

ENDNOTES

¹ For more information, please refer to a dedicated EPRS [briefing](#) on EU rules for renewable hydrogen.

² As established in the Commission Delegated Act on values for global warming potential ([Regulation \(EU\) 2020/1044](#)). See Part B, table 1 of the Annex to the Delegated Act.

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