



KlimaInnovation

# ELECTRIFYING ENERGY INTENSIVE INDUSTRIES

Ramping Up Hydrogen Production  
and Steering It Toward Industrial  
Decarbonisation

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# IMPRINT

## TITLE

Electrifying Energy-Intensive Industries: Ramping Up Hydrogen Production and Steering It Toward Industrial Decarbonisation

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## DESCRIPTION

This brief was developed using the results of the workshop on accelerating the decarbonisation of Energy-Intensive Industries (EII), hosted by EPICO KlimaInnovation on 8 May 2025. Participants included representatives from Agora Energiewende, Bundesverband der Deutschen Industrie e.V. (BDI), European Chemical Industry Council (Cefic), Climate Strategy, Third Generation Environmentalism (E3G), Union of the Electricity Industry (Eurelectric), European Steel Association (EUROFER), Future Cleantech Architects, Hydrogen Europe, International Federation of Industrial Energy Consumers (IFIEC), SSAB, and Vattenfall.

The recommendations outlined in this policy brief are those of the author and do not represent the opinions of the workshop participants and their organisations.

## DESIGN AND TYPE SETTING

Arthur Dubois. Brussels, Belgium.

# RAMPING UP HYDROGEN PRODUCTION AND STEERING IT TOWARD INDUSTRIAL DECARBONISATION

On 8 May 2025, EPICO KlimalInnovation hosted a workshop focused on accelerating the decarbonisation of Energy-Intensive Industries (EIs). Looking mainly at greenhouse gas (GHG) emission reduction, the event addressed both direct and indirect electrification as key pathways to decarbonise these. Importantly, discussions on carbon capture and storage/utilisation (CCS/CCU), circular economy, and lead market policy approaches were not the focus of this workshop.

EIs remain foundational to the EU's industrial base and resilience; they are also crucial for the basic materials needed for a net-zero society. However, they also account for a significant share of emissions. Between 1990 and 2017, industrial sectors reduced their GHG emissions by around 40% – mainly

through technological optimisation, energy efficiency, electrification, and nitrous oxide cuts in chemicals – but only by 17.6% since the introduction of the ETS in 2005 ([CE Delft & Ecologic Institute for European Parliament, 2020](#); [The Green Tank, 2025](#)). Some emissions arise from processes that cannot be fully electrified, such as the reduction of iron ore or steam methane reforming. In these cases, hydrogen – an energy carrier – can act as a decarbonisation agent. One of the workshop's sessions, therefore, focused on the potential of low-carbon hydrogen and its derivatives to support the decarbonisation of Europe's energy-intensive industries. The following output summarises the workshop discussions and is supplemented by data and additional insights.

Hydrogen is the lightest and most abundant chemical element in the universe, making up around 75% of all normal matter. On Earth, however, it is bound to other elements and must be extracted from natural gas (CH<sub>4</sub>) or water (H<sub>2</sub>O) through energy-intensive processes. For fertiliser production and other chemicals, hydrogen can be combined with nitrogen (N<sub>2</sub>) to form NH<sub>3</sub>. For steel production, it can act as a reducing agent to strip the oxygen from iron ore (mainly Fe<sub>3</sub>O<sub>4</sub>) to form iron (Fe), which is then molten, refined, and alloyed. For synthetic fuels, hydrogen is combined with carbon monoxide and carbon dioxide to create syngas, which is then turned into fuel in a Fischer-Tropsch reactor. Low-carbon hydrogen can therefore contribute to the industrial decarbonisation of certain fuels, ironmaking, and ammonia production. Importantly, while ammonia and iron production can in principle achieve near-zero emissions, the main climate benefit of synthetic fuels comes from using CO captured from unavoidable industrial emissions – such as cement, calcined clay, and lime production – or direct air capture, combined with 100% renewable hydrogen.

Today, however, most of the hydrogen in Europe is “grey”, meaning it is produced from natural gas through steam methane reforming, which releases around ten tonnes of CO<sub>2</sub> for every tonne of hydrogen produced (excluding the significant impact of methane emissions across the entire value chain). Fossil-free electrolytic hydrogen, by contrast, avoids the use of fossil fuels and is made by using electricity to split water into hydrogen and oxygen. If that electricity comes from renewables, it is called green hydrogen. If it comes

from nuclear power plants, it is called pink hydrogen. If the electricity is produced using fossil sources, it can however cause significant induced emissions. Electrolyser buildout should not trigger fossil generation. Electrolysers are capital-intensive, and the clean electricity they require remains scarce and expensive. Operating costs are also high, as electricity alone accounts for 50% to 75% of production costs (CATF, 2023). Efficiency gains are marginal, with alkaline and PEM electrolyzers typically converting a lower input energy into hydrogen than solid oxide technologies, and vary based on the input power (Virah-Sawmy, Beck, & Sturmberg, 2024). The role of pink hydrogen remains politically divisive, due to Member States' disagreements over nuclear energy. Nuclear offers baseload electricity that can improve electrolyser utilisation and reduce costs, but its contribution must be balanced against broader system needs.

White hydrogen, a naturally occurring form found underground, is also fossil-free, but extraction raises concerns about methane leakage, ecological damage, and extreme purity, which makes it more inflammable and prone to seepage. Among fossil-based options, blue hydrogen combines steam methane reforming with carbon capture and storage; the aim is to curb emissions, but residual CO<sub>2</sub> and methane emissions, a potent short-term GHG, remain. Turquoise hydrogen uses heat to break down methane (CH<sub>4</sub>) into hydrogen (H<sub>2</sub>) and solid carbon (C, a powder that can easily be stored), but it is not technologically mature. While EU Member States produce little gas and rely on imports from countries such as Algeria (19% of EU natural gas imports in 2024), Russia (16%), and Azerbaijan (7%), renewables for green hydrogen are domestic assets that enhance energy sovereignty.

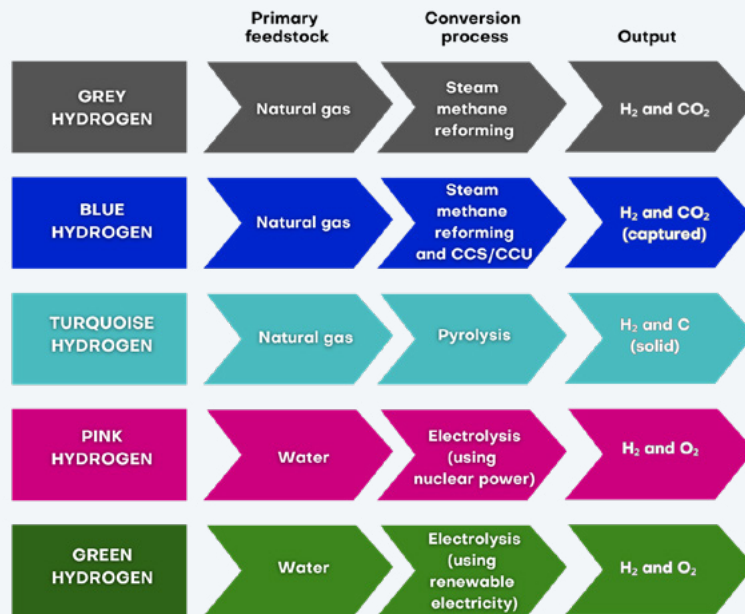


Figure 1: The hydrogen rainbow: What do the different colours mean? (source: own production)

## Overview

Workshop participants emphasised the potential of hydrogen (and its derivatives) as a critical feedstock and energy vector for net-zero, particularly in hard-to-electrify sectors such as ironmaking, ammonia production, synthetic fuels for shipping and aviation, and certain high-temperature industrial heating processes.

However, there was also agreement that it would not serve as a universal energy carrier, but rather as a targeted, and strong-added-value decarbonisation resource that must be allocated strategically and used efficiently, echoing similar calls in the following publications: [E3G, Steelwatch, EEB, et al., 2025](#); [Future Cleantech Architects, 2025](#); [Fraunhofer, 2022](#); [Marcu, Imbault, & Cavallera, 2025](#); [Transport &](#)

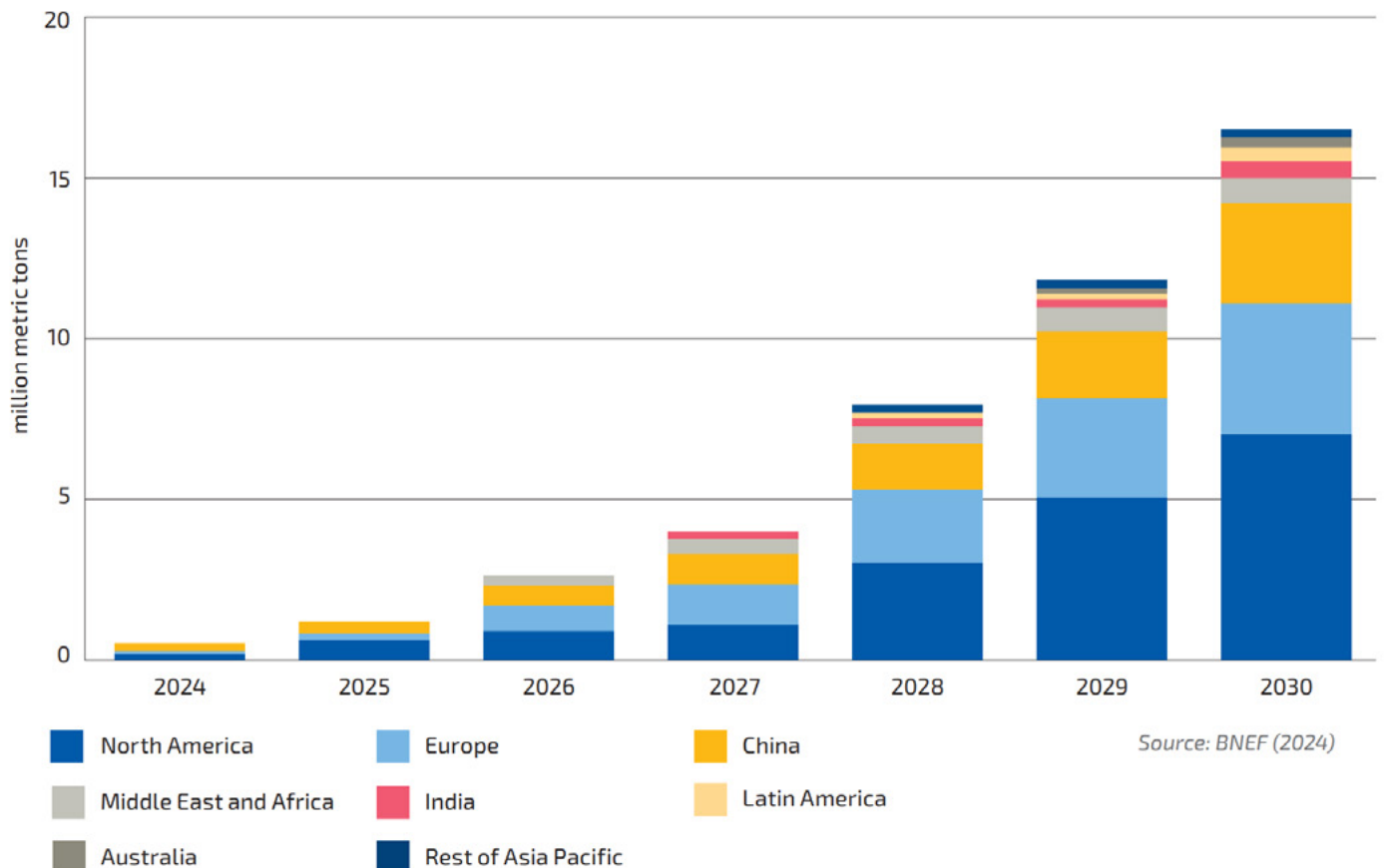
[Environment, 2023](#). Besides the cost aspect, it was also noted that public discussions also seem to understate the highly inflammable nature and leakage risk of hydrogen (including renewable hydrogen), which contributes to warming by extending the lifetime of methane and ozone, both potent GHGs.

## EU POLICY LANDSCAPE: GAPS, DELAYS, AND OPPORTUNITIES

The EU has promoted renewable hydrogen through the 2020 European Hydrogen Strategy and the 2022 REPowerEU plan, which sets a target of 20 million tonnes (Mt) of renewable hydrogen consumption per year in 2030, a goal the Commission itself later deemed unachievable. In its 2024 performance audit, the European Court of Auditors suggested major improvements to EU hydrogen policy, notably warning that current targets were “driven by political will rather than

being based on robust analyses,” and that policy was fragmented across complex and often inaccessible support schemes ([ECA, 2024](#)). As of September 2024, Germany leads in an underwhelming list, with an existing electrolyser capacity of only 123 MW, followed by Spain (40 MW), the Netherlands (39 MW), and France (25 MW), while Poland, Italy, and Belgium each have less than 10 MW ([OIES, 2025](#)). The EU-wide targets, set in the RePowerEU Plan, were 6 GW for 2024 and 40 GW for 2030, which shows the clear need to reassess those targets. Still, the capacity in the pipeline leaves room for hope, with over 141 GW projected by 2030 as is also visible in Figure 2 ([IEA, 2024](#)). The Commission’s estimates suggest that renewable hydrogen consumption will reach only 2 to 6 Mt in 2030, while a recent study by Sandbag forecasts a potential of 5.5 Mt of “truly” fossil-free hydrogen, which excludes induced emissions caused by carbon-intensive electricity, by 2030, as visible in Figure 3 ([Sandbag, 2025](#)).

Figure 2: Global Clean Hydrogen Production Forecast (source: [EWI/CASSIS “H2 Reality Check - Reappraising the EU’s H2 Strategy in a New Era of Geopolitical Disruptions,” 2025](#))



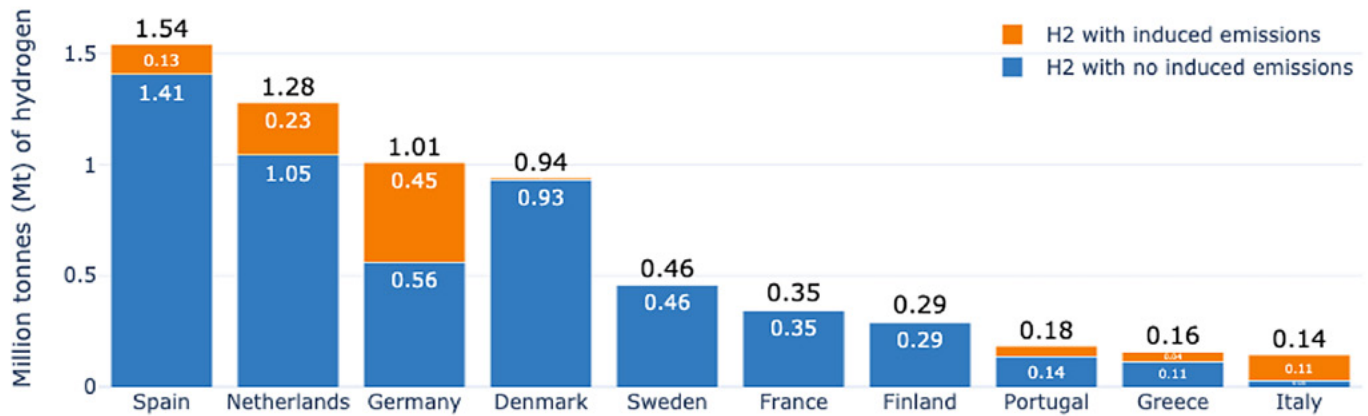


Figure 3: Forecast of RFNBO hydrogen production in 2030, under Sandbag's mixed scenario (source: Sandbag, *Getting Electrification Right*, 2025)

The European Hydrogen Bank has drawn a lot of interest, although it is seen more as a price discovery mechanism and support for production than as a real catalyst for hydrogen uptake. The pilot auction, launched in November 2023, drew 132 bids for €800 million; the second, launched in April 2025, drew 61 bids with projected RFNBO (Renewable Fuels of Non-Biological Origin) volumes of 7.3 Mt over 10 years. While the first and second auctions focused on RFNBO hydrogen only, the third auction, scheduled for the end of 2025, will partially include low-carbon electrolytic hydrogen for the first time (European Commission, 2025).

A European Hydrogen Mechanism is scheduled to launch in September 2025, with the aim of aligning supply and demand and improving market visibility. However, design details remain limited, and it does not appear that the mechanism will in any way help fill the gap between offtake price and production costs.

In June 2025, a joint position paper by 14 German and European industry associations called for the new German federal government to lead the creation of an EU-level Hydrogen Alliance, to coordinate national efforts, reform hydrogen regulation, and accelerate infrastructure development and financing. This would include cross-border import corridors,

a unified certification system, and an expanded European Hydrogen Bank.

## HYDROGEN USE

Hydrogen demand in Europe declined by 3.2% in 2023 compared to the previous year, and over 95% of production is still fossil-based (European Hydrogen Observatory, 2024). Most of the consumption is concentrated in the petrochemical and chemical sectors, especially refineries and ammonia synthesis. In refining, hydrogen is used for hydrocracking, hydrotreating, and desulphurisation, making it relatively easier to absorb higher RFNBO hydrogen costs. Refineries could eventually pivot to e-fuels, drawing on existing skills and integration with petrochemicals, but this would require major capital investment and higher operating costs.

Hydrogen policy should follow three distinct objectives. First, clean up unavoidable existing uses where there are no substitutes (such as ammonia, methanol, and some refining processes) by replacing fossil hydrogen with low-carbon or renewable hydrogen. Second, create new demand in hard-to-abate sectors where hydrogen is one of the few viable options, such as green ironmaking and sustainable aviation fuels (SAF). Third, avoid low-value or easily electrifiable uses, such as

passenger cars, buses, and short-haul vessels, where alternatives are cheaper, more efficient, and already rely on an existing infrastructure network. Current patterns across the EU often diverge from this hierarchy. Member States like France are deploying hydrogen in road and river transport, where electrification would deliver the same service more efficiently: there are over 1,000 hydrogen taxis in Paris, as well as over 1,600 light vehicles, 58 buses, 5 heavy trucks, and several niche boats that are all running on hydrogen ([France Hydrogène, 2025](#)).

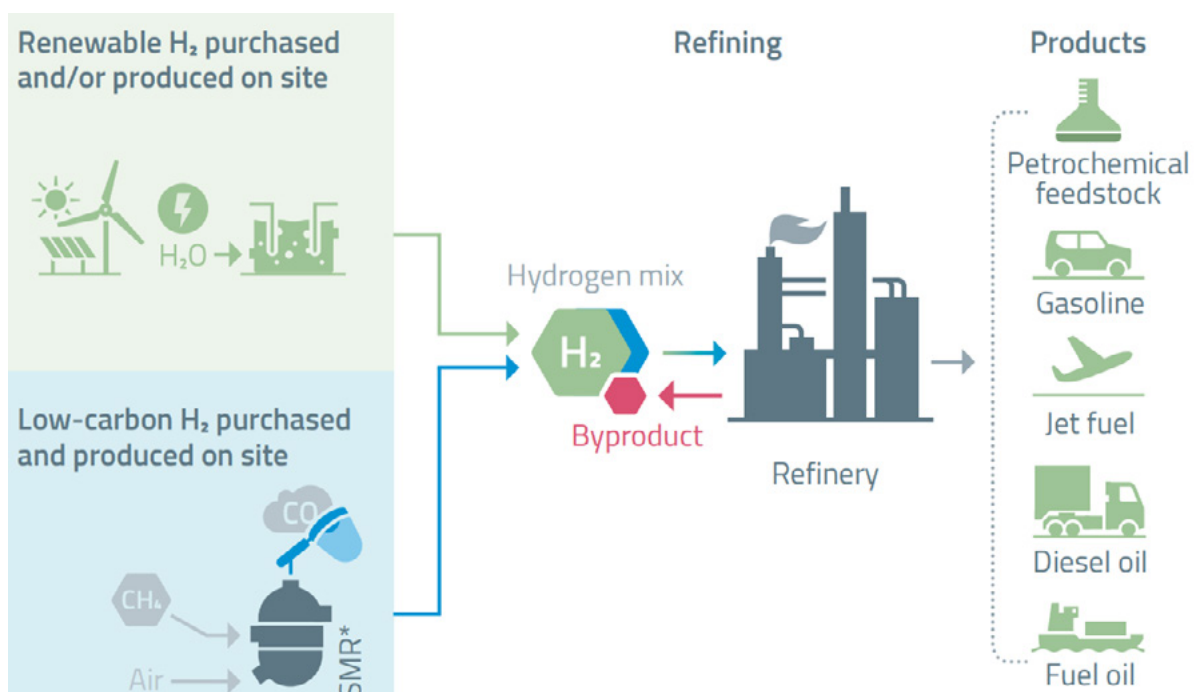
*“Without a clear policy filter, there is a risk that scarce EU funding and early volumes of renewable hydrogen will be locked into transitional or low-impact markets instead of accelerating decarbonisation.”*

Without a clear policy filter, there is a risk that scarce EU funding and early volumes of renewable hydrogen will be locked into transitional or low-impact markets instead of accelerating decarbonisation. Conversely, CCS should be allowed and supported, where there is a clear technical-economic case.

While the EU’s SAF project pipeline is expanding, with over 41 e-kerosene projects under development, none have reached a final investment decision ([T&E, 2025](#)). Unlike e-kerosene, a main SAF targeted by aviation mandates, there is little market for other Fischer-Tropsch products like e-diesel and e-naphtha ([ESMAP, 2024](#)). As a result, the entire cost of the hydrogen input and associated GHG abatement would have to be recovered via e-kerosene pricing alone, even though it is only one of several outputs. Policy support could incentivise e-diesel and e-naphtha use in hard-to-electrify sectors such as military vehicles, shipping, heavy industry, or petrochemical feedstocks, while explicitly excluding their use in passenger cars.

Without lead markets, affordable energy, and competitive manufacturing, hydrogen production in the EU will stall, especially with

Figure 4: Hydrogen use in refining (source: [Future Cleantech Architects, 2025](#))



electrolyser costs rising instead of falling. The high share of transport in hydrogen usage is likely due to the early targets set out in EU legislation, such as the Renewable Energy Directive II (RED II, adopted in 2018), ReFuelEU Aviation (adopted in October 2023), and FuelEU Maritime (also adopted in October 2023).

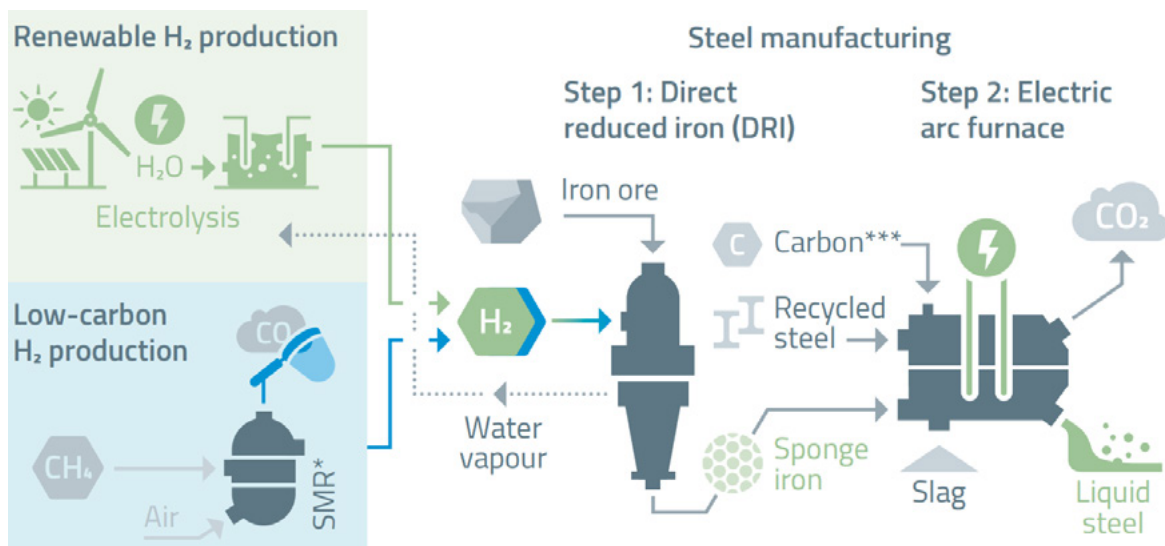
*“Without lead markets, affordable energy, and competitive manufacturing, hydrogen production in the EU will stall, especially with electrolyser costs rising instead of falling.”*

Converting just six EU steel plants currently running on coal to hydrogen-based direct reduced iron (DRI) could prevent over 320 Mt of CO emissions over their lifetime (E3G, Steelwatch, EPICO, et al., 2025). While several European projects are progressing – GravitHy recently raised €60 million, Stegra and Salzgitter aims to begin operations in 2026,

and Hydnum in 2027 – the overall outlook is less encouraging. Thyssenkrupp, the second-largest EU steel producer, recently suspended its hydrogen tender (GMK Center 2025) while ArcelorMittal, despite receiving billions in support for H<sub>2</sub>-DRI, withdrew its plan to produce DRI in Bremen and paused plans in Ghent (Belgium), Dunkirk (France) and Gijon (Spain) (GMK Center, 2025).

Ammonia already accounts for 2 Mt of hydrogen demand annually, a number that is expected to grow due to global fertiliser needs. Article 22a of the revised RED (adopted in October 2023) mandates that Member States must ensure that 42% of the hydrogen used in industry is RFNBO by 2030 and 60% by 2035. This is a target widely deemed unrealistic. At the EU level, there are no targets for low-carbon hydrogen, which, as a result, struggles to generate market demand. One risk is therefore that ammonia production follows methanol’s path. While in 2023 nearly all methanol was imported (0.8 Mt of 0.9 Mt consumed), most ammonia (1.9 Mt of 2.3 Mt) is still produced domestically (OIES 2025a). But there is high potential that domestic production could be replaced by U.S.-based production, as hinted by Norway’s Yara’s plans for blue hydrogen in the Gulf of Mexico (Hydrogen Insight, 2025; OIES, 2025a;

Figure 5: Hydrogen use in green steelmaking (source: Future Cleantech Architects, 2025)



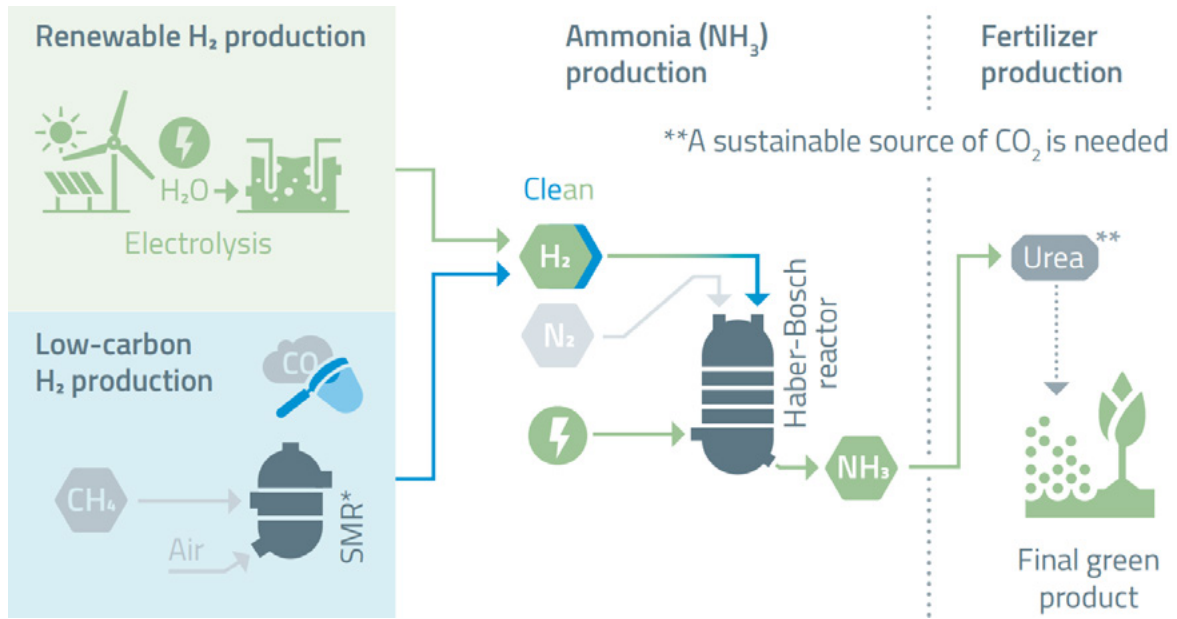


Figure 6: Hydrogen use in fertiliser production (source: [Future Cleantech Architects, 2025](#))

[OIES, 2025b](#); [Verpoort et al., 2024](#)). Ammonia production has already decreased sharply since the Russian gas phaseout, while Russian fertiliser imports increased in parallel (from 17% to 30%) ([Deutsche Welle, 2025](#)). Demand for green ammonia in Europe is limited because as fertiliser markets are highly price-sensitive and globally traded, with few buyers willing to pay a green premium. Ammonia production requires large volumes of hydrogen and nitrogen, making new plants or retrofits technically complex and capital-intensive. Unlike green steel, these projects receive less public visibility and political support, and lack a strong offtake pull as fertilisers are rarely procured by public bodies.

*“There is high potential that domestic ammonia production could be replaced by U.S. imports.”*

These sectors face high production costs, limited infrastructure, and a lack of tailored support mechanisms, despite offering far greater systemic and climate value.

Workshop participants highlighted the need to direct public resources toward critical applications such as green ironmaking and green fertilisers, rather than into fossil-linked sectors. Steering scarce EU funds and early green hydrogen volumes to these strategic, hard-to-abate uses would avoid inefficient spending and ensure hydrogen delivers genuine decarbonisation benefits while making public investment more justified ([Future Cleantech Architects, 2025](#)).

## EU DEFINITIONS

Additional challenges stem from EU regulation. Delegated acts adopted in 2023 set strict criteria for RFNBO certification, centred on additionality, temporal correlation, and geographical correlation. Even if an electrolyser is co-located with a wind or solar farm, it will still be physically connected to the grid and draw from it when on-site renewable output is insufficient. Under EU RFNBO rules, hydrogen producers must therefore match all electricity used in electrolysis with output from a designated renewable installation through a power purchase agreement (PPA). From 2028, the additionality requirement will apply, meaning that this renewable electricity must come from

newly built installations commissioned no more than 36 months before the electrolyser, and the generating asset must not receive operating aid, although the hydrogen producer may receive support. Temporal correlation rules require matching electricity consumption with renewable generation on a monthly basis until the end of 2029, shifting to hourly matching from 2030.

*“There is growing recognition that overly rigid rules could backfire, slowing the uptake of hydrogen across sectors and undermining the broader development of a hydrogen economy.”*

There are estimates – including from the German Federal Ministry for Economic Affairs and Climate Action – that full compliance could add €2.3 to €2.4 per kilogram of hydrogen ([Frontier Economics for RWE AG, 2021](#); [Hydrogen Insight, 2024](#)). This poses a particular challenge to countries like Germany, where electricity prices are already among the highest in the EU, making RFNBO production less competitive even as the government and industry strongly support the development of a hydrogen economy. Moreover, there is growing recognition that overly rigid rules could backfire, slowing the uptake of hydrogen across sectors and undermining the broader development of a hydrogen economy ([Ruhnau & Schiele, 2023](#)). These constraints have also intensified debate over the relative merits of building regional hydrogen clusters versus prioritising a fully integrated EU-wide hydrogen backbone. The stricter and costlier the regulatory environment, the more attractive regional clusters become compared to an integrated EU-wide hydrogen market.

After more than one year of fraught negotiations, on 8th July 2025, the European Commission adopted the long-awaited Delegated Regulation defining how to calculate GHG savings for low-carbon hydrogen. A 70% GHG reduction compared to unabated fossil hydrogen was introduced in the Gas and Hydrogen Directive (2024/1788), but the Delegated Regulation is the instrument that makes it enforceable by providing the precise methodology for assessing compliance. For example, it introduces differentiated treatment for pipeline gas and LNG. Default upstream methane emissions for pipeline gas were [lowered](#), while potential loopholes remain for LNG due to incomplete emission coverage. One of the most contentious issues was the exclusion of hydrogen produced from nuclear electricity (“pink hydrogen”). Hydrogen Europe condemned the final text as “falling well short of what is needed.” They particularly criticised the ban on sourcing nuclear electricity through PPAs and the lack of recognition for nuclear-based hydrogen ([Hydrogen Europe, 2025](#)). The Commission is expected to initiate an assessment by mid-2026 on alternative approaches to recognise low-carbon nuclear electricity, including via PPAs, based on adequate and transparent criteria.

*“The delayed regulatory clarity has significantly hindered project planning and investment cycles, resulting in lost time during a critical phase of market development.”*

The RFNBO rules should have been published well before June 2023. The delayed regulatory clarity has significantly hindered project

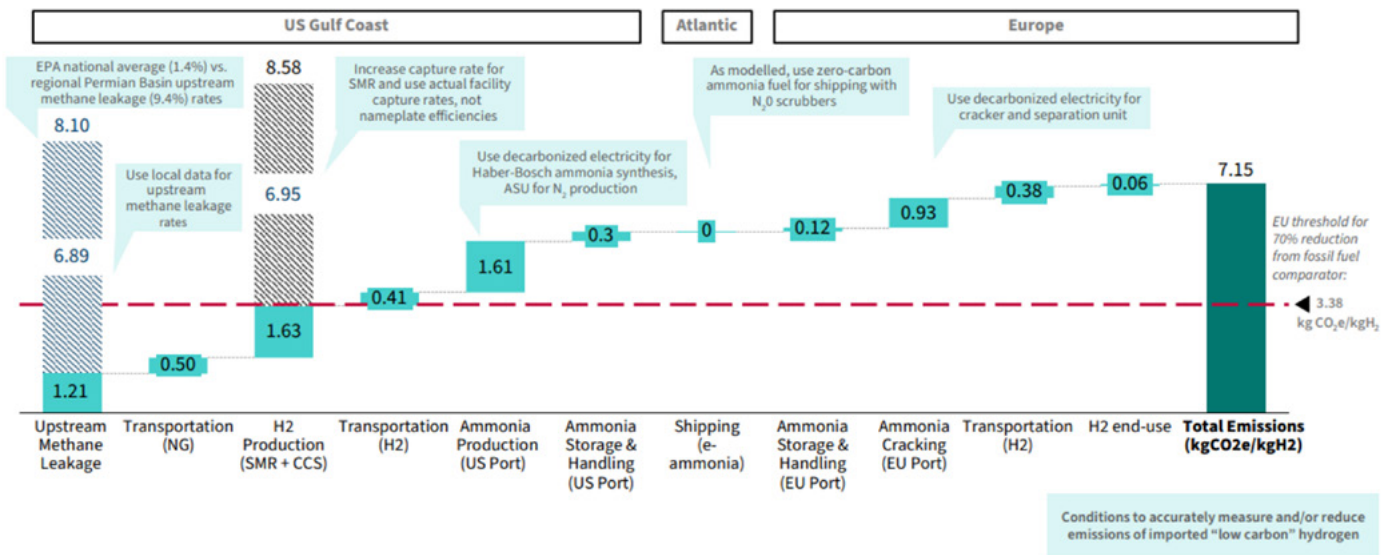


Figure 7: Calculated emissions intensity of landed blue hydrogen in Europe, kgCO<sub>2</sub>e/kgH<sub>2</sub> (source: IEEFA, 2025)

planning and investment cycles, resulting in lost time during a critical phase of market development. Moreover, the current requirement to procure electricity through direct contracts with renewable producers, excluding more flexible portfolio-based models, limits access to affordable and dispatchable clean electricity. Combined with a lack of robust risk mitigation mechanisms, this has created an unfavourable investment environment. As a result, several hydrogen projects have paused development, highlighting the impact of regulatory design on market confidence and deployment pace.

## IMPORTS

Given the significant concentration of hydrogen-intensive industries in Europe and the relatively limited potential for surplus domestic renewable energy, several Member States, notably Germany, have been exploring hydrogen import schemes for several years. As the main existing instrument of the import strategy, H2Global was created by the German government as a market-based support mechanism to facilitate international trade in renewable hydrogen and its derivatives through a double auction model. Hintco, which is part of H2Global, purchases

hydrogen under long-term contracts via competitive supply-side tenders and resells it under short-term contracts to buyers, bridging the price gap with public funding.

The first auction, backed by €900 million from Germany for green hydrogen and derivatives production outside of Europe, concluded in July 2024. Fertiglobe, the largest producer of nitrogen fertilisers in the MENA region, won the bid for renewable ammonia. There was no winner for e-SAF, and the funds were therefore meant to be reallocated to the methanol bid winners, yet this bid also failed.

*“Importing hydrogen instead of green iron, ammonia or urea adds cost without proportionate jobs and value added.”*

Bidders who decided not to submit a final offer blamed regulatory uncertainty around GHG accounting outside the EU, insufficient contract value and duration relative to the investment required, and the fact that RED II

requires proportional allocation of GHG savings across all Fischer-Tropsch products (ESMAP, 2024). The second tender, worth €2.5 billion and also co-financed by Germany and the Netherlands, began in February 2025 ([Hydrogen Insight, 2025](#)). Since May 2023, the EU has been considering using H2Global as a vehicle for the international auctions; however, broader backing (from Member States such as France, Italy and Spain) is missing.

The workshop discussions around imports revolved around the relevance of imports of derivatives, based on their applications and energy loss, as illustrated in Figure 7. Imports of hydrogen rather than products lower down the value chain – such as green iron, green ammonia, or green urea – would significantly add to costs without demonstrating a clear added value in terms of cost versus societal benefit, including employment and added value ([Verpoort et al., 2024](#)).

## KEY TAKEAWAYS FROM THE DISCUSSION

**Regulatory Over-Complexity:** RFNBO certification imposes rigid additionality, hourly correlation, and locational rules for electricity sourcing, which add up to €2.3–2.4/kg H in certain regions and undermine project bankability in a way that is not proportional to the potential GHG savings.

**Prioritisation Misalignment and Lacking Demand:** Only 3.6 % of EU hydrogen projects planned for 2030 have reached final investment decision, and binding offtake agreements cover just 4.5 % of the REPowerEU target ([ERCST, 2024](#)). Yet hydrogen continues to be promoted across a wide range of sectors without clear prioritisation, with low-impact uses often attracting more support than high-abatement sectors such as ironmaking and ammonia, where viable

alternatives are scarce. Redirecting subsidies toward applications where low-carbon hydrogen is truly indispensable, combined with strong lead market policies, would allow public resources to deliver greater climate benefits and better value.

**Delayed and Incomplete EU Framework:**

The Delegated Regulation on low-carbon hydrogen is still pending, thus blocking recognition of blue and nuclear-based hydrogen. The 2023 adoption of RFNBO rules should have been synchronised with supporting acts to avoid today's uncertainty. There is also no demand for low-carbon hydrogen since all EU legislation focuses on narrowly defined renewable hydrogen, even though it could slash emissions, for instance, in ammonia production.

**Import Strategy Under Scrutiny:** Stakeholders raised concerns following the failed Norway-Germany hydrogen import partnership, the inefficiency of imported ammonia cracking, and the risk of locking in fossil-based infrastructure through retrofitted LNG terminals.

**Geographical Disconnect in Infrastructure:**

Hydrogen pipelines and storage planning do not sufficiently align with regions offering cheap renewable electricity. Core production zones – e.g. Spain, Portugal, the Nordic countries, France, and offshore wind hubs – remain under-connected. Whether to prioritise clusters or a backbone needs to be addressed by decisionmakers.

**Lack of Financial Derisking Mechanisms:**

Without robust demand signals and sector-specific differentiation, investment remains stalled. The Carbon Border Adjustment Mechanism (CBAM) and the EU Emissions Trading System (EU ETS) will neither lower the cost of hydrogen nor generate sufficient demand on their own. To accelerate FIDs, Member State-backed

guarantees for offtake contracts, such as Hydrogen Purchase Agreement (HPA) guarantee models, could play a critical role. Meanwhile, infrastructure investment remains constrained by the lack of clear amortisation frameworks and anticipatory planning. This could be addressed through regulated asset base (RAB) models, availability-based contracts, or long-term capacity bookings for midstream assets such as pipelines, terminals, and storage facilities. Long-term commitments (10 to 15 years), take-or-pay clauses, and pricing mechanisms that reflect fixed and variable costs could be decisive for bankability.

## POLICY RECOMMENDATIONS

- 1. Reform RFNBO Certification to Enable Faster Rollout:** Additionality and temporal correlation rules need to be pushed from 2028 and 2030 to 2035. Meanwhile, geographical correlation requires that the renewable electricity source and the electrolyser be located in the same bidding zone. A more pragmatic approach could allow sourcing from interconnected bidding zones with comparable or higher renewable shares, in line with broader grid decarbonisation. The EU should also revise its RFNBO rules to allow access to subsidised imports of derivatives, for instance, in the case of 45Y (renewables), to align with 45V (clean hydrogen) and 45Q (clean fuels). This would potentially open the door for an end to the additionality principle restricting subsidies for electricity generation for hydrogen. This will be cheaper than EU domestic production and will not compete with it, given the expected EU deficit in hydrogen and derivative needs.
- 2. Enable Blue Hydrogen in Ammonia:** Stakeholders noted that steam methane reforming with carbon capture and storage (SMR+CCS) in ammonia production

provides high-purity CO<sub>2</sub> streams and enables technically feasible capture rates above 90%. In the EU, the ammonia sector remains largely domestic, with around 1.9 million tonnes of the total 2.3 million tonnes of hydrogen used for ammonia production still produced within the Union. Yet this could shift if the EU maintains a narrow focus on RFNBO-only hydrogen, which risks undermining existing assets and accelerating import dependence. European ammonia plants, especially those already located near planned CO<sub>2</sub> storage sites or CO<sub>2</sub> pipelines, offer a realistic short- to medium-term opportunity to deploy low-carbon hydrogen with verifiable climate benefits, assuming that methane leaks are monitored and addressed. Where robust (independently verified data demonstrate that the process achieves at least a 70% reduction in lifecycle GHG emissions compared to the fossil benchmark, as mandated by the Delegated Regulation), Low-Carbon Hydrogen should count towards RED III targets for industry.

*“Ammonia plants near CO<sub>2</sub> storage or pipelines offer a near-term opportunity for blue hydrogen – if methane leaks are controlled.”*

- 3. Stop Public Support for Hydrogen Use in Low-Temperature Heat and Electrifiable Transport:** Hydrogen is an inefficient and costly option for most low-temperature industrial heat (<200°C), where direct electrification via resistance heaters, heat pumps, or induction is both more

energy-efficient and commercially available at a lower cost ([Future Cleantech Architects, 2025](#)). Electrification of heat through heat pumps – which can reach up to 150°C as of 2025 ([ECCO Climate, 2025](#)) – can achieve 90% efficiency, compared to around 48% for hydrogen once electrolysis and combustion losses are included ([Future Cleantech Architects, 2025](#)). Nonetheless, EU and national subsidies still support hydrogen in these applications. Hydrogen can replace gas in energy-intensive industries where high-temperature processes cannot be electrified cost-effectively, and where the oxygen from electrolysis can be used on-site, improving system efficiency. Similarly, battery electric vehicles (BEVs) outperform hydrogen fuel cell vehicles across light-duty segments on cost, efficiency, and infrastructure readiness, converting over 70% of grid electricity into motion, compared to around 30% for hydrogen cars ([Future Cleantech Architects, 2025](#)). Policy support for transport applications should therefore be limited to hard-to-electrify sectors, notably maritime, aviation, and long-haul freight, where hydrogen or its derivatives offer real advantages in energy density and refuelling speed. Concentrating support where hydrogen has clear comparative benefits would improve energy system efficiency and free up renewable electricity for more impactful uses.

- 4. Embrace an EU-wide Industrial Policy:** Net zero redraws the cards. Member States should acknowledge this. The EU should pursue an integrated industrial policy based on territorial partnerships between renewables-rich regions (such as Spain, Portugal, the Nordic countries, and Greece) and industrial centres with high industrial production and

skilled labour (such as the blue banana and Central and Eastern Europe). These cross-border corridors should promote value-sharing mechanisms that channel part of the upstream cost advantage into investments in infrastructure and social needs. Upstream intermediates (e.g. hot briquetted iron, ammonia, urea, ethylene) could be transported to high-demand regions where more complex downstream processes – such as hot and cold rolling of steel, metal coating, painting, and forging, like the Ostwald process for nitric acid or ethylene polymerisation into plastics – remain in existing industrial clusters. In the absence of coordination, fragmented national strategies risk undermining the viability of energy-intensive industries; a shared framework offers a way to preserve and strengthen these critical sectors in a decarbonising Europe.

*“EU-wide corridors moving intermediates like HBI, ammonia and ethylene to renewable-rich regions should redirect upstream cost gains to social infrastructure and reskilling.”*

- 5. Expand and Reform EU Funding to Reflect GHG Savings:** Stakeholders called for a fundamental shift in how instruments such as the Hydrogen Bank, the Innovation Fund, and future Carbon Contracts for Difference (CCfDs) under the Industrial Decarbonisation Bank allocate support. Rather than selecting projects solely based on the lowest bid price, funding should prioritise those delivering

the highest GHG abatement per euro spent. The EU could integrate carbon abatement per kilogram of hydrogen into selection criteria, but also introduce sector-specific baskets, account for baseload offtake needs, and recognise regional resilience factors. A move away from price-only competition towards performance-based modulation is needed to reflect sectoral decarbonisation potential and system value. This is particularly relevant for hard-to-abate sectors such as steel, which already accounts for an estimated 2.12 million tonnes of hydrogen demand across 60 projects in Europe ([EUROFER, 2024](#)). To ensure that strategic industrial uses are not displaced by speculative bids from low-impact applications, dedicated sectoral allocations should be introduced. The Hydrogen Bank's Auctions-as-a-Service mechanism, which allows Member States to provide national co-financing for eligible bids under EU auction rules, can support geographic complementarity. Spain, Lithuania, and Austria have already committed up to €836 million through this tool. More Member States should participate, and the EU should significantly increase the Hydrogen Bank's budget in the next Multiannual Financial Framework to enable more targeted and effective support for industrial decarbonisation.

## CONCLUSION

Unless there is a course correction, current dynamics could see public funding absorbed by low-impact applications while sectors and regions with the highest decarbonisation potential are left under-supported. Renewable hydrogen will remain a vital tool, but one that must be deployed with discipline, precision, and a clear sense of purpose. Workshop discussions reflected underlying tensions: between cost-down strategies and targeted use; backbone infrastructure and decentralised clusters; and domestic production and diversified imports. There was also a lack of alignment on whether strict safeguards or pragmatic flexibility should guide uptake, and on how to balance ambition with cost-effectiveness. The continued support for refineries, despite their limited emissions reduction per tonne of hydrogen used, was noted with concern. Echoing calls from the European Court of Auditors, participants stressed the need for forward-looking techno-economic analyses to identify where renewable hydrogen costs can fall fastest and where pink and blue hydrogen might deliver climate value at a lower cost. As industrial decarbonisation plans move from concept to execution, a more coherent, prioritised, and regionally grounded hydrogen policy is essential to prevent delays, cancellations, or offshoring.

## ABOUT US

EPICO KlimaInnovation is an independent think tank that advances constructive, market-based, and innovation-driven climate and energy policies through clear concepts and viable, balanced solutions. We create a network that brings together key stakeholders in climate and energy policy to establish and implement a socially broad-based agenda. We provide a platform for actors from politics, business, science, and civil society to engage, consult, contribute, and advance solution-oriented approaches.

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