

THE CLEAN TECH BUSINESS CASE RACE

How can Europe stimulate its hydrogen industry by taking a page from the US book

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**Policy
Brief**

Introduction

One promising way for Europe to decarbonise, especially its energy-intensive industries, is **hydrogen**. Hydrogen is crucial for hard-to-abate emissions. These emissions are found in sectors and applications where electricity is not the current form of energy at the point of end use, and where direct electricity-based solutions come with high costs or technical drawbacks (e.g. cement production).

Globally, four-fifths of total final energy demand by end users today is for carbon-containing fuels, not electricity. To provide alternatives to those fuels, solutions such as hydrogen are needed. The EU institutions know this and have put hydrogen at the top of their agenda. **'Some will tell you hydrogen is for the future. I disagree. Europe's hydrogen economy is being built today,'** commented Ursula von der Leyen in 2020.

To scale up production and shorten the timelines for its adoption, hydrogen needs incentives. However, as hydrogen is not yet a commodity, it is difficult to transport and is currently too expensive to produce. Thus, a business case is needed to bridge the cost production gaps and prompt off-takers to make commitments. This Policy Brief addresses these three points by taking inspiration from the US model and provides **three recommendations that will pave the way for a compelling business case for the deployment of hydrogen in Europe.**



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Recent US legislation, namely the Inflation Reduction Act (IRA) and Infrastructure Investment and Jobs Act (IIJA), has served as an awakening for EU policymakers. Through these industrial policies, the US has introduced a suite of investment and production tax credits, as well as funding for infrastructure buildout. The US has **signalled long-term policy support, reduced cost of capital and risk of investments, and decreased operational costs**. In short, the US has created a superior environment for commercialising hydrogen, providing benefits for investors, companies, and communities.

The European context looks different and here's why:

First, hundreds of hydrogen projects have been floated by European governments over the past few years, yet only 7 % of those have the financing to start construction. This is because Europe is facing the 'chicken-and-egg problem' – producers wait for a sign from hydrogen off-takers, while off-takers are impatiently waiting for producers.

The EU regulatory framework is made even more complex by the fact the EU doesn't consider hydrogen only in terms of production volumes and emission reductions but has introduced two separate hydrogen categories, namely renewable or green hydrogen and low carbon. The former is produced by the electrolysis of water using electricity from renewable sources and thus emits no greenhouse gases during its production. The latter is produced from non-renewable sources and produces at least 70% less greenhouse gas emissions than fossil natural gas across its full lifecycle.

The US has adopted a 'clean hydrogen' policy (setting a clean hydrogen production standard of less than 4kg of carbon dioxide-equivalent (CO₂e) per kg of hydrogen, supporting different types of projects. In essence, the cleaner the produced hydrogen, the higher the tax credit.

Second, the reason why hydrogen projects lack in Europe is not only because governments in Europe are not investing enough. **Energy companies say** 'there's not enough infrastructure in place to use hydrogen as a fuel for power plants or transport it to end users, making it complicated to plan large-scale investments.' If all the projects proposed in the EU were built, they would still only cover 3.5 % of the bloc's energy needs.

The German utility company EnBW, which has the country's most advanced plans to run plants on hydrogen, **says that even if funding ends up being streamlined, the outlook for Europe is still gloomy.** The lack of infrastructure is a bottleneck because hydrogen is the lightest and smallest element, and in its liquid form can be explosive when exposed to air. That makes it difficult to transport and why it requires infrastructure.

The US framework by contrast, in particular the Infrastructure Investment and Jobs Act, includes support for building infrastructure, thus providing greater security to off-takers and producers.

Third, while the EU has high ambitions, it still lacks the technology. The bloc doesn't invest in manufacturing electrolyzers — expensive machines that split molecules to produce hydrogen — and has not designed the regulatory tools (special contracts) that will ensure there will be enough renewables powering those electrolyzers to meet the EU's own green hydrogen goals.

The US approach boosts manufacturing capacity and ensures that technologies have the needed support from lab to deployment. Thus, US now accounts for 70 % of committed clean hydrogen production globally.

The US' strong business environment

Propelled by the Inflation Reduction Act (IRA) and Infrastructure Investment and Jobs Act (IIJA), the US is quickly strengthening its posture to dominate the hydrogen market. Three important lessons can be learnt from this.

► *De-risking investments*

The IRA is fuelling an unprecedented surge in the US clean energy economy, allocating a massive USD 369 billion for renewable and low-carbon energy production and investment incentives. A key feature of the IRA is its production tax credit of up to USD 3/kilo of clean hydrogen, dependent on carbon intensity. This **clear and direct financial incentive** is a major pull for investments into the American clean energy sector. Production tax credits serve as a significant incentive for investment in hydrogen, as they directly reduce the financial risk and improve the return on investment for producers. Essentially, these credits provide a rebate on the taxes that producers owe, **lowering the overall cost of production and making hydrogen more attractive to investors.**

As production credits are **self-activating**, this gives producers reassurance that they will receive the necessary support. Additionally, by offering a production tax credit, the US has signalled its strong support for the hydrogen industry, creating **a more certain policy environment that is conducive to long-term investment**. In fact, the tax credits **encourage** the industry to produce cleaner hydrogen, because the cleaner the hydrogen, the bigger the tax break is. This can encourage producers to scale up operations, innovate, and reduce costs over time, further strengthening the business case for hydrogen.

► *Supporting infrastructure*

The US Department of Energy's commitment of USD 8 billion to develop '**Regional Clean Hydrogen Hubs**' is another strategic lever that is accelerating the US's advancement in the field [1]. The programme presents three key benefits.

First, it designs hubs to be centres of excellence for **research and development**, accelerating innovation in green hydrogen technologies and making it more commercially viable and attractive to investors. Second, the hubs can **stimulate demand** for green hydrogen by fostering its use across various sectors. By building a robust, interconnected regional hydrogen economy, these hubs can provide a ready market for green hydrogen, potentially boosting investor confidence in the sector's profitability. Third, these hubs can **provide infrastructure for green hydrogen storage and distribution**, which is a significant challenge given hydrogen's low density and high flammability.

► *Supporting the life-cycle of a technology (from lab to deployment)*

In addition to de-risking finance and supporting infrastructure, the US package also includes support for manufacturing electrolysers. This is important, because technological development is supported from the lab to production, thus strongly encouraging innovation.

The US IIJA included USD 1 billion for electrolysis research, and USD 0.5 billion for research into and the development of clean hydrogen manufacturing and recycling.

[1] The USD 8 billion earmarked for the DOE's Regional Clean Hydrogen Hubs programme was allocated in the IIJA, the US's landmark bipartisan infrastructure bill passed in August 2021.

The IRA has shed light on the administrative hurdles tied to EU funding for the net-zero transition. Some commentators have **opined** that if the EU enters a subsidies race with the US, the EU would not win, nor will it benefit its own industries, which would lose competitiveness.

The problem is more nuanced. The EU has a resource pool for net-zero technologies; however, the funding framework is more cumbersome in comparison to the IRA. Against this background of the US framework for scaling hydrogen production, the section below outlines the EU's approach and highlights the drawbacks associated with the fragmented funding landscape.

It remains to be seen whether the US approach will have the desired impact of guiding industries through the green transitions. The supporters of a less-subsidised transition might say US government could be spending the funding more efficiently, as currently projects can stack up incentives (e.g. some will receive funding from the hydrogen hubs programme and will later receive the production tax credits). Furthermore, **research has shown** that while the US will increase production of hydrogen, it lacks a methodology for calculating the emissions from hydrogen on top of the lack of targets for off-takers.

Nevertheless, the US framework has been successful, in mobilising the industry and providing support for technologies from the lab to deployment. This robust framework is a good example against which the EU can compare its own approach and identify existing gaps.

The EU's (fragmented) approach to hydrogen

In July 2020, the EU adopted a **hydrogen strategy** for a climate-neutral Europe. Later, in 2022 the Commission published its **RePowerEU proposal**, which sets a production target of 10 million tonnes of renewable hydrogen domestically and for importing 10 million tonnes of renewable hydrogen by 2030.

Following RePowerEU and the adoption of the US IRA, President Von der Leyen announced a European Hydrogen Bank in her **2022 State of the Union speech**. This appeared to be a targeted effort to not only incentivise EU hydrogen producers to stay in Europe, but also to ensure the EU will be able to meet its own domestic hydrogen targets. This effort was followed by the adoption of a **Net-Zero Industry Act** (NZIA) which supports the deployment of clean tech and aims to provide a business case for clean tech manufacturing.

Table 1. Overview of EU framework and measures.

EU Hydrogen policy	
Technology framework	Legislation
Hydrogen production, transport and market rules	Gas Package - low carbon hydrogen, market rules and infrastructure (not yet adopted – should be adopted by 2023) Renewable Energy Directive 3 (RED 3) – targets for renewable hydrogen production, targets for industry and transport
Hydrogen offtake	ReFuel EU Aviation – quotas for sustainable aviation fuels (to be adopted by mid-2023) Fuel EU Maritime – quotas for renewable fuels of non-biological origin (RFNBO) (to be adopted by Q2 2023)
Hydrogen scale up	NZIA –lists hydrogen as a strategic tech and establishes incentives and streamlined procedures for tech with TRL 8 and above Project support, European Hydrogen Bank, Important Projects of Common European Interest (IPCEI) Hy2Tech

Source: [DG Ener](#)

► *Creating a reliable hydrogen market*

For the EU, the first piece of the hydrogen puzzle was to create a functioning market. The 2021 **EU Gas Package** was proposed to **establish a hydrogen market** similar to those previously developed for natural gas and electricity. The Gas Package includes an elaborate definition of ‘low-carbon hydrogen’. However, policymakers seemed to prioritise **the demand for renewable hydrogen**. Policymakers solidified EU **renewable** hydrogen production ambitions (see RED3 above) by indicating to industries that they must procure at least 42 % of its hydrogen from fuels of non-biological origin (RFNBOS) by 2030. Furthermore, the EU included renewable hydrogen targets which assign sectoral targets, thus aiming to ensure that those sectors would be off takers.

The issue with the EU 'green vs low-carbon' system and prioritising green hydrogen is **that it increases regulatory complexity and slows down the creation of a liquid market** as green hydrogen is currently not produced at scale and is prohibitively expensive. Focusing only on green hydrogen could mean directing valuable and scarce renewable energy to hydrogen production (possibly resulting in the cannibalism of renewables as hydrogen is not a primary energy source) and neglecting other hydrogen production pathways which can increase supply and decrease emissions.

Additionally, industry representatives **argue** that hydrogen is inefficient. For example, in hydrogen vehicles, between 30-40 % of the starting renewable electricity is lost in making the fuel and a further 40 % is lost in the fuel cell. This means that any type of hydrogen holds a compelling case as a decarbonisation option only in cases when direct electrification is not feasible — in industrial processes that require a chemical reaction, for instance. Therefore, assessing which industries need hydrogen the most and ensuring hydrogen supply is not wasted for sectors which can decarbonise via other pathways is crucial.

► *Incentivise missing infrastructure*

Another piece of the hydrogen puzzle is infrastructure. To have a functioning market, meet procurement targets and attract investment, infrastructure is essential.

The EU's Gas Package introduces some incentives for infrastructure where hydrogen can be transported from production to consumption. However, a supportive investment framework to accelerate the development of hydrogen infrastructure, particularly in the early stages, is missing. Policymakers still debate if the NZIA proposal should include 'hydrogen valleys' which if done right could provide security for industry. Details about funding remain to be ironed out by legislators, however.

Another overlooked issue is that energy transmission systems are capital-intensive networks and have proven to be akin to natural monopolies. Therefore, infrastructure planning is needed to create a functioning internal hydrogen market which benefits all EU Member States.

► *Reducing burdens for the industry*

For the hydrogen economy to function well, the technology necessary for producing the hydrogen needs to be scaled-up. While market rules, as described above, are crucial for creating economies of scale, making hydrogen a commodity requires incentives and targeted spending which will prompt industries to scale-up production.

The NZIA aims to incentivise the hydrogen industry to invest in Europe. It designates electrolysers and fuel cells (which are crucial for hydrogen production) as strategic technologies. Similar to the US, EU policymakers included a domestic clean tech production target. Upstream electrolyser components and fuel cells were also included in the proposal. In addition, the NZIA leverages the power of public procurement (facilitating clean tech's access to markets) and lists instances in which hydrogen projects can receive a 'strategic net-zero status' to speed up the permitting process.

So whilst the NZIA successfully addresses some of the barriers facing industry, certain elements needed to provide investment certainty, such as the Sovereignty Fund (a fund the Commission proposed as a part of its [Green Deal Industrial plan](#)), remain unclear.

► *EU funding paradigm*

Presently, the EU funding mechanism for green tech is structured around a grant-making model. This model is more complex than the self-activating tax credits provided under the auspices of the IRA because of the eligibility and admissibility criteria set for EU funding calls which include lengthy processes, case-by-case evaluations and ultimately do not provide any guarantee that projects will receive the needed support.

As such, the EU-level funding landscape for hydrogen deployment is fragmented and includes initiatives such as the Hydrogen Bank, which the European Commission intends to invest EUR 3 **billion** into to kickstart the European hydrogen market and fulfil domestic hydrogen production targets. Details of how the funds will be allocated are still being discussed, however, the dedicated amount is likely to cover less than 1 % (300 000 tonnes) of hydrogen production due to the domestic production target being 10 million tonnes.

A second option for supporting the hydrogen economy in the EU is state aid. In July 2022, the Commission approved the Important Projects of Common European Interest (IPCEI Hy2Tech) under EU state aid rules. IPCEI Hy2Tech is focused on funding projects which fail to secure private investment by pooling state aid funding from 15 Member States amounting to EUR 5.4 billion. The injection of public funding is projected to unlock an additional **EUR 8.8 billion in private investments**.

Beyond the IPCEI Hy2Tech, EU state aid initiatives tied to hydrogen include the General Block Exemption Regulation (GBER) and the Temporary Crisis and Transition Framework (TCTF). These measures facilitate the establishment of a 'quasi pre-approval mechanism' for state aid deployed towards clean tech production within the EU. Overall, these funds enable innovation and development in the hydrogen sector by de-risking investments in related projects that contribute to the EU's objectives.

While the funds available through state aid are limited in their ability to unlock large-scale hydrogen production, the further loosening of the state aid rules to allow for more ready access to funds also carries the risk of distorting competition within the internal market. The risk is based on the asymmetrical spending power of the EU Member States. Put simply, larger EU economies could benefit disproportionately from the loosening of state aid controls [2].

Recommendations

The EU should aim to **tailor its funding to support innovation and reduce costs**. To truly make a business case for clean tech (and hydrogen in particular), **funding needs to be easy to access** and streamlined to bring technology through the different stages from research to development and from demonstration to commercialisation. With various countries offering incentives, if the EU does not get the business case for hydrogen right, it will risk losing the hydrogen-producing industries to competitors, thus making it more expensive for off-takers who would need to rely on imports.

This Policy Brief gives three concrete recommendations to ensure that this does not happen:

**1**

Adopt a technology-neutral approach to support production and off take

[2] This concern is well founded as Germany and France accounted for 77 % of the EU state aid allocation following the economic fallout from the Russian invasion of Ukraine.

The EU approach directs more financial support towards green hydrogen production. Instead, the EU **should focus on hydrogen definitions based on their emissions intensity.**

The current approach adopted by the EU would be unlikely to support the most cost-efficient hydrogen options as the RePowerEU and the NZIA focus on green (renewable) hydrogen. **The NZIA should be expanded to cover not only electrolyzers for green hydrogen, but also other proven technologies needed for low-carbon hydrogen production** such as steam methane reforming and auto-thermal reforming.

Similarly, the EU Hydrogen Bank should allocate funds to green and low-carbon hydrogen to ensure coherence across frameworks.

**2**

Investments in building the infrastructure necessary

Investing in hydrogen infrastructure would be the key for unlocking investments. Currently, such infrastructure is not only costly but also does not go beyond existing energy clusters. To design economies of scale and ensure off-takers will have access to hydrogen and would make long-term investment decisions, policy instruments to speed up the build-out of midstream infrastructure to transport the hydrogen between producing sites and off-takers would be necessary.

**3**

Funding paradigm shift: Ease access to funds to de-risk investments

The EU does not need to go euro-for-dollar with the US given that the rigidity attached to EU state aid rules is a function of the legal nature of the Union. If further relaxed, state aid rules would result in unfair competition between Member States.

Ultimately, instead of focusing on national subsidies, Member States **need to leverage possibilities provided by existing funds and simplify access to those funds by diversifying and optimising the suite of instruments used.** For example, Carbon Contracts for Difference (instruments used to set a fixed carbon price over a given period, which reduces the investment risk for companies and shares the CO2 costs between public and private entities, could be used when disbursing funds from the Hydrogen Bank as a means of de-risking investments in hydrogen deployment and safeguarding the investments from market volatility.

In sum, this policy brief interrogates the EU-US climate relations against the background of the US IRA. The EU Green Deal represents the EU's commitment towards climate action. To move the needle in the fight against climate change, the EU has a vested interest in the collaborative efforts of international partners. The raft of policies in the IRA fill this gap by availing significant funds for the deployment of clean tech. Even so, the EU must preserve its global competitiveness in attracting entities involved in the production and deployment of clean tech.

The hydrogen industry demonstrates the EU balancing act based on these considerations. The EU can draw lessons from the strong business environment created by the US model in structuring a business case for hydrogen deployment at scale within the EU market. The key lessons include adopting a technology neutral approach to hydrogen production and take-off; investing in the build-out of hydrogen infrastructure to facilitate distribution at scale; and, easing access to funds available in order to de-risk investments in the hydrogen market. Conclusively, the EU should implement these key lessons in order to create an ideal business case for the hydrogen industry within the EU.

Conclusion

This Policy Brief has analysed the US legislative framework for hydrogen and has compared it against the EU one. It concluded that the US strong business environment results from supporting hydrogen infrastructure development, providing incentives across the entire lifecycle of technologies and successfully derisking investments. The Brief also argued that while there has been growing regulatory support for hydrogen in Europe, to be able to drive investments in the Europe and compete with the US, policymakers in Brussels and the Member States need to consider adopting a technology-neutral approach to support production and off take, investing in infrastructure and shifting the current funding paradigm.



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