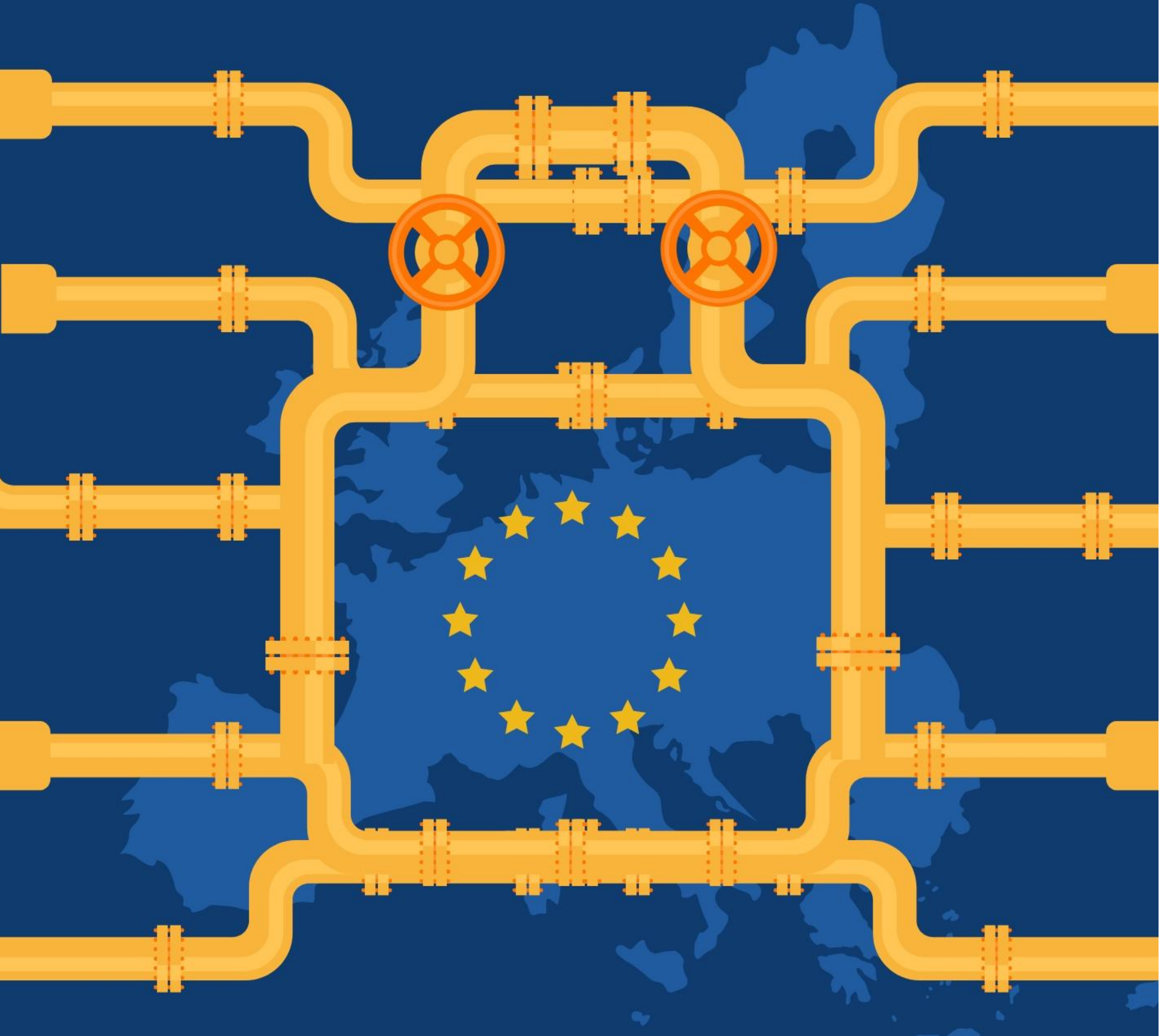
Hallucinating hydrogen

Why the PCI/PMI process must be overhauled



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Executive summary

This briefing analyses the hydrogen projects included in the European Commission's Delegated Regulation for the second list of Projects of Common Interest (PCIs) and Projects of Mutual Interest (PMIs), published in December 2025 under the Trans-European Networks for Energy (TEN-E) Regulation. The purpose of the briefing is to inform the European Parliament and the Council, who hold the power to veto the list, about the structural and procedural shortcomings in the latest PCIs and PMIs selection process. These have resulted in a list dominated by hydrogen projects whose necessity has not been demonstrated and which do not have credible climate benefits.

The second PCI and PMI list includes 108 hydrogen-related projects: 59 transmission pipelines, 21 electrolysers, 19 storage facilities and 9 reception terminals. Their combined estimated capital costs exceed EUR 80 billion. Most of them have been proposed by the fossil fuel industry, and the vast majority by members of the European Network of Transmission System Operators for Gas (ENTSOG).

While the list is framed as part of the EU's climate and energy agenda, the inclusion of large-scale hydrogen infrastructure risks repeating the mistakes of the fossil gas infrastructure era. The hydrogen projects included are oversized and incompatible with the EU's climate and energy goals.

More than two-thirds of the hydrogen pipelines on the list – 42 out of 59 – are likely to transport fossil-fuel-based hydrogen for decades. And seven of them are rebranded gas projects. Few, if any, electrolyser projects are set to include additional renewable electricity capacity; most will rely on grid power, which risks cannibalising existing power generation. Although far from economically viable, hydrogen import terminals aim to receive mostly fossil-fuel-based ammonia. The use of hydrogen derived from fossil fuels will undermine the EU's current plans to limit dependence on fossil fuel imports.

The scale of the planned hydrogen infrastructure far exceeds the current level of hydrogen economy development in the EU, and is out of touch with realistic forecasts for renewable hydrogen production and demand. This creates a serious risk of stranded assets if these projects are ever built. Even in the best case scenario, it would still mean wasting public funds on expensive feasibility studies and permitting procedures, which could amount to tens of millions of euros, based on recent Connecting Europe Facility (CEF) calls.

Public subsidies, notably from the Connecting Europe Facility for Energy (CEF Energy), are already being diverted towards these speculative hydrogen projects – for now, mostly for studies and permitting – at the expense of mature decarbonisation solutions such as grid interconnections, electrification and renewable energy integration.

Governance flaws in the TEN-E framework are one of the reasons for this outcome. ENTSOG retains control over infrastructure planning, scenario development and cost–benefit analyses, despite its clear conflicts of interest, which have been repeatedly flagged by the EU Agency for the Cooperation of Energy Regulators

(ACER), the European Scientific Advisory Board on Climate Change (ESABCC) and civil society. The result is a self-reinforcing cycle in which gas incumbents define 'system needs', shape the methodology used to assess candidate projects, and then evaluate projects proposed by their own members.

The limited oversight of the process by both the European Parliament and the Council of the European Union, which can only accept or reject the list in its entirety, further weakens accountability within the PCI and PMI selection process.

The Council and Parliament must reject the current Delegated Regulation on PCIs and PMIs, as it would support an oversized network running on fossil-based hydrogen. Alternatively, it risks creating costly stranded assets.

Upcoming reforms to the TEN-E Regulation must curb the influence of the fossil-fuel industry, ensure democratic oversight, and end public funding for fossil-based hydrogen and related infrastructure. The EU's hydrogen plans must focus on local and fully renewable production used only in sectors that cannot be directly electrified. Overall, the EU's energy planning and financing must prioritise electrification and proven renewable technologies, such as interconnections, smart grids, and renewable integration, as the most efficient path to decarbonisation.

Recommendations

1. Vote against the proposed Delegated Regulation on the list of Projects of Common and Mutual Interest

The European Parliament and the Council of the European Union must reject the Commission's Delegated Regulation. While some projects may be justified, such as electricity grids and some of the electrolysers, too many hydrogen-related projects remain deeply problematic. Approving this list would legitimise plans for an oversized and fossil-fuel-dependent hydrogen network. If these projects are built, they risk either becoming a costly set of stranded assets or locking Europe into continued reliance on hydrogen powered by fossil fuels.

2. Reform the TEN-E Regulation and hydrogen network governance, and end fossil-fuel financing

The upcoming review of the TEN-E Regulation must break the cycle of fossil-fuel industry influence over EU energy planning. The governance of the PCI and PMI selection process and ten-year network development plans (TYNDPs) must be opened up to democratic oversight and civil society participation. Conflicts of interest must be addressed to ensure decisions serve the public interest and EU climate and energy objectives. The review must also exclude support for fossil-fuel-based hydrogen (including with carbon capture and storage), cross-border hydrogen infrastructure, and carbon dioxide (CO_2) networks. EU public funding must no longer support or extend the use of fossil fuels.

3. Focus the EU Hydrogen Strategy on local, renewable production and limit hydrogen use to hard-to-abate sectors

The upcoming EU Hydrogen Strategy review must prioritise local production and consumption, limiting hydrogen use to niche sectors where direct electrification is not feasible. Only renewable hydrogen powered by additional generation capacity should qualify for support.

4. Prioritise electrification and proven renewable technologies

The EU must redirect its energy planning and investments toward the most efficient decarbonisation pathways: direct electrification, electricity interconnections, smart electricity grids, and renewable integration. These mature, efficient technologies are key to achieving climate goals and ensuring energy independence.

The CEF Regulation should only allow funding for projects that advance electrification in the EU, such as electricity interconnections, smart electricity grids and renewable energy integration. More funding must be allocated to mature technologies that support electrification, as this is essential for decarbonisation.

Introduction

This briefing covers the hydrogen infrastructure included in the second list of Projects of Common Interest (PCIs) and Projects of Mutual Interest (PMIs) published by the European Commission in December 2025.[1]

The list includes 113 electricity projects – of which 24 are storage, six are smart grids, and 19 are offshore infrastructure – 17 carbon transport infrastructure facilities and three smart gas grid projects. It also contains 108 hydrogen projects, including 59 pipelines,[2] nine terminals, 19 storage facilities and 21 electrolysers. Finally, the list includes two fossil-gas pipelines: the Melita and the EastMed.[3]

The analysis details the high costs and risks of hydrogen infrastructure and the need for a reality check on the EU's renewable hydrogen and related infrastructure needs. We then examine the governance structure behind the PCI and PMI framework, highlighting how it lies at the core of current shortcomings, leading to our four key recommendations to put Europe's cross-border energy infrastructure on track for future-proof development.

[1] European Commission, Annexes to the Commission Delegated Regulation (EU) .../... amending Regulation (EU) 2022/869 of the European Parliament and of the Council as regards the Union list of projects of common interest and projects of mutual interest, *European Commission*, 1 December 2025.

[2] The Commission mentions 51 pipelines, while Food & Water Action Europe and Bankwatch have counted 59 pipelines appearing on the list. The discrepancy arises because we counted projects by application, while the European Commission grouped them by project. The hydrogen interconnector between Finland, Estonia, Latvia, Lithuania, Poland and Germany (known as the 'Nordic-Baltic Hydrogen Corridor') is counted as one project by the Commission, while according to our methodology there are seven separate pipelines.

[3] Connection of Malta to the European gas network – pipeline interconnection with Italy at Gela, Pipeline from the East Mediterranean gas reserves to Greece mainland via Cyprus and Crete (currently known as 'EastMed Pipeline'), with metering and regulating station at Megalopoli.

TEN-E Regulation and the PCI and PMI list

With the adoption of the Trans-European Networks for Energy (TEN-E) Regulation[4] in 2013, the European Commission introduced Projects of Common Interest (PCIs) as key cross-border infrastructure projects connecting the energy systems of EU Member States. Projects of Mutual Interest (PMIs), added in the 2022 TEN-E Regulation revision,[5] link the EU's energy infrastructure network with non-EU countries. Receiving PCI or PMI status provides projects with significant advantages, including accelerated permitting and planning procedures, and easier access to EU public funding, primarily from the Connecting Europe Facility (CEF). The PCI and PMI status are intended to advance EU energy and climate objectives and enhance interconnections between national systems.

In line with the European Green Deal and the EU's broader energy transition and decarbonisation goals, the revised TEN-E Regulation[6] excludes pure fossil gas projects from PCI and PMI eligibility, with certain exemptions. These include a derogation for gas interconnections for Cyprus and Malta until 2030, a transitional period for blending of hydrogen with fossil gas until 2030, and so-called smart gas grids. It also allows support to hydrogen transmission pipelines, storage facilities, reception facilities and electrolysis infrastructure, while also introducing mandatory sustainability criteria for all types of supported projects. Besides hydrogen, the TEN-E Regulation covers electricity infrastructure, offshore grids, smart electricity grids and CO_2 networks.

The 2022 TEN-E Regulation revision and the 2024 Hydrogen and Gas Market Decarbonisation package[7] reshaped the governance of energy infrastructure planning within the EU, with the introduction of the European Network of Network Operators for Hydrogen (ENNOH), which is responsible for hydrogen network planning. ENNOH has not yet been formally established. Until 2027, its mandate is entrusted to the European Network of Transmission System Operators for Gas (ENTSOG). But in any case, **the very same Transmission System Operators** (TSOs) **are members of both associations**.[8]

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[4] European Commission, Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009, *EUR-lex*, 17 April 2013.

[5] European Commission, Regulation (EU) 2022/869 of the European Parliament and of the Council of 30 May 2022 on guidelines for trans-European energy infrastructure, amending Regulations (EC) No 715/2009, (EU) 2019/942 and (EU) 2019/943 and Directives 2009/73/EC and (EU) 2019/944, and repealing Regulation (EU) No 347/2013, *EUR-lex*, 30 May 2022.

[6] Ibid.

[7] European Commission, Directive (EU) 2024/1788 of the European Parliament and of the Council of 13 June 2024 on common rules for the internal markets for renewable gas, natural gas and hydrogen, amending Directive (EU) 2023/1791 and repealing Directive 2009/73/EC (recast) (Text with EEA relevance), *EUR-lex,* 15 July 2024; European Commission, Regulation (EU) 2024/1789 of the European Parliament and of the Council of 13 June 2024 on the internal markets for renewable gas, natural gas and hydrogen, amending Regulations (EU) No 1227/2011, (EU) 2017/1938, (EU) 2019/942 and (EU) 2022/869 and Decision (EU) 2017/684 and repealing Regulation (EC) No 715/2009 (recast) (Text with EEA relevance), *EUR-lex,* 15 July 2024.

[8] European Union Agency for the Cooperation of Energy Regulators, List of founding members: European Network of Network Operators for Hydrogen, *European Union Agency for the Cooperation of Energy Regulators*, 2024.

According to Hydrogen Europe, hydrogen consumption in Europe[9] remained stable at 7.8 million tonnes in 2024. According to the same source, hydrogen is mostly used as a feedstock in the oil refining (58%), fertiliser, and chemical sectors, while demand beyond these sectors remains limited. Hydrogen production capacity in Europe amounted to 10.9 million tonnes per year at the end of 2024, and is dominated by fossil fuels with a share of over 95%, while water electrolysis represents only 0.6% of hydrogen production capacity, with a theoretical production capacity of 65,000 tonnes of hydrogen per year.[10] By June 2025, the installed water electrolysis capacity in Europe reached 571 megawatts (MW).[11]

To recall, the EU Hydrogen Strategy target was to deploy 6 gigawatts (GW) of electrolysers by 2024,[12] which was clearly not met. Based on the above figures, the EU's electrolyser capacity would have to increase 46-fold in less than five years to reach the goal of three million tonnes of renewable hydrogen produced in the EU by 2030 under the Renewable Energy Directive (RED III),[13] or 150-fold to reach the REPowerEU plan[14] goal of ten million tonnes in the same period. The latter would, according to the European Commission, require roughly 150 to 210 GW of additional renewable capacity generating electricity at low cost to make renewable hydrogen competitive with its fossil alternatives.[15]

ACER's hydrogen market monitoring report, published in November 2024, warns that the current infrastructure plans for the European Hydrogen Backbone rely on speculative demand scenarios rather than concrete market needs, which could lead to oversizing and underuse. ACER also urges the EU to improve hydrogen infrastructure planning to identify realistic needs.[16]

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[9] EU, EFTA and UK regions.

[10] Hydrogen Europe, Clean Hydrogen Monitor 2025, *Hydrogen Europe,* September 2025.

[11] Ibid.

[12] European Commission, EU Hydrogen Strategy, *EUR-lex*, 8 July 2020.

[13] European Commission, Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652, *EUR-lex*, 31 November 2023.

[14] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions REPowerEU Plan, *EUR-lex*, 18 May 2022.

[15] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the European Hydrogen Bank, *EUR-lex*, 16 March 2023.

[16] European Union Agency for the Cooperation of Energy Regulators, European hydrogen markets 2024 Market Monitoring Report, *European Union Agency for the Cooperation of Energy Regulators,* 19 November 2024.

Public funding

The Connecting Europe Facility for Energy is the main EU fund that has so far financed the development of PCI/PMI hydrogen projects. The total CEF budget for 2021 to 2027 is EUR 5.84 billion.

The first CEF Energy funding call to include hydrogen projects closed in October 2024 and a list of the selected projects was published in January 2025.[17] This was CEF Energy's largest funding call to date, totalling EUR 1.25 billion, and it granted a significant share to studies for hydrogen infrastructure projects. Out of this EUR 1.25 billion, EUR 742 million went to electricity projects (59.4 per cent), 16.3 per cent went to hydrogen pipeline, storage, and ammonia project studies, and 4.3 per cent to electrolyser project studies.

Out of the 65 hydrogen projects on the first PCI and PMI list, 21 projects were supported by CEF Energy in its first available funding call (13 pipelines, 4 electrolysers, 2 storage, 2 ammonia).

The main types of hydrogen projects that received funding were hydrogen pipelines, electrolysers, ammonia, and hydrogen storage. Hydrogen-related infrastructure projects received EUR 204 million, and electrolysers received EUR 54 million. Hydrogen pipeline project studies received by far the most support with over EUR 172 million, ammonia and hydrogen storage projects received EUR 20 million and EUR 12 million, respectively.

The combined CAPEX of 14 projects supported by CEF Energy in 2024 is roughly EUR 38 billion, and the costs for 7 projects are confidential. This does not account for the 44 projects which have so far not received financial support from the fund.

With the increase in hydrogen projects in the new PCI and PMI list, the competition for limited public funding in CEF Energy and other relevant EU funds will grow.

Although the TEN-E regulation follows the logic that the market has priority to invest in the projects first, this is highly unlikely in the case of hydrogen. These costly projects will, to varying extents, need public funding support due to the very early development stage of the hydrogen market. Therefore, PCI/PMI hydrogen projects will be competing for EU and national funds. Awarding more hydrogen projects PCI/PMI status runs the risk of using up public funds for grandiose and unrealistic infrastructure projects, while the funding available for electricity grids shrinks.

[17] European Commission, "EU invests over €1.2 billion in cross-border infrastructure contributing to build our Energy Union and to boost competitiveness", *European Commission,* 30 January 2025.

Analysis of hydrogen projects on the second PCI and PMI list

The second list of PCIs and PMIs includes 108 hydrogen-related projects – 59 transmission pipelines, 21 electrolysers, 19 storage facilities, and 9 reception terminals, exceeding EUR 80 billion in capital costs.

Hydrogen transmission pipeline projects

The above means that the second PCI and PMI list contains roughly twice as many hydrogen transmission pipelines as appeared on the first list from 2024 (59 compared to 29). Based on publicly available data (published for 86% of pipelines), these 59 pipelines account for approximately EUR 55 billion in capital expenditure (CAPEX) and EUR 1 billion in operating expenses per year (OPEX). With our estimates for the remaining projects for which the project proponents failed to provide data, the total CAPEX could reach around EUR 60 billion.[18]

According to our analysis, 42 out of 59, or more than two thirds of the transmission pipeline projects, are expected to carry fossil-based hydrogen – either 'blue' (fossil gas with carbon capture) or 'grey' (unabated fossil gas).[19] Fossil-based hydrogen, whether with or without carbon capture, produces more greenhouse gas emissions than burning fossil gas directly,[20] making it a wrong turn in the energy transition. Only one-quarter of pipelines are likely to transport only renewable hydrogen – and even these presuppose very ambitious production levels.

The dominance of gas-based hydrogen pipelines is not surprising if we consider that 54 of the hydrogen transmission pipelines on the list are promoted by ENTSOG members and another two by its observers, with only three projects by other promoters. Looking at the promoters' portfolios, 57 of them invest almost exclusively in fossil fuel infrastructure. Seven hydrogen transmission pipeline projects are essentially dropped gas routes – renamed and rebranded as hydrogen infrastructure without clear evidence of market need.[21]

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[18] This estimate is based on the CAPEX and OPEX information of similar projects.

[19] Information on the origin (fossil-based or renewable-based) of the future hydrogen transported by pipeline projects was either collected from developers' applications that explicitly mentioned it, from the answers provided in regional meetings, or was deduced from the countries of origin of the hydrogen. Imports from the Near and Middle East, for example, will entail at least a large proportion of fossil-based hydrogen for the short to middle-term, if not only fossil-based hydrogen, Bloomberg, "Europe Hunts for Clean Energy in the Middle East, but How Clean Is It?", *Bloomberg*, September 2022; European Clean Hydrogen Alliance, Learnbook: Hydrogen imports to the EU market, *ENTSOG*, November 2023, p.22-23; German Institute for International and Security Affairs (SWP), Europe and the Eastern Mediterranean: the Potential for Hydrogen Partnership, *SWP*, August 2022.

[20] Robert W. Howarth, Mark Z. Jacobson, How green is blue hydrogen?, *Energy Science & Engineering*, 9(10), 1676–1687, October 2021.

[21] Seven hydrogen pipeline projects slated to receive EU support appear to be, at least partially, rebranded gas pipeline routes: H2T-A-1156, H2T-A-131, H2T-A-779, H2T-A-1239, H2T-A-642, H2T-A-788, H2T-A-1205. Robert Rozansky, New data insights - Europe Gas Tracker, *Global Energy Monitor*, May 2025.

This dominance of fossil-based hydrogen pipelines, promoted by gas transmission system operators (TSOs), shows that the planned network is a continuation of business as usual under a new label. The PCIs and PMIs selection process gives the impression that the EU is decarbonising only its pipelines, rather than its energy system. These projects raise serious doubts about the EU's claim that the pipelines will transport renewable, fossil-free hydrogen in the future, and about the credibility of reaching the Union's long-term decarbonisation goals. These assumptions rest on unrealistic expectations of large-scale renewable hydrogen production and imports.

Our analysis indicates that most of the hydrogen transmission pipeline projects fail to adequately demonstrate future hydrogen demand or supply and rely on overly optimistic scenarios. At least twenty projects are based on the speculative assumptions of industrial and transport-sector hydrogen uptake, regardless of the absence of large-scale, proven future markets.[22] This lack of robust demand forecasts by all stakeholders, including the European Commission, significantly increases the risk of stranded assets in the making.

The H2rcules project is a striking example: This German 'super-sized hydrogen infrastructure' is widely expected to be under-utilised for a long time.[23] Its transport capacity will likely far exceed actual hydrogen demand, at least in the near to medium term. Moreover, the network's success depends on large industrial hydrogen offtakers, such as steel and chemical producers. If a major demand actor withdraws, it significantly increases the network's risk. For instance, Thyssenkrupp Steel Europe recently delayed its hydrogen-based 'green' steel project due to economic viability concerns, primarily the lack of affordable, large-scale renewable hydrogen supply, putting the broader hydrogen pipeline network's viability at risk.[24]

This reasoning applies also to reception facilities and storage facilities, which are intrinsically linked to pipelines, European hydrogen production, and industrial need.

Climate impact of hydrogen

While hydrogen is used to replace fossil fuels in the energy system and reduce greenhouse gas (GHG) emissions, its production is often carbon intensive. 'Green' or renewable hydrogen produced from renewable electricity via water electrolysis has the most significant greenhouse gas emissions reduction potential of all hydrogen production methods, but accounts for only 0.1 to 0.2 per cent of global hydrogen production. 99 per cent of hydrogen globally is produced from fossil fuels (over 60 per cent from fossil gas

[22] Alpine HyWay, UK-BE H2 Interconnector, Central European Hydrogen Corridor (UKR part), mosaHYc (Mosel Saar Hydrogen Conversion) - Germany, Internal hydrogen infrastructure in Greece towards the Bulgarian border, H2Poseidon Pipeline, H2Med-CelZa (Enagás), H2Med/CelZa, H2Med/CelZa, HySoW Mediterranean, HySoW Atlantic, MidHY, Portuguese Hydrogen Backbone, Nordic-Baltic Hydrogen Corridor - FI section, Nordic-Baltic Hydrogen Corridor - LV section, H2ercules Network North-West, H2ercules Network South-East, H2ercules Network South-West, H2ercules Network West, H2ercules Network North.

[23] Klaus Stratmann, Kritiker halten das geplante Wasserstoff-Netz für überdimensioniert, *Handelsblatt,* 6 March 2024.

[24] SteelRadar, Thyssenkrupp has postponed the green hydrogen project tender due to high costs, *SteelRadar*, 8 April 2025.

via steam methane reforming), resulting in significant carbon emissions.[25] Fossil-based 'grey' (without carbon capture) or 'blue' (with carbon capture) hydrogen can play no useful role in decarbonisation as such, as both are associated with high carbon dioxide and methane emissions.[26]

Hydrogen itself also has a climate impact. Regardless of how it is produced, leakage of hydrogen into the atmosphere has an indirect warming effect due to its impact on the atmospheric composition of greenhouse gases, such as methane.[27] This leads to methane staying in the atmosphere longer, worsening climate change. Although research varies on its exact global warming potential (GWP), the conclusion is the same: hydrogen leaks need to be minimised to avoid reducing its potential climate benefits.[28]

Hydrogen's climate impact is considerable and must be taken into account in infrastructure planning. It can leak from every part of the supply chain, so the longer its transport routes, the higher the risk. Accounting for these physical factors is therefore paramount in deciding where and how hydrogen should be produced and used, and localised production should be preferred in order to avoid long pipeline routes.[29]

Electrolysers

The PCI and PMI list includes 21 electrolyser projects, representing the EU's effort to develop domestic hydrogen production capacity. In total, these projects amount to EUR 2 billion in CAPEX and EUR 100 million per year in OPEX.

13.5 GW of electrolyser capacity could be added if all the projects appearing on the list are constructed, theoretically producing roughly 1.5 million tonnes of hydrogen per year.[25]

According to our analysis, three electrolyser projects will most likely use electricity from the non-decarbonised electricity grid, meaning that they will produce fossil-based hydrogen; ten do not exclude the use of fossil or nuclear-based electricity, and only eight claim to rely entirely on renewable energy or

[25] International Energy Agency, Global Hydrogen Review 2025, *IEA,* 12 September 2025.

[26] Robert W. Howarth, Mark Z. Jacobson, How green is blue hydrogen?, *Energy Science & Engineering*, 9(10), 1676–1687, October 2021.

[27] Nicola Warwick, Paul Griffiths, James Keeble, Alexander Archibald, John Pyle, Keith Shine, Atmospheric implications of increased Hydrogen use, *UK Government,* 8 April 2022.

[28] Candice Chen, Susan Solomon, Kane Stone, On the chemistry of the global warming potential of hydrogen, *Frontiers in Energy Research*, 12, 28 October 2024.

[29] Ilissa B. Ocko, Steven P. Hamburg, Climate consequences of hydrogen emissions, *Atmospheric Chemistry and Physics*, 22(14), 9349-9368, 20 July 2022.

have plans for dedicated renewable energy production.[30] Thus, the majority of included electrolysers cannot guarantee genuine renewable hydrogen production.

Thirteen of the 21 electrolyser projects plan to rely partly or fully on grid electricity. Some intend to use a mix of grid and renewable electricity, while others aim to source 'RFNBO-compliant'[31] power from grids that are still carbon-intensive, or even to use nuclear energy.[32] This means their hydrogen output will likely be, at least in part, fossil-based or nuclear-based, given the continued carbon intensity of most European power systems. According to current EU criteria, only France, Sweden, and Finland maintain sufficiently low average grid emissions for hydrogen produced from grid electricity to qualify as 'low-carbon' – due to nuclear, not renewables.[33]

Even among the eight projects that rely on renewable energy sources – through dedicated renewable energy infrastructure or power purchase agreements (PPAs) – such claims rest on ambitious assumptions. Most projects depend on **new renewable capacity** that does not exist yet, with electricity that will be unavailable for other uses. Without these additional renewables, the promised exclusively renewable supply remains uncertain, and the actual climate benefit of these projects may be far lower than projected.[34]

Hydrogen produced via electrolysis remains far from economically viable. Renewable hydrogen is about six times as expensive as fossil-based hydrogen,[35] and project developers face serious investment and market risks.[36]

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[30] Projects that will most likely use energy from the grid, including fossil-fuel based electricity and/or nuclear energy: - H2E-N-867 H2E-N-865, H2E-N-864, H2E-N-836, H2E-N-1342, H2E-N-1335, H2E-N-1210, H2E-A-1357, H2E-A-1302, H2E-A-1208
Projects that will most likely use only renewable energy: H2E-N-881, H2E-N-1346, H2E-N-1343, H2E-N-1211, H2E-N-1165, H2E-N-1164, H2E-N-1160, H2E-A-1150

[31] Renewable Fuels of Non-Biological Origin.

[32] For example, Thalis 1 in Greece or CrHySALiS in Sweden, CHYMIA in Belgium, GHYga H2 in France, HOST PtX Esbjerg, Esbjerb and Hela in Denmark.

[33] European Parliament, Briefing on the Delegated act on low-carbon hydrogen, *European Parliament*, 11 September 2025.

[34] Bellona Europa, Will Hydrogen Cannibalise the Energiewende?, *Bellona Europa*, 2021.

[35] In 2024, the cost range for the production of hydrogen from unabated fossil gas decreased to USD 0.8-4.6/kg, while renewable hydrogen production cost USD 4-12/kg. International Energy Agency, Global Hydrogen Review 2025, *IEA,* 12 September 2025.

[36] For example, in Germany, leaders are already doubting their renewable hydrogen production capacity. A September 2025 monitoring report on the German 'Energiewende' states that even 10 GW of German renewable hydrogen by 2030 is 'barely achievable'. Energiewirtschaftliches Institut an der Universität zu Köln gGmbH (EWI), BET Consulting GmbH, Energiewende. Effizient. Machen. Monitoringbericht zum Start der 21. Legislaturperiode, *Bundesministerium für Wirtschaft und Energie (BMWE)*, September 2025; Sören Amelang, Carolina Kyllmann, Germany aligns renewable rollout with slower grid expansion to cut costs, *Clean Energy Wire*, 15 September 2025.

In 2023, fossil-based hydrogen production in the EU cost EUR 2.94 per kilogram (kg), while renewable hydrogen production ranged from EUR 4.1/kg (Finland) to EUR 12.4/kg (Poland), with an average of around EUR 7.90/kg.[37]

In 2024, BloombergNEF (BNEF) forecasted that renewable hydrogen costs would likely remain relatively high until 2050.[38] They expect renewable hydrogen to fall from a current range of USD 3.74 to 11.70 (EUR 3.45 to 10.82) per kilogram to USD 1.60 to 5.09 (EUR 1.48 to 4.70) per kilogram in 2050. According to the BNEF, the cost of hydrogen produced from fossil gas today, without abatement, is USD 1.11 to USD 2.35 (EUR 1.03 to 2.17). BNEF expects prices for such 'grey' hydrogen to remain largely the same until mid-century.

Reception terminals for hydrogen

The list includes nine reception terminal projects, for which most of the information on capital and operating expenditures is missing. CAPEX data is provided for only three projects, totalling EUR 3.5 billion, and OPEX data for two projects totalling EUR 100 million annually. This severe lack of transparency on cost information prevents a realistic assessment of the projects' viability and potential risks. According to the project proponents' claims, all the terminals are designed to handle ammonia-based hydrogen imports. These will be made from fossil fuels in the foreseeable future.

Eight project descriptions mention Norway as a hydrogen sourcing partner. However, this assumption appears overly optimistic as all fossil-based hydrogen infrastructure projects in Norway are currently halted or cancelled.[39] And Norway's renewable hydrogen capacity remains minimal, with only 38 MW of electrolysers today, largely due to the 24 MW Yara Project.

Thus, most of the imports that will transit through these reception facilities will be from countries outside of Europe. Almost all these projects are described as operating on a non-discriminatory basis, meaning that they will receive any ammonia regardless of its origin or carbon footprint. Five projects explicitly mention LNG-related supply chains as sources for their ammonia, implying strong dependence on fossil-based imports – largely from the United States, given current geopolitical dynamics and foreseeable trade deals.[40]

This type of hydrogen import is unlikely to be economically viable or environmentally sound.

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[37] European Parliament, Renewable and low-carbon hydrogen: State of play and outlook, *European Parliament*, 3 February 2025.

[38] Bloomberg, 'Green Hydrogen Prices Will Remain Stubbornly High For Decades', *Bloomberg*, 2024.

[39] Polly Martin, 'Green hydrogen is clearly favoured' – Shell and partners cancel blue H2 project in Norway, *Hydrogen Insight*, 24 September 2024.

[40] The IEA confirms this in its 2025 Global Hydrogen Review: 'Ammonia accounts for 85% of the trade from announced projects, reflecting the chemical industry's existing experience in shipping ammonia. Australia and the United States combined could account for 10 Mtpa H2-eq of exports in 2030, while most projects (75%) target Europe as an import market.'

Studies consistently show that the chain of conversion, long distance shipping and reconversion dramatically increases hydrogen's final cost. As Hydrogen Europe pushes for imports of hydrogen derivatives from distances above 3,000 kilometres,[41] the IEA estimates that moving hydrogen by ammonia tankers to Europe already entails levelised transport costs of EUR 1.75 per kg for 3,000 km.[42] The International Council on Clean Transport (ICCT) estimates that the additional cost of shipping, including the cost of converting the hydrogen to ammonia, transporting it over a long distance, and then re-converting the ammonia back into hydrogen, can be as high as the production cost itself.[43]

The environmental case for reception terminals is also shaky. Long-distance transport, conversion and handling of hydrogen often entail significant resource use, energy losses and downstream emissions.[44]

Significant reliance on imported hydrogen could increase the EU's long-term exposure to external supply chains and price volatility, potentially reinforcing existing energy dependencies and affecting overall energy security that the EU is trying to solve. At the same time, sourcing renewable hydrogen from countries that have not yet met their own clean energy needs or that already face water scarcity raises important questions about environmental and social sustainability. These considerations are relevant for assessing the sustainability of projects in the PCI and PMI selection process, which is supposedly the main criterion for their selection.

Storage facilities

The second hydrogen PCI/PMI list includes 19 hydrogen storage facility projects, with total CAPEX costs of more than EUR 5 billion and annual OPEX costs of more than EUR 100 million. Seven of these projects are promoted by ENTSOG members, while twelve are led by other promoters.

The vast majority of these projects are being promoted by fossil fuel companies (18 of the 19) and about 90% are expected to store fossil-based hydrogen. Only one project, the Danish Hydrogen Storage facility, is explicitly designed to store hydrogen produced from renewable sources. Data on many of the proposed storage facilities clearly indicates that they will store fossil-based hydrogen, or at minimum, expect to do so initially. For example, SaltHy Harsefeld and SaltHy Harsefeld II will store fossil-based hydrogen and stock imported as ammonia.

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[41] Hydrogen Europe, Hydrogen infrastructure: the recipe for a hydrogen grid plan, *Hydrogen Europe*, October 2024.

[42] Oxford Institute for Energy Studies, Green Hydrogen Imports into Europe: An Assessment of Potential Sources, *Oxford Institute for Energy Studies*, April 2024.

[43] International Council on Clean Transportation, The economics and greenhouse gas emissions of renewable hydrogen and e-fuels imported in the European Union, *International Council on Clean Transportation*, June 2025.

[44] Joint Research Centre, Environmental life cycle assessment (LCA) comparison of hydrogen delivery options within Europe, *Publications Office of the European Union*, 22 May 2024.

Some of the projects do not mention the sourcing countries. However, given the current and projected scarcity of renewable hydrogen, reliance on fossil-based hydrogen is almost unavoidable. Their planned connection to a potential large-scale hydrogen network further confirms this, as most of the pipelines will transport hydrogen derived from fossil gas with carbon capture or, in some cases, unabated fossil hydrogen.

Governance of the PCI and PMI list selection process needs to be reformed

Although the PCI selection is formally a Commission-led process, European Networks of Transmission System Operators for Gas (ENTSOG) and Electricity (ENTSO-E) have a major influence on the projects that will appear on the list due to the central role they play.[45] The ENTSOs' Ten-Year Network Development Plans (TYNDPs) are the basis of the PCI/PMI selection process. Among other tasks under the TEN-E Regulation, the ENTSOs are responsible for scenarios for the ten-year network development plans (developed jointly every two years), drafting a methodology for energy system-wide cost-benefit analysis of PCI and PMI candidates, and infrastructure gap identification.

1. The TYNDP: A precondition for eligibility for the PCI and PMI status.

The process starts with the submission of candidate projects by their promoters. To be eligible for inclusion in the list, hydrogen projects must be included in the most recent TYNDP prepared by the relevant ENTSO on a biennial basis.[46]

The majority of hydrogen-related projects in the TYNDP originate from stakeholders who are members of ENTSOG.

2. Project Submission and Evaluation

Following the TYNDP, the European Commission (DG ENER) launches a call for projects. Submitted projects are assessed according to the criteria outlined in the TEN-E Regulation, including sustainability, market integration, security of supply, and innovation.

The Cost-Benefit Analysis (CBA) methodology used for project evaluation was developed by ENTSOG.[47]

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[45] According to the TEN-E Regulation, the relevant ENTSOs are responsible for a draft methodology for an energy system wide cost-benefit analysis (Article 11), scenarios for the ten-year network development plans (Article 12) and for infrastructure gap identification (Article 13). ENTSOG's main regulatory tasks are defined by Regulation (EU) 2024/1789, including the development of TYNDPs for gas and for hydrogen (during the transition period until 1 January 2027, when ENTSOG will be replaced by the European Network of Network Operators for Hydrogen – ENNOH, an organisation for cooperation of EU Hydrogen Transmission Network Operators whose members are the very same gas TSOs that are part of ENTSOG).

[46] Annex III, 2. (4) of the TEN-E Regulation.

[47] ENTSOG, Methodologies and modelling, *ENTSOG*, accessed 20 November 2025.

The following step is the assessment and ranking of the candidate projects by regional groups which are composed of the representatives of the Member States, national regulatory authorities, TSOs, as well as the Commission, the Agency, the EU DSO Entity[48] and ENTSOG, based on the methodology developed by the cooperation platform. Decision-making power in the Groups is restricted to Member States and the Commission (the decision-making body), and is based on consensus.

3. Public consultation

During the assessment phase, the Commission opens a public consultation, allowing EU citizens, civil society organisations, and market actors to provide feedback on the draft project list. However, concerns persist regarding the transparency and impact of this consultation process. There is limited public information on how the feedback is analysed or incorporated into final decisions.

4. ACER evaluation

ACER, composed of representatives from the national regulatory authorities, issues an opinion on the proposed PCI/PMI list.

The draft regional lists drawn up by the Groups are submitted to ACER six months before the adoption date of the PCI and PMI list. ACER provides an opinion on the draft, in particular on the consistent application across the regions of the criteria and the cost-benefit analysis.

This opinion is issued after the main technical assessment and just before the final decision-making phase. Although intended to act as a balancing mechanism, ACER's input is often underutilised, while the influence of ENTSOG and other industry actors remains disproportionately strong.

5. Decision-making and High-Level Decision-Making Meeting

The decision-making bodies of the Groups submit the final regional lists to the Commission. The deliberations of the decision-making bodies of the Groups and the project ranking are confidential, while Member States may object to projects planned on their territory. The Commission consolidates all final regional lists into a PCI and PMI list.

6. Final Adoption and Parliamentary Oversight

The final PCI/PMI list is adopted by the Commission in the form of a delegated regulation and is subsequently transmitted to the European Parliament and the Council for scrutiny. They may veto the list. However, no PCI/PMI list has yet been rejected by the European Parliament. A major procedural constraint is that the list must be accepted or rejected as a whole, with no possibility for amendment. This all-or-nothing approach hinders Parliament in exercising meaningful oversight over individual projects.

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[48] The association for Distribution System Operators (DSOs) in Europe.

Already in 2020, ACER and Council of European Energy Regulators (CEER) warned that most of the problems that arose during the past implementation of the TEN-E Regulation could be ascribed to the regulatory role inappropriately attributed to the ENTSOs, despite their conflict of interest.[49] Yet, despite the 2022 revision of the regulation, the same structural flaws persist. As recognised by both ACER and the ESABCC in their latest opinions on the PCI and PMI selection process and the TYNDP, and by numerous NGOs, the reform failed to address the fundamental conflict of interest that stems from leaving ENTSOG in charge of developing the demand and supply scenarios that underpin project selection, as well as the cost-benefit methodology used to justify their selection. In other words, the fossil-gas industry remains judge and jury over the future of Europe's gas infrastructure decarbonization.

ACER, in its recent opinion from 2025,[50] issued within its remit to assess the consistency and transparency of the PCI and PMI assessment process under the TEN-E Regulation, questions the credibility and robustness of the process, and reiterates its call for stronger transparency in the selection of energy infrastructure projects. ACER underlines that many of the concerns raised in its 2023 opinion, when it concluded that it was unable to assess the consistent application of the TEN-E criteria and the cost-benefit analysis across all projects, remain valid, particularly regarding the selection process, the identification of infrastructure needs, and the methodologies used to assess projects.

The ESABCC concluded in 2024[51] that the TYNDP process, which preceded the second PCI and PMI list, failed to adequately reflect the transformational changes and rapid emission reductions required to meet the EU's 2050 climate neutrality and resilience targets. These shortcomings extended across the entire TYNDP process — from scenario development and the system needs assessment to the cost-benefit analysis (CBA) and the subsequent selection of PCIs and PMIs. To address these persistent weaknesses, the ESABCC urges that priority be systematically given to full decarbonisation, energy efficiency, and infrastructure resilience, with a clear shift toward rapid and widespread electrification and demand-side flexibility. Ensuring that these principles are fully embedded in the TYNDP and PCI selection process is essential for restoring credibility and aligning EU infrastructure planning with its climate commitments.

The TEN-E regulation fails to tackle the fundamental conflict of interest created by leaving ENTSOG in charge of developing the scenarios that underpin the selection of projects and responsible for developing the methodology for the cost-benefit analysis used to help choose projects. In the upcoming review of the TEN-E Regulation, the EU institutions should remove ENTSOG from its central role in the decision-making process and create a governance system that is genuinely independent and fit for driving the energy

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[49] Council of European Energy Regulators, ACER-CEER Position on Revision of the Trans-European Energy Networks Regulation (TEN-E) and Infrastructure Governance, *Council of European Energy Regulators*, 19 June 2020.

[50] European Union Agency for the Cooperation of Energy Regulators (ACER), OPINION No 10/2025 on the 2025 draft regional lists of proposed electricity and hydrogen projects of common interest and projects of mutual interest in trans-European energy infrastructure, *ACER*, September 2025.

[51] ESABCC, "Towards climate neutral and resilient energy networks across Europe - advice on draft scenarios under the EU regulation on trans-European energy networks", *ESABCC*, June, 2024.

transition. ENNOH would merely continue the status quo, as it involves the same players, and should also not be allowed to play a central role.

A new proposal for the revision of the TEN-E Regulation is expected soon. However, this review will unfold in a context increasingly shaped by deregulation, industrial lobbying, and a narrow focus on competitiveness rather than climate action. Major fossil fuel industry stakeholders are already pushing to weaken environmental safeguards and redefine hydrogen policy to favour so-called 'low-carbon' hydrogen, produced from fossil fuels or nuclear energy. With fossil hydrogen still far cheaper than renewable alternatives and with renewable hydrogen production lagging, the risk is clear: Europe might be heading in the wrong direction.

Conclusion

Hydrogen transmission, storage and reception projects should not be awarded PCI and PMI status, as they are ineffective solutions that will fail to deliver the energy transition the EU needs. Electricity interconnection and grid modernisation projects must instead be a priority.

The EU's current hydrogen strategy relies on major overestimates of hydrogen's potential as an energy carrier. It has a much smaller role than estimated in delivering climate goals by 2050, meaning deployment of mature solutions is needed on a grander scale. Its gravely inflated mid-term potential as a climate solution has resulted in overly ambitious expectations. The EU has fallen drastically short of its own Hydrogen Strategy targets. At the end of 2025, it is nowhere near its electrolysis target for 2024, let alone 2030.

The two main points where the oversized infrastructure vision perpetuated by the PCI and PMI list fails, are hydrogen's climate impact and its price. Its proponents promise hydrogen to be a climate solution which delivers radical emissions reductions, but this is only the case for renewable hydrogen, which is decades away from scale-up, and whose ceiling is much lower than estimated in the EU's Hydrogen Strategy and the REPowerEU plan due to the physical constraints related to high conversion losses. Its price projections are overly optimistic and rely on unrealistically low future renewable energy prices.

Yet the EU is providing faster permitting and financing opportunities for transmission infrastructure for a fuel which has not proven its economic viability by a long shot, and which is not produced at a significant level. The last thing that European citizens need is for governments to socialise the cost of hydrogen due to their own misjudgment.

To make matters worse, as shown in our analysis, the projects on the draft PCI and PMI list are likely to largely rely on polluting fossil-based hydrogen production that will lead to even more emissions than gas. The pipeline transport infrastructure is not even for undeveloped, absurdly expensive renewable hydrogen, but will foster the development of fossil hydrogen – effectively a more expensive and energy-intensive version of fossil gas.

ENTSOG, and in future ENNOH, plays a central role in the current framework; however, its involvement raises serious conflict-of-interest concerns. While industry actors often possess the technical expertise needed to design and operate infrastructure projects, having the same stakeholders playing a key role in scenario development and project assessment raises questions about independence and transparency of the process. Institutional separation between project proposals and their evaluation must be strengthened. Establishing an independent body to oversee the PCI and PMI selection process will enhance credibility, accountability, and public trust.

In addition, the cost of these hydrogen projects could easily eat up more than the entire predicted CEF budget for the foreseeable future, and put a heavy strain on national budgets, carrying the completely unpredictable risk of future hydrogen prices. Considering the political priority given to economic competitiveness of European industries in the face of decarbonisation and energy sovereignty, it is unlikely that Europe will break its dependence on cheaper fossil-based hydrogen in favour of domestic but more expensive renewable hydrogen.