ADVISORY PANEL FOR FUTURE GAS GRIDS

RECOMMENDATION REPORT

APRIL 2026

DISCLAIMER

The Recommendation Report was drafted by ENTSOG. It is based on the input of the Panel stakeholders participating in the meetings and in no way reflects the position of every individual stakeholder or of ENTSOG itself.

The following stakeholders took part in the Panel discussions: Eurogas, Hydrogen Europe, Gas Infrastructure Europe, Council of European Energy Regulators, International Association of Oil & Gas Producers, IFIEC, GEODE, GD4S, European Chemical Industry Council, Fertilisers Europe, European Heating Industry, Gas for Climate, European Federation of Energy Traders, European Engine Power Plants Association, EU Turbines, European Biogas Association, H2GAR, ENTSO-E, Marcogaz, GERG, EASEE-gas, Florence School of Regulation, Copenhagen School of Energy Infrastructure, Gassco, European Union Agency for the Cooperation of Energy Regulators, European Commission, Zero Emissions Platform, CERRE & University of Oslo, Bellona Europa, CO_2 Value Europe, The Norwegian Ministry of Petroleum, KN Energies, Fluxys and DESFA.

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1 ADVISORY PANEL FOR FUTURE OF GAS GRIDS (FoGG) OVERVIEW

In January 2021, ENTSOG launched an Advisory Panel for Future of Gas Grids (FoGG) with the purpose of ensuring transparency and coordination across the entire value chain to transition to net zero emissions by 2050 and to identify practical challenges and solutions to support the transition also through the gas grids.

The Advisory Panel was established to support gas TSOs and stakeholders in identifying practical challenges and potential solutions related to the evolution of gas infrastructure, including in particular:

- The development of an EU-wide approach to CO_2 transport and storage;
- security of supply and system resilience;
- the repurposing of existing energy infrastructure;
- the integration and scale-up of biomethane.

Following the Recommendation Report 2023, FoGG continued to provide a platform for stakeholders to exchange views on how existing infrastructure could be adapted to future needs, with a particular focus on technical, market, regulatory, planning and financing aspects of the transition.

In 2024 and 2025, ENTSOG welcomed external speakers from the European Commission, the European Parliament, the Florence School of Regulation, Zero Emissions Platform (ZEP), CERRE & University of Oslo, Gas Infrastructure Europe (GIE), Eurogas, IOGP Europe, CO_2 Value Europe, Bellona Europa, the Norwegian Ministry of Petroleum, Fluxys, DESFA, KN Energies, as well as industry players, who all joined our exchanges to share ideas and best practices. The rounds of discussions are translated into the FoGG Recommendation Report, which provides an overview of stakeholders' input.

1.1. FoGG FOCUS 2024: SETTING THE SCENE FOR CCUS

Discussions during the FoGG panels in 2024 highlighted the central role of carbon capture and storage (CCS) in supporting the EU's decarbonisation objectives, particularly for industrial sectors with limited abatement alternatives under the EU Emissions Trading System (EU ETS). Stakeholders identified CCS as a key ingredient of the value chain, with its availability, location and permitting conditions shaping the feasibility and sequencing of transport infrastructure development.

Participants also pointed at significant market uncertainty and coordination challenges across the CO_2 value chain. Stakeholders emphasised the "chicken and egg problem", whereby infrastructure development is hindered by uncertain demand, while emitters remain reluctant to commit in the absence of predictable access to transport and storage capacity.

In this context, the importance of targeted de risking mechanisms, public support and appropriate interactions with the EU ETS was highlighted as critical to underpin viable business cases. Practical project examples discussed during the panels illustrated both the potential of cluster based approaches and the permitting, regulatory and financing hurdles that still need to be addressed to enable timely deployment.

1.2. FoGG FOCUS 2025: CO_2 MARKETS AND INFRASTRUCTURE LEGISLATIVE INITIATIVE

In October 2025, at the time of ENTSOG's 14th FoGG Advisory Panel, the public consultation for the CO_2 Markets and Infrastructure legislative initiative was expected to be launched shortly thereafter, offering stakeholders an opportunity to provide further input on the proposed scope and objectives of the initiative.

During the introductory remarks, participants set the initiative within its broader policy context, referring in particular to the Industrial Carbon Management (ICM) Strategy and the 2040 climate target impact assessment. They highlighted the envisaged phased development of the market, with an initial focus on CCS, while noting that the framework would need to remain sufficiently flexible to accommodate the potential inclusion of carbon capture and utilisation (CCU) at a later stage, notably beyond 2040. It was also recalled that the EU is not starting from scratch, as several relevant policy instruments are already in place, including the CCS Directive, the TEN-E Regulation, the Net Zero Industry Act (NZIA) and the EU ETS.

Participants recalled that, despite the EU's high level of ambition, current project developments struggle to progress, highlighting the challenges of translating policy objectives into concrete investments.

Additional considerations included ongoing investment uncertainty, the absence of harmonised technical specifications, and the need for a clear and predictable regulatory framework to provide clarity and investment incentives across the value chain. Lessons learned from infrastructure repurposing in the context of hydrogen were also referenced as potentially relevant. Finally, participants noted the importance of establishing a permanent and comprehensive permitting framework, as existing provisions under instruments such as the NZIA and Important Projects of Common European Interest (IPCEIs) currently only apply to certain assets within the CO_2 infrastructure and market value chain.

2 THE EMERGING CO_2 VALUE CHAIN

2.1. MARKET FUNDAMENTALS

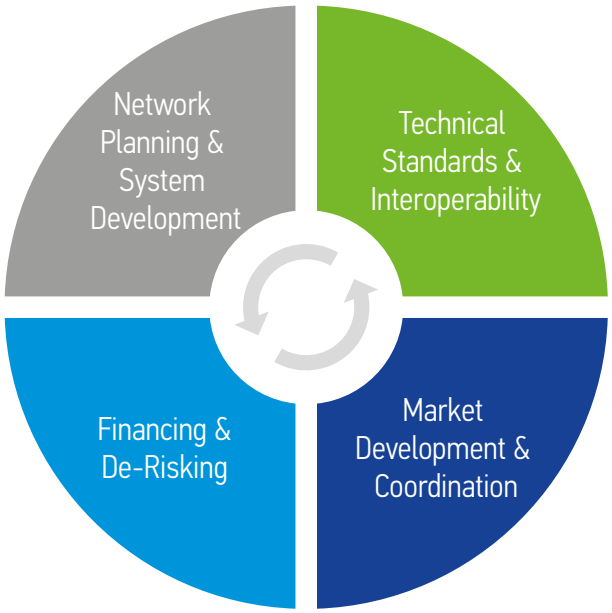
The development of a competitive CO_2 value chain was identified as a key consideration, with particular attention given to how risks can be mitigated and investments de-risked. In this context, the importance of providing a long-term perspective was noted, alongside the need for flexible business models and technical rules, reflecting the nascent nature of the market.

At the same time, stakeholders noted that the CO_2 value chain is subject to a range of legal, fiscal and regulatory challenges. These include persisting barriers to cross-border CO_2 transport, interactions with non-EEA countries, and legal constraints arising from international conventions such as the London Protocol. Infrastructure development, notably related to CO_2 pipelines, was identified as raising specific questions regarding market architecture and regulatory treatment, given their monopolistic characteristics and the need to support cross-border value chains while preserving competition across transport modalities.

While pipelines were recognised as the most cost-competitive transport option, it was also noted that other transport modes, such as shipping, rail and road, are expected to play a complementary role, particularly in the early phases of market development.

Additional considerations included ongoing investment uncertainty, the absence of harmonised technical specifications, and the need for a clear and predictable regulatory framework to provide clarity and investment incentives across the value chain. Vast experience from analysis and discussions on the infrastructure repurposing in the context of hydrogen were referenced as potentially relevant.

Finally, participants noted the importance of establishing a permanent and comprehensive permitting framework, as existing provisions under instruments such as the NZIA and IPCEIs currently only apply to certain assets within the CO_2 infrastructure and market value chain.



2.2. CO_2 STORAGE – THE ANCHOR OF THE VALUE CHAIN

Stakeholders highlighted that CO_2 storage constitutes the anchor point of the CO_2 value chain and a prerequisite for the development of transport networks. The availability, location and permitting conditions of storage sites were seen as fundamentally shaping the feasibility, sequencing and timing of CO_2 infrastructure investments. As a result, storage availability is expected to strongly influence the geographical development of CO_2 transport networks. In addition, stakeholders noted that CO_2 storage projects are characterised by high upfront capital intensity, long development timelines and a risk specific profile, including geological uncertainty, long-term liability and volume risk, particularly in early market phases.

It was further noted that the CO_2 value chain remains characterised by significant uncertainty, notably with regard to the speed, scale and geographical distribution of future demand. Yet, at the same time, stakeholders underlined that several fundamentals were already clear. Large-scale deployment of CCS is expected to play a critical role in helping achieve the EU climate objectives, particularly for ETS installations with limited abatement alternatives.

Against this background, the development of a CO_2 transport grid was viewed as indispensable, even if its final configuration remained uncertain, while access to storage is clearly affecting the possibility to use CO_2 pipelines.

A participant also noted that the upcoming revision of the EU ETS could play a role in enabling access to CO_2 storage in non-EEA countries, including the United Kingdom and parts of the Southern Mediterranean, e.g. Egypt.

Stakeholders further stressed that the specific characteristics of CO_2 needed to be fully reflected in policy and regulatory design. CO_2 was noted to currently have little intrinsic use value, with its economic rationale deriving almost entirely from EU ETS incentives and the climate value of safe and permanent storage. The CO_2 value chain was therefore considered inherently monodirectional, flowing from capture to storage. This distinguishes it from gas and electricity markets and may thus justify a targeted regulatory approach.

3 MARKET DEVELOPMENT CHALLENGES

3.1. COORDINATION AND DEMAND UNCERTAINTY

Stakeholders again underlined the "chicken-and-egg" challenge as a central barrier to the development of the CO_2 market. Infrastructure developers face uncertainty regarding future CO_2 volumes and demand, while potential users are reluctant to commit without credible assurances that transport and storage capacity will be available at predictable cost as well as without support mechanisms.

It was noted that, irrespective of the regulatory framework eventually adopted, the CO_2 market is unlikely to fully materialise before 2030–2035.

This further reinforces the importance of early coordination mechanisms and forward-looking planning to avoid delays that could jeopardise the achievement of EU climate targets.

In this context, stakeholders widely considered a cluster-based approach to be a pragmatic starting point. Developing CO_2 infrastructure around regional clusters was seen as enabling investments to be aligned with early demand, facilitating coordination across the value chain, and allowing a gradual expansion towards wider regional and cross-border networks as volumes increase.

3.2. ENABLING CO_2 CROSS-BORDER TRANSPORT

Stakeholders identified cross border CO_2 transport as a key enabler of a functioning European CO_2 value chain. However, several legal, regulatory and administrative barriers persist, including fragmented national regimes, interactions with non EEA countries, and constraints linked to international conventions such as the London Protocol.

It was noted that geographical conditions were uneven, with storage potential and announced projects concentrated in certain regions, e. g. North Sea and the Mediterranean. While this created natural advantages, stakeholders stressed that EU level coordination remained essential to ensure that industrial decarbonisation opportunities were not constrained by national boundaries.

Discussions highlighted the importance of clarifying the notion of cross border infrastructure, recognising that assets could:

- Have physical cross-national borders, or;
- Remain within one Member State while serving multiple countries as part of an integrated network and/or, more generally, of a logistic chain.

A coherent EU framework was widely seen as necessary to ensure interoperability, continuity of CO_2 flows and investor confidence.

4 INFRASTRUCTURE SYSTEM DESIGN

4.1. NETWORK PLANNING AND PERMITTING

Stakeholders highlighted the absence of an EU level network planning coordination framework for CO_2 transport, such as the Ten Year Network Development Plan (TYNDP). This gap was considered as difficult to justify given the expected scale, cost and cross border relevance of CO_2 infrastructure.

Discussions underlined the importance of coordinated and anticipatory network planning at EU level, while recognising the specific challenges associated with CO_2, including demand uncertainty and uneven geological storage potential.

Effective planning was considered necessary to:

- Avoid stranded assets while ensuring scalability;
- Exploit synergies across infrastructures (e. g. natural gas, biomethane, hydrogen);
- Support cross border value chains where storage resources serve multiple Member States.

While geology was recognised as ultimately determining where storage could be developed, stakeholders considered that system level planning could play a key role in ensuring that CO_2 transport infrastructure evolved efficiently.

In addition to these planning challenges, stakeholders also highlighted permitting as critical factor affecting the timely development of CO_2 infrastructure. Permitting procedures were described as lengthy and complex, often involving multiple competent authorities, misaligned timelines and fragmented approval processes across jurisdictions. In addition, participants noted the importance of establishing a permanent and comprehensive permitting framework, as existing provisions under instruments such as the NZIA and IPCEIs currently only apply to certain assets within the CO_2 infrastructure and market value chain.

The absence of a single point of contact was seen as further complicating project development, requiring developers to engage with a wide range of authorities in parallel. In addition, stakeholders noted that the emergence of CO_2 transport and storage as a new sector has coincided with capacity constraints within public administrations, including a limited availability of dedicated expertise, which may contribute to longer and less predictable permitting timelines.

4.2. TECHNICAL STANDARDS AND INTEROPERABILITY

Stakeholders highlighted the lack of harmonised technical standards for CO_2 transport as a barrier to interoperability and cross border network development. Differences in CO_2 specifications and operational requirements were seen as risking fragmentation and increasing overall system costs.

Broad support for pursuing greater harmonisation of technical standards has been voiced, while maintaining sufficient flexibility to reflect the early stage of market development and the diversity of projects. Over standardisation at an early stage was widely regarded as a risk that could stifle innovation and delay deployment.

Lessons from hydrogen infrastructure development were again quoted as very relevant, while recognising that direct parallels were limited due to the fundamentally different nature of CO_2 transport.

5 REGULATORY FRAMEWORK AND GOVERNANCE

Stakeholders considered that CO_2 transport and storage infrastructure displayed monopolistic characteristics, particularly in the case of pipelines and storage due to their essential facility features. In such circumstances, regulatory intervention was considered justified in order to prevent access discrimination and excessive pricing.

It was highlighted that the CO_2 value chain comprised a mix of essential and non-essential services, with storage widely regarded as an essential facility. This was seen as raising complex questions regarding the appropriate scope, sequencing and intensity of regulation.

Drawing on experience from other network industries, stakeholders noted that competition law alone was unlikely to provide sufficient safeguards. At the same time, concerns were expressed that overly rigid regulation could hinder investment in a nascent market, especially if it affects early projects that are already under development.

With regards to governance, stakeholders acknowledged that potential conflicts of interest would need to be carefully assessed. While such conflicts had been clearly identified in the hydrogen context, the case of CO_2 was considered more nuanced. Assigning certain system-level roles to gas TSOs or ENTSOG was therefore viewed by some stakeholders as a pragmatic option, provided appropriate safeguards were in place.

6 FINANCING, DE-RISKING AND INVESTMENT CERTAINTY

Stakeholders underlined that regulation alone would not render CO_2 infrastructure bankable. Targeted de-risking mechanisms were therefore seen as necessary to enable early investments and crowd in private capital.

The potential relevance of anticipatory financing mechanisms, similar to those applied to hydrogen networks in certain Member States, was highlighted. Such approaches were seen as acknowledging economies of scale and the role of clusters, while allowing initial costs incurred during the build-out phase to be recovered over the long term.

Public funding was widely recognised as essential to reduce risk and to limit overall system costs. Stakeholders stressed the importance of transparency on tariffs, clarity on risk allocation, and appropriate accountability for beneficiaries of public support.

7 KEY MESSAGES

Stakeholders concluded that a clear, predictable and enabling EU framework for CO_2 transport and storage is essential to support industrial decarbonisation and Europe's long-term climate objectives.

In particular, discussions highlighted the importance of:

- Early coordination and system-level planning;
- Effective cross-border cooperation;
- A flexible regulatory approach with a gradual phase-in.

It was noted that, if designed and implemented effectively, the forthcoming CO_2 Markets and Infrastructure package could enable a resilient and competitive European CO_2 value chain. Conversely, insufficient coordination or clarity was seen as risking fragmentation, underinvestment and delayed decarbonisation.

8 OUTLOOK AND NEXT STEPS

The FoGG Advisory Panel will continue in 2026 with ENTSOG's work to promote and encourage dialogue amongst stakeholders in a dynamic energy landscape. ENTSOG will continue to analyse planning, technical, market and financial elements necessary for the energy transition concerning the existing gas grids and discussion with end-users concerning their needs.

Discussions in 2025 confirmed that the forthcoming CO_2 Markets and Infrastructure legislative initiative represented a good opportunity to address structural barriers to the development of a CO_2 value chain. It was noted that the call for evidence, launched in July of 2025, attracted over 180 responses, underlining strong stakeholder engagement and the relevance of the issues under consideration.

Looking ahead, stakeholders considered that 2026 would be a decisive year, with the Impact Assessment and the CO_2 Markets and Infrastructure package expected to be published in Q3 of 2026. In this regard, ENTSOG will continue to make use of the FoGG Advisory Panel to encourage stakeholder engagement and support continued dialogue on key and timely issues.

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