ADVISORY PANEL FOR FUTURE GAS GRIDS

RECOMMENDATION REPORT

FEBRUARY 2024

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 and European Commission.

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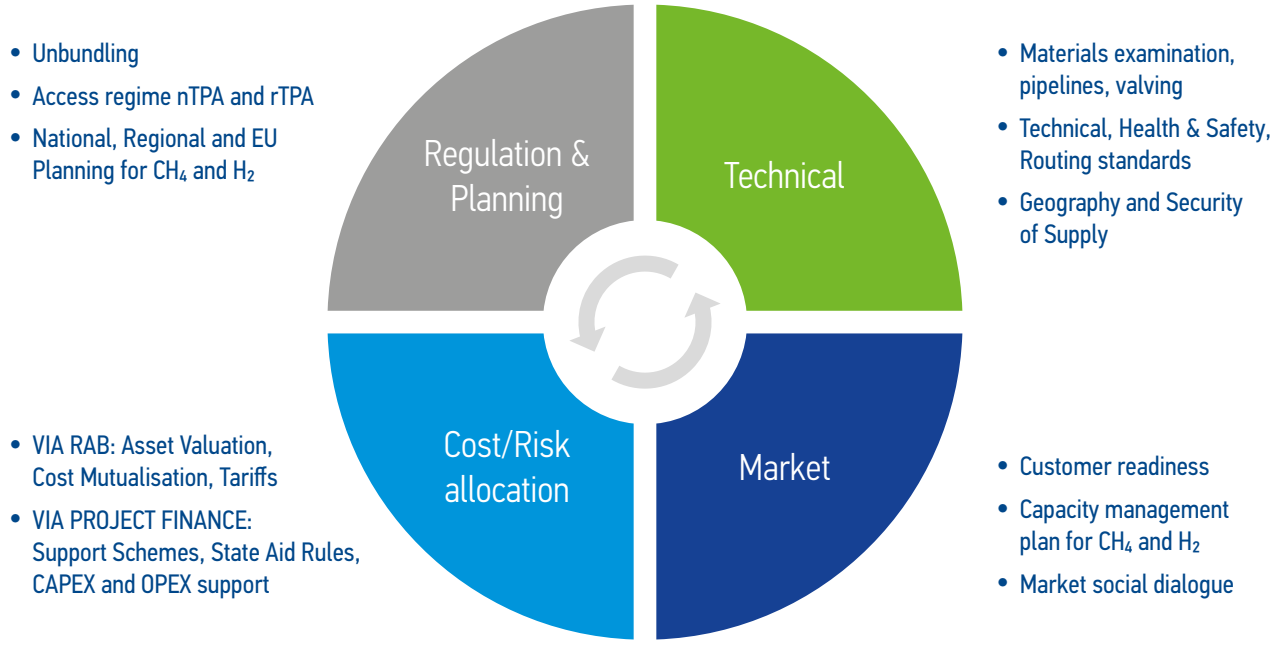
1 INTRODUCTION

In January 2021, ENTSOG launched an Advisory Panel for Future Gas Grids with the purpose to ensure transparency and coordination between 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 Group meets on a quarterly basis and includes stakeholders along the entire value chain – from production, transmission and distribution, to end-use, as well as academia. The main focus is to discuss the market, technical, planning, regulatory and financing elements of how to repurpose the existing gas infrastructure for renewable and low-carbon gases including hydrogen, biomethane and CO_2 transport.

This year, we welcomed external speakers from the European Commission, European Associations, the Florence School of Regulation as well as industry players, who all joined our exchanges to share ideas and best practices. The result of these discussions is the creation of the Recommendation Report, which provides an overview of stakeholders' input.

The Recommendation Report 2021 focused on the Repurposing Framework and identified several technical, regulatory, planning, market and financing elements needed to repurpose the gas grids for renewable and low-carbon hydrogen.

The Recommendation Report looking back on 2022 brought the following discussions and insights:

- **In 2022**, in view of the European Commission's REPowerEU Communication and Action Plan the scope of the Recommendation Report included next to hydrogen detailed focus on biomethane.
- **In 2023**, the Advisory Panel participants discussed several aspects of how to best transition gas grids to reach the targets identified in the REPowerEU – 20 million tonnes of renewable hydrogen and 35 bcm of biomethane by 2030.

2 FOCUS 2023: CCUS AND CO_2 TRANSPORT

The majority of stakeholders agreed that the existing gas infrastructure is ready to transport biomethane and is an important asset that can be repurposed in a cost-efficient manner to facilitate the transportation of hydrogen.

Parallel to the finalisation of the Hydrogen and Decarbonised Gas Package, CCUS and CO_2 transport were also added to the 2023 panel discussion. This topic was timely with developments related to the Net-Zero Industry Act and the upcoming CCUS strategy, expected in the first quarter of 2024.

3 REGULATION FOR CCUS AND CO_2 INFRASTRUCTURE

Participants in the panel acknowledged that if Europe wants to achieve its climate and decarbonisation targets, CCUS needs to be introduced in the picture. It may be needed in different industry sectors, mostly hard-to-abate – cement, steel or even hydrogen production. Additionally, CO_2 capture might also be needed in the power sector. CCS, CCU and CO_2 capture will be a major part of our future, and several participants of the panel requested for opening up CCUS to all industries for a thorough development of the market.

3.1 REGULATION FOR CCUS VALUE CHAIN – DIFFERENT LEVELS OF REGULATION MAY BE NEEDED

Concerning CO_2 infrastructure, there is a need for a new regulatory framework. The level of regulation will very much depend on the market. Concerning regulation, there is no "one-size fits all" solution. Stakeholders agree that different parts of the value chain will need different regulation levels.

Some parts of the value chain – especially those dealing with natural monopolies such as pipelines – may need a higher level of regulation, like Third Party Access (TPA) and tariff regulation. Regulated tariffs could have a role in the de-risking of transportation infrastructure investment. Revenue uncertainties for pipeline infrastructure investors could be reduced by a fit for purpose tariff regulation.

However, there may be other parts of infrastructure or the value chain that may not need the same level of regulation – for example CO_2 storage or transport via ship or rail. The regulation level of the respective parts of the value chain needs to be carefully considered, as applying it incorrectly might limit investment. However, there should be some basic principle to prevent fragmentation and to give some certain regulatory certainty for the market to develop.

An example could be high-level regulatory principles like third party access, non-discriminatory access and natural monopoly policy for infrastructure that can be considered essential - for example for pipelines. However, the approach shall be flexible and open to evolve over time.

3.2 REGULATION TO SUPPORT BUSINESS CASES FOR A NON-EXISTING MARKET

Participants of the Advisory Panel agree that new regulations have to be drafted very carefully. Simply mirroring regulation designed for an existing market (gas infrastructure) may fall short in a variety of aspects. Infrastructure operators and industry agree that regulation must be designed with the objective of making CCS attractive and creating business cases. More feasibility and more positive trust in the future CCUS market rapidly increases development of infrastructure and projects. All participants agree that regulatory clarity is needed due to expected large-scale investments over the next few years.

4 PLANNING OF CO_2 INFRASTRUCTURE AND DEVELOPMENT

The European Commission will apply a number of scenarios in its upcoming CCUS strategy and CO_2 transport. One base for a future CO_2 transport grid could be projects which are supported by Innovation Fund and TEN-E, which will already form a certain network and already represent the first hubs of CO_2.

In the Advisory Panel there is a wider range of perspectives regarding infrastructure planning. There is a view that infrastructure planning should be bottom up in the beginning. According to this logic, planning could start with existing industrial plans – e. g. current PCI projects in Europe. In the next step, regulators and other relevant organisations could finetune these plans into a broader vision. However, other participants of the Advisory Panel argue for planning and processes from the Commission, both at international and national level - as CCS development may not happen without these processes.

4.1 ACCEPTABILITY AND PERMITTING FOR CCUS PROJECTS

One important element for development of projects is also capacity building and acceleration in terms of licensing and permitting for speeding up projects. Acceptability of CCS needs to be strengthened as well, as weak acceptability of CCS leads to delays in the permitting process. Both processes can benefit from strong support of governments and policy makers.

4.2 RIGHT SIZING OF INFRASTRUCTURE AND LONG-TERM OUTLOOKS

Concerning discussions of sizing of infrastructure - e. g. pipeline size and capacity – operators are looking to develop infrastructure with a long-term outlook. The latter meaning infrastructure that is laid out for large capacities, which may not be needed at the start of the infrastructure. This long-term right sized infrastructure can drive costs down and is able to open a fluid market.

Operators seek to create a large scale, cost efficient, flexible and robust system – big enough to make sure sufficient transport and storage is available. To drive down costs, several operators are focusing on pipelines to transport as much volume of CO_2 possible - arguing that they are crucial to reduce costs in the value chain, avoiding intermediate storage, liquefaction, or manual transport by ships, trucks, or trains.

5 TECHNICAL ELEMENTS OF CCUS

5.1 INTEROPERABILITY AND CROSS-BORDER TRANSPORT

To develop a fluid market and to enable cross-border transport, participants of the Panel ask for tackling cross-border issues. There is the need for standards and network codes to lend clarity to operators as harmonisation in this area is beneficial for the market.

6 MARKET AND FINANCING ELEMENTS FOR THE VALUE CHAIN

In a nascent market, de-risking the whole value chain requires strategic approaches, tailor made respectively for emitters, transport and storage operators.

6.1 DE-RISKING THE NASCENT MARKET

With this nascent market, we find ourselves in a classic chicken-and-egg dilemma. Emitters may not invest in capturing installations, unsure if there is CO_2 storage. Storage operators are not investing in developing projects, unsure of the supply of CO_2.

To start the market, the different players need security – for example, a steel factory will need a long-term offtake contract before they invest into CO_2 capture facilities. The transportation company may need funding and guarantees as they risk oversizing their infrastructure for the start, not knowing the market development. Storages will need long-term store or pay contracts and a certainty that the storage is needed with a certain number of bookings. Pipeline operators need long term back-to-back capacity bookings.

Advisory Panel participants agree that it is particularly important to be transparent to each other and to provide commitments. Each part of the value chain needs clarity regarding infrastructure needs to better support the activities of the other actors. The whole value chain needs to be established to ensure a functioning market.

6.2. INCENTIVISING INVESTMENTS

A remarkably important way to kickstart a market is proper incentivisation. As an example of the past, the production of wind power was incentivised in order to kick-start the wind power market. Investments need to have business cases. A brand-new value chain is developed, and it is not economic yet. Therefore, funding and de-risking mechanisms are of great importance. Participants argued that another way for policymakers to incentivize the new market is to welcome all industry to the use of CCS. To have cost-efficient infrastructure, the market shall not be fragmented.

7 OVERVIEW OF INSIGHTS

OF THE ADVISORY PANEL ON CCUS AND CO_2 TRANSPORT

For a high-level summary of insights of the Advisory Panel on kick-starting CCUS and CO_2 infrastructure, please see the bullet points below:

The level of regulation may differ for the various parts of the value chain

- Essential facilities may need a higher level of regulation
- Other parts of the value chain may not need the same level of regulation
- High-level regulatory principles can help lend clarity to value chain
  - E. g. non-discriminatory open access to infrastructure for example

Infrastructure planning

- Planning can happen at bottom-up and top-down
- Current PCI projects can be a base for a future CO_2 network
- Support from policy makers concerning the acceptability of CCS is needed

De-Risking and cost-efficiency of infrastructure

- The entire value chain is prone to risks
  - Emitters, transport and storage need commitments from each other to invest in their respective parts
  - Regulation should aim to facilitate the development of a CCUS and CO_2 market
- Infrastructure needs to be developed with long-term outlook and proper sizing for this outlook
- CCUS needs to make sense as a business for it to ramp-up – it needs to be attractive to build and invest in the first infrastructure.
  - Incentives and guarantees play a major role to develop a nascent market
  - To enhance chances of cost-efficiency CCUS may be available to all industries

Technical perspective of CO_2 transport

- Cross-border issues need to be tackled to develop a fluid market and to enable cross-border transport
- There is the need for standards and network codes

8 CONCLUSION AND NEXT STEPS – OUTLOOK 2024

The Panel will continue in 2024 with ENTSOG's work to promote and encourage the dialogue amongst stakeholders in a dynamic energy landscape with the closed Hydrogen and Decarbonised Gas Market package and the upcoming CCUS strategy. 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.

The Advisory Panel's Recommendation Report summarises the shared perspectives of the involved stakeholders on the best ways to approach a future CO_2 transport market and CCUS value chain. The Recommendation Report summarises a variety of perspectives, it does not reflect the position of every individual stakeholder nor ENTSOG, but it shows the scope and positions voiced during the debate.

The Panel will continue in 2024 with ENTSOG's work to promote and encourage the dialogue amongst stakeholders in a very dynamic energy landscape with topics such as:

- Implementation of the Hydrogen and Decarbonised Gas Market package
- The upcoming CCUS strategy and outlook for CO_2 transport infrastructure
- Hydrogen infrastructure in Europe – development status

ENTSOG WILL CONTINUE TO ANALYSE PLANNING, TECHNICAL, MARKET AND FINANCIAL ELEMENTS NECESSARY FOR THE ENERGY TRANSITION AND FOR THE INCLUSION OF ALL RENEWABLE AND LOW-CARBON GASES IN THE EXISTING GAS GRIDS AND DISCUSSION WITH END-USERS CONCERNING THEIR NEEDS.

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