Trans-European Networks for Energy

Equinor's contribution

Equinor welcomes the European Green Deal and supports the European Commission in its efforts to position the energy transition at the heart of the post-pandemic recovery plan. We have already brought down our CO_2 emissions in the oil and gas production process to industry-leading levels, and we continue to develop oil, gas, wind and solar energy in more than 30 countries worldwide. In February 2020 we presented our new Climate Roadmap, with the ambitions of i) reducing the net carbon intensity (from initial production to final consumption) of energy produced by at least 50% by 2050, ii) growing renewable energy capacity tenfold by 2026, iii) strengthening our industry-leading position in carbon-efficient production with the aim of reaching carbon neutral global operations by 2030. Equinor's climate commitments are set out in our Climate Roadmap.

As a major European energy supplier, Equinor is determined to contribute to cost-efficient decarbonisation of the EU's energy system. Our broad portfolio of offshore and floating offshore wind, carbon capture and storage (CCS) and clean hydrogen projects offers scalable long-term decarbonisation solutions.

We believe that a comprehensive, technology-neutral and forward-looking legislative framework for pan-European energy infrastructure planning and energy sector integration will be necessary to enable these solutions. We appreciate the opportunity to contribute to the revision of the Trans-European Networks for Energy Regulation, our key recommendations are summarised below.

Key recommendations:

- **PCI selection.** The sustainability dimension should be incorporated on the basis of GHG emissions reduction potential applied in a non-discriminate manner to all technologies and network development plans, as is the case for decarbonisation projects under the Innovation Fund. Emission performance-based evaluation in the context of TEN-E Regulation would ensure its consistency with the EU's climate & energy legislation as well as help avoid counterproductive outcomes in terms of energy and resource use.
- **Thematic focus.** Infrastructure to support low carbon energy – including hydrogen – will not be developed at the same pace across Europe due to regional differences. The TEN-E Regulation should allow for a multispeed transition to low carbon energy infrastructure in different regions of the EU. The new TEN-E rules should facilitate dedicated hydrogen infrastructure workstreams. These cooperative workstreams should cluster hydrogen-ready member states; promote the development of clean hydrogen infrastructure projects; and address standardisation and safety issues in a timely manner.
- **Role of natural gas.** The just transition principle implies that member states and regions should be allowed to adjust to the clean energy transition at a just and sustainable pace. A one-size-fits-all approach could impact energy system security and economic resilience negatively. In cases where a coal-to-gas shift can significantly contribute to emissions reduction, adequate policy and support measures should be endorsed by the EU. At the same time, it is important to make any new gas infrastructure developments hydrogen-ready.
- **Definition of sustainable gas.** The sustainability dimension of gas as defined in the TEN-E Regulation should not be limited to gas produced from renewable sources only. Art 4(b)(iv) of the Regulation states that the sustainability criteria for projects of common interest in gas relates to 'enhancing deployment of renewable gas'. Non-renewable low-carbon gases should be added to the scope to recognise their potential for the gas sector decarbonisation.
- **CO2 transport network definition.** A CO2 transport network should not be limited to pipelines but encompass maritime, road, railway and other transport that can be part of a shared CO2 transport network. It is particularly relevant during the pilot project and scale-up phases of CCS deployment in Europe, where pipeline construction might not be feasible or economic.
- **Role of CCS and clean hydrogen.** CCS and clean hydrogen technologies will play a pivotal role in decarbonising the EU's energy system, as both are recognised as climate change mitigation activities under the EU's sustainable taxonomy. The TEN-E Regulation should reinforce the governance system around infrastructure planning for CCS and hydrogen. In line with the TYNDP

framework, or in parallel to it, member states should be asked to list and report planned CCS and hydrogen interconnection projects at the national level in order to facilitate network planning and long-term visibility of low carbon infrastructure development across Europe.

- **Clean hydrogen for industry and its role in scaling up clean hydrogen networks.** Industrial activities are often located in clusters, which benefit from shared infrastructure, thereby reducing the individual project costs for the initial large-scale clean hydrogen deployment projects. The roll-out of industrial clean hydrogen projects can contribute to gradual clean hydrogen interconnection development across the European regions through pipelines, maritime transport solutions or other. The TEN-E Regulation should encompass industrial clean hydrogen networks to facilitate the large-scale hydrogen infrastructure development.
- **Clean hydrogen production in the TEN-E.** The TEN-E Regulation should not include hydrogen production facilities in the scope of hydrogen network definition as this could distort the role of TSOs in a liberalised European energy market. However, if used as a last-resort measure for balancing purposes in the event that commercial entities do not take up such activities, regulated investments into clean hydrogen production facilities should respect the following principles: 1) the TEN-E framework should adopt a technology-neutral approach with regard to clean hydrogen production PCIs, encompassing both power-to-gas as well as SMR/ATR technologies; 2) investment costs for system balancing purposes should be shared adequately between the power and gas system users; and 3) the investment framework should not undermine the market liberalisation rules, i.e. hydrogen production and storage services should be carried out in full compliance with unbundling rules.
- **Synergies between the TEN-E and TEN-T.** The TEN-T Regulation can help to scale the use of clean hydrogen or ammonia in the transport and in particular, the maritime sector. At the same time, clear boundaries between the TEN-E and TEN-T sections on hydrogen should be established on the basis of hydrogen use.

1 Pan-European CO2 transport infrastructure: industrial decarbonisation in the EU

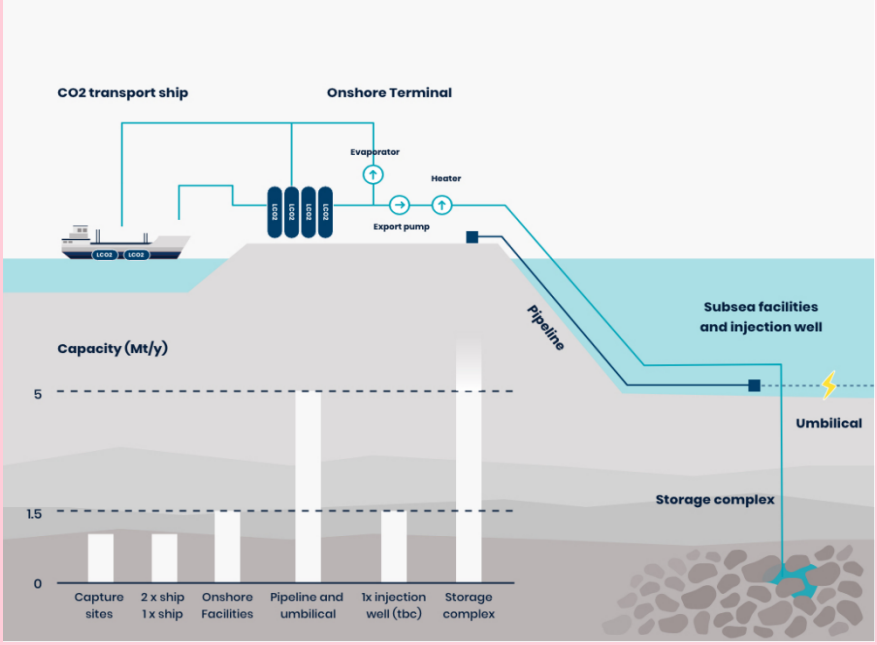
The EU's ambitious GHG emissions reduction targets and the EU ETS are expected to increase the pressure for accelerated industrial decarbonisation. Industrial carbon capture facilities and the development of associated transport infrastructure across Europe will provide a decarbonisation opportunity for Europe's energy intensive industries by storing CO2 in several geological storage locations. There are five CO2 transport projects on the EU's fourth PCI list, which demonstrates both the maturation of the CO2 transport network development as well as the growing interest in CCS across Europe. The concept of a European cross-border CO2 transport network has shifted considerably over the past decade as all of the new PCI projects focus on capturing and transporting emissions from industrial clusters (as opposed to vertically-integrated CCS point-to-point projects that were predominant in the first wave of European CCS development under the NER300 programme). A staged development of CO2 capture, transport and storage components enables carbon capture for the EU's industries including to those that cannot store CO2 in the immediate proximity. Equinor, Shell and Total are cooperating on the Northern Lights CCS project (described below) to enable the European industries access to CO2 transport and storage infrastructure and as a result contribute to the development of a pan-European CO2 management network development.

Northern Lights[1]: towards the development of a pan-European CO2 transport and storage network

The Northern Lights project is part of the Norwegian full-scale carbon capture and storage (CCS) project. The full-scale project will include capture of CO2 from one or two industrial capture sources. The Northern Lights project comprises transportation, receipt and permanent storage of CO_2 in a reservoir in the northern North Sea. The project will be developed in phases. Phase 1 includes the capacity to transport, inject and store up to 1.5 million tonnes of CO2 per year. Once the CO2 is captured onshore by industrial CO2-emitters, Northern lights will be responsible for the transport by ships, injection and permanent storage some 2,500 metres below the seabed. The facility will allow for further phases to expand capacity. Investments in subsequent phases will be triggered by market demand from large CO2 emitters across Europe.

[1] Nothern Lights: https://northernlightsccs.com/en/about

Equinor, on behalf of the partners, has already signed non-binding Memoranda of understanding with several European companies for the development of value chains in carbon capture and storage. Binding commercial agreements will depend on positive investment decision from the Norwegian authorities and for individual third-party projects. This cross-industry collaboration is a unique solution and enables handling of large CO2 volumes that would otherwise have been emitted. This new value chain and infrastructure for carbon capture and storage projects can only be developed with cooperation between governments and companies.



On May 15, Equinor, Shell and Total announced their decision to invest in the Northern Lights project. The investment decision is subject to final investment decision by Norwegian authorities and approval from the EFTA Surveillance Authority (ESA). The facilities are scheduled to be operational in 2024.

In turn, the development of an open-source CO2 transport and storage network will give Europe's industrial players a viable decarbonisation solution. The TEN-E Regulation will play a crucial role in enabling the development of a European CO2 transport network and should therefore be updated to respond to new market development models.

- First, the CO2 transport network referred to in Annex II (4)(a) is defined in Directive 2009/31/EC (CCS Directive), which limits the scope to a network of pipelines. **A CO2 transport network should not be limited to pipelines but encompass maritime, road and railway transport that can be part of a shared CO2 transport network**. Other transport solutions and in particular shipping offer an agile and tailored made option for industrial sites with smaller volumes of CO2 which are out of reach of CO2 pipeline for economical or technical reasons. In contrast, a certain minimum capacity is needed to justify the rationale of constructing a CO2 transport pipeline. A multimodal CO2 transport network increases the flexibility of the CCS chain in Europe as it allows to connect emitting sites to several sequestration sites and can add new CO2 volumes from elsewhere.
- Second, **pan-European CO2 transport network planning should be reinforced and reflected in the governance framework of the Trans-European energy infrastructure development**. In line with the TYNDP framework or in parallel to it, member states should be asked to list and report the planned CCS and CO2 transport projects on the national level so as to facilitate transport network planning and long-term visibility for CCS infrastructure development across Europe. It is important to create visibility for the ongoing CO2 network development efforts on the EU- as well as national levels.
- Third, CO2 network development and CCS commercialisation at large should benefit from strong links with other EU and national programmes for clean energy transition. Given the relevance of CCS in the context of industrial decarbonisation, **the EU as well as the member states should work towards a more streamlined effort to invest in scaling up CCS through the existing EU mechanisms for industrial decarbonisation and in particular the EU ETS.** A future EU ETS should create a framework for intensified cooperation between Member States on GHG emissions reduction in the energy intensive sectors. This implies earmarking national EU ETS auction revenue for large-scale industrial decarbonisation projects, including those using CCS technology. National support for large-

scale projects will be crucial to complement the EU-level (Innovation Fund & Modernisation Fund) funding and realise low carbon technology development. The TEN-E Regulation should therefore establish stronger links to parallel EU legislation on decarbonisation in order to guarantee consistency as well as reinforce the European CO2 transport and storage network development potential.

2 Pan-European hydrogen network infrastructure

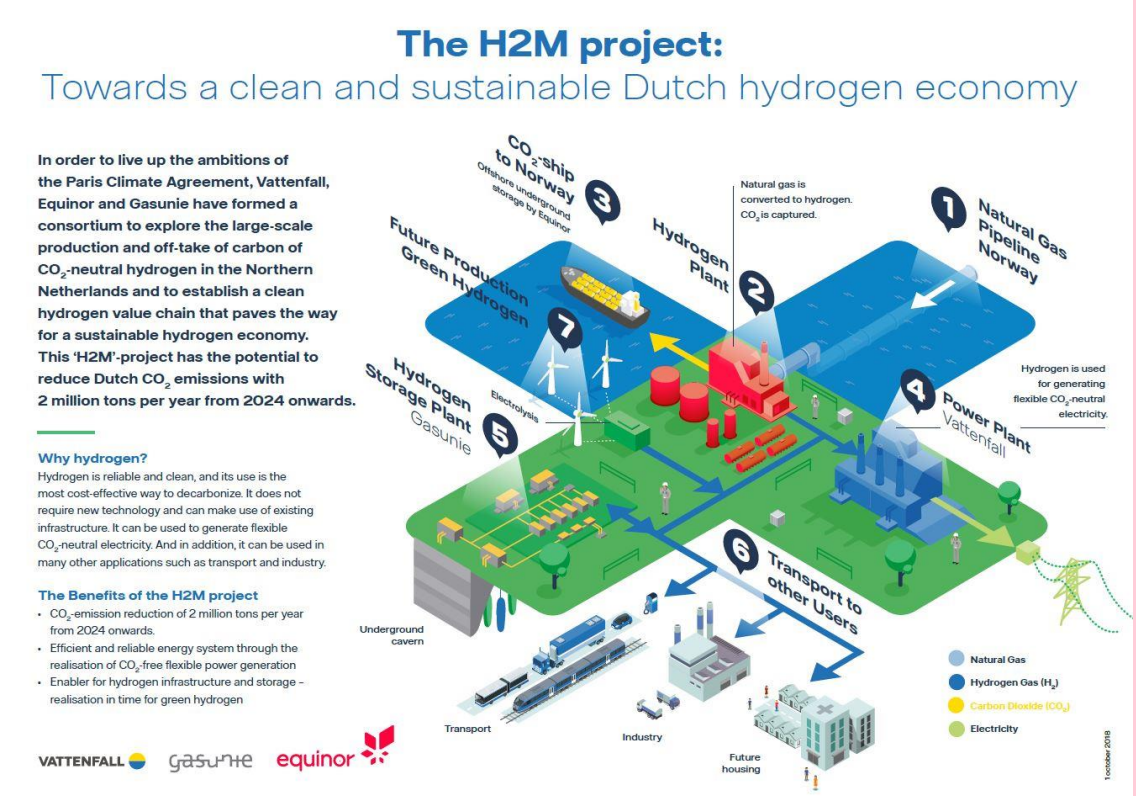
Clean hydrogen will be an important energy vector in the EU's decarbonisation efforts. It is therefore important to guarantee a consistent and non-discriminatory framework for such hydrogen in the EU legislation. It is also crucial to recognize the role of hydrogen as a flexible energy carrier that can contribute to power system stability and integrity and enable industrial activities in a low carbon environment. Equinor is involved in a number of industrial large-scale clean hydrogen projects, two of which – aimed at clean power production and industrial decarbonisation – are described below.

H2M: clean hydrogen for flexible power production

Vattenfall, Equinor and Gasunie have formed a consortium to explore the conversion of the Magnum power station in the Eemshaven area from natural gas to hydrogen. Clean hydrogen will be supplied from reformed natural gas used in combination with CCS technology. The CO2 from the hydrogen plant will be separated and stored offshore in Norway, feeding into the infrastructure, to be developed by the Norwegian full value chain CCS project. The concept will also provide an option to store hydrogen in the Zuidwending caverns. The initial stage of the project aims to convert one unit of the power plant, which would lead to a direct reduction equivalent to offsetting the emissions of 750,000 households.

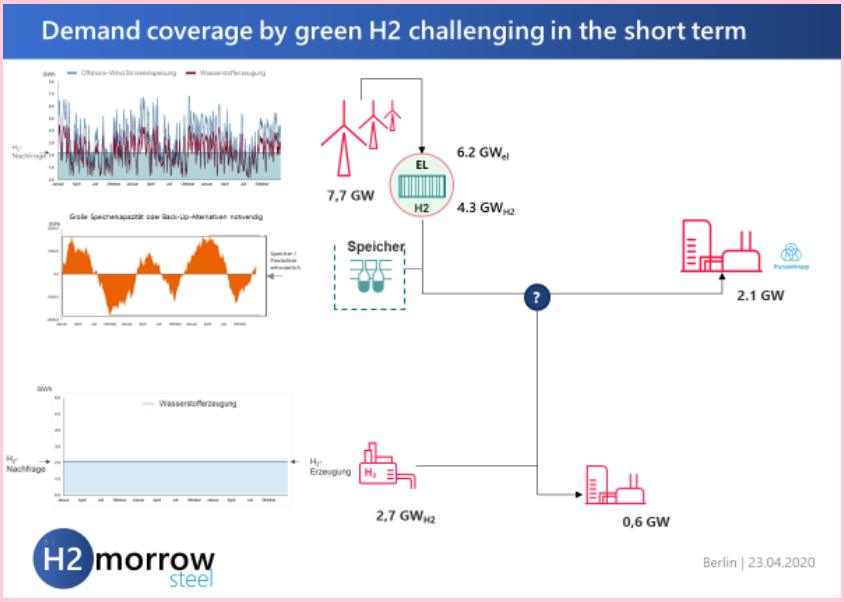
Further spin-offs could be made towards other industrial plants to build a larger regional hydrogen market. In this regard, the H2M project can provide good foundation to a future hydrogen economy in the Netherlands, which has one of the most developed gas infrastructures in the world. The project could mark the start of a larger future hydrogen network in the region that would be connected to permanent CO2 storage in Norway.

The H2M project can be developed and realised within a 6-7-year timeframe and it would be the first step in developing hydrogen infrastructure today and thereby pave the way for future renewable hydrogen production from electrolysis. In addition, it would support the integration of larger shares of renewable electricity as it provides flexible, clean back-up capacity for intermittent renewable energy.



H2morrow steel

H2morrow steel, a consortium consisting of Equinor, OGE and thyssenkrupp Steel Europe (tkSE) is working on a joint feasibility study on the decarbonisation of tkSE's steel production with up to 7 million tonnes/year in a 2025/30 perspective. This represents up to 10.5 million tonnes of CO2 emission savings a year compared to the conventional production process. In a climate-neutral future, this project would help to preserve no less than 25,000 jobs, which corresponds to tkSE's current employment level in the Ruhr area alone, not taking into account the related jobs in supporting industries. The project partners are considering both CCS-enabled and renewable hydrogen for the production of clean steel. To allow for plant operation, the hydrogen has to be reliable and available at all times. The study partners have thus far concluded that renewable energy-based hydrogen will not be able to guarantee sufficient and stable volumes needed for steel production.



The figure above illustrates the comparison between the two production methods and their potential in the context of the H2morrow steel project. The scenarios show that a renewable hydrogen pathway would require doubling the totality of Germany's existing offshore wind capacity within the next 8 years. In addition, significant investments in the electrolyser capacity and hydrogen storage would be needed, further exacerbating the associated costs. Instead, the H2morrow steel plans to produce CCS-enabled clean hydrogen from natural gas on Germany's North Sea coastal area or the Netherlands Groningen area and transport it to Duisburg for the production of clean steel. In a second stage, the project could connect to the energy intensive industry cluster in North-Rhein-Westphalia. The H2morrow steel example demonstrates that CCS-enabled hydrogen will be an important building block of the future energy system and for realisation of the hydrogen economy. Scalable clean hydrogen solutions are needed to create an initial market for hydrogen within this decade, avoiding carbon leakage and the loss of industrial jobs in Europe.

The two projects aim at kick-starting large-scale clean hydrogen deployment across Europe and prove the viability of hydrogen as a flexible energy carrier that can contribute to reinforcing the energy system. From a project point of view, it is crucial that hydrogen transport and storage infrastructure is developed in parallel with large-scale projects to gradually link hydrogen into the EU's energy networks. The TEN-E Regulation will prove pivotal in this regard.

- First, a new thematic area for clean hydrogen networks should be introduced under the TEN-E Regulation. **Both new infrastructure projects as well as hydrogen transport (including pipelines, maritime, road and other) solutions, intermediate storage and associated infrastructure projects should be encompassed in the framework of TEN-E.** The hydrogen thematic area should encompass other clean fuel forms, such as ammonia or liquid organic hydrogen carriers.
- Second, a European hydrogen network will not be rolled out at an even pace across the EU, which is why the **TEN-E Regulation should allow for a multi-speed network development in different**

regions in the EU. That could encompass a framework to facilitate flexible hydrogen cooperation groups to cluster member states willing to work on hydrogen network development on a regional basis.

- Third, in the EU member states where natural gas network development still offers considerable decarbonisation potential, **new gas PCI projects should be made hydrogen-compatible** where it is technically feasible, cost-efficient and aligned with the emission trajectory of the hosting country.
- Third, the **TEN-E and TEN-T Regulations should establish synergies for scaling up clean hydrogen use in Europe**. The TEN-T Regulation can help to scale the use of clean hydrogen, ammonia or liquid organic hydrogen carriers in the transport and in particular, the maritime sector. At the same time, clear boundaries between the TEN-E and TEN-T sections on hydrogen should be established on the basis of hydrogen use – whether as clean fuel in energy or in transport.
- Finally, **a pan-European hydrogen transport network planning should be reinforced and reflected in the governance framework of the Trans-European energy infrastructure development**. In line with the TYNDP framework or in parallel to it, member states should be asked to list and report the planned clean hydrogen and hydrogen interconnection projects on the national level so as to facilitate network planning and long-term visibility of hydrogen infrastructure development across Europe. It is important to create visibility for the ongoing hydrogen development efforts on the EU- as well as national levels.

3 Pan-European electricity infrastructure: enabling offshore wind

Expanding offshore wind capacity is a key building block of the EU's low-carbon energy sector. Coordinated planning and development of the European offshore grid is key to enabling additional volumes of offshore wind deployment across the EU. We therefore support the EU's accelerated efforts to encourage member states to actively participate in cross-border grid development plans, both on a regional as well as the EU level.

It is important to note that the EU's cooperation on offshore grid development should not be limited to the EU member states to enable cost-efficient infrastructure development. While Brexit negotiations might present a challenging political context, the UK is a major European player in the offshore wind sector and a valuable partner in the context of clean energy transition. We therefore encourage the EU to continue to cooperate with the UK after Brexit in order to guarantee energy policy alignment and facilitate common energy infrastructure.