International Association of Oil & Gas Producers

MAY 2020

# IOGP input to the forthcoming EU Strategy for Energy System Integration

## General remarks

**The International Association of Oil & Gas Producers' (IOGP) member companies account for approximately 90% of oil and gas produced in Europe. IOGP supports the goals of the Paris Agreement and the EU's objective of climate neutrality by 2050 upon the implementation of enabling measures. Many challenges must be overcome to meet this objective, and the energy transition requires significant investments, new technologies, effective policies and behavioural changes.**

IOGP welcomes the European Commission's intention to present an EU Strategy for Energy System Integration. We appreciate the focus on better interlinkages between the different sectors, which recognises the challenges associated with a new energy landscape, the importance of geographical and social differences, their diverse levels of industrialisation and the starting points of the energy transition in Member States.

Today's energy sector in the EU is the result of the completion of the Third Energy Package, which for natural gas meant the development of an internal market for natural gas in Europe. We believe that it is the right time to develop an energy system which would build on this success in a cost-effective manner, leading to decarbonisation by integrating various energy sources, increasing energy efficiency and linking them to the existing internal energy market(s) and end users. Overall, the future energy system needs to be underpinned by market-based carbon pricing and take a technology-neutral approach to drive the most cost-efficient and cost-effective decarbonisation.

We agree with the Intergovernmental Panel on Climate Change (IPCC), the International Energy Agency (IEA), the European Commission and many others that carbon capture utilisation and storage (CCUS) is a key technology for the decarbonisation of Europe, as confirmed by numerous climate models and reports[1]. The current suite of carbon capture and storage (CCS) projects in development aims to capture emissions from industrial clusters where different industries may share a transport and storage infrastructure, allowing for meaningful cost reductions and for cross-sectorial and cross-border industrial systems to develop. Coupled with a hydrogen infrastructure, CCS can also support delivering low-carbon hydrogen across the European economy.

Through the following input, we provide a set of recommendations for how an integrated energy system could be developed to lead to the emissions reduction needed in Europe.

[1] The IPCC Special Report on Global Warming of 1.5°C, the IEA World Energy Outlook and the European Commission's 2050 long-term strategy all show that CCS is essential to meet the 1.5°C target. The TEG Technical Annex on taxonomy also stresses the role of CCS (March 2020).

## An integrated energy system: main features and challenges

### *Question 1: What would be the main features of a truly integrated energy system to enable a climate neutral future? Where do you see benefits or synergies? Where do you see the biggest energy efficiency and cost-efficiency potential through system integration?*

IOGP recommends that the upcoming Strategy should include the EU climate objectives while safeguarding the already substantial achievements in the internal gas market. Additionally, the Strategy should maximise the use of market-based and technology-neutral instruments for achieving EU climate objectives while minimising potential distortive effects from regulatory measures.

**Continued research and innovation are essential to reach the EU climate neutrality objective**. Therefore, the European Green Deal and the subsequent enabling policy framework should help accelerate the pre-commercial demonstration, deployment of key low-carbon technologies, improvement of energy efficiency and development of needed infrastructure.

Investments in pre-commercial, early-stage technologies can enable breakthroughs leading to scalable technologies that are commercially viable under a carbon pricing programme. These efforts should encourage investment in the integration of both renewable power and low-carbon gases (e.g. hydrogen) on a life-cycle basis and include policy support for technologies such as nature-based solutions (e.g. restoring and protecting forests) and CCUS. In particular, low-carbon gases will be an essential part of the solution.

**However, investments will be required for infrastructure and market development to meet the EU 2050 climate targets. Therefore, initial support could be provided to reduce the lead time for new low-carbon technologies.**

### *Question 2: What are the main barriers to energy system integration that would require to be addressed in your view?*

We welcome a more holistic approach aimed at promoting synergies by linking the gas and electricity markets to achieve a competitive European economy while reducing emissions. Gases will be an essential part of the solution to deliver on the EU climate objectives.

**Therefore, an inclusive, technology-neutral approach will be required to encourage development and deployment of all low-carbon gases in a cost-effective manner.**

In contrast, an imbalanced approach, such as the suggestion that full electrification can achieve the EU climate targets, ignores the benefits of natural gas and low-carbon gases in delivering more cost-effective solutions. In their National Energy and Climate Plans (NECPs), several Member States have announced the phase-out of coal from their energy mix, referring to a shift from coal to gas as one of the main solutions to reach their 2030 greenhouse gas (GHG) emission reduction targets[2]. In the short term, switching from coal to natural gas in power generation would significantly reduce up to 60% $CO_2$ emissions (in the power sector)[3]. Coal-to-gas switching has already helped to deliver significant reductions in EU GHG missions. Coal-to-renewables and coal-to-gas switching each contributed about half to the 24% reduction of coal in power generation in 2019 versus 2018 and were the main drivers behind the 120 MT $CO_2$ savings in the EU power sector[4]. This follows the UK's fuel switch away from coal to natural gas, which has delivered an increasingly lower-carbon electricity mix. In Germany, fossil fuel plants emitted 33% less $CO_2$ in June 2019 compared to the same month in 2018 due to a market-driven fuel switch from coal to gas.[5,6]

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2 See IOGP analysis of NECPs: https://www.oilandgaseurope.org/wp-content/uploads/2020/04/NECPs-Factsheet-v2.pdf.

3 https://gasnaturally.eu/wp-content/uploads/2018/12/long-term-vision-of-the-european-gas-industry.pdf.

4 2020 Agora/Sandbag report: https://www.agora-energiewende.de/fileadmin2/Projekte/2019/Jahresauswertung_EU_2019/172_A-EW_EU-Annual-Report-2019_Web.pdf

5 See Fraunhofer ISE – Energy Charts (2019): https://www.ise.fraunhofer.de/de/presse-und-medien/news/2019/33-prozent-weniger-co2-emissionen-durch-brennstoffwechsel-von-kohle-auf-gas.html.

6 In the United States power sector emissions have fallen 25% since 2008, in large part due to coal-to-gas fuel-switching: https://poweringpastcoal.org/insights/energy-security/coal-to-gas-switch-slashes-us-power-sector-co2/.

**The EU should, therefore, be pragmatic by allowing technology-neutral market mechanisms such as carbon pricing drive cost-efficient emission reductions from coal-to-gas switching in power generation. Furthermore, because natural gas is a flexible fuel, it can enhance energy security, make a low-emission but intermittent electricity system resilient (even in periods of 'dunkelflaute') and facilitate the use of low-carbon gases, including hydrogen.**

**Natural gas already delivers home heating[7] for more than 120 million European citizens[8] and its use in this sector can be further developed to deliver air quality benefits**. Efficient gas boilers can replace old coal-based furnaces, leading to reductions in $CO_2$, $NO_X$, $SO_X$ and PM emissions. The use of natural-gas-based combined heat and power (CHP) can even further reduce emissions and increase energy efficiency. Moreover, in areas with no access to the national gas distribution network, liquefied natural gas (LNG) can be supplied to regasification stations that feed off-grid 'island' gas networks.

**Natural gas (compressed natural gas (CNG) and LNG) can also contribute to the EU's efforts in reducing emissions from the transport sector**. As for road transport, the use of natural gas (CNG/LNG) has some emissions advantages compared to diesel as it is inherently cleaner burning. Gas in the shipping industry is already meeting stringent emissions values set by the 2020 International Maritime Organization (IMO) regulations. Using LNG as a marine transport fuel can reduce SOx emissions by 100%[9], NOx by 80%–90% and $CO_2$ emissions by up to 21%.[10]

## The role of electrification

### *Question 3: How could electricity drive increased decarbonisation in other sectors? In which other sectors do you see a key role for electricity use? What role should electrification play in the integrated energy system?*

**GHG emissions reduction is the key objective**. Although the share of electrification across various sectors is expected to increase to meet GHG emission reduction targets, certain parts of the EU economy will be difficult, if not impossible, to electrify. The Eurelectric study, 'Decarbonisation Pathways,' states that deep decarbonisation of the economy requires 50% electrification or more, up to 60%, by 2050[11]. This means that at least 40% of the economy won't be electrified. For this reason:

**full electrification must not be an objective in itself as more cost-effective carbon-emission reductions may be achieved by using low-carbon liquids (biofuels, syn-fuels) and low-carbon gases (biogas, hydrogen, syn-gas) in hard-to-decarbonise sectors such as aviation, marine, heavy-duty vehicles and industry.**

In addition, the IEA states that only '65% of the final energy use could be technically met by electrification'[12]. This signals that there are limits to the penetration of renewable-based electricity, besides public acceptance issues. Electrifying all areas of the economy would have substantial repercussions for the power system. Policymakers would have to support the reinforcement and extension of the electricity grid, including overhead lines, to handle higher power volumes and more renewables, as well as the deployment of batteries and other sources of flexibility to balance the system.

**The EU should therefore leverage the existing natural gas system for low-carbon gases to reduce the significant challenges and limitations of an all-electric solution.**

This approach saves valuable time, is a key enabler to achieving the 2050 climate targets, and mitigates any public acceptance challenges associated with the expanding power infrastructure and its corresponding environmental impacts. The current natural gas grid delivers a peak capacity which is more than twice as high as the current electricity system. From a geopolitical perspective, one must keep in mind that in a post-pandemic, more fragmented world, the rare earths (72% controlled by China), graphite (70% controlled by China) and cobalt (71% controlled by Congo)[13] needed for electric batteries could become a major issue. Hence, the molecules that provide not only 75% of the primary energy but also most of today's energy storage cannot be disregarded until another efficient technology is available.

**An inclusive and holistic approach, taking account of life-cycle emissions, is needed.**

7 District heating (including CHP) and for individual use.
8 Gas already delivers home heating for more than 120 million European citizens: https://gasnaturally.eu/wp-content/uploads/2018/04/gasnaturally_infographics_spreads_032.pdf
9 See UMAS (2018), 'LNG as a marine fuel in the EU': https://u-mas.co.uk/LinkClick.aspx?fileticket=yVGOF-ct68s%3D&portalid=0/.
10 Jingjing Xu, David Testa & Proshanto K. Mukherjee (2015), 'The use of LNG as a marine fuel: The international regulatory framework', *Ocean Development & International Law*, 46:3, 225-240, DOI: 10.1080/00908320.2015.1054744; 'Life cycle GHG emission study on the use of LNG as marine fuel': https://info.thinkstep.com/lng-ghg-study/.
11 https://cdn.eurelectric.org/media/3457/decarbonisation-pathways-h-5A25D8D1.pdf.
12 IEA (2018), 'World energy outlook 2018': https://www.iea.org/weo2018/.
13 Source: BP Statistical Review, June 2019.

There is an increasing consensus that an inclusive approach to decarbonisation, which combines renewable electricity with other technologies such as low-carbon liquids and gases from various sources, can deliver decarbonisation faster and at lower costs than an all-electric scenario. This inclusive approach can address issues such as the intermittency of renewable electricity and the requirement for high-temperature heat in industry. Low-carbon gases can be produced from biomass, renewable electricity or natural gas with CCUS[14]. An energy transition, which is not 100% renewable-based, does not imply that carbon emissions cannot be net-zero, taking also into account negative emission options to offset very low residual carbon emissions, which all technologies have:

- **Emissions from the power sector or industry can be captured, used, stored and removed from the air (CCUS, direct air capture, etc.)**. Most of the carbon emission scenarios consistent with the Paris Agreement include CCS. For example, the IPCC's (2018) 'Special Report: Global Warming of 1.5°C' describes four main pathway scenarios, three of which include CCS as well as bioenergy with CCS (BECCS). These technologies complement the energy transition and mitigate climate change.
- **The electric option is currently too immature for aviation and the marine sector**. Therefore, low-carbon liquid fuels (including biofuels) are an important option as high energy-density fuels are needed in aviation. For the shipping industry, LNG offers a solution for short- and long-distance large vessels in the short term and medium term and, e.g. hydrogen, in the longer term. This quality gives LNG an advantage relative to other technologies, such as batteries, which constitute a supplement to traditional ship engines rather than an alternative. Based on current technology, large vessels cannot sail across oceans running on electric engines[15] alone. It is also evident that, due to the ambitious IMO target of at least 50% GHG emissions reductions by 2050, from 2008, the shipping industry will need to be ready to build lower-carbon vessels in the next 10–15 years. The use of LNG offers an immediate answer to the IMO's ambition. In the long term, the use of liquefied bio-methane, liquefied synthetic methane, hydrogen, ammonia, methanol and other options can contribute to lowering emissions reductions. In other transport sectors, particularly heavy road transport or public transport, natural gas (LNG and CNG) provides a readily available option for emission reduction, whereas the electric option is still under development.

## The role of renewable gases

### *Question 4: What role should renewable gases play in the integrated energy system? What measures should be taken to promote decarbonised gases?*

IOGP supports the development of low-carbon gases, including gases from renewable and non-renewable sources. Because of this, any regulatory regime must recognise that Europe will continue to need a reliable market and infrastructure for the supply of natural gas for the foreseeable future to meet energy demand. According to the IEA World Energy Outlook 2019 most ambitious Sustainable Development Scenario, 35% of EU energy demand in 2040 will still be met by oil and natural gas. Furthermore, Europe still holds significant natural gas reserves, and continued investment in Europe's indigenous gas production and gas infrastructure remains even more important today after the recent pandemic. Therefore, continued EU support for grid development and adaptation to future uses, i.e. via European Regional Development Fund (ERDF), Connecting Europe Facility (CEF) and the European Investment Bank policy, are necessary.

**In our view, trying to expand the use of low-carbon gases by setting targets for specific technologies (e.g. bio-methane, biogas, syn-gas, green hydrogen, blue hydrogen, etc.) would not promote the most cost-effective and sustainable solutions for meeting decarbonisation targets.**

Specific technology targets would ignore that each technology may have variable GHG intensity and costs which will not be monitored and stewarded. Furthermore, splitting the internal gas market into different products would damage the success of completing the EU gas market and reverse the gains made by EU citizens in terms of more efficient and cheaper energy supplies.

[14] DENA study 2018 (German government think tank): 'Technology open solutions including low carbon gases can deliver deeply decarbonised energy systems at substantially lower costs than electricity from renewables only'; UK Climate Change Committee (CCC) outlines renewables and low carbon gases as key component to achieve the UK government net zero 2050 target.

[15] Some ships do cross with electric engines but using a diesel-electric configuration.

**In this context, renewable gases should be treated on a level playing field with other decarbonised gases. Taking this approach will require a common EU definition. All low-carbon gases should be rewarded for their contribution to decarbonisation goals. Therefore, we support one standardised system for Guarantees of Origin and subsequent certification for renewable and non-renewable low-carbon gases, which include the GHG emissions remaining of the product based on a (standardised) life-cycle basis. Certified emission savings due to low-carbon gases could be recognised under the EU Emissions Trading System (ETS) as reductions of GHG emissions.**

Such a technology-neutral approach will accelerate the deployment of low-carbon gases and deliver the most cost-effective solutions for the decarbonisation of gas. This approach will also stimulate infrastructure and market development, as well as research and development to improve technologies. For this reason, all available technologies for the production of low-carbon gases should be encouraged to compete on a level playing field.

**We support a limited review of EU gas legislation and network codes to determine whether the provisions are fit for purpose for new gases, including hydrogen. As an example, 'transmission' and 'distribution' are defined in the current Gas Directive as 'the transport of natural gas'. This appears to be too restrictive and should be expanded to include new gases. However, any review should not roll back the achievements of the natural gas market. The amendments should be strictly limited to their purpose.**

Some of the new gases are already injected into the distribution grid. We support enabling consistent wholesale trading of the energy content of all gases that are physically injected and consumed between the transmissions and distribution grids or in dedicated hydrogen networks. This provides a level playing field between new gases injected in the Transmission System Operator (TSO) and Distribution System Operator (DSO) networks and further increases the market available for new gases.

## The role of hydrogen

### *Question 5: What role should hydrogen play and how its development and deployment could be supported by the EU?*

The Green Deal and its roadmap clearly indicate that the transition to climate neutrality requires a smart and reliable infrastructure and stresses that priority areas include hydrogen, fuel cells and other alternative fuels; energy storage; and CCS and carbon capture and utilisation (CCU). As IOGP, we welcome this EU commitment, which is also reflected in the NECPs in which 12 Member States foresee a role for CCS and 22 Member States foresee a role for hydrogen in meeting their decarbonisation objectives.[16]

**IOGP supports a strategy which comprises all hydrogen production pathways, regardless of their 'colour'. What matters is the ability to cost-effectively reduce GHG emissions and contribute to reaching targets. We genuinely believe that hydrogen is the missing link which will enable energy sector integration while reducing emissions. In addition, investments in a broad range of low-carbon technologies can create more new jobs.**

In this context, with 17 industry actors from the oil and gas, gas transmission and hydrogen sectors, IOGP is participating in the Hydrogen for Europe study. 'Hydrogen for Europe' is a research project carried out over the course of 2020 by research institutes IFPEN and SINTEF and managed by Deloitte. The aim is to assess how hydrogen can contribute to reaching climate neutrality in Europe and the milestones on the path to 2050. The Hydrogen for Europe pre-study has already been made publicly available.[17]

Hydrogen overall is of utmost importance to ensure a competitive and clean EU industrial base. Europe will need hydrogen produced from natural gas with CCS and methane pyrolysis in addition to hydrogen produced from renewables to establish a hydrogen economy with competitive value chains. These types of hydrogen can complement each other in delivering the EU objective of carbon neutrality by 2050.

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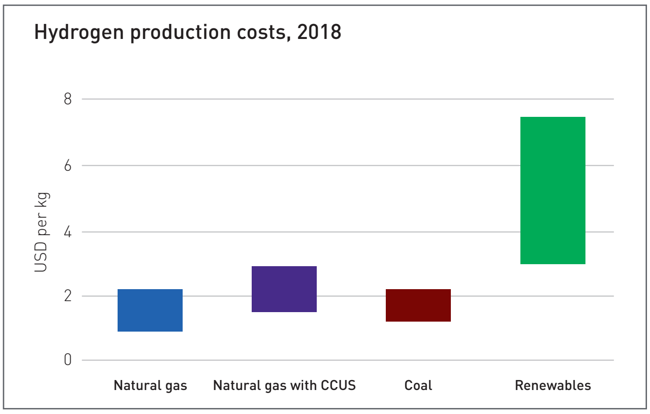
16 See IOGP (April 2020) assessment of NECPs: https://www.oilandgaseurope.org/wp-content/uploads/2020/04/NECPs-Factsheet-v2.pdf.
17 IFPEN & SINTEF (2019) 'Hydrogen for Europe' pre-study: https://www.sintef.no/globalassets/sintef-energi/hydrogen-for-europe/hydrogen-for-europe-pre-study-report-version-4_med-omslag-2019-08-23.pdf.

Today, hydrogen produced from natural gas delivers the lion's share of industrial hydrogen, while hydrogen from renewables is produced in smaller and more expensive volumes and is used primarily in pilot demonstration projects and for transport refuelling stations. Europe's energy-intensive industries will require much larger volumes of hydrogen with a lower $CO_2$ footprint than is currently produced[18]. According to the IEA Report on hydrogen, costs ($/kg) to produce hydrogen from natural gas with CCUS are lower than those for hydrogen using renewable electricity and electrolysis of water.[19]




Hydrogen can be applied at an industrial scale today with proven technologies up to a 90%–97% decarbonisation rate and therefore has a key role to play for the timely development of markets and infrastructure. While the costs of renewable hydrogen production can be expected to decrease with research, development and deployment and could become competitive with hydrogen from natural gas with CCUS over time, it will still be crucial to take into careful consideration the availability of renewable electricity for hydrogen production. This is particularly true in the 2030 time frame and given the envisaged expansion in demand for electricity for personal transport.

**Any changes to the gas regulatory regime must recognise the development of hydrogen from reforming natural gas and pyrolysis as well as hydrogen from electrolysis. IOGP believes that the volumes needed for delivering on the EU's ambitions can be produced within Europe from natural gas in combination with $CO_2$ management technologies such as CCS or methane pyrolysis. This will be key to building scale and competitiveness, lowering costs, generating employment and enabling an earlier transition to a sustainable and secure energy system. CCS in Europe could also support the development of a hydrogen economy while providing up to 5.4 million jobs by 2050,[20] along with the retention of existing high-skilled jobs in Europe's energy-intensive industries.[21]**

IOGP believes hydrogen has great potential to be a cost-effective solution for decarbonisation. Hydrogen can supply energy to sectors which will be difficult to decarbonise (e.g. industry and heavy transport) or sectors that will take considerable time and costs (e.g. home heating). The reforming process generates a $CO_2$ stream which, due to its high concentration, is efficient for implementing CCUS. Hydrogen from natural gas with CCUS will, for a considerable time, produce far fewer emissions than hydrogen derived from the average EU grid electricity.[22]

Rapid deployment of a hydrogen market and infrastructure at scale based on natural gas can also facilitate and support the development of hydrogen-related technologies such as power-to-gas technology and the production of synthetic methane. Larger amounts of hydrogen from electrolysis can enable electricity storage using the gas infrastructure (including gas storage facilities).

**The use of the existing gas infrastructure for low-carbon gases saves time and costs while reducing the requirement to dramatically expand the power transportation infrastructure, which is an issue in some Member States that faces public acceptance challenges.**

The parallel development of a dedicated hydrogen infrastructure and the ability to blend hydrogen with natural gas (hythane gases) are important. Blending provides a flexible 'default' demand and builds on the existing natural gas assets and the internal market. Hydrogen should be accepted in the natural gas system provided there is either a dedicated outlet or the gas is blended before reaching end users.

**The Network Code on Interoperability and EN16726 currently do not explicitly limit the possible blending of hydrogen with natural gas. Whilst we support this, setting a minimum tolerance level for hydrogen that should be agreed on in Interconnection Agreements between relevant TSOs (e.g. 2 vol% as a starting point), depending on their grid technical limitations, will be helpful to enable cross-border transport.**

[18] See the High-Level Group on Energy Intensive Industries (2019), 'Masterplan for a competitive transformation of EU energy intensive industries enabling a climate-neutral, circular economy by 2050': https://ec.europa.eu/docsroom/documents/38403/.

[19] https://www.iea.org/reports/the-future-of-hydrogen/.

[20] FCH JU (2019), 'Hydrogen roadmap Europe: https://www.fch.europa.eu/sites/default/files/Hydrogen%20Roadmap%20Europe_Report.pdf.

[21] High-Level Group on Energy-Intensive Industries (2019), Masterplan for a competitive transformation of EU energy-intensive industries enabling a climate-neutral circular economy by 2050: https://ec.europa.eu/docsroom/documents/38403/.

[22] IFPEN & SINTEF (2019), 'Hydrogen for Europe' pre-study: https://www.sintef.no/globalassets/sintef-energi/hydrogen-for-europe/hydrogen-for-europe-pre-study-report-version-4_med-omslag-2019-08-23.pdf.

## Circular economy and the use of waste

### *Question 6: How could circular economy and the use of waste heat and other waste resources play a greater role in the integrated energy system? What concrete actions would you suggest to achieve this?*

Recycling $CO_2$ from energy and industrial production can enable the more sustainable production of chemicals and materials by utilising emissions for valuable applications (e.g. construction materials, raw materials for the chemical industry, etc.). CCUS can therefore contribute to a circular economy and significantly reduce carbon emissions, subject to a lifecycle analysis and clear carbon accounting rules.

Additionally, making use of industrial excess heat and waste gases will increase global energy efficiency and reduce carbon emissions. Low-temperature heat can be used for space heating, whereas high-temperature heat can be used for industrial processes.

## Creation of a more integrated energy system

### *Question 7: How can energy markets contribute to a more integrated energy system?*

The key objective of the Third Energy Package was the completion of the Internal Energy Market. With respect to the market for natural gas, this objective has largely been achieved at the wholesale market level for the major gas-consuming markets in Europe. This is reflected in ACER's latest Market Monitoring Report showing a spread of less than 1 Euro/MWh between different national markets. Under the existing regulatory framework, much has been achieved to allow EU gas consumers to benefit from competitive liquid gas markets. Where there are still gaps in individual Member States, these should still be addressed under the existing regulatory framework in terms of better implementation of the existing legislation and binding network codes. In some regions across Europe, additional efforts might be necessary to continue diversification of natural gas supply sources.

**Any proposal for new legislative initiatives should maximise the use of market-based instruments for achieving European climate objectives while safeguarding the substantial achievements in the internal gas market. The existing regulatory framework for gas has enabled the trade of gas separate from the physical molecules. Transmission of gas molecules is assigned to unbundled TSOs, and gas is traded separately—as energy—without tracking the molecules. This has opened the gas market to new participants and has increased market liquidity. The development of low-carbon gases can benefit from this successful experience by facilitating the trade of GHG emission certificates separate from the molecules. Unbundling the emission benefits would create a common market for GHG emission certificates from all low-carbon gases, which would enable consumers to set their own pace of decarbonisation without the need to be physically connected to a source of low-carbon gas, and should also help to leverage market efficiencies to significantly reduce costs of decarbonisation.**

### *Question 8: How can cost-efficient use and development of energy infrastructure and digitalisation enable an integration of the energy system?*

IOGP supports the ongoing work by the European Network of Transmission System Operators for Electricity (ENTSOE) and -for Gas (ENTSOG) to continuously improve the coordinated network development planning through the Ten-Year Network Development Plan (TYNDPs) to better integrate gas and power systems and to drive cost-effective emissions reductions in the following ways:

- Through taking a holistic approach to the cost-efficient use and development of energy infrastructure, which has significant benefits because gas transmission is approximately 10–20 times more cost-efficient compared to the transport of electricity
- To better leverage the flexibility of gas storage, as existing gas storage facilities reported on the AGSI+ platform hold 1440 TWh of gas, which is equivalent to about 20 billion Tesla 75D batteries[23], and LNG supply is flexible and accounts for another 260 TWh of floating worldwide storage

[23] https://www.clingendaelenergy.com/files.cfm?event=files.download&ui=D8913D33-5254-00CF-FD03018BC5DD9343

When existing gas infrastructures can be (re)utilised, this further reduces the cost of decarbonisation and avoids creating stranded assets. Whilst storage and flexibility in the gas sector is less expensive than in the electricity sector, it still involves some additional cost. Network users in the gas sector pay for storage and flexibility through a combination of gas market prices and tariffs for transmission, distribution, storage and LNG services. Gas storage capacities could enable the expansion of power-to-gas technology while creating synergy between gas and electricity sectors. Power-to-gas applications may be potential long-term solutions to deal with excess renewable electricity while utilising the existing gas infrastructure. In the near term, flexible use of gas-fired power generation can provide cross-sectoral flexibility triggered either by (negative) price signals in the electricity market or by a capacity market for power generation.

**The same costs should apply to parties in the electricity sector that wish to use the gas system to store electricity via power-to-gas applications.**

Natural gas can also be used as a backup fuel for renewable energy source generation by providing flexibility to balance the system and storage facilities. The current regulatory framework for natural gas does not constitute a barrier but rather can be used as an enabler for low-carbon gases. The development of low-carbon gases would benefit when all gases would be traded with natural gas in a single market. Already today, hydrogen and synthetic methane can be injected in the gas system, provided it complies with gas quality safety limits, and enjoy all the benefits of a functioning, liquid market in gas, reaching a multiple end users connected to the gas infrastructure.

**We believe that TSOs and DSOs should be enabled to undertake a reasonable level of R&D activities and pilot projects as part of their regulated activities, without compromising the general unbundling principles. This could include projects for transmission and distribution of hydrogen/natural gas blends and $CO_2$ pipeline transport projects linked to CCUS initiatives.**

Where the EU provides funding for network-related R&D and pilot projects to reduce $CO_2$ emissions, we believe the funding mechanisms should not discriminate between sectors and technologies. This ensures that the most cost-effective measures are developed and that public money is spent wisely, a factor which is even more important given the COVID-related economic downturn. R&D support should provide the opportunity for multiple technologies to develop their potential towards decarbonisation.

**Additionally, IOGP recommends that methane emissions are brought within the scope of regulated activity so that mitigation and repair costs are eligible for cost recovery from National Regulatory Authorities (NRAs). This would require an amendment to the Gas Directive to expand the scope of what constitutes regulated activity as part of network planning.**

## Knowledge sharing for an integrated energy system

### *Question 10: Are there any best practices or concrete projects for an integrated energy system you would like to highlight?*

**H21 North of England Report**[24]: As a concrete project for an integrated energy system, the North of England project is a detailed analysis of hydrogen production and distribution in Northern England for heating purposes. This study was conducted by Northern Gas Networks, Cadent and Equinor to study the decarbonisation of the heating sector. All fossil-fuel-based production pathways include CCS. Hydrogen production technologies analysed include natural gas reforming in both a steam methane reformer and an autothermal reformer, coal gasification, offshore wind-powered electrolysers and storage of hydrogen in the form of ammonia. Furthermore, the required hydrogen transport network and the seasonal storage of hydrogen were investigated. The results of the different production routes can be compared due to similar assumptions in the report.

[24] 'H21 North of England' report: https://www.h21.green.

**Clean Gas Project/Net Zero Teesside**[25]: Net Zero Teesside is a CCUS project based in Teesside in North East England. In partnership with local industry and with committed, world-class partners, it aims to decarbonise a cluster of carbon-intensive businesses by as early as 2030. Each year, the project plans to capture $CO_2$ emissions equivalent to the annual energy use of up to 1 million homes in the United Kingdom. Plans for the project include decarbonising local industry by building a transportation and storage system to gather industrial $CO_2$, compress it and store it safely in a reservoir under the North Sea, which will encourage new investment in the region from industries that wish to store or use $CO_2$. There are also plans for a combined-cycle gas turbine facility with carbon capture technology which will provide low-carbon power as a complement to renewable energy sources and underpin the investment in the infrastructure.

**Northern Lights and the Norwegian Full-Scale CCS project**[26]: The Northern Lights project is designed to constitute a ship-based, open-source European $CO_2$ transport and storage network. By recovering $CO_2$ emissions from European industries, the project is looking to achieve economies of scale and lower costs, while also making a larger-scale contribution to reducing EU $CO_2$ emissions. Due to its pan-European approach, the project will facilitate the establishment of horizontal industry-wide standards to promote the interoperability of the $CO_2$ ships and storage sites with EU Member States. The ship-based solution makes CCS relevant for many companies and industrial sites, as they now can connect to a $CO_2$ storage solution. Northern Lights has identified 350 industrial sites with $CO_2$ emissions of more than 100 ktpa that are within reach of its ships. The project has resulted in signing memorandums of understanding (MoUs) with 7 of these sites in six European countries. The $CO_2$ shipping component of this project first received PCI status in 2017. In 2020, the project was granted an updated Project of Common Interest (PCI) status, expanding its geographical scope to capture sites located in Belgium, France, Germany, Ireland, the Netherlands, Sweden and the United Kingdom. Equinor, Total and Shell are responsible for the transport and storage parts of the project. The partners are currently conducting FEED studies and aim at final investment decisions in 2020. The Northern Lights $CO_2$ transport and storage project is then planned to start operating in 2024, and the project's extension to cross-border shipping of $CO_2$ is expected to take place from 2024 to 2025. The Norwegian Full-Scale CCS project, of which Northern Lights is the transport and storage part, aims to become the world´s first CCS project receiving $CO_2$ from several industrial sources. The concept of the Norwegian Full-Scale CCS project foresees $CO_2$ capture in two onshore industrial facilities for transport by ship to a receiving point in Naturgassparken in Øygarden municipality, where it will be sent through pipelines to offshore injection wells on the Norwegian continental shelf.

**The Rotterdam CCUS project Porthos**[27]: The Rotterdam CCUS project Porthos (Gasunie, EBN, & Port of Rotterdam Authority) aims at collecting the $CO_2$ from multiple industrial installations in the Rotterdam port area and transporting it in an open-access, public pipeline for offshore storage to a depleted gas field 25 km from the coast at a depth of around 3 km. Under the plan, around 2.5–5 Mtpa $CO_2$ from the refineries and chemical plants in the port would be captured and stored. A relatively small amount of $CO_2$ from Rotterdam industry is already being used (CCU) by greenhouse horticulture in South Holland, where it enables plants to grow faster. The Porthos infrastructure will also be suitable for transporting $CO_2$ for use by industry, if there is demand for this in the future. In February 2019, companies were invited to participate in an 'Expression of Interest' to signal their potential readiness to supply volumes of $CO_2$ into the planned public collector pipeline. As of December 2019, Porthos signed an agreement with companies ExxonMobil, Shell, Air Liquide and Air Products to work on preparations for the capture, transport and storage of $CO_2$. The capture is to take place at the companies' refineries and hydrogen production sites in Rotterdam. Transport to and storage beneath the North Sea is being prepared by Porthos. Sharing a common infrastructure between several industrial sites, the Porthos project aims to drive cost efficiencies relative to old CCS business models based on a single industrial emitter. The project was awarded CEF funding in January 2019 and has enjoyed the status of PCI since 2017. Finally, the Dutch government has put in place a financing scheme, SDE++, which is a kind of contract for differences between the current ETS price and the needed $CO_2$ price to make the project economically viable.

[25] https://oilandgasclimateinitiative.com/clean-gas-project/; https://netzerotees.wpengine.com.
[26] Northern Lights and the Norwegian Full-Scale CCS project: https://northernlightsccs.com/en/about/.
[27] Rotterdam CCUS project Porthos information: https://www.rotterdamccus.nl/en/.

## IOGP policy recommendations

### *Question 11: What policy actions and legislative measures could the Commission take to foster an integration of the energy system?*

**Facilitating exchange of views**: IOGP is in favour of using existing (e.g. the Madrid Forum, the Infrastructure Forums) and future platforms (e.g. establishment of the CCS Forum could be considered) to share experiences and best practises and to further contribute to the definition of an integrated energy system. Our industry is ready to contribute with our experiences and participate in identifying technology needs, investment opportunities, innovative business models and regulatory barriers and enablers. In this context, we welcome the Commission's proposal to establish a European Clean Hydrogen Alliance as part of the EU Industrial Strategy as well as the European Clean Hydrogen Partnership as part of Horizon Europe. Such platforms should encompass all clean hydrogen production technologies needed to achieve deep decarbonisation, including the production of hydrogen from natural gas in combination with CCS or pyrolysis technologies. We encourage the Commission to create working groups on CCS under these initiatives.

**Innovation and support schemes**: The European Commission and Member States should expand research, development and innovation programmes for all promising low-carbon, pre-commercial breakthrough technologies and projects to establish an economy of scale such as natural gas-to-hydrogen with CCS, CCU, power-to-gas and low-carbon liquid fuels. In the review of the State Aid Environmental Protection and Energy (EEAG), it is important to reflect on, inter alia, provisions enabling integration of CCUS and hydrogen into the EU energy system and a suitable scope for Member States to support development of these sectors using state resources. Proper configuration of the integrated energy sector will require expansion and refurbishment investments in terms of the existing gas grid (transmission and distribution) as well. In this respect, we recommend a coherent approach in relation to the available EU financing instruments (e.g. ERDF) to tackle the cost-effectiveness aspect of energy sector integration.

**Gas quality**: IOGP supports the work undertaken by CEN on gas quality to define an acceptable Wobbe Index range for H-gas. We welcome the suggestion by CEN of a wider range at EU entry points and a classification system for exit points to gas consumers; however, the currently discussed range is still too restrictive for certain domestic gas fields. Gas quality ranges should both increase the diversity of the upstream supply of gas and provide the vast majority of gas consumers—those connected to exit points with a specified class—with a predictable and stable gas quality. This should be supplemented with tailor-made solutions for extended class exit points. It is important to maintain the capacity of the transportation system to blend and commingle gas of different sources by avoiding undue quality restrictions at system entry points; this is especially important in regions where gas supply is not sufficiently diversified, and indigenous gas production is a critical contributor to supply security. This should also allow renewable and low-carbon gas to enter the system. Setting a minimum tolerance level for hydrogen that should be agreed on in Interconnection Agreements between relevant TSOs (such as say 2 vol%), depending on their grid technical limitations, will be helpful to enable cross-border transport.

**Institutional framework to mirror electricity market design**: The regulatory framework for electricity and natural gas has been well aligned up to the adoption of the revised Electricity Directive and Regulation in 2019, taking into account that there are structural differences between gas and power markets in particular with respect to supply and storage of energy and cross-border transmission. IOGP agrees that certain features of the 2019 power market reform should be considered for mirroring to the gas markets where this has tangible benefits. However, cross-border flows of gas are already much higher in terms of energy than cross-border flows of electricity. Furthermore, the cooperation between TSOs for gas has been strengthened by the network code on interoperability and data exchange. Hence, we see no merit for additional legal instruments to strengthen regional cooperation between TSOs for gas. Although provisions for inter-TSO compensation are not included in the existing gas regulation, this has not prevented inter-TSO compensation mechanisms for gas being developed where this has been agreed on a bilateral basis between the relevant TSOs and NRAs in the context of mergers of market areas. Areas where we could see added value of mirroring include the following:

- **Clear commitment to the internal market and market-based mechanisms**: The recasting of the electricity Regulation 2019/943 makes an unequivocal statement that 'prices shall be formed on the basis of demand and supply' and that 'market rules shall encourage free price formation' (Article 3). Similarly, the legislation underlines the need for market participants to be 'balance responsible' and financially responsible for imbalances (Article 5). Although these principles are already implied by, for example, the gas network codes, any redrafting of the gas Regulation could usefully reinforce these in a similar way for the gas market, including for future low-carbon gaseous fuels.
- **Retail market liberalisation**: The Third Energy Package has been instrumental in establishing functioning gas markets at the wholesale level, but this does not automatically benefit retail markets. The 2019 revisions of the power market aim to better link wholesale and retail markets, and further measures with respect to retail gas market liberalisation would better enable EU citizens to share in the benefits of a competitive wholesale gas market. In addition, an open retail market would also support a functioning wholesale market. EU citizens should have access to the uninterrupted supply of gas at competitive, market-based prices and with the freedom to select their supplier of choice. Similar to the provisions in the revised Electricity Directive, Member States should phase out end-user price regulation for gas and use other means, such as social policy, for the protection of energy poor and vulnerable household customers.
- **Basic contractual rights for consumers applying equally for the supply of gas as well as for electricity**: The same applies to bills and billing information and the right to switch suppliers. However, some of the consumer rights are specific to the electricity market and not relevant to natural gas, such as provisions about active customers that generate, store, consume and sell self-generated electricity. In addition, the provisions that entitle final customers to a dynamic price contract do not make a lot of sense for gas which does not have the same granularity of prices during the day. Smart metering is another area where applications differ between electricity and gas, although there are some common benefits, such as improved consumption monitoring and easier switching of suppliers. IOGP believes that only those provisions should be mirrored, which have tangible benefits for gas consumers.
- **Cooperation between DSOs**: The focus of a possible European body of gas DSOs should be on cooperation between DSOs in areas such as digitalisation, data management, cyber security and data protection. We do not see merit in network development planning at the EU level for distribution networks given there is no significant cross-border connectivity at the gas distribution level. Because many smaller DSOs are not unbundled, the governance of the EU DSO body should provide a stronger voice to those unbundled DSOs.
- **Mirroring ENTSO duties**: With respect to the role and governance of the ENTSOs, we see merit in mirroring the provisions on the duties of the ENTSO to act independently and for the European good and to provide transparency on decisions by the ENTSO. We have noted the changes to the procedure for the development of electricity network codes, which more closely involve stakeholders. With respect to the development of network codes for gas, ENTSOG has from the start applied an open and transparent process with extensive stakeholder involvement and consultation. We believe ENTSOG has set a high standard for stakeholder consultation which we support very much.
- **More emphasis on obligations of national regulators**: With respect to regulatory oversight, we support mirroring the provisions that put more emphasis on the obligation of national regulators to cooperate with neighbouring regulators and with the Agency for the Cooperation of Energy Regulators (ACER). The role of the Agency has recently been reinforced with the recast of the ACER Regulation. ACER should focus on further improving the coordination and cooperation between NRAs and make recommendations to assist NRAs in sharing good practices.
- **Amending network codes**: The Commission is empowered to adopt implementing or delegated acts in the area of network codes for electricity. While we question the need for new network codes for gas, we believe a fit-for-purpose procedure for amending the network codes would be helpful. In this context, we see merit in mirroring these provisions.

## Annex I – Further inputs:

- **Initial views on TEN-E Guidelines**. Regulatory changes will be necessary to enable the roll-out of infrastructure for CCS and hydrogen. This paper outlines our initial feedback to the upcoming evaluation and review of the Regulation on guidelines for Trans-European Energy Infrastructure (TEN-E): https://www.oilandgaseurope.org/wp-content/uploads/2020/04/IOGP-initial-views-on-TEN-E-guidelines-paper.pdf
- **New and old CCS projects in Europe**: CCS failed to live up to its potential during the previous investment cycle (2009-2015). This paper outlines what has changed since then in terms of regulatory context and the development of new business models for CCS, making the case for CCS as a key component in reaching the EU's long-term climate objectives: https://www.oilandgaseurope.org/wp-content/uploads/2020/04/New-and-old-CCS-projects-in-Europe-paper.pdf
- **Policy matrix: key recommendations on CCS in the current and future EU legislative framework**: This document provides an overview of existing EU legislative measures, highlighting for each of them the key changes needed to enable the development of CCS in Europe at larger scale: https://www.oilandgaseurope.org/ccs-in-the-current-and-future-eu-legislation-paper/
- **Factsheet - NECPs**: IOGP assessed the final National Energy & Climate Plans (NECPs) of EU Member States. The factsheet shows what role Member States see for exploration and production, the use of oil and gas, and CCS and hydrogen technologies in the 2030 perspective: http://www.oilandgaseurope.org/wp-content/uploads/2020/04/NECPs-Factsheet-v2.pdf
- **Methane emissions**: The paper outlines IOGP's views and policy recommendations in the context of the planned EU Methane Strategy. The document represents IOGP's initial contribution to the European Commission's strategy on methane emissions: https://www.oilandgaseurope.org/wp-content/uploads/2020/04/Methane-Management-paper.pdf
- **IOGP coordinated report 'The potential for CCS and CCU in Europe'**: The 31st Madrid Forum invited IOGP to coordinate a report on the potential of Carbon Capture and Storage (CCS) and Carbon Capture and Utilisation (CCU) technologies, including technical, economic and public acceptance considerations, working with all interested stakeholders. A Taskforce composed of interested stakeholders was subsequently established, and this group began regular discussions, including on current regulatory barriers and incentives. https://ec.europa.eu/info/sites/info/files/iogp_-_report_-_ccs_ccu.pdf
- **IOGP CCS Map** which provides An overview of existing and planned Carbon Capture and Storage facilities in Europe http://www.oilandgaseurope.org/wp-content/uploads/2020/02/IOGP_Map-of-EU-CCS-Projects.pdf
- **The Hydrogen for Europe pre-study** has been undertaken with the purpose of assessing current knowledge about the potential hydrogen has to decarbonise the European economy. http://www.oilandgaseurope.org/wp-content/uploads/2020/01/IOGP_Hydrogen-for-Europe-Final-report-of-the-pre-study_reportstudy.pdf

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