Gas infrastructure Europe (GIE) represents the European gas transmission operators, gas storage facilities and LNG terminals. In the future, gas infrastructure will play a key role in ensuring a high uptake of renewables, including offshore wind, into the EU energy system.

Existing gas infrastructures, including storage facilities and gas networks, could **cost-effectively** be converted to transport (renewable) hydrogen. Based on the **commonalities between methane gas and hydrogen**, gas infrastructure operators could play a key role in transporting and storing renewable hydrogen, facilitating the development of a **liquid and open-access hydrogen market**, and thereby indirectly supporting the development of renewable energy such as offshore wind.

Offshore renewable energy resources can be utilised to **decarbonise "hard to abate" sectors** such as parts industrial and transport energy demand. This can be done via conversion to other energy carriers, such as hydrogen, synthetic gas or fuels. Besides, the conversion of power to gas (in the form of hydrogen or other gases) **provides flexibility to balance electricity demand** and supply, which reduces the need for curtailment and optimizes utilization of variable renewable power generation. Additionally, if energy is destined to be consumed far from coastal sites, its transport and storage in form of molecules can bring **advantages both in terms of lower OPEX (lower energy losses**) as well as substantial **lower CAPEX (avoided investment** in additional existing cables using mainly existing gas infrastructures).

Accelerating offshore wind production requires similar ambitious policy measures in related sectors, **particularly within hydrogen and P2X**. In order to exploit the full potential of offshore wind, supporting legislation that help EU realise 40 GW green hydrogen production in 2030 must follow. Moreover, the development of the offshore energy sector in the EU can play a **major role in recovering from the current COVID-19** related economic crisis and consequently should be accelerated in Europe.

This requires coordination in the energy sector and amongst infrastructure operators handling different energy carriers. In general, looking to the European Commission's ambition of 230-450 GW offshore before 2050, Power-to-X (PtX) and hydrogen infrastructure will be a prerequisite for an optimized utilization of the resources. The uncertainty in terms of future supply and demand of hydrogen, adds a premium financial risk, which can be mitigated through incentives at the EU level.

The following aspects need to be considered for a successful integration of large-scale offshore wind energy in the energy system:

To utilize the full potential of offshore wind and renewable power, ambitious policy measures for PtX and hydrogen must follow:

1. In order to ensure the maximisation of the contribution of offshore wind to decarbonisation which is critical to achieve carbon-neutrality across the EU, investments in offshore development should be supported based on the highest benefit to society. This entails ensuring that the electricity generated offshore can be fully utilised, where needed as hydrogen or other fuels.

2. Conversion from power to molecules, such as hydrogen, should take place offshore or onshore depending on the highest societal benefit.
3. Onshore conversion has the advantage that both the hydrogen and the oxygen produced could be captured more easily than offshore. In places with access to district heating networks, excess heat from electrolysers could be valued.
4. The advantage of offshore conversion is that the existing (retrofitted) natural gas infrastructure could be used to transport the energy to shore in gas form. This could save costs compared to developing an extensive offshore electricity grid - especially at distances further from land. Additionally, producing hydrogen offshore could help stabilise the offshore electricity grid closer to the variable source, and thus reducing the need for large cable infrastructures.

With regards to sector integration and PtX, the planning of energy infrastructure needs to be holistic and coordinated:

1. Continued collaboration between ENTSO-G and ENTSO-E in the development of the ten-year network development (TYNDP) scenarios will help ensure an optimized grid planning between energy systems.
2. A strong domestic and cross border gas and electricity transmission infrastructure, with cost-efficient flexibility options at scale and across all time scales (including sector coupling and storage) are required. Large-scale electricity and gas infrastructure projects, both offshore and onshore, domestic and cross border will be key.
3. The upcoming strategy is an opportunity to rework grid connections for offshore wind. It is important that the new paradigm shift reflects the new synergies and overall system efficiency gains which can be brought by new gases like hydrogen for dedicated RES/H2 conversion and transport projects offshore, also solving potential H2 storage issues onshore. An appropriate regulatory framework should be facilitated, while ensuring a level playing field during the entire energy transition period.

The appropriate infrastructure needs to be chosen based on lowest cost for society:

1. A challenge for the fast expansion of renewable electricity capacity in Europe is the existing electricity grid capacity. In 2018, close to €1 billion of renewable on- and offshore wind electricity in Germany was curtailed because of capacity constraints in the electricity grid. Part of the solution to integrating large amounts of renewable energy into the energy system while reducing the necessarily required substantial electricity grid upgrades is the conversion to hydrogen[1]. Investments in making available hydrogen infrastructure, either by building new infrastructure or by converting the existing gas infrastructure, will help accelerate renewable offshore generation across EU.
2. A gas grid is more cost-efficient than an electricity grid: building “new” gas infrastructure is 10-20 times cheaper than building the same energy transport capacity with a “new” electricity infrastructure[2]. Much of the future hydrogen grid will be based

[1]https://hydrogeneurope.eu/sites/default/files/Hydrogen%20Europe_2x40%20GW%20Green%20H2%20Initative%20Paper.pdf

[2] https://d1rkab7tlqy5f1.cloudfront.net/Websections/Energy_Initiative/Technical%20Report%20Hydrogen%20-%20the%20key%20to%20the%20energy%20transition.pdf

on existing gas infrastructure as opposed to building new pipelines. Converting existing gas pipelines are 66-90% cheaper than building new hydrogen infrastructure[3].

Gas infrastructure that can potentially transport renewable gases should be supported under TEN-E also in case the source is an offshore renewable production.

1. Finally, to reach 2030 and 2050 energy and climate objectives also other renewable energy sources will be crucial, both in terms of potential magnitude and for exploiting renewable energy streams with possible complementary production patterns.
2. In particular, a key role in this direction can be played by solar energy, which might deserve an analogous strategy having comparable benefits in terms of EU industrial development and leadership as well as jobs creation as wind energy.
3. This could also constitute – in coordination with the recently adopted Hydrogen strategy – an opportunity for mitigating the potential downturns and related negative impacts which could emerge from changed energy supply technologies and unsettled import/export balances, which could exacerbate already critical economic landscapes ("European Neighbourhood Policy" framework). Overall, the existing gas infrastructure can be used in all European regions to transport hydrogen from renewable sites (e.g. North Africa) towards the consumption centres.

Gas Infrastructure Europe (GIE) is the association representing the interests of European gas infrastructure operators active in gas transmission, gas storage and Liquefied Natural Gas (LNG) regasification. GIE is a trusted partner of European institutions, regulatory bodies and industry stakeholders. It is based in Brussels, the heart of European policymaking. GIE currently represents 70 member companies from 26 countries. GIE's vision is that by 2050, the gas infrastructure will be the backbone of the new innovative energy system, allowing European citizens to benefit from a secure, efficient and sustainable energy supply.

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[3] Trinomics, DG ENER, Hydrogen regulation workshop, 3 September 2020