

The EU gas package post-Ukraine invasion

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The year 2022 is pivotal for gas policies in the European Union, with the adoption of three key pieces of legislation to move the sector towards climate neutrality. The "gas package" proposed by the European Commission in December 2021 aims to *"facilitate the penetration of renewable and low-carbon gases into the energy system, enabling a shift from natural gas and to allow for these new gases to play their needed role towards the goal of EU climate neutrality in 2050"*. It has less political visibility than both the "climate package" (Fit for 55), whose implementation should lead to a 30% reduction in natural gas consumption by 2030; and the REPowerEU plan, formulated in March 2022 following the invasion of Ukraine, which envisages a total reduction of 60% by 2030.

This *Policy Brief* analyses the challenges of the European gas package, currently under discussion in the European Parliament, which will be on the agenda of the Czech Presidency of the Council of the European Union in the second half of 2022, in the dual context of supply and price crises and decarbonization strategies. Beyond the challenge of reducing natural gas consumption, this reform must support essential transformations for the energy transition including changes in gas uses and the emergence of other so-called "low-carbon" gases. The European Commission's proposal identifies these key issues, but must be strengthened, particularly with regard to hydrogen, through provisions that guarantee network governance adapted to climate objectives.

KEY MESSAGES

The main issue of the "gas package" is unchanged following the invasion of Ukraine: it concerns implementing the decrease of natural gas in the European energy system to achieve the climate objectives. In an emission-neutral energy system, other so-called "low-carbon" gases can be mobilized, but they would play a different role to that of natural gas today, which requires to rethink our current gas uses and infrastructure.

To ensure the alignment of short-term crisis recovery with climate objectives, the gas package must provide a framework for infrastructure governance that relies not only on the technical expertise of network operators, but also on stakeholder consultation and scientific expertise. From the perspective of optimizing systems for transition, the planning of electricity, natural gas and hydrogen networks should be integrated.

The changing role of gases in the system requires to reconsider the way the network is organized and financed, including the option to decommission in response to lower consumption, particularly on the distribution side. Beyond the gas package, this aspect must be included in the energy-climate planning of Member States, for example via the national energy-climate plans, in the same way as for the other possible transformations in the residential sector.

While hydrogen can play an important role in the decarbonization of certain industrial and heavy transport sectors, it cannot replace natural gas in the current system. The option of blending hydrogen into the natural gas network is therefore of limited value, as the move from natural gas to hydrogen is not an obvious step in the transition and its climate benefits are low.

1. REDUCE NATURAL GAS AND DEVELOP LOW-CARBON GASES TO ACHIEVE THE TRANSITION

In the context of the transition to climate neutrality, the gas package must respond to the need to reduce natural gas consumption, which should occur before 2030. The rise in fossil fuel prices since the fall of 2021, and the exacerbation of tensions with Russia following the invasion of Ukraine make an even stronger case for this objective, as the European Commission emphasises in its [REPowerEU](#) crisis response plan.

Natural gas plays a major role in the energy system, accounting for [22%](#) of primary energy consumed in Europe and [15%](#) in France in 2019. However, to achieve climate neutrality in 2050 and a 55% reduction in greenhouse gases (GHG) emissions in the EU between 1990 and 2030, as set out in the Fit for 55 package, its role in the European energy supply must decrease by 26% and then by 28% between 2015 and 2030 depending on the scenario, and reach almost zero by 2050 according to the [European Commission's impact assessment](#). The REPowerEU plan further increases this target to a 60% reduction in consumption by 2030, while the target for biomethane production is set at 350 TWh, and that for hydrogen supply at 660 TWh, i.e. around 9% and 17% respectively of the EU's current natural gas consumption.

Although a certain amount of natural gas can technically be substituted by other gases if they are produced via sustainable methods, notably biomethane (from organic matter), synthetic methane (produced from hydrogen and carbon dioxide), and to a lesser extent hydrogen, these gases will either be insufficiently abundant or too expensive to completely replace natural gas.

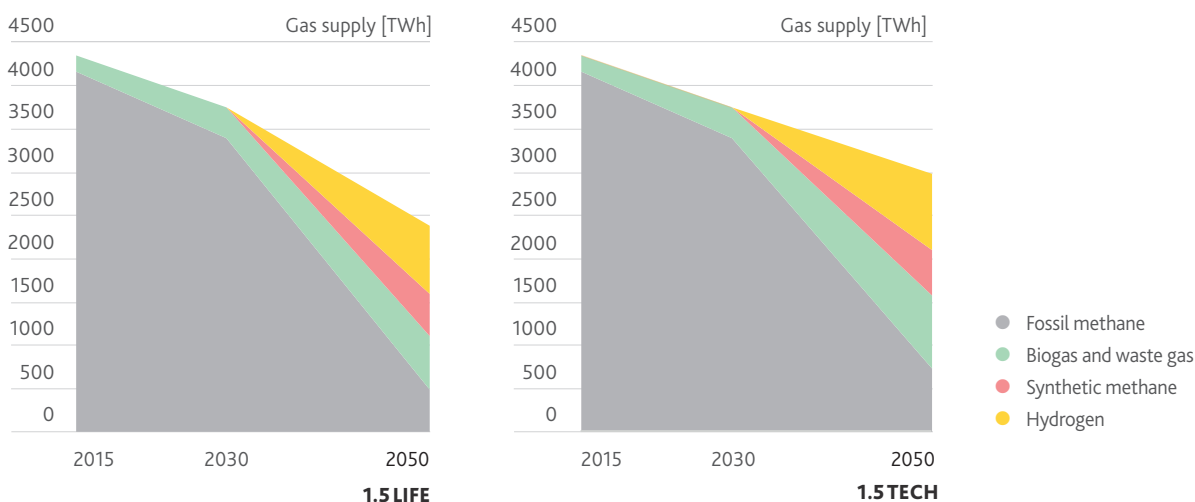
- The potential for biogas is strongly constrained by biophysical limitations, by the need to protect biodiversity, and by land-use competition. The highest estimates assume a quantity of available biomethane in 2050 corresponding to half of current natural gas consumption. For the EU, estimates vary according to the studies, from [352 TWh for ICCT](#) to [1,700 TWh for Engie](#) by 2050.
- Hydrogen produced by electrolysis is not a solution to massively replace natural gas because it is in strong competition with the direct use of electricity for many applications, compared to which it presents a significant energy penalty since it requires an additional conversion stage. Hydrogen seems likely to establish itself in certain minority segments (industry, long-distance transport) where it can provide a specific function (particularly energy storage, etc.).
- The potential for synthetic methane, made from electrolytic hydrogen and CO₂ produced from biomass, industry or air, is even more limited than that of hydrogen since it requires an additional processing step.

Given these constraints, the volumes of low-carbon gas available by 2050, including methane alone and methane-hydrogen combined, are significantly lower and more expensive than natural gas today,¹ and because they have different applications (as shown in an [IDDRI study and a scientific article](#)), they will not necessarily need the same network.

These transformations were already illustrated by the two scenarios of the European Commission's long-term strategy

¹ Ueckerdt, F., Bauer, C., Dirmaichner, A., Everall, J., Sacchi, R., & Luderer, G. (2021). Potential and risks of hydrogen-based e-fuels in climate change mitigation. *Nature Climate Change*. <https://doi.org/10.1109/EDUCON.2018.8363203> Gas for Climate. (2019). The optimal role for gas in a net-zero emissions energy system. Navigant Netherlands B.V.

FIGURE 1. Consumption of gaseous fuels up to 2050 according to the European Commission's 1.5LIFE and 1.5TECH scenarios



Source: European Commission (2018). https://knowledge4policy.ec.europa.eu/publication/depth-analysis-support-com2018-773-clean-planet-all-european-strategic-long-term-vision_en

published in 2018 (see Figure 1). Between 2015 and 2050, natural gas consumption declines between 82 and 88%, while total methane consumption (natural gas, biomethane and synthetic methane) falls by 50-60% over the same period. This decline differs depending on the sector: the largest decrease (a fall of approximately 70% between 2015 and 2050) concerns buildings, followed by the electricity sector (53%) and industry (37%). The severe constraints imposed on the natural gas supply since the end of 2021 make these changes even more necessary.

The transition of the gas system to climate neutrality does not consist in the gradual "greening" of the natural gas mix through the incorporation of more environmentally-friendly gases. It is a matter of transforming current gas applications to reduce natural gas consumption by applying energy sufficiency and efficiency strategies, and by supplying the residual demand with other vectors, including electricity, while low-carbon gases will develop in specific markets, sometimes as a substitute for natural gas (industry), but often as a substitute for oil derivatives. This raises structural questions for the natural gas network, particularly that of its sizing and financing, as described in an [IDDRI study](#) and a [scientific article](#).

2. HYDROGEN NETWORK GOVERNANCE ADAPTED TO DECARBONIZATION

The development of the role of gas in the energy system towards climate neutrality questions the governance of gas transmission networks, which was conceived in the early 2000s in a context where the priority was the formation of a single gas market in Europe. In particular, decision-making on new investment in hydrogen infrastructure must be compatible with decarbonization pathways.

Rules for the development and operation of hydrogen infrastructure proposed in the European Commission's gas package are similar to existing rules for natural gas and electricity transmission infrastructure, where network development plans are mainly based on the expertise of transmission system operators.

The revised [TEN-E Regulation](#) has consolidated the existing process by involving an independent scientific expert body, the European Scientific Advisory Board on Climate Change (the "Advisory Board"), and by strengthening the role of the Agency for the Cooperation of Energy Regulators (ACER), but the planning of investments in the cross-border gas and electricity transmission network still relies heavily on the expertise of network operators. According to the Commission's proposal, the stronger involvement of ACER and the Advisory Board introduced by the TEN-E revision is not applied to hydrogen networks.

As with electricity and natural gas, applying this decision process to hydrogen infrastructure raises the issue of accounting for all possible network developments (see [2021 IDDRI note](#)). Ensuring the security of supply is not only about additional network investment, but also about energy efficiency and

flexibility strategies. For example, ACER made the [recent decision](#) not to approve one of the assessments of the electricity network operator ENTSO-E, as it underestimated the potential for flexibility. Hydrogen technologies are key in this context since they allow the demand curve to match a more variable electricity supply, particularly by ensuring inter-seasonal storage, thus providing flexibility in the energy system.

To ensure that infrastructure decisions are aligned with decarbonization objectives, it is essential that the governance framework is complemented as compared to the existing electricity and gas framework. As a minimum, the governance framework for hydrogen should be aligned with the revised TEN-E and include the requirement for broad stakeholder consultation, exchanges with independent scientific experts such as the Advisory Board and approval by the European Commission for network developments.

Furthermore, while gas and electricity operators are required to develop integrated scenarios (Art. 51 of the Directive), the process as proposed by the Commission does not ensure that the assessment of hydrogen infrastructure needs is consistent with that of electricity and natural gas infrastructure, which is essential to properly assess the potential for flexibility, which can reduce infrastructure needs. This process could be improved by integrating hydrogen into the gas and electricity scenario.

If the governance framework is not strengthened, there is a risk that the EU will finance cross-border infrastructure that is inconsistent with decarbonization pathways, which would rapidly therefore become obsolete and result in stranded assets, or would encourage lower priority hydrogen applications, delaying the decarbonization of hard-to-decarbonize sectors. For example, the viability of liquefied natural gas import infrastructure projects, proposed by the European Commission under [REPowerEU](#), is questionable given the projected consumption of natural gas in the EU.

3. ADAPTING THE SIZE OF THE NETWORK

The significant long-term decline in the volumes of gas transported in the network, which could affect the geographical distribution of consumption, raises questions about the economic viability of part of this network, as explored by IDDRI in a [study](#) and in a [recent scientific publication](#).

The network's operational costs are mostly fixed, i.e. they do not vary according to the volume of gas flowing through it. Rather, the network is financed in proportion to the gas it transports. The fall in consumption therefore raises the issue of financing the infrastructure. This issue is particularly relevant for the distribution network, which mainly supplies buildings where the sharpest falls in gas consumption are expected (see section 1), and should be explored in the same way as the reinforcement of the electricity system in order to cope with changes in consumption.

These trends highlight the need to explore the possibility of decommissioning parts of the network, as indicated by several

recent studies.² It is therefore vital that gas network planning considers not only necessary network extensions—from the perspective of climate objectives, these investments are minimal or non-existent for distribution and limited for transmission, even in view of REPowerEU³—and hydrogen conversion, but also the areas that could be decommissioned based on supply and demand projections and the impacts on costs.

The proposed gas package requires network operators to provide information on parts of the network that can be decommissioned or converted to hydrogen. To complement these technical elements, the economic balance of networks in the transition should be integrated into the transition planning of the building heating sector at the national level, which should assess the costs of different options from a system-wide perspective.

Decommissioning parts of the gas network, if deemed appropriate in some areas, would require a phased approach accompanied by the deployment of alternative energy solutions for consumers. The Commission's proposal could therefore be complemented by an obligation for Member States to include neutrality pathways for buildings in their national energy and climate plans (to be updated in 2023), including an analysis of the economic challenges for energy networks (heat, electricity, natural gas, hydrogen). Distribution system operators could also be required to prepare ten-year network development plans, as is the case for transmission system operators.

- 2 Bouacida, I., & Berghmans, N. (2021). Carbon neutrality in Europe: future challenges for the gas infrastructure. *Study IDDRI*, 1. <https://www.iddri.org/en/publications-and-events/study/carbon-neutrality-europe-future-challenges-gas-infrastructure> Schwartzkopff, J. (2022). The future role of gas in a climate-neutral Europe. Report based on the discussions of an Expert Group convened by the Heinrich-Böll-Stiftung European Union and Environmental Action Germany (Deutsche Umwelthilfe). <https://eu.boell.org/en/future-role-of-gas> Wachsmuth, J. et al. (2019). Roadmap Gas für die Energiewende - Nachhaltiger Klimabeitrag des Gassektors. <https://www.umweltbundesamt.de/publikationen/roadmap-gas-fuer-die-energiewende-nachhaltiger>
- 3 Artelys. (2022). Does phasing-out Russian gas require new gas infrastructure? Briefing Paper. <https://www.artelys.com/reports/does-phasing-out-of-russian-gas-require-new-gas-infrastructure/> Brown, S., Vangenechten, D., Claey, B., & Lovisol, M. (2022). EU can stop Russian gas imports by 2025. Accelerating clean energy avoids fossil lock-in. Briefing. <https://ember-climate.org/insights/research/eu-can-stop-russian-gas-imports-by-2025/>

4. HYDROGEN BLENDING IN THE NETWORK: AVOIDING WASTING A SCARCE RESOURCE

In an early deployment phase of hydrogen technologies, some stakeholders are advocating the injection of small volumes of hydrogen blended with natural gas into the grid, to create demand for hydrogen and to lower grid gas emissions. The European Commission opens the door to this practice in its gas package by proposing to oblige methane transmission system operators to accept 5% blended hydrogen (by volume) at border points.

In theory, hydrogen blending would provide a use a buyer for any hydrogen produced, even in a phase where final hydrogen consumers were not as developed as the producers.

However, customers for hydrogen already exist: the EU currently consumes 340 TWh of hydrogen annually, which is mainly produced from natural gas and used by refineries and the chemical industry. These customers could use the hydrogen produced directly, while new consumers could also develop. For example, steel manufacturing, which is essentially coal-based today, could consume 45 TWh of electrolytic hydrogen as early as 2030.

In addition, hydrogen injection into the network would encourage it to be directed to non-priority sectors. However, hydrogen is scarce and essential for the decarbonization of certain sectors (refineries, chemical industry, steel and long-distance transport), which do not generally correspond to today's natural gas consumers. The resulting emissions reduction would be much lower than that from the direct use of hydrogen: 20% hydrogen blending (i.e. four times the rate proposed by the Commission) corresponds to a 6-7% reduction in GHG emissions. Although it may reduce emissions marginally, blended hydrogen does not structurally reduce GHG emissions in the long term.

Thus, blending hydrogen into the gas network cannot be regarded as a natural step forward in hydrogen's deployment pathway for the decarbonization of priority uses. The Commission's proposal runs the risk of dispersing limited hydrogen resources into non-essential applications.

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