ENTSO-E iAC Advice on Sector Coupling between Electricity and Gas

Context

a. The term sector coupling usually refers to the interaction between different energy sectors (such as electricity, gas, heating, cogeneration and transport) in the context of the process towards carbon neutrality.

b. However, given that much of the policy debate on this area focuses on the coupling of the electricity and gas sectors, in this note we will use the term in a narrower sense, referring to actual and potential interactions between the gas and electricity systems notably through the development of technologies allowing the production of gas using electricity. The term is frequently combined (sometimes in a confusing way) with terms such as **power-to-gas**, **green** or **renewable gases, green** or **blue hydrogen**, **biogas**, etc.

c. These terms refer to a variety of **products** (hydrogen, biogas, natural gas, methane, etc.) as well as **technologies and production processes** (electrolysis, methanization, etc.), with different technical maturities and carbon footprints. These products and technologies can be applied in a wide variety of **activities and business models** (production of hydrogen for injection into the natural gas grid or for local use in industrial processes or transportation; production of synthetic methane to generate electricity in existing CCGT plants or for seasonal storage of electricity; use of biogas in transportation or industry, etc.).

d. It is still **unclear which of these activities and business models** (or new ones not yet foreseen) will be **sustainable and reach large-scale development in the coming decades**. Different products and business models might have very different needs in terms of infrastructure and investment in terms of transportation grids, storage or facilities to produce gases.

e. In any case, **sector coupling is likely to play a relevant role in a carbon neutral economy**. On the one hand, decarbonised gases will be needed to deliver energy to industrial or transport processes that cannot be efficiently electrified. On the other hand, power-to-gas technologies are among the technologies that could deliver seasonal storage of electricity and therefore ensure carbon neutral firmness and flexibility in the power system, facilitating the efficient integration of a large share of renewable production. Therefore, power-to-gas sector coupling could be both a **complement to** and a **tool for electrification** in the decarbonisation process.

f. At the same time, since natural gas is currently a significant source of greenhouse gas emissions**, the gas industry will have to undertake a significant transformation to decarbonize its products, if it aims at contributing to the decarbonisation process in the 2050 horizon**. Moreover, this process can also lead a significant decrease of gas consumption as a whole, making parts of the current gas infrastructure **stranded assets**.

g. **Power-to-gas technologies could have a significant impact on future electricity and gas grids developments**. Some opinions regard sector coupling as an opportunity to reduce the need for expansion of the electricity grid, while making use of existing gas infrastructure or even expanding it, while others perceive the need for further development of electricity networks.

h. The available time to make the energy sector carbon neutral is short, and **we cannot afford to wait for the clarification of all these uncertainties** before the implementation of any changes in the current legal and regulatory framework, as far as necessary.

Advice

In this context, the Advisory Council of ENTSO-e formulates the following strategic advice on sector coupling. This is not a general position on this wide subject, but is specifically addressed to ENTSO-E, since the electricity TSOs need to make assumptions about gas infrastructure and demand. They also need to reflect on the potential for sector coupling to influence the infrastructure that will need to be maintained or built. Finally, ENTSO-E is an active participant in the policy and regulatory debate about this issue.

a. **Clarity**. Any legal framework for sector coupling must be based on a commonly accepted taxonomy and accurate definitions of all the terms related to power-to-gas and sustainable gases. This is a prerequisite for any legislative or regulatory measure.

b. **Caution in policy and regulation**. The regulatory and policy debates currently taking place include aspects such as targets for renewable gases, quotas for decarbonisation of the gas supply, electricity and gas grid tariffs, rules for ownership and regulatory treatment of power to gas facilities, etc. Given the uncertainties regarding the viability of different technologies and activities, legislative and regulatory measures should be based on no-regret actions.
   - The introduction of long-term targets must be avoided, since it currently seems very challenging to accurately estimate levels of penetration of hydrogen or renewable gases in the long run.
   - The utilisation of market based mechanisms and instruments is to be encouraged as a means of incentivising more economically efficient solutions in suitable locations.
   - One priority should be the removal of distortions and barriers that could arise, for instance, from inadequate grid tariff design or taxation.
   - Financial instruments, such as those arising from the sustainable finance initiatives, should be used for the decarbonisation of the gas system. This will require the future adaptation of the proposed EU taxonomy, which currently doesn't reflect the complexity and uncertainty of the gas decarbonisation process.

c. **Power-to-gas facilities belong to the competitive domain** and are in competition with technologies such as electricity storage, power-to-heat, demand-side response, gas-to-power with CCS, etc.
   - Only if natural monopoly conditions were identified, should the option of allowing TSOs to invest and operate power-to-gas facilities be considered as a last resort.
   - When there is clarity about sustainable activities involving power-to-gas, if it is concluded that the development of power-to-gas should be accelerated, the measures for such acceleration should be consistent with a market approach. Examples of such measures would be strengthening the emissions trading scheme; restricting the use of fossil fuels in heavy trucks, shipping or aviation; requiring shares of green or decarbonised gas on consumers or suppliers.
   - Direct subsidies for power to gas facilities can be considered only for R&D and demonstration projects.

- Power to gas facilities might indeed play a role in reducing total costs for electricity and gas transport infrastructure, as they can facilitate the joint optimization of gas and power systems. In such case, TSOs/DSOs should identify the need for congestion management services and procure such services. This procurement should be technology neutral and be open for both new and existing assets.

d. **Caution in planning scenarios**. Given the uncertainty regarding the future needs for gas infrastructure and the risk of stranded assets, planning should be particularly cautious.
   - ACER and NRAs should play a key role in ensuring that both ENTSOs' TYNDP scenarios reflect the new reality; include long-term projections for the overall electricity and gas supply and demand that are consistent with the Paris agreement and take into account the maturity of power-to-gas technologies.
   - The risk of stranded assets has to be adequately weighed against the carbon neutrality goal: the energy transition will generate stranded assets not only in the gas infrastructure, but also among thermal power generators, oil refineries or plants to manufacture internal combustion engines. Ensuring the use of these stranded assets at any cost should not be a priority, if this leads to a non-optimal management of the power and/or gas systems.

e. **Focus on technology development and deployment.** Decarbonisation of the gas system and coupling it more intensely with the electricity system will require further research and development is both sectors and in many aspects. Significant investment in research and development is required to foster technological breakthroughs, to bring innovative technologies to maturity and to develop industrial scale processes. Regulatory sandboxes may be considered to explore business models and analyse regulatory barriers and alternatives. Public support for this research might be needed, but cannot distort the functioning of the gas nor the electricity markets. Appropriate schemes should be implemented to facilitate the feasibility of pilot projects with an adequate allocation of risks and benefits.

f. **Achieving a fair transition**. The framework to reach a carbon neutral economy should be structured to deliver the best value for consumers and society as a whole. To help build the principles of cost-effectiveness and affordability into the design of the energy transition, the analysis underpinning draft policies and scenario planning should clarify the distributional impact on consumers' bills. Policies that do not put most of the burden on household consumers, especially those in vulnerable situations, and allow them to enjoy the benefits, should be prioritized. At the same time, the reality of industrial consumers needing to remain competitive on a global level also has to be a key considerationin policy design.