Preparing a future EU strategy on energy system integration
EBA's contribution

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?
    - It is of utmost importance that the EU follows technology-neutrality principle and promotes the energy sources that add value to the energy system in terms of flexibility, reliability as well as the highest greenhouse gas emission savings over the life cycle. Further valuable attributes like the impact on air quality, circular economy and security of supply should also be considered. Energy sources that are available must be deployed and scaled up right away as they offer immediate opportunity for decarbonization. A truly integrated energy environment will couple electricity and gas advantages to reach a hybrid and cost-efficient energy system. It will take advantage of the positives externalities of renewable energies such as biomethane and value them across sectors such as mobility, agriculture and buildings, and for the biodiversity.
    - A smart combination of renewable electricity and gas seems the cheapest and most effective way to achieve a climate neutral energy system. An integrated energy system will facilitate the production and integration of high rate of renewable energy both electric and gaseous, taking benefits from their specific advantages: low costs of production for the electric intermittent renewables (according to LCOE) and low costs of long-term storage and transportation for the renewable gases**.** By means of decentralized sector coupling appliances, such as hybrid heat pumps (HHP) or cogeneration, renewable energy use can be maximized, minimizing at all time CO2 emission. Renewable gas can be used, when needed, to balance and stabilize the electric grid, by means of electric generation, cogeneration or replacement of electric heat generation by gas heat generation in hybrid systems. Ultimately, massive costs of electricity grid reinforcement will be avoided.
    - The development of biomethane produced via anerobic digestion, gasification of biomass or Power-to-Methane is and will contribute to substantial GHG emissions reduction. Biomethane is an enabler of sector integration because it can be used as a fuel in the industry, in the buildings and in mobility. It also creates links with several sectors such as agriculture, waste management or environment (by for example increasing biodiversity) among other benefits. Maintaining existing gas infrastructure and using it to transport, store and distribute biomethane and hydrogen enables societal cost savings of €217bn/year in achieving climate neutrality compared to achieving the target largely without gas infrastructure.[1]
    - Renewable gas also brings along innovation and jobs to Europe. ICEs for CNG cars and trucks are built in Europe and the biggest technology providers and producers of

[1] Gas for Climate, 2020. Gas Decarbonization Pathways 2020 – 2050.

renewable methane combined with numerous research institutes are located in Europe.

- The creation and implementation of a resilient and holistic system for Guarantees of Origin for renewable energy such as renewable gas, in compliance with Article 19 of RED II, is a milestone to efficiently integrate all energy markets (while simultaneously promoting renewable electricity generation).

2. What are the main barriers to energy system integration that would require to be addressed in your view?

- The EU regulatory framework should be adapted to deploy the gas infrastructure, integrated in the energy system, to serve renewable gases, as a key asset for the sustainable and cost-efficient decarbonisation of the European economy.
- Thus, there is a lack of an appropriate funding instrument at EU level for local/regional gas and electricity infrastructures. A new funding mechanism based on the model of the TEN-E Regulation would be welcomed to develop local and regional infrastructures enabling the coupling of grids and the uptake of renewable energies.
- The current regulations at the EU level are neither coherent nor technology-neutral, e.g. in the transport sector, the uptake of all alternative fuels should be supported as complementary fuels, but the CO2 standards and Clean Vehicles Directive clearly favour electrification over other clean fuels. As a result, car manufacturers invest unilaterally in electric options and drop other technologies before true emissions over the life-cycle are properly taken into account in the European legislation.
- National barriers prevent cross-border trading of renewable methane: Despite the European Court ruling in 2017, several EU countries continue to implement import restrictions that not only put the current biomethane flow in danger but would also put any future power-to-gas flows at risk. Mass-balancing in gas grids within and between countries must be fully implemented and accepted in national and EU regulations and additionally, it should be legally clarified how greenhouse gas emissions targets and the renewable energy targets are accounted for when renewable energy is traded across borders.
- Economic barriers: lack of cost-competitiveness today due to small volumes of biogas produced so far and ongoing fossil fuel subsidies, insufficient CO2 price signal, low cost finance, utilisation of land cost-efficiently and incentivisation via price of carbon. The State Aid Guidelines and the Energy Taxation Directive should help renewable energy to become more competitive than fossil energy.
- Ideological barriers claiming that bioenergy is in competition with the food/feed sector without showing the real potential of efficient integration of biogas in the circular economy model. Such “black and white” thinking must be left outside legislation and Europe must efficiently use its resources and base decisions on scientific evidence and comprehensive impact assessments. Renewable gas production provides very efficient utilization of various residue and waste feedstock materials which should be acknowledged and incentivized accordingly. We also need

a holistic approach when looking at biogas: it is not only a sustainable way to produce renewable energy, but it also contributes to nutrients recycling, carbon sequestration, improved food production, etc.

- The lack of urgency and direction from some EU Member states, to lead, drive and support decarbonisation in difficult sectors such as agriculture, heat and transport. Must act now to be able to deliver targets in 2030 and 2050.
- Poor long-term vision for the role of renewable gas in the European energy system. Renewable gas targets at EU level could contribute to a shared acknowledgment of the key role of renewable gas in the EU climate ambition.
- Lack of strategy to present a comprehensive approach evaluating and combining the role of all kind of renewable gases according to their relative levels of maturity and social benefits.
- The administrative authorization process for biomethane production facilities is often complex and time consuming, resulting in excessive costs and revenue postponement.

3. More specifically:

- 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?
    - Electricity shouldn't be considered as an aim in itself, but as a mean among others, to achieve a safe, sustainable and affordable decarbonisation. Further electrification is needed but it should not be pushed forward at any price; it must be kept in mind that, similarly to gas, also electricity must be further decarbonized. Most European electricity supply is still fossil (or nuclear). And batteries are mostly produced outside Europe creating a new security of supply risk in Europe due to the limited availability of materials like lithium. Furthermore, the batteries' complete lifecycle should be taken into account when assessing their environmental impact, especially their disposal when they cannot longer hold enough charge for the initial application they were originally intended for.
    - But, increased production of renewable electricity will likely stimulate production of power-to-gas fuels which will further support the integrated energy system.

- What role should renewable gases play in the integrated energy system?
    - As electricity, biogas should primarily be used where it brings the highest socio-economic and environmental benefits). Biomethane does not need excessive investments in new infrastructure; it profits from the existing gas grid, gas boilers & heat pumps, CNG cars, etc. Therefore, gasous and liquified forms of biomethane have a great potential to substitute natural gas use in industry, heating and transport sectors, including sea transport and heavy long-haul transport. Hydrogen could gradually become important in the transport sector and the electricity sector through the use of fuel cells. Ultimately,

hydrogen could decarbonize refineries and heavy industries such as steel. A combination of gas grid solutions (injecting both biomethane and hydrogen in the gas grid) and off grid solutions is needed to fully decarbonise the energy system. This requires also a full and rapid realisation of the biomethane production potential from both household and industrial wastes and from forest and agricultural residues and sequential cropping.

- Renewable gases are the best way to store and transport energy over space and time: they can be used to meet seasonal and peak demands, and thus can be used to maximise the integration of intermittent renewable electricity by means of efficient hybrid appliances such as hybrid heat pumps or power-to-gas facilities. Thus, they provide an opportunity to expand renewable power production based on wind and solar power and other intermittent production technologies. No other technology is currently able to provide large scale seasonal storage of electricity.
- Biogas is the common enabler for full and efficient integration of the water treatment system, sustainable waste management, electricity system and sustainable farming, making these systems fully renewable and circular.

- What measures should be taken to promote decarbonised gases?
  - Set-up the principles of technology neutrality and source neutrality as the key guiding principles.
  - In order to accelerate the production and deployment of renewable gases, we need a binding European target for renewable gases. The target should be implemented in national policies and it should be broad enough to give Member States the freedom to develop different types of renewable gases according to their national potential and preferences. We also need a long-term vision for the role of renewable gas in the European energy system.
  - Renewable gases should be considered in critical objectives in 2030 and 2050. The support systems need to be gradually harmonized.
  - Member states should provide clear and balanced policies and directions for the ETS and non ETS sector, avoiding unintended consequences of placing any sector in a competitive disadvantage. Biogas should be recognized as ‘zero-carbon’ under the EU ETS (thus power plants and industrial installations using renewable green gases should not be required to surrender allowances), and other renewable gases from innovative technologies be recognised by the CER to also be classed as ‘carbon neutral’. This could allow also agriculture to be finally acknowledged for its essential environmental contributions such as reducing CO2 in the atmosphere through the photosynthesis, biomass cropping, AD and production of organic fertilisers, BECCS, etc.
  - The clean energy transition should involve and benefit all consumers through socialization of costs in delivering clean energy, improved air quality, and reduced pollution related illness.
  - Harmonized technical standards, including blending rules, will be needed to prepare for a future use of parts of the existing gas infrastructure as well as dedicated pipelines for the transport and distribution of hydrogen.
  - Support mechanisms: Different schemes could be envisaged (and are already implemented in some countries): 1) Production support through FIT/CFD – based on

tenders for larger installations; 2) consumption through tax advantages or quota schemes (with tradable certificates as for instance required by RED II in the transport sector). Schemes should cover CAPEX and OPEX (as for instance the cost of electricity including network tariffs, taxes and levies are an important cost factor for green hydrogen production); 3) Exemptions from network tariffs, taxes and levies could also be envisaged, in particular where this is needed to create a level playing field with alternative solutions that are not confronted with a similar burden (in principle, network tariffs / connection charges should be cost-reflective for all technologies and ensure efficient / non-distortive sector integration).

One of the best support models for biomethane is found in Italy where the scheme will help the country to reach the national target for advanced biofuels by 2030. The Italian Biomethane Decree adopted in 2018, in force until 31 December 2022, is based on a fixed incentive allocated to biomethane producers for 10 years as well as trading of certificates (CIC) to reach the national quota. This quota obligation for biofuels is the main driver for the development of biomethane. It is expected that by 2022, 1.1 bcm biomethane can be produced annually for the transport sector. In order to provide consumers with a proof of the renewable origin of biomethane, the decree foresees introduction of a system of guarantees of origin.

- (EU) funding for green gases: green gases + relevant infrastructure should qualify as PCIs, dedicated "green gas funding programmes"
- Support CO2 taken from the atmosphere in CCS solutions, with BECCS prioritized'. CCS as well as CCU should be used in connection with bio energy (BECCS). In considering CCS solutions, BECCS should also have priority ahead of fossil CO2.
- CO2 pipelines should be put in place, in order to integrate the CO2 sources and the CO2 consumer; using the renewable electric energy from variable sources to produce hydrogen and finally to methane by using CO2 for example from biomethane installations.
- Introduction of compulsory fermentation of manure and organic waste can realise the technological potentials and receive the required economic boost.
- For less developed technologies, R&D programs and the deployment of demonstration and scale up of projects are also needed. Regulatory sandboxes at national level could facilitate learning and experiencing with these new technologies.

- What role should hydrogen play and how its development and deployment could be supported by the EU?
  - Hydrogen will play an important part in an affordable energy transition. In the latest study of Gas for Climate and in its Accelerated Decarbonisation Pathway, which is a good match with the European Green Deal, hydrogen provides 2,200 TWh of energy by 2050: 1,600 TWh green hydrogen (from renewable electricity) and 600 TWh blue hydrogen (from natural gas with CCS). The deployment could be supported by introducing targets for renewable gases including hydrogen.
  - Competition between different renewable gases must be avoided; they must be supported in a complementary way.

- 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?
    - Waste biomass, both agricultural waste and residues, municipal waste and forestry waste and residues, is an important source of biogas/biomethane production by different technologies.
    - The EU policies should facilitate the use of industrial waste gases that can be used to make fuels, thereby offering opportunities to integrate industry with transport and heating sector.
    - The circular economy action plan should provide policy on sustainable products. Secondly, the European Commission must oblige Member States to comply with the European objectives for waste separation and recycling. The EU legislation should also further promote the use of fermentates and digestates as an organic fertilizer, a soil improver and as nutrient media for microbial conversions leading to sustainable chemicals, feed/food and polymer production. The greenhouse gas emission savings related to the replacement of fossil fertilisers should be taken into account in the CO2 balance of biogas production – organically derived fertilisers and nutrient media help to recycle the essential nutrients, contributing thus to a circular economy.
- How can energy markets contribute to a more integrated energy system?
    - Renewable gases can be used in all energy sectors making the European energy system more flexible.
    - The EU should create a European market for green gases for documenting the usage of renewable gases. Such a documentation shall enable to fulfill compliance targets and enable cross border exchange. This documentation shall go beyond but consider existing requirements for applications related to RED Art. 19 (Guarantees of Origin) and RED Art. 25-30 (sustainable biofuels). European coordination (via CEN EN 16325, platforms like ERGAR/AIB/CertifHy) shall be pushed to ensure registration schemes are interoperable while clarifying questions related to sustainability and carbon content certification, mass balancing, book & claim, counting towards national targets while avoiding double counting .
- How can cost-efficient use and development of energy infrastructure and digitalisation enable an integration of the energy system?
    - First, the gas infrastructure will play an important role to ensure security of energy supply and to accelerate energy system decarbonisation in an integrated way with electricity infrastructure. Ultimately, separate methane and hydrogen infrastructures will likely emerge, both largely based on existing gas infrastructure. These infrastructures would be connected to electricity infrastructures through the production of green hydrogen, and power to methane, and reverse use of hydrogen and biomethane to produce dispatchable electricity. Continued use of gas infrastructure is a cost-effective way to store and transport energy at a low cost.
    - Secondly, the use of smart hybrid equipment such as hybrid heat pump, cogeneration will enable optimisation of the use and development of existing grids, both electric and gas, at distribution and transport level. The capacity to use the very large gas storage and transport capacities will greatly reduce the need to reinforce the costly electric grids and reinforce the resilience of the whole energy system.
    - Thirdly, those energy infrastructure developments coupled with digitalisation (installation of smart sensors on grid to optimise the management of flows, smart metering to empower consumers with energy management and communication chains to generate

flexibilities from hybrid technologies) will contribute to reach a cost-efficient system while creating benefits for citizens and the environment.

- Finally, the use of digitalisation can greatly contribute to the integration of the energy system and promotion of green gases by developing a resilient and transparent IT system to facilitate the cross-border transfer, trade, documentation of certificates for renewable gases. In particular, a transparent system for any transactions of renewable gases can provide information to producers and consumers in order to develop a mature and reliable gas market.

4. Are there any best practices or concrete projects for an integrated energy system you would like to highlight?
    - Sustainable city concepts like Linköping in Sweden: District heating is connected to excess heat sources from industry and CHP plants fuelled by bioenergy, biogas and/or waste incineration. Organic waste (from housholds, industry and agriculture etc) is separated and is digested to produce biogas that is upgraded to biomethane to fuel the public transport and CNG cars and/or injected into grid or further liquified and then used for heavy transport. Nutrients are recycled by biofertiliser spread on agricultural lands. The water treatment plants are connected to the district heat network and sewage is digested to biogas and connected to upgrading facility. Biofertiliser from digested sewage to agriculture.
    - The EU funded project Interflex and particularly its French chapter called Nice Smart Valley contributes to research on an integrated energy system, on sector coupling at local level. This project tests at the distribution level two technologies (hybrid heat pumps and cogeneration units) and demonstrates a promising way to generate electricity/gas flexibilities. These flexibilities allow to reduce the pressure on the electricity grid in case of peak demand (or more generally constraints on the electricity grid).
    - The EU funded project REGATRACE (Renewable Gas TRAde Centre in Europe) strongly contributes to the uptake of a European integrated energy system by supporting the setup of a European biomethane/renewable gases market system closely integrated to the electricity and hydrogen GoO systems. Documentation of the renewable content will be a major task among the involved organizations such as AIB, ERGaR and their members.

5. What policy actions and legislative measures could the Commission take to foster an integration of the energy system?

    - Create a target for renewable gas share in the gas grid / in the final gas consumption by 2030 and 2050.
    - The EU should create a level-playing field for gas and electricity-based solutions (regulation is often biased in favor of electrification): for instance in heating → recognize the role of biomethane and bioLPG + do not over-estimate the potential of electric heat pumps and do not neglect their impact on peak demand for electricity (in terms of significant electricity infrastructure and equipment costs); enable bioCNG

and bioLNG in transport (LCA / well-to-wheel approach, investment in refueling and production infrastructure), industry: renewable / decarbonized target for renewable gases, appropriate criteria for hydrogen to qualify as “green” (see RED II implementation / delegated act on REFUNOBIOs). Acknowledging the storage capacity of the gas infrastructure and using the gas for electricity to cover winter peaks.

- Remove any legal and administrative barriers for renewable gases
- Create a long-term vision for the role of renewable gas in the European energy system should be strengthened.
- The administrative authorization process for biomethane production facilities should be simplified and made less time-consuming.
- Policies should be oriented to integrate consumers using those emitting energy carriers that cannot be integrated in the sector coupled system (e.g. coal, gasoil, butane for heating).