



Sector Coupling

The electricity industry perspective

32nd European Regulatory Gas Forum
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5 June 2019

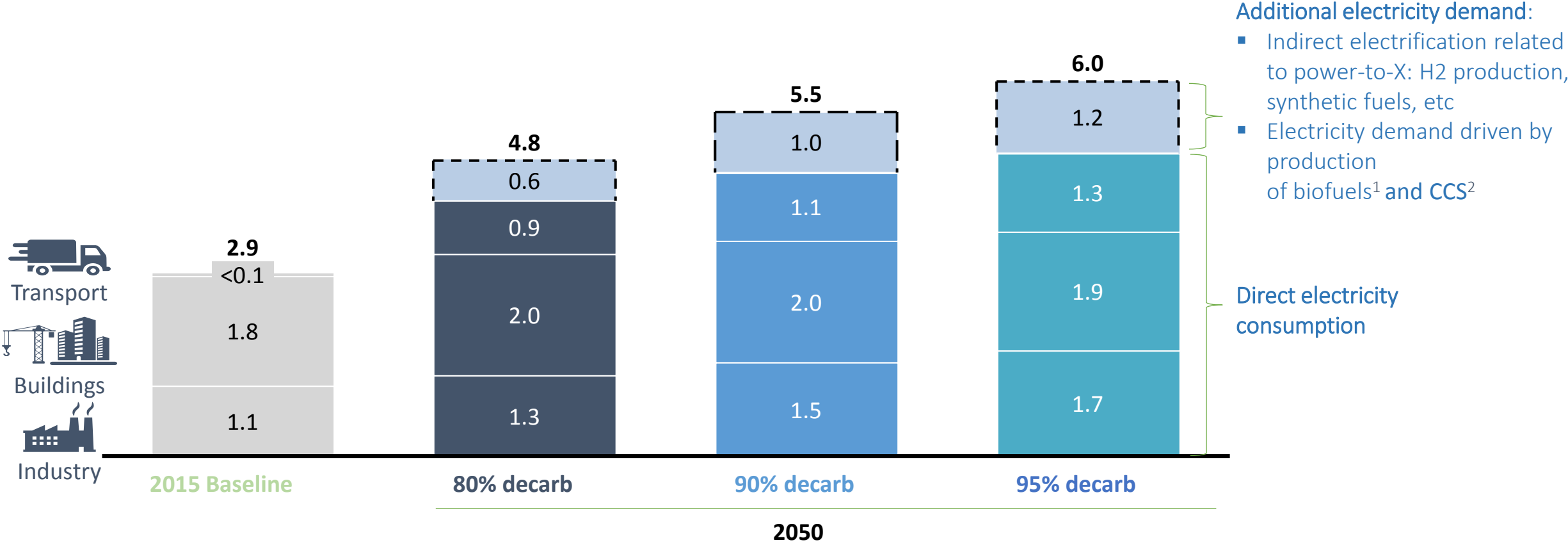
Significant benefits and synergies can be found through the coupling of electricity and gas sectors



- The achievement of the EU climate objectives requires the decarbonisation of all sectors of the economy
- Renewable-based and carbon-neutral electricity is the most important resource needed for the European GHG emissions reduction strategy.
- In addition, **Europe should strive to maintain leadership in green molecules**, including green hydrogen, which are needed to decarbonise especially specific segments of industrial activity and heavy-duty transport
- The well-managed interaction between electricity and gas systems will enable a cost-effective decarbonisation

Decarbonisation across the economy will increase sector integration and rely on cost-effective sector coupling of gas and electricity

Total electricity consumption
1,000 TWh

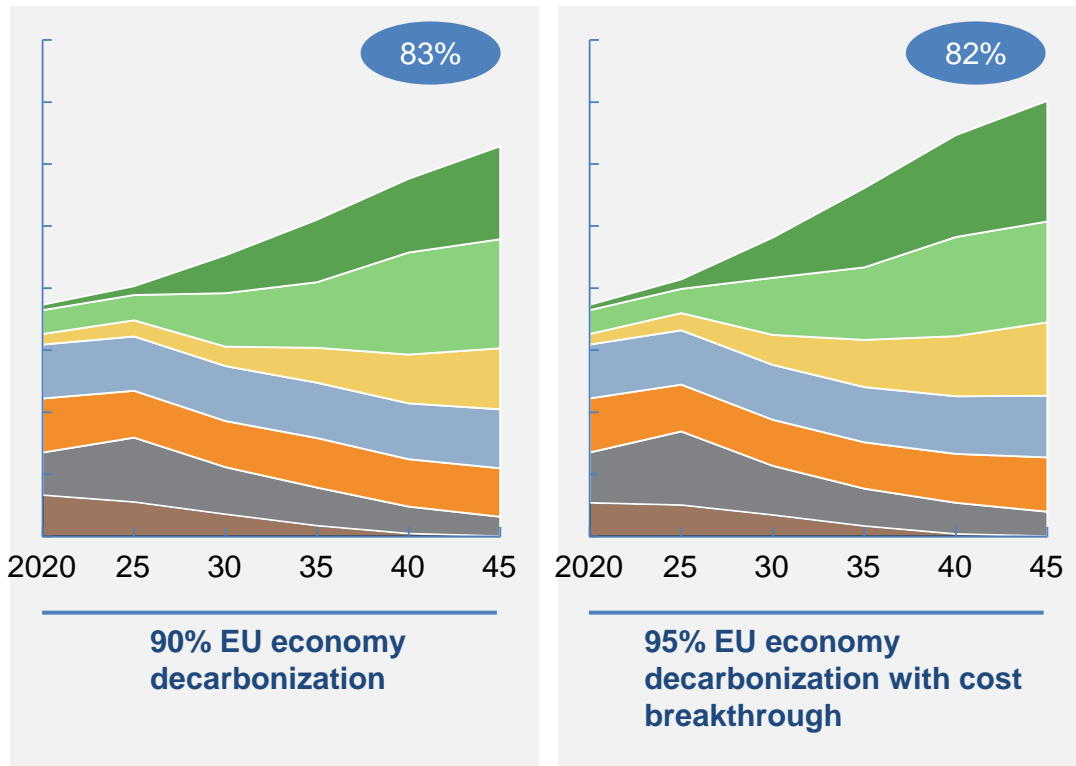


¹ Biofuels require feedstock as well as additional energy (either in form of thermal energy or power) for their production – see glossary
² Total CO2 abated through CCS: <200 Mt Co2; CCS may require technology improvement as well as increasing acceptability, e.g., for underground storage

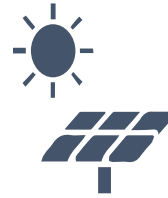
In a carbon-neutral electricity system dominated by variable renewables, what role of gas-to-power plants and for power-to-gas?

Generation by fuel type, TWh

- Offshore wind
- Onshore wind
- Solar
- Hydro and other RES¹
- Nuclear²
- Gas and other non-RES³
- Coal²



Xx% Share of renewables



High penetration of renewables and transmission build will be the main driving force of the European energy transition.



System reliability and flexibility needs provided by multiple sources in the power sector and from other industrial sectors. These include hydro, nuclear power and gas, and emerging sources deployed at scale such as demand side response, battery storage, hydrogen electrolysis and power-to-X

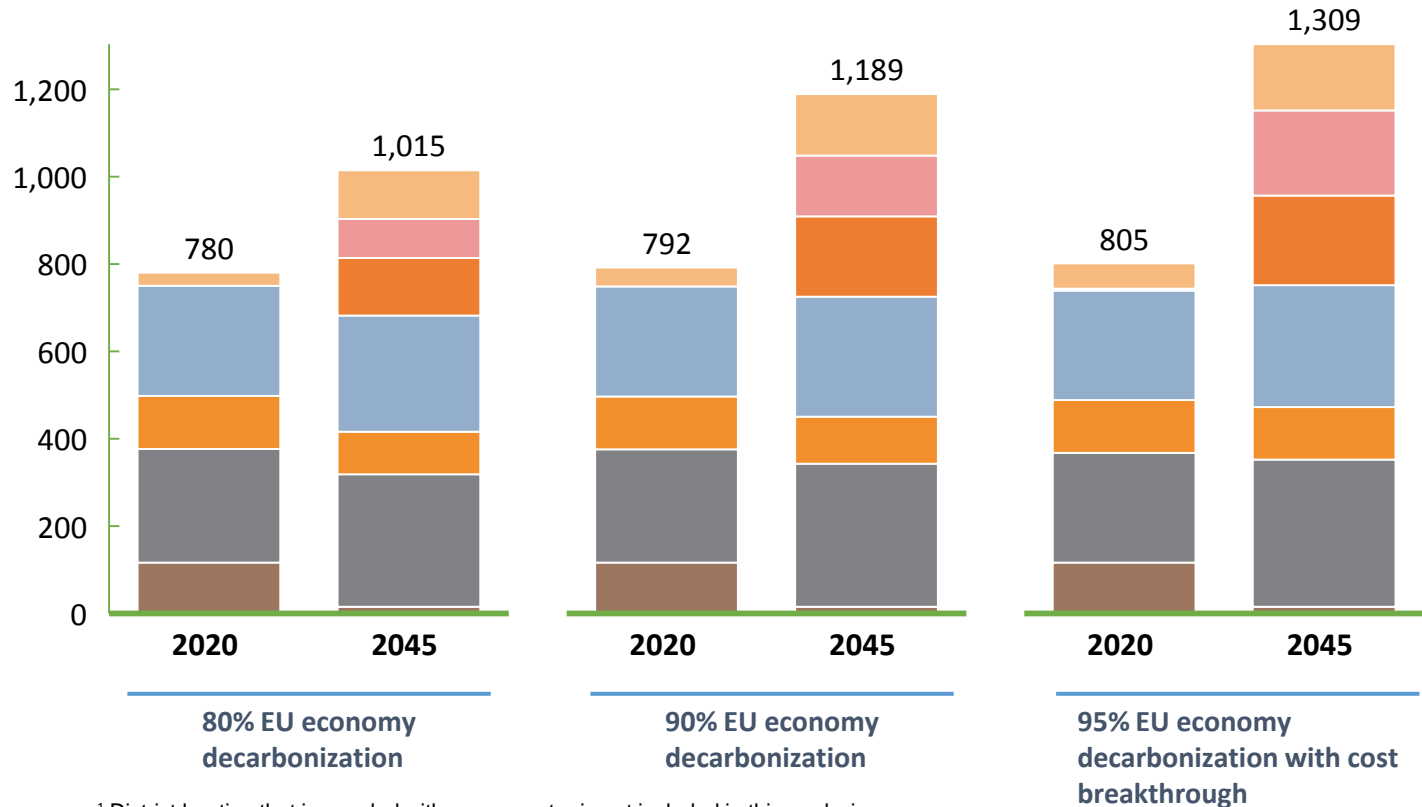
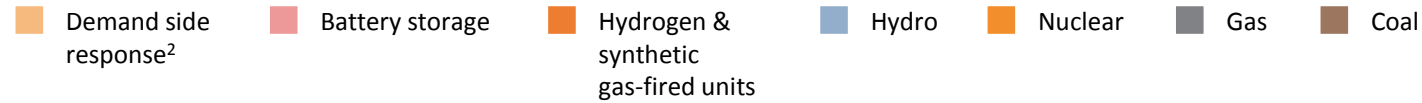


Changing role of fossil generation. Fossil electricity supply will be gradually phased out and represent only ~5% of total supply by 2045. However, **gas will still represent ~15% of total installed capacity** to contribute to system reliability, especially in regions that don't have access to hydro or nuclear

¹ Includes also small amounts of geothermal, biomass and biogas
² National policies on nuclear and coal phase out have been reflected
³ Up to 15% of gas capacity with CCS and other non-renewables

Power-to-Gas is one of the flexibility options required to decarbonize the energy sector

Dispatchable resources¹, GW



New sources of flexibility

- Enable better utilization of other generators
- Significant increase in capacity expected

Traditional sources of flexibility

- Similar capacity needed in a high renewables, higher demand system as today
- Provide electricity when renewables production is low and ability to leverage DSR has been exhausted
- Hydro plays a unique role and can improve the overall dispatch and system economics

¹ District heating that is coupled with power sector is not included in this analysis

² DSR flexibility is provided by hour to hour load shifting in transportation, buildings and heating

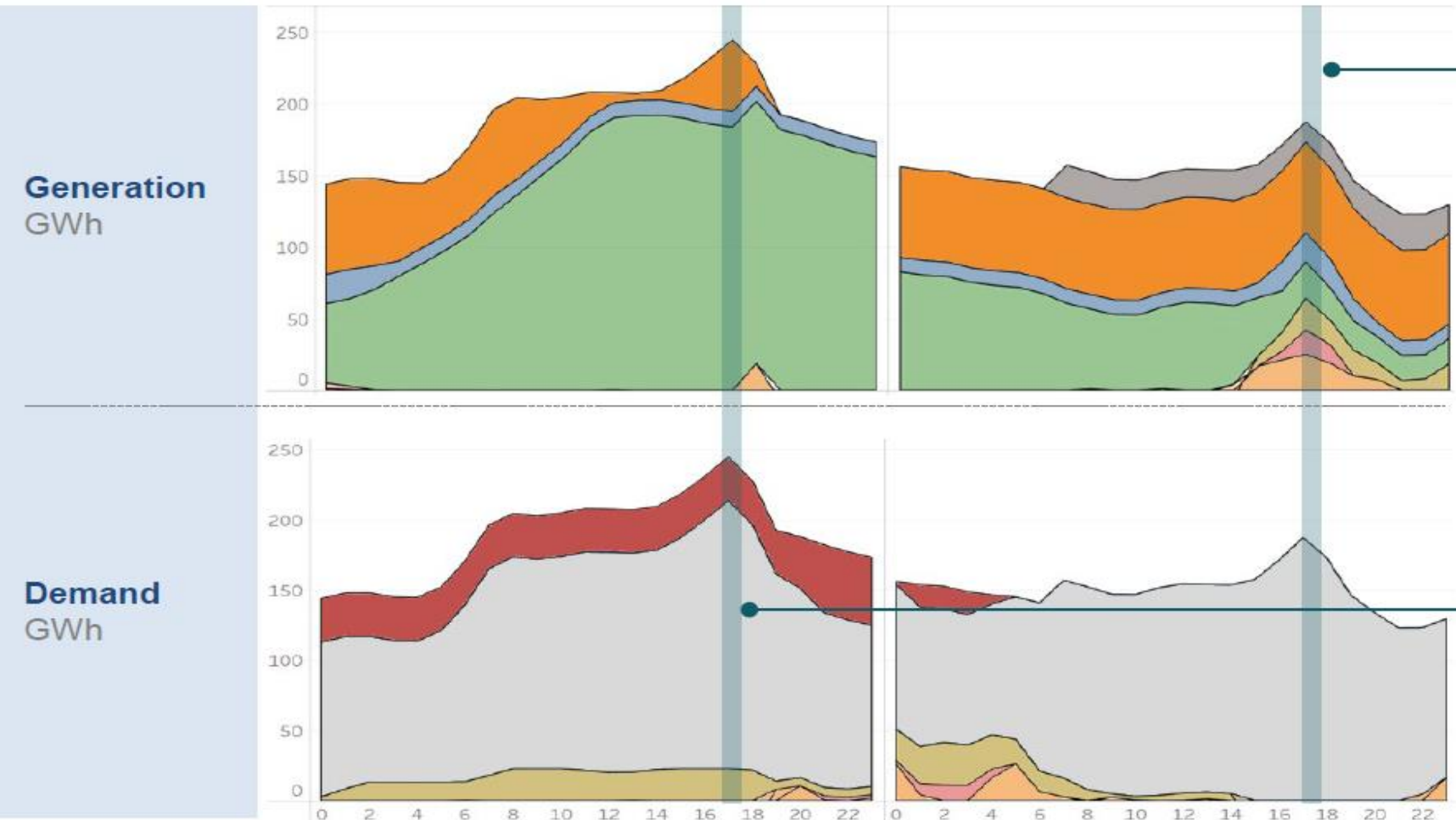
Example: the role of power-to-gas to match supply and demand when renewable production is low



Unconstrained day:
14th Dec, 2045

Constrained day:
18th Dec, 2045

Thermal
 Nuclear
 Hydro
 Wind and solar
 Net transmission flow¹
 DSR
 Battery storage
 End use demand
 P2X and H2



- Most constrained hour for reliability is defined by very low renewable output
- Remaining thermal capacity maintains system reliability when renewables are low
- Dispatchable resources all contribute in the most constrained hour
- Dec 14th demand higher than Dec 18th, but existence of higher renewables result in no thermal dispatch. Surplus electricity is used for P2X and exports to other regions

¹ Imports/exports

Recommendations to achieve a cost-effective transition unlocking the benefits of sector coupling

Joint statement issued on 23rd May



1. Develop a **consistent and clear taxonomy of sustainable and other gases**, including power-to-gas fuels that reflects their different lifecycle emissions.
2. **Make an independent analysis of the potential** of gases in the 2030 and 2050 perspective, and of the need for green molecules across sectors of the economy based on sound modelling
3. **Ensure a cost-effective and future-proof approach to infrastructure requirements and investments.** The ENTSOs' TYNDP scenarios must reflect this new reality, ensuring that long term projections for the overall energy and gas demand are Paris Agreement compliant.
4. **Revise the 2013 TEN-E Infrastructure Regulations** as soon as possible in light of the changing infrastructure and system security needs taking into account the potential of sector coupling and the importance of DSOs
5. Ensure that **Research & Innovation funds and investments** are allocated to the development of competitive carbon neutral industrial solutions and feedstocks to accelerate the transition in hard-to-abate sectors.

Coordinated infrastructure planning based on the principle of cost-effectiveness is critical



- Increasing linkages will require a **more integrated infrastructure planning and a coordination for risk-preparedness**
- **A coordinated electricity-gas approach is necessary:** joint work between ENTSOs must be encouraged.
- Sector coupling and the **cost efficient use of existing infrastructure** should be seen as key principles.
- Given the uncertainties on the evolution of gas demand in the long run and the ongoing discussions on sector coupling technologies, **new investment decisions on gas infrastructure should be carefully assessed.**
- **A stronger oversight by ACER and NRAs will be necessary** and the increasing importance of links between gas and electricity infrastructure shall be reflected in a new requirement for joint grid planning activities, at both European and national levels.

Regulatory and market design implications



- The main goal is that “new” decarbonised and renewable gases can be supplied and traded on a **level playing field with natural gas as part of the gas market**. Possible barriers for entry (e.g. in the form of undue technical requirements) should be eliminated.
- **Eurelectric does not support the introduction of sub-targets for renewable gas penetration**. Until power-to-gas reaches maturity, renewable gases will be used primarily when no competitive electric alternative to fossil fuel exists for some industrial processes and shipping. In this context the implementation of a trading system for renewable guarantee of origin can be a pivotal instrument.
- **Role of TSOs/DSOs in Power-to-gas technologies**
 - **1st step** : enabling P2G business cases for investors through **public funding for financial R&D support**. Investors can be primarily technology providers and mainly **consortia involving market parties and network operators**.
 - **2nd step** : once the technology is mature/commercially available, **TSO/DSOs should not be allowed to be active in this area as P2G is a contestable activity**. To facilitate better outcomes in circumstances where the market cannot (yet) provide the activity, **NRAs should be in the position to decide on exceptions, on a temporary basis**, and subject to regular and thorough market analysis.
- **Eurelectric does not support the implementation of specific electricity and gas grid tariff reductions or exemptions to support the development of power to gas production units**. Tariff structures should be tailored so that each grid user pays a price covering the costs it induces on the grid.
- **Hydrogen:**
 - The need to establish large scale/greenfield hydrogen pipelines should be carefully assessed to ensure economic efficiency.
 - A mandatory common high European threshold for the blending of hydrogen in gas networks is not recommendable until sufficient safety, technical and economic feasibility studies have been carried out.
 - Should a dedicated regulation of hydrogen networks be needed, it should be developed only when such a network starts to develop and has reached a certain scale, in terms of feed-in points, customers and volume.



Ambition
Technology
Consumer
Regulation

Thank you