Gas sector decarbonisation and sector coupling – Ensuring a market based approach

Launch of Frontier report for the European Federation of Energy Traders

26 February 2020
The objective of our work for EFET was to set forward a vision for market-based decarbonisation of the gas sector

We considered three key questions...

- How could the EU and national governments mandate measures to transform the natural gas sector into a contributor to decarbonisation of the economy, rather than a source of carbon emissions?

- How best can such measures help the gas system contribute to flexibility in the electricity system (to the extent needed and valued by the market)?

- Is it feasible to design pan-European targets or quotas, which set a timetable for decarbonisation of the gas system, in combination with a continuing roll-out of renewable power generation, and be amenable to fulfilment through the redemption of standard certificates?
To achieve 2050 climate goals the EU must achieve deep decarbonisation, including in sectors currently reliant on natural gas.

Despite the uncertainties, scenario studies featuring deep decarbonisation consistently find a long-term role for gases…

1. EU final energy demand is expected to fall


2. Electricity demand is expected to increase

Source: Frontier Economics, based on EC (2018)

3. More of that electricity will come from renewables – implying a greater need for energy system flexibility

Source: Frontier, based on sources indicated. Projected 2050 RES-E share of electricity supply.

4. Ren./low carbon gases play important role in decarbonising heat/transport and provision of flexibility

The gas system will need to be more integrated with other energy carriers than is currently the case.
The current climate policy framework features gaps and overlaps, leading to inefficiencies.

**Sectoral coverage of current climate policy arrangements**

- **Electricity**
  - ETS
  - RED
  - EED

- **Gases**

**Transport**

- **Industry**

- **Heat & Processes**

- **Residential**

**Resulting Inefficiencies**

- Incomplete policy coverage
- Overlapping policies
- Failure to coordinate low-carbon gas support policies
- Insufficient harmonisation of energy taxes
- Unclear policy objectives

Source: Frontier Economics
Wider market arrangements may also distort choices between technologies and energy carriers...

**Wholesale market design** does not provide price signals that reflect wider costs and benefits on the system. Consequences more significant in a sector coupling context (e.g. a PtG facility could have impacts on future network reinforcement and balancing costs across electricity and gas grids).

**Lack of level playing field between technologies, energy carriers and infrastructures**

**Distortive structure of tariffs and levies**, for example:
- To recover sunk costs of legacy investments
- To tax electricity used by PtG facilities

**Uncoordinated network planning**, for example:
- No clear incentive to optimise network investments across electricity and gas and across borders
- Electricity and gas grid operators’ bias towards “own” infrastructure solutions

... increasing the risk of an insufficient or inefficient energy transition

Policymakers will need to define an overall level of ambition, and may need to define solutions where significant co-ordination is critical.

Market-based mechanisms should be able to deliver significant low carbon gas investment. However, they will not address all barriers and market failures affecting gas decarbonisation - policymaker facilitation (and sometimes direction) will also be required.
The choice of decarbonisation incentives features two key dimensions: carbon price or subsidy, and level of application.

**Carbon price**
- Price paid for emitting CO2 varying by gas CO2 content.
- Design 1: Emission trading or Minimum Carbon price/tax.
- Design 2: Minimum Carbon price/tax at retail level.
- Current ETS.

**Hybrid carbon price & subsidy regime**
- Mix of carbon price and subsidy scheme for different types of gases.
- Design 5: Combination of instruments in power sector today.

**Subsidy regime**
- Subsidy paid to low carbon gas producers based on CO2 abated.
- Design 4: Certificate scheme.

**Mechanisms harmonised at EU-level** would be most efficient.

Applied at production/import level:
- Design 1: Emission trading or Minimum Carbon price/tax.
- Design 5: Combination of instruments in power sector today.

Applied at sale to final customer:
- Design 2: Minimum Carbon price/tax at retail level.
- Design 6: Certificate scheme.

Reality is that policymakers may also choose non-market-based tools, such as fossil fuel use prohibition / phase outs.

Objective

Problem

Solution

Recommendation
Carbon pricing and support mechanisms can both incentivise relevant investments

**Upstream models:** Producers/importers face carbon price on emissions or receive support based on avoided emissions.

**Downstream models:** Retailers/traders face carbon price on emissions within portfolio or obligation to meet avoided emissions quota through trading of standard certificates.

All models: Need to verify emissions content.

**Objective**

**Problem**

**Solution**

**Recommendation**

Carbon emissions from gas

Natural gas / LNG
- Low carbon gas
- Biogas

CO2 content

Importer

Storage

Traders

Spot market

Retailers

SME

Biogas
- Low carbon gas
- Biogas

CO2 content

Objective:

- Recommend objective

Problem:

- Describe problem

Solution:

- Propose solution

Recommendation:

- Summarize recommendation
Both approaches require a common way of assessing the carbon content of low-carbon gas – could build on existing instruments

**Guarantee of Origin (GoO)**
- Energy source
- Identity / location / capacity of installation
- Details of financial support
- Operational dates
- RED II: for all renewable energy

**Sustainability certificate**
- GHG intensity Origin of feedstock
- Characteristics of land (e.g. biodiversity)
- Other aspects possible (e.g. soil, water, air protection)
- RED II: for biofuels, bioliquids and biomass fuels

**Certificate of (avoided) emissions**
- Energy source + production process + assumed GHG intensity = emissions
  - (Option to add lifecycle GHG emissions)
  - Methodology for conversion between energy carriers
- Identity / location / capacity
- Details of financial support
- Operational dates
- Coverage: all fuels (incl. non-renewable) / end-uses

- Need to extend to non-renewable low-carbon energy
- Need for recognition of third country GoOs (especially important for gases)
- Need to merge information from GoOs and Sustainability Certificates
- Need for rules to allow conversion between different forms of energy
Carbon pricing can ensure low-carbon gases are deployed – if cost-effective – in the long-run

... but support may be needed, at least initially, to help bring costs down
Support mechanisms could be used in the interim, but should ideally be coordinated at EU level and open across borders

Support may be an appropriate **transitional mechanism** for encouraging the required **technological cost reduction** (with EU-wide carbon pricing the long-term goal).

Impact of support on **consumer energy prices** ought to be lower, compared to carbon pricing, given support can be targeted to new investment.

But **clearly less efficient** than a harmonised carbon price at EU level (as a main driver of GHG emissions abatement).

In particular, risk of **substantially increased deployment costs** if support schemes are not coordinated at EU level and open across borders – given the extensive existing cross border gas infrastructure the **cost of a national approach is much higher for gas than for electricity**.

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Cross-border transport capacities for gas and electricity to / between eight countries analysed

**Source:** Frontier Economics based on ENTSO-E and ENTSOG

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**Cross border capacities in GW (as of Oct 2018)**

- **Electricity**
- **Gas**

Width of arrows represents capacities (with 2 GW per ¼ pt)
Efficient outcomes also require market participants to face the costs (or benefits) that they impose across the energy system

**Co-ordinated network planning**
- Need to ensure optimal infrastructure investment decisions across gas and electricity
- Given the amounts being invested*, this is an area in which improvements could deliver substantial benefits for consumers
- Need to ensure power and gas TSOs consider alternative solutions to their own infrastructure that may help to reduce overall system costs, including through setting appropriate regulatory incentives

**Fit for purpose market design and charging**
- Participants should face charges / earn revenues which reflect the (forward-looking) cost/benefit that they impose/create for the whole of the gas & electricity system
- Implies the need to ensure complete markets (e.g. in flexibility) and continue to address issues around locational signals** and imbalance pricing
- And to ensure that support schemes do not insulate producers from market signals

**Dealing effectively with ‘cost-recovery’ issues**
- Cost-reflective charges will leave some costs unrecovered (e.g. costs of past investment in grids, low-carbon support costs, etc.)
- These costs should be recovered in the least distortive way possible
- Sector coupling adds an additional layer of complexity – need to avoid distorting choices between electricity and gas (and other energy carriers)

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*Total cost of gas projects submitted to 2018 ENTSOG TYNDP was EUR 96 billion. ENTSO-E TYNDP envisages EUR 144 billion of electricity grid projects by 2040.

**According to ENTSO-E “Powerfacts” 2019, the amount spent on congestion management in Europe has increased by around 25% between 2015 and 2017, from €999 million to €1.27 billion.
Key recommendations and potential pathway for future reforms to enable gas decarbonisation

**Objective**

**Problem**

**Solution**

**Recommendation**

### Carbon pricing
- National taxes / carbon pricing
- Review of ETS
- Climate neutrality law
- Expand scope of ETS to maritime, road transport and buildings
- Growing credibility of ETS price signal

### Low carbon gas support
- R&D support
- National support regimes for gases
- Increasing cross-border opening
- Potential coupling with electricity
- Phase out support
- EEAG revision
- RED III

### Wider system impacts
- Improving co-ordination between ENTSOs
- Regulatory incentives for cost-effective infrastructure development
- Ongoing improvement in market design

- 2020
- 2050

- ▪ Standardised methodology / certification for CO2 content, extended beyond renewable energy (i.e. expansion of GoOs)
- ▪ Promotion of market integration of support, competitive tendering and technology-neutrality
- ▪ Provisions on cross-border opening & coupling with electricity
- ▪ Possible introduction of pan-EU quota scheme and measures to ensure liquidity of trade in certificates
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