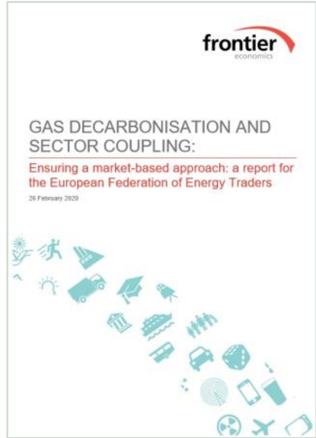


Gas sector decarbonisation and sector coupling – Ensuring a market based approach

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

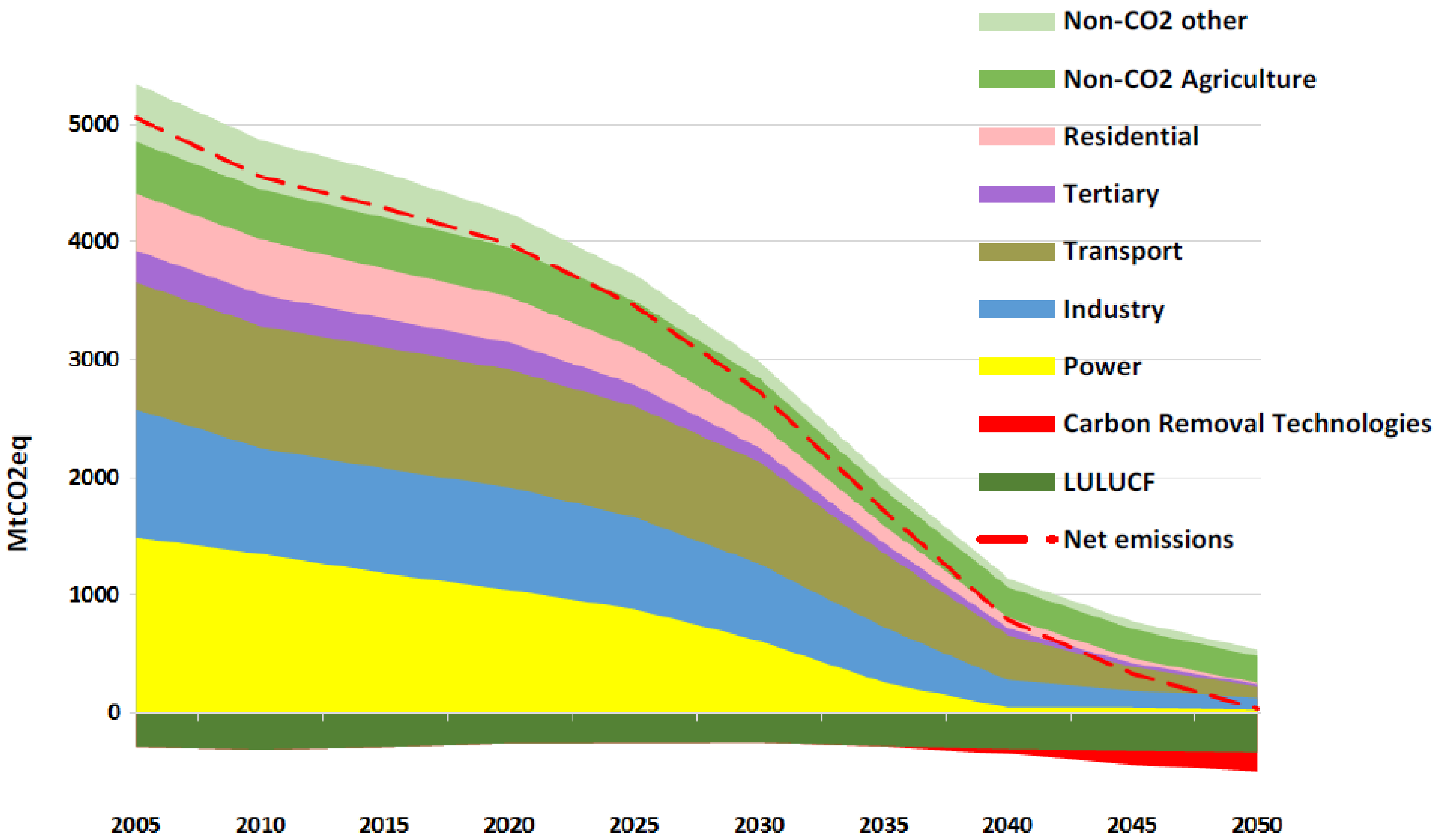
We considered three key questions…

- 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**?

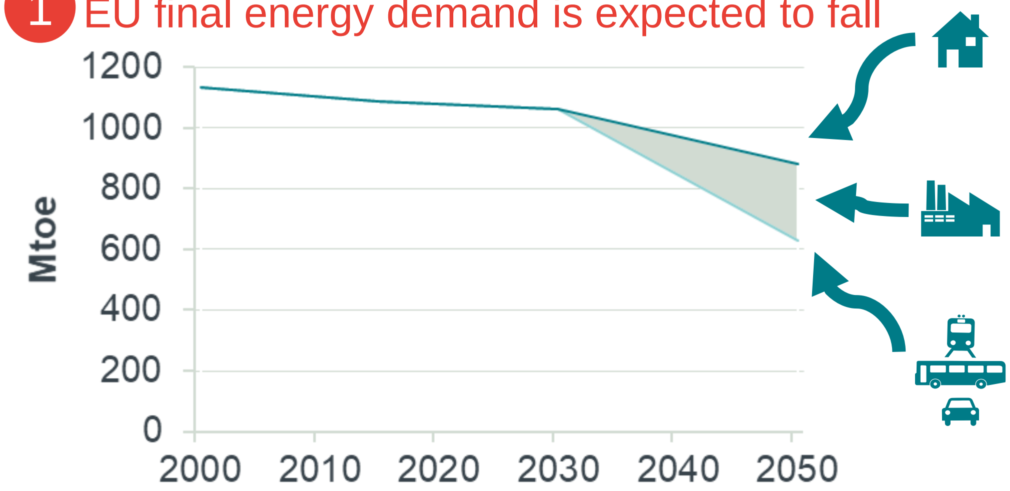
To achieve 2050 climate goals the EU must achieve deep decarbonisation, including in sectors currently reliant on natural gas



Source: EC (2018), A Clean Planet for all - A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy, COM(2018) 773 final Brussels, 28.11.2018,

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

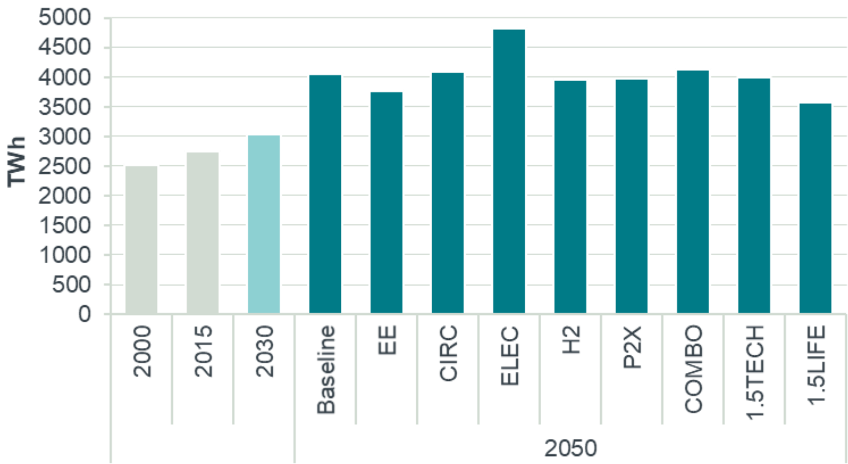


Source: Frontier Economics and CE Delft, based on EC (2018)

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

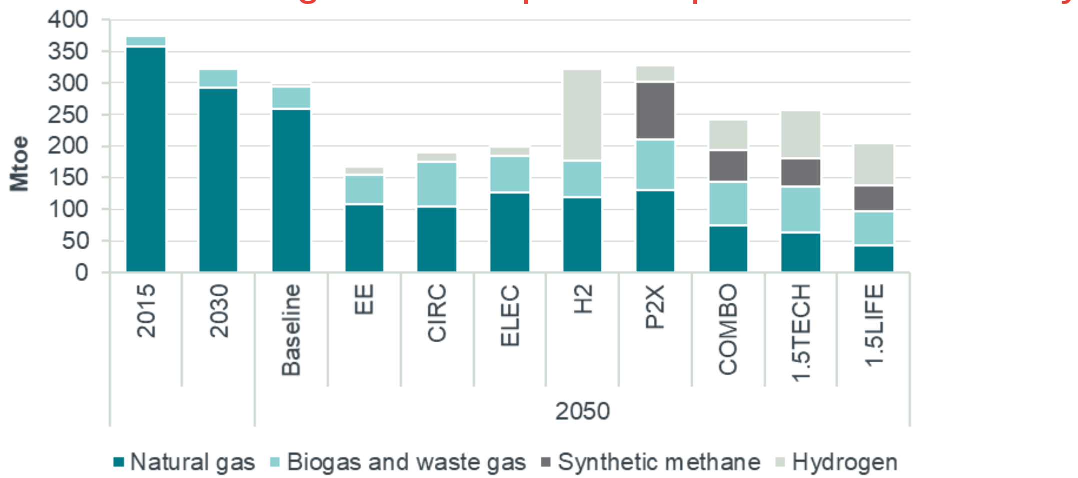
Source: Frontier, based on sources indicated. Projected 2050 RES-E share of electricity supply.

2 Electricity demand is expected to increase



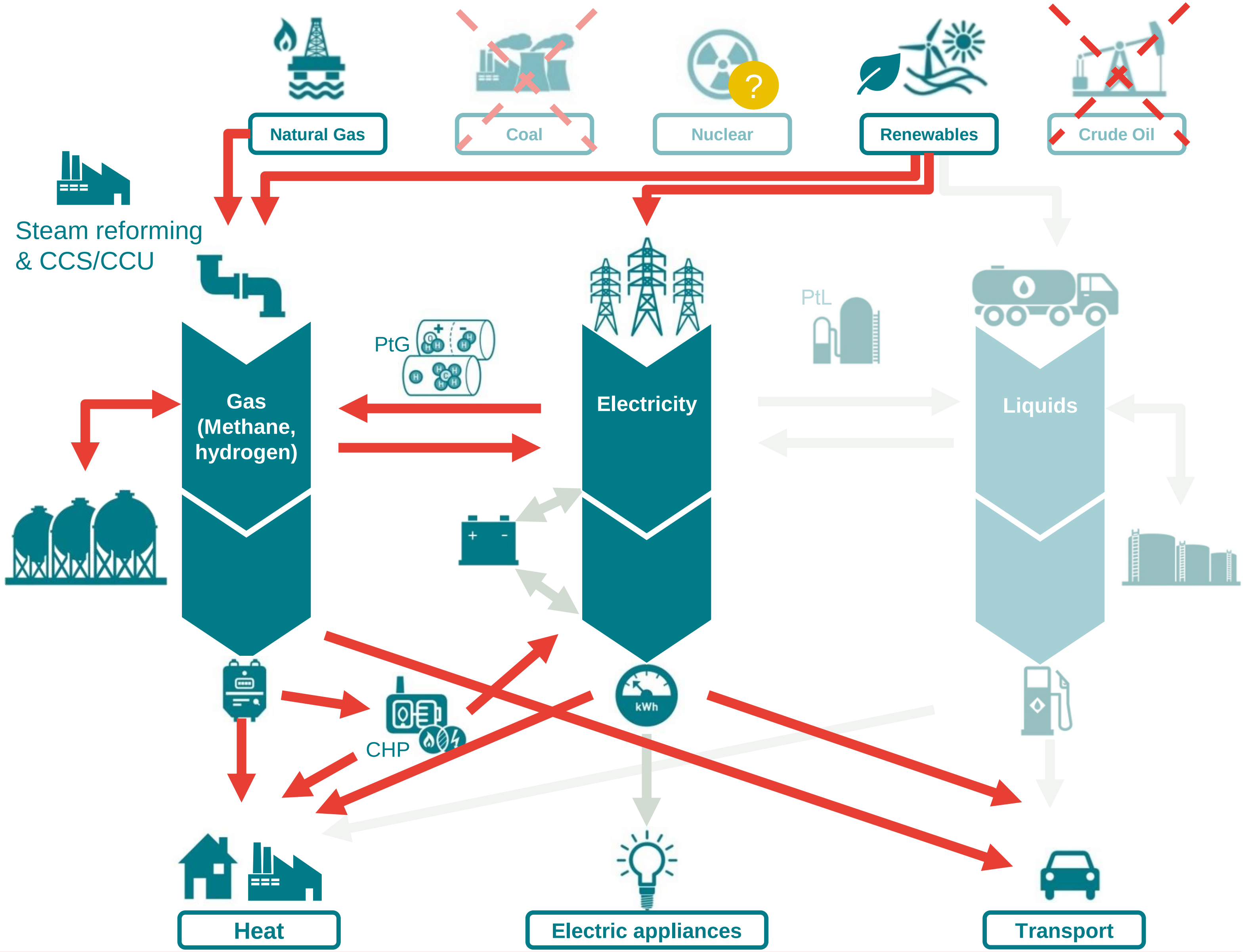
Source: Frontier Economics, based on EC (2018)

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



Source: Frontier Economics and CE Delft, based on EC (2018)

The gas system will need to be more integrated with other energy carriers than is currently the case

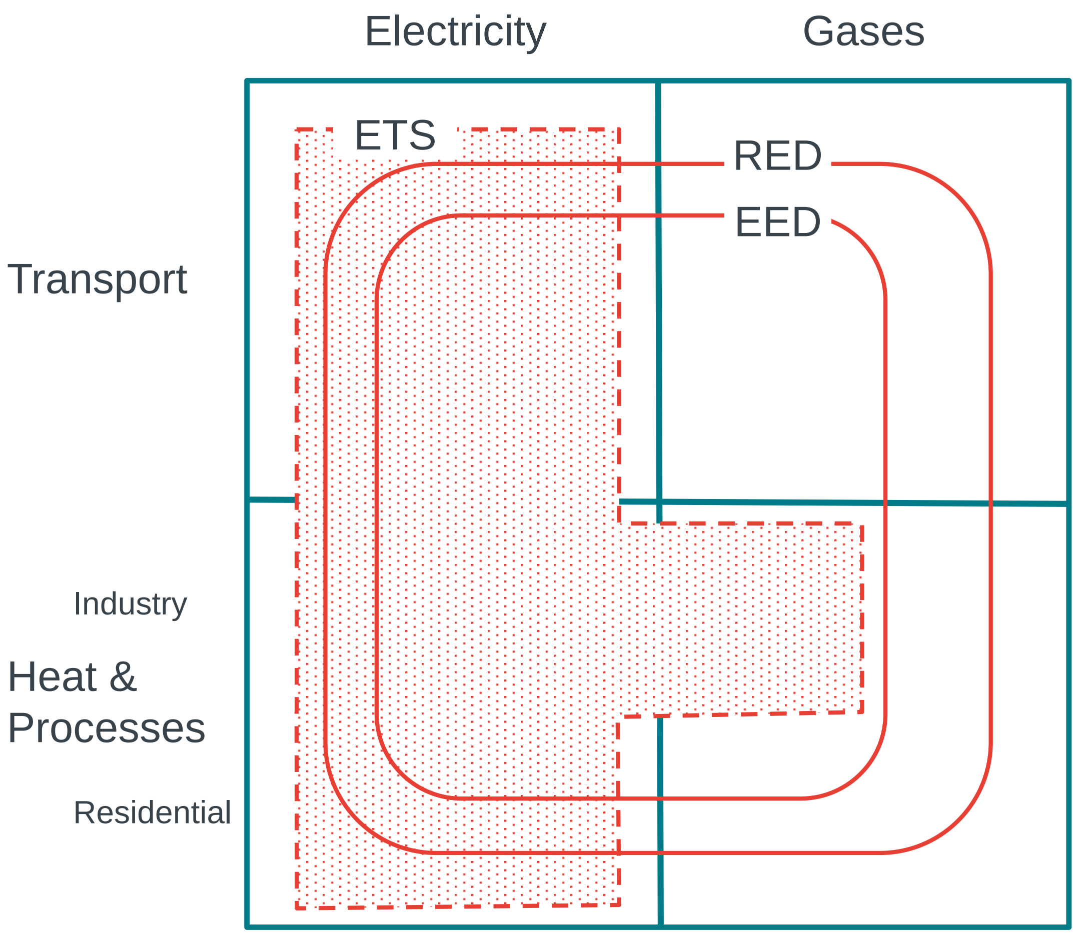


Coupling links between gas and electricity

Source: Frontier Economics

The current climate policy framework features gaps and overlaps, leading to inefficiencies….

Sectoral coverage of current climate policy arrangements



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**)

Distortive structure of tariffs and levies, for example

- To recover sunk costs of legacy investments
- To tax electricity used by PtG facilities

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

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

See also: Frontier Economics, CE Delft et al (2019), "Potentials of sector coupling for decarbonisation: Assessing regulatory barriers in linking the gas and electricity sectors in the EU : final report".

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

Price signals / market mechanisms

- Need to define GHG emission targets level / emissions price
- Possibility of setting gas-sector-related targets

Other interventions

Need to address other barriers, e.g.:

- Behavioural
- Co-ordination effects (e.g. H_2 switchover, gas quality)

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

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

		Carbon price	Hybrid carbon price & subsidy regime	Subsidy regime
		Price paid for emitting CO2 varying by gas CO2 content	Mix of carbon price and subsidy scheme for different types of gases	Subsidy paid to low carbon gas producers based on CO2 abated
Applied at production / import level	Producers or importers pay CO2 price or receive support payments	Design 1 **Emission trading or Minimum Carbon price/tax**	Design 5	Design 3 **Tenders for low carbon gas**
Applied at sale to final customer	Party selling to final customers pays CO2 price or has obligation to purchase low carbon	Design 2 **Minimum Carbon price/tax at retail level**	Design 6	Design 4 **Certificate scheme**

Current ETS

Combination of instruments in power sector today

Most RES-E schemes today

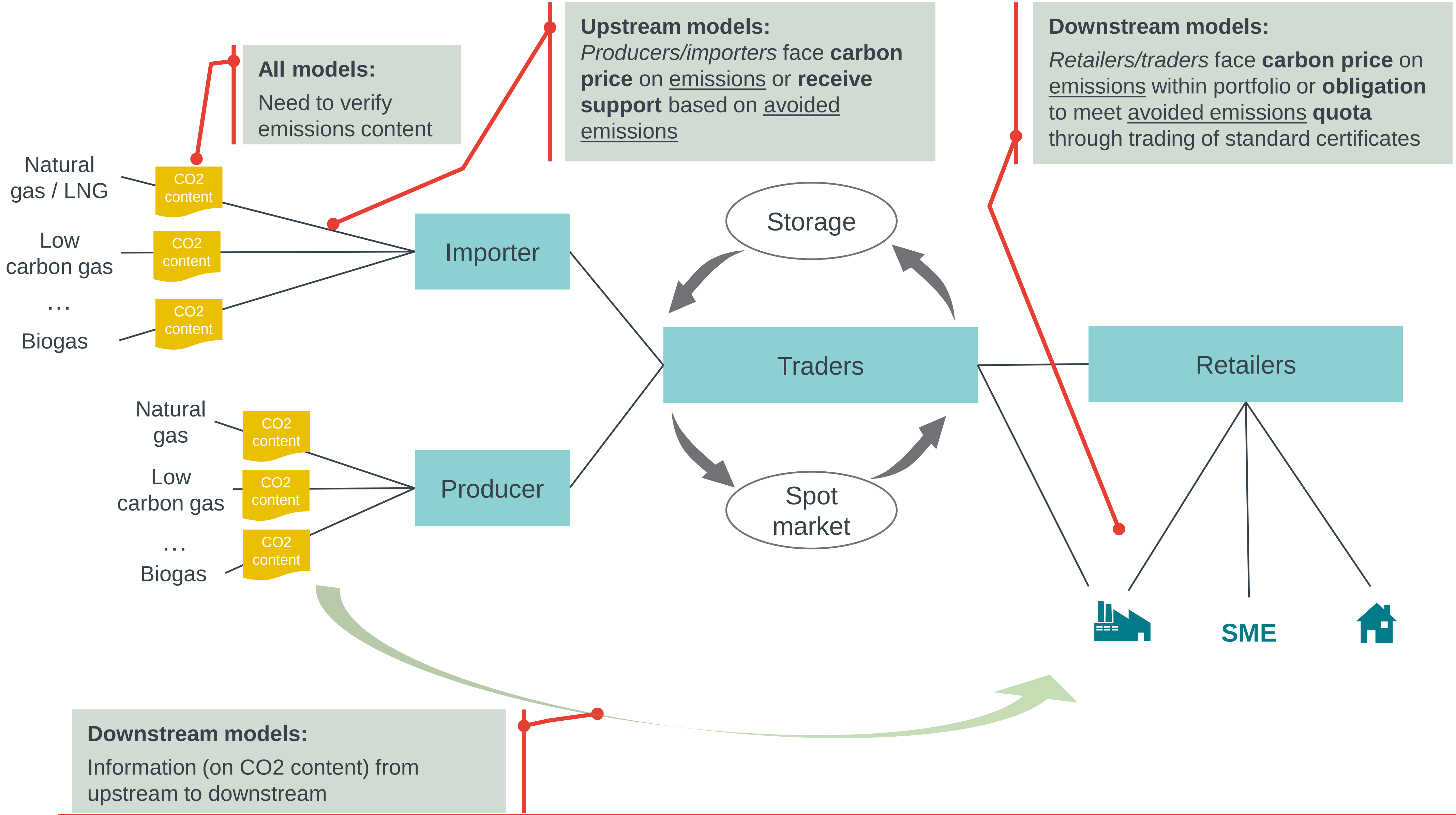
NO/SE joint scheme, previous RO scheme in UK

Interim period to 2030

Enduring regime to 2050

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

Carbon pricing and support mechanisms can both incentivise relevant investments



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

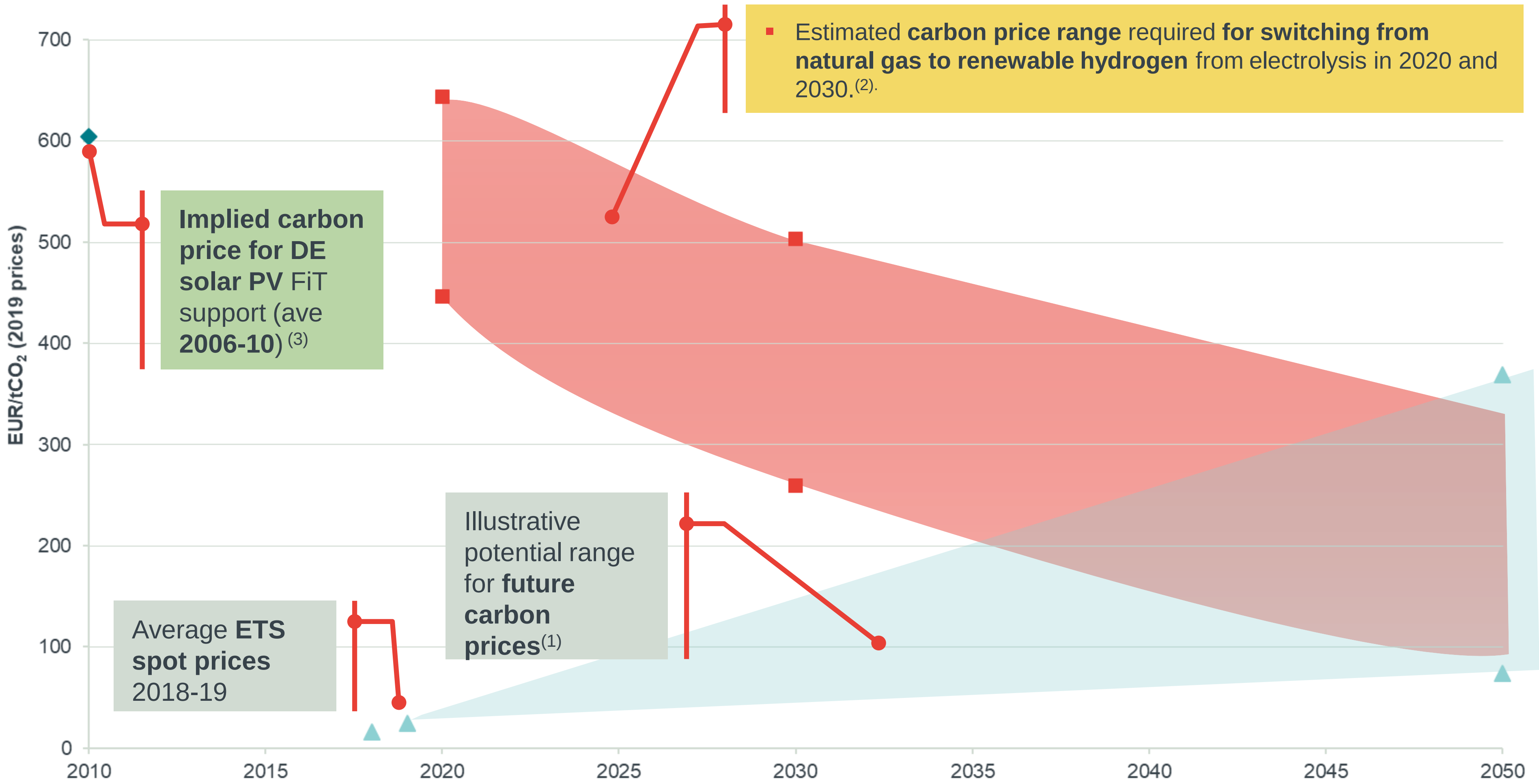
- Need to extend to non-renewable low-carbon energy
- Need for recognition of third country GoOs (especially important for gases)

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 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



Sources: Frontier Economics. (1) High and low 2050 carbon price based respectively on EC (2018) Long Term Strategy paper (net zero GHG emissions scenario) and low end of range of shadow carbon price recommended by High Level Commission on Carbon Prices. (2) Range based on "optimistic" and "pessimistic" scenarios from Agora/Frontier (2018)Breakeven price for clean hydrogen based on Agora/Frontier P2X calculator (Reference case assumptions for H2 produced from electrolysis with North African solar, including cost of export to Germany). Excludes cost of upgrades to gas infrastructure and appliances. Actual breakeven CO2 price will depend on cost of electricity, hydrogen production technology cost and counterfactual fuel (i.e. natural gas or conventional hydrogen). (3) Marcantonini and Ellerman (2014) "The Implicit Carbon Price of Renewable Energy Incentives in Germany", EUI working paper.

… 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

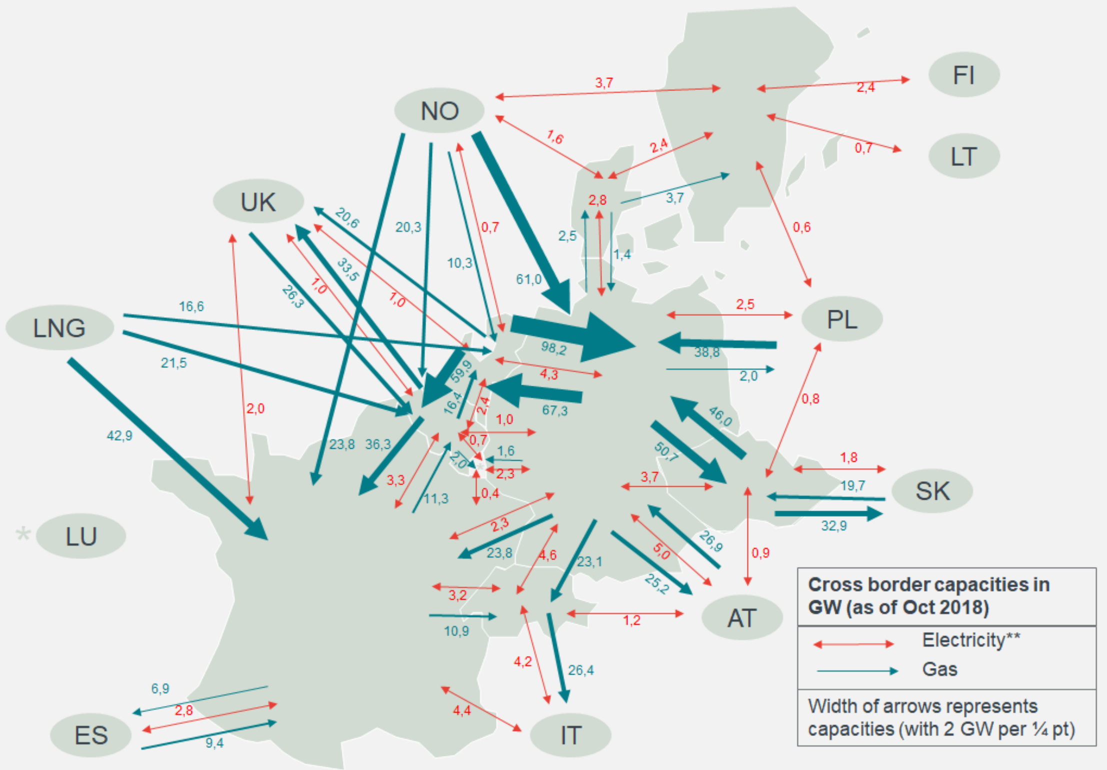
Support may be an appropriate **transitional mechanism** for encouraging the required **technological cost reduction** (with EU-wide carbon pricing the long-term goal)

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**

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



Source: Frontier Economics based on ENTSO-E and ENTSOG

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)

*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