GAS FOR CLIMATE

THE OPTIMAL ROLE FOR GAS
IN A NET ZERO EMISSIONS
EU ENERGY SYSTEM

MADRID FORUM
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• Gas for Climate: a consortium of seven European gas transport companies and two renewable gas industry associations.

• Navigant’s 2019 Gas for Climate study analyses the entire energy system:
  – Supply: biomethane, power-to-methane, green hydrogen (from additional wind and solar), blue hydrogen (from natural gas with CCS) and renewable electricity
  – Demand: buildings, industry, transport, power; range of decarbonisation options
  – Gas and electricity infrastructure

• In our analysis, we aim for lowest overall societal cost
NEW GAS FOR CLIMATE STUDY ANALYSES ALMOST THE FULL ENERGY SYSTEM

### Vision
Achieving a net zero emissions EU energy system by 2050 based predominantly on renewables

### Scenarios
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<th>Minimal gas scenario</th>
<th>Optimised gas scenario</th>
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#### Future energy categories
- **Variable renewable electricity**
- **Hydropower**
- **Biomass power**
- **Green hydrogen**
- **Power to methane**
- **Green hydrogen**
- **Blue Hydrogen**

#### Infrastructure

#### Demand sectors
- BUILDINGS
- TRANSPORT
- INDUSTRY
- POWER
Picture shows the process of producing renewable hydrogen which is used to produce fertilizer, which boosts crop production in a more climate-friendly way.
THE SUPPLY SIDE: BIOMETHANE AND HYDROGEN POTENTIAL

**BIOMETHANE** can supply up to 1,010 TWh (95 bcm) at strongly reduced costs of €47–57/MWh.

**HYDROGEN** can supply up to 1,710 TWh to the buildings, industry, transport and power sectors. Costs can come down to €52/MWh (based on dedicated renewable electricity).

- **Green hydrogen** has a large technical potential, linked to the potential of offshore wind and solar PV.

- **Blue hydrogen** produced from natural gas combined with CCS can be a scalable and cost-effective option to accelerate decarbonisation in coming years.

- Navigant envisions that on the longer term the future energy system will be **fully renewable**, with blue hydrogen being replaced by renewable green hydrogen.

Source: Navigant analysis
Renewable methane is used primarily in the buildings and power sectors and in the transport sector (as bio-LNG).

Hydrogen is used primarily in the transport, industry, and power sectors.

Source: Navigant analysis
FUTURE GAS IN EXISTING INFRASTRUCTURE CREATES VALUE

Renewable methane and hydrogen used optimally in the energy system can save society €217 billion annually compared to an energy system with a minimal amount of gas

- Gas used in existing gas infrastructure is indispensable to achieve cost-effective full decarbonisation. Not scaling up renewable and low carbon gas and decommissioning gas infrastructure will lead to unnecessary costs.
- Large cost reductions in green and blue hydrogen, biomethane and power to methane are possible, requiring dedicated efforts by companies and governments.
- Using existing gas infrastructure is vital to maximise public acceptance to the energy transition by avoiding unnecessary new overhead powerlines.

Gas infrastructure can continue to ensure the reliability and flexibility of the energy system, even when quantities of gas decrease. Current gas grids would almost completely continue to be used, to transport and distribute renewable methane and hydrogen.
GAS INFRASTRUCTURE NEEDED TO SCALE UP RENEWABLE GAS TO 272 BCM BY 2050

Medium and low pressure gas networks can serve to collect biomethane where it’s produced and distribute it to buildings and other sectors.

High pressure pipelines can serve to transport hydrogen, carrying offshore wind energy from the North, and solar energy from the South.

Source: ADEME

Source: Navigant, on map by ENTSOG
A smart combination of renewable gas and electricity, together with existing gas grids, will be the optimal way to decarbonise the EU energy system, with the system becoming fully renewable.

Total electricity and gas use in 2050 in optimised gas scenario

- **Renewable methane**: 1,170 TWh
- **Hydrogen**: 1,710 TWh
- **Electricity**: 4,460 TWh
- **Industry**: 700 TWh (iron & steel, ammonia, methanol)
- **Power**: 1,105 TWh
- **Transport**: 845 TWh (road, shipping, aviation)
- **Buildings**: 230 TWh

Total annual savings €217 billion in optimised gas scenario compared to minimal gas scenario

This quantity of renewable and low-carbon gas equals 272 bcm of natural gas equivalent (energy density).
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