

# Gas Decarbonisation Pathways 2020-2050

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# Who we are

Gas for Climate was initiated in 2017 to analyse and create awareness about the role of renewable and low carbon gas in the future energy system, aiming for **full compliance with the Paris Agreement target** to limit global temperature increase to well below 2°C.

To this end, the entire economy has to become (net) zero carbon by mid-century.

The Gas for Climate group consists of ten leading European gas transport companies and two biogas consortia:



# Gas decarbonisation pathways 2020-2050

This new Gas for Climate study develops gas decarbonisation **pathways** from 2020 to 2050, and identifies what **investments** and **actions** are needed across the energy system along the way.

The central pathway in this study achieves the 2050 Optimised Gas end state, as analysed in the Gas for Climate 2019 study.

The study analyses individual decarbonisation pathways for the **demand** side (buildings, industry, transport, power generation) that are matched with scale-up pathways for **biomethane** and **hydrogen**. The specific pathways are blended in three overall pathway scenarios that also include implications for gas **infrastructure**.

# Three pathway scenarios for 2020 to 2050

## Aim

Analyse gas decarbonisation pathways towards cost-effective climate neutrality by 2050

## Geography

## Pathway scenarios

### Current EU Trends Pathway



How can the renewable and low carbon gas pathway develop between today and 2030 in the context of current EU 2030 climate, energy and agricultural policies?

### Accelerated Decarbonisation Pathway



How does a plausible 2030 and 2050 pathway develop within the context of accelerated decarbonization efforts enabled by the **EU Green Deal**?

### Global Climate Action Pathway



How does a plausible 2030 and 2050 pathway develop if **globally** a similar effort as in the Green Deal will happen leading to technological and commercial **breakthroughs** in the eight sub-pathways?

## Energy Supply

Variable renewable electricity



Biomethane



Hydrogen



Infrastructure



## Energy demand

Buildings



Transport



Industry



Power



## 2020 Study Scope

The central and aspirational *Accelerated Decarbonisation Pathway* examines which **investments and innovations** have to take place to achieve a 2030 greenhouse gas reduction target of **minus 55%**, and climate neutrality by 2050.

# Accelerated production of biomethane

Accelerated Decarbonisation Pathway could generate 370 TWh or 35 bcm of biomethane per year by 2030 through:

- Converting **12 bcm** of biogas that is **already produced** today to grid-injected biomethane.
- Constructing 6,000 **new digesters** (average production 500 m<sup>3</sup>/h) that will feed into 3,000 larger centralised biogas upgrading units to produce **15 bcm** biomethane.
- Constructing 500 new **integrated biogas-biomethane** plants (2,000 m<sup>3</sup>/h biogas) to produce **5 bcm** of biomethane.
- Biomass feedstock for these new installations will partly come from sustainable cover crops. To enable this, more than 2,000 farmers and biogas producers would need to adopt 'Biogasdoneright'.
- Constructing 21 large 200 MW **gasification plants: 3 bcm** of biomethane.

Post-2030, a continuation of the policy and societal drivers will continue to accelerate biomethane deployment to 2050. In this scenario, it would be likely that the full EU biomethane potential of 1020 TWh (95 bcm natural gas equivalent) can be mobilised by mid-century

**1** → Enable the construction of thousands of biomethane plants

**2** → Develop a solid business case for hydrogen in the next decade

**3** → Make existing gas grids ready for renewable and low carbon gas

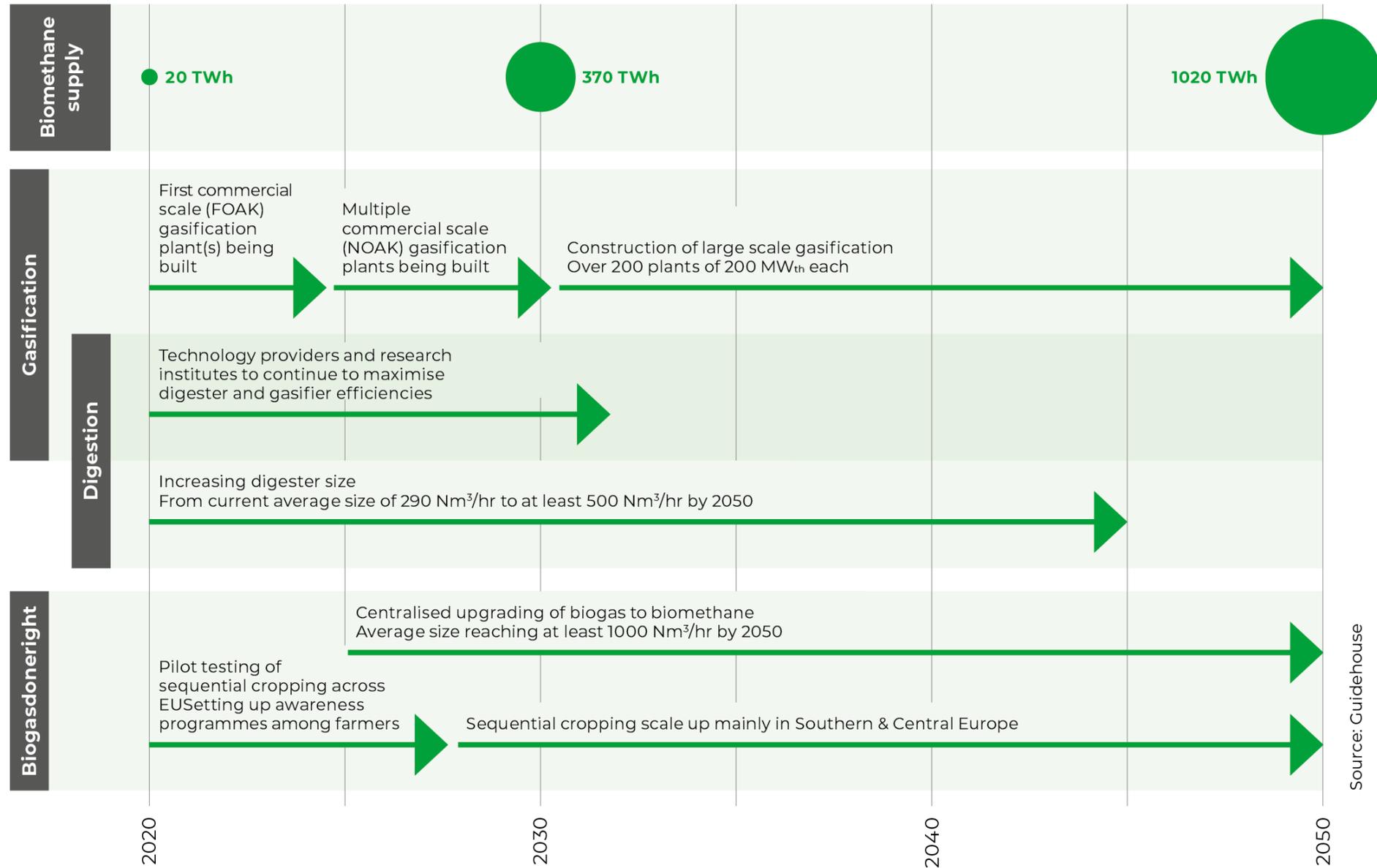
**4** → Achieve 100 million hybrid heat pumps in renovated older buildings

**5** → Ensure that EU industry opts for deep decarbonisation investments

**6** → Set the transition towards carbon neutral transport

**7** → Ensure continuous power supply with gas-fired power plants

# The critical timeline for Biomethane



Source: Guidehouse

# Accelerated decarbonisation of buildings: energy system integration at the demand side

## Deployment pathway for hybrid heating systems

Per home a modest electric heat pump is added to the existing gas-fired boiler, with a smart control to make the combination a hybrid heat pump



As the home gets better insulation, the heat pump takes up a higher share of the heating, and the ratio between gas and electricity shifts



As the share of biomethane in the gas distribution grid increases, the gas part is greened



As the share of renewables in the electricity distribution grid increases, the electricity part is greened

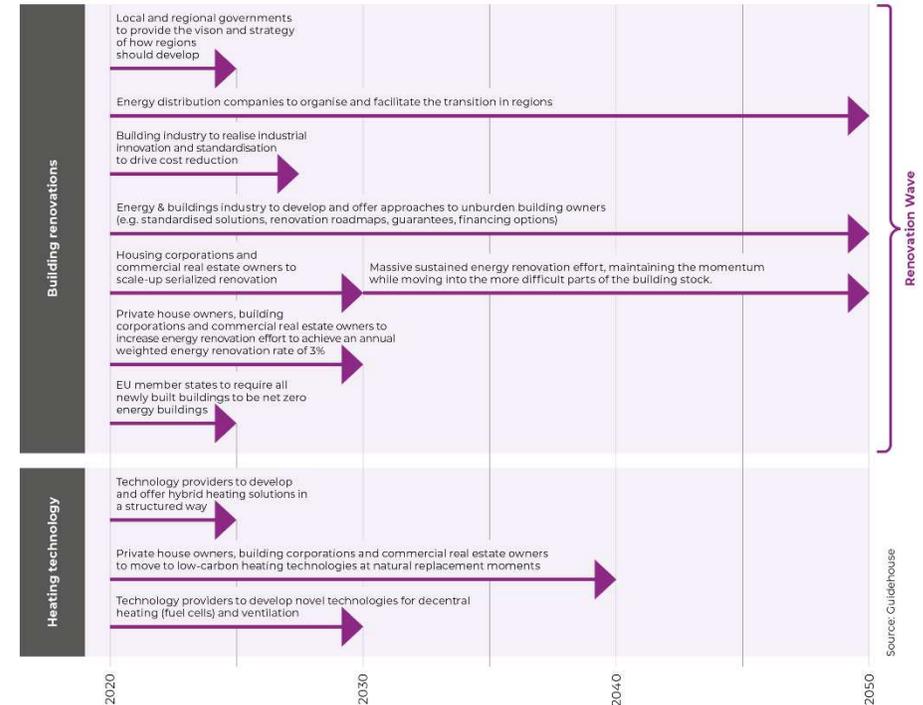
2050 optimised gas: Heat demand in buildings through district heating, all electric- and hybrid-heat pumps

## Heating of buildings in 2050 end state

Buildings with gas grid connections today will continue to receive gas, by 2050 this will be 37% of the EU building stock. In a hybrid heating solution these buildings are heated with a small-dimensioned electric heat pump plus with a small-dimensioned boiler during cold winter periods.



Source: Guidehouse



Source: Guidehouse

# Accelerated decarbonisation of buildings

- Accelerated Decarbonisation Pathway envisions an increase in energy renovation rates to **2.5%-3% per year**, at **deep renovation** levels, towards 2030.
- Gas demand for heating and hot domestic water is currently about 1,600 TWh (natural gas), will reduce to around 1,300 TWh in 2030
- By 2030, buildings would receive 5%-10% **biomethane** on average
- In addition to **district heating** and **all-electric heat pumps**, **hybrid heating solutions** are increasingly implemented
- By 2050, existing buildings with a gas connection today will continue to use gas by 2050 (37% of all buildings) through hybrid heat pumps, using 230 TWh of biomethane.

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# Accelerated Decarbonisation Pathway towards an optimal role for gas in a net-zero emissions energy system

## Policy recommendations

- 1 Adapt the EU regulatory framework to make gas infrastructure future proof in an integrated energy system. It will be a key asset for the sustainable and cost-efficient decarbonisation of the European economy.
- 2 Stimulate the production of biomethane and hydrogen by a binding mandate for 10% gas from renewable sources by 2030.
- 3 Foster cross-border trade of hydrogen and biomethane, by amongst others a well-functioning Guarantee of Origin system. Clarify market rules for green and blue hydrogen including for hydrogen transport.
- 4 Incentivise demand for hydrogen and biomethane by strengthening and broadening the EU Emissions Trading System (ETS) combined with targeted and time-bound Contracts for Difference.



# Recommendations for the European Green Deal

The *Accelerated Decarbonisation Pathway* accelerates emission reductions, create sustainable EU jobs, and brings first mover advantages for EU industry. To achieve this, the European Green Deal should include the following:

1. Adapt the EU **regulatory framework** to make **gas infrastructure future proof** in an integrated energy system. It will be a key asset for the sustainable and cost-efficient decarbonisation of the EU economy.
2. Stimulate the production of biomethane and green hydrogen by a binding mandate for **10% gas from renewable sources by 2030**. This is an 'EU domestic' measure without the geopolitical challenges related to strengthening the ETS combined with a carbon border adjustments. Extending the existing RED transport target to cover aviation and marine fuels has a similar advantage.
3. Foster **cross-border trade and transport of hydrogen and biomethane** and clarify market rules for green and blue hydrogen including for hydrogen transport. A well-functioning Guarantee of Origin system will be crucial in this.
4. Incentivise demand for hydrogen and biomethane by strengthening and broadening the EU Emissions Trading System (**ETS**) combined with targeted and time-bound **Contracts for Difference**.

# For more information

See our website [www.gasforclimate2050.eu](http://www.gasforclimate2050.eu)



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