The role of natural gas in the EU to 2050

James Watson, Secretary General

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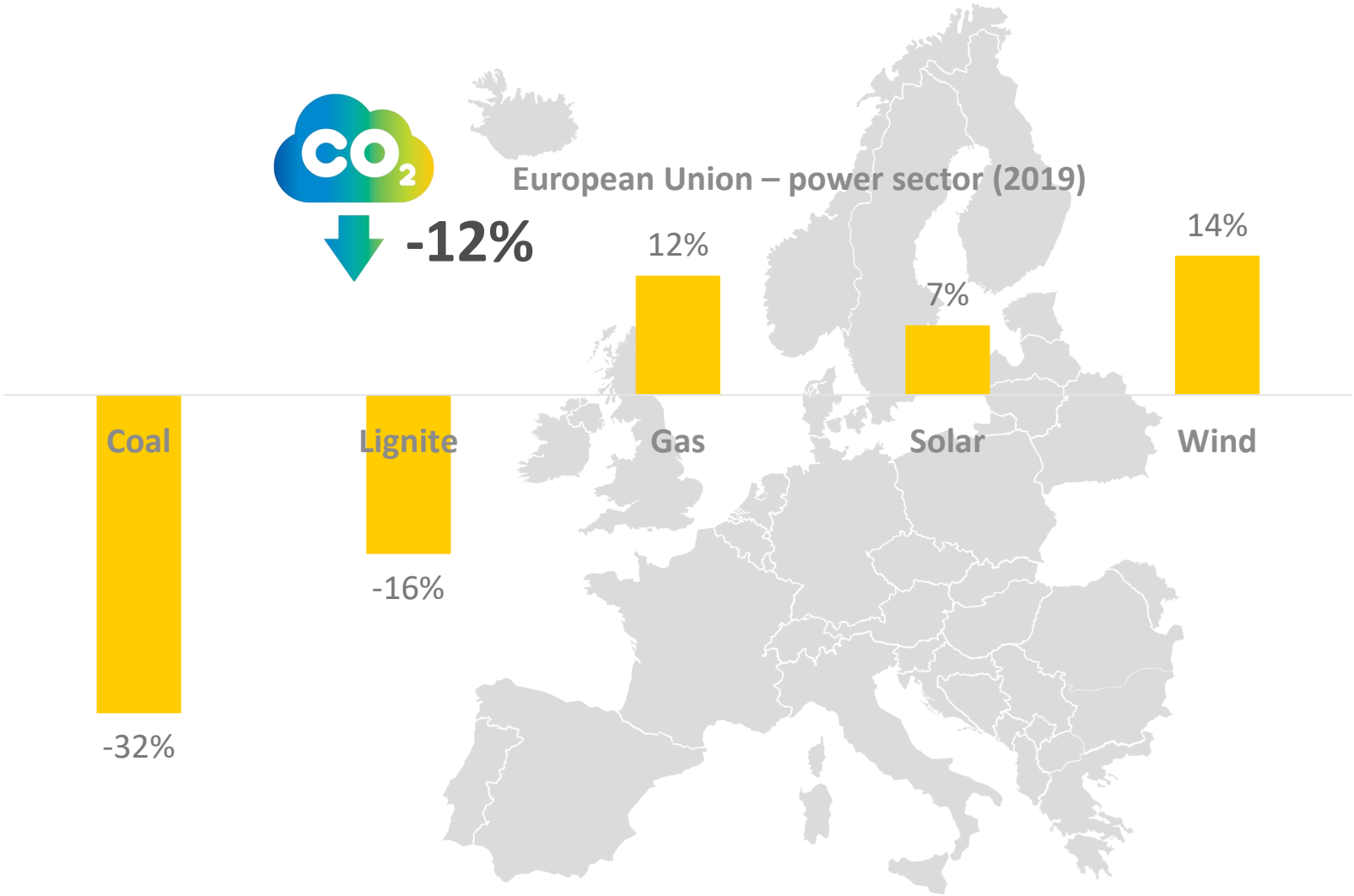
The situation now: Gas and res-e displace coal and drive down greenhouse gas emissions in power



Low gas prices drive fuel switching, along with carbon pricing.

Gas is an ideal alternative to coal, lignite and oil while cutting emissions.

Gas enables and supports deployment of intermittent renewables

Source: Agora Energiewende: The EU Power Sector in 2019 (Feb 2020)

Today the LNG market is also supporting decarbonisation

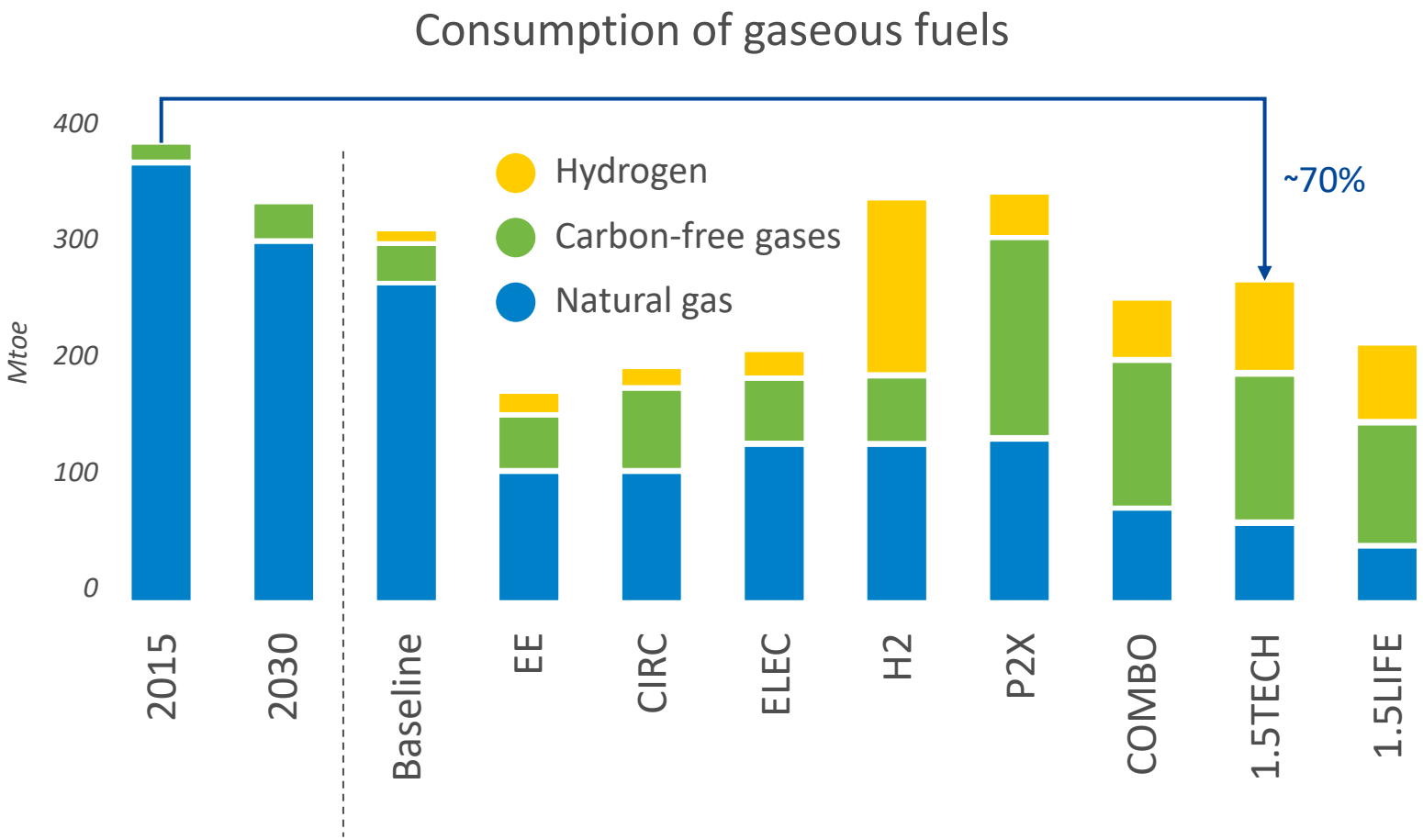
Global demand for LNG grew by 12.5% in 2019, underpinning LNG's growing role in the transition to a lower-carbon energy system.

Europe absorbed the majority of 2019 supply growth.

- new LNG liquefaction projects near completion – Krk in Croatia
- competitively-priced LNG furthered coal-to-gas switching in the power sector
- 2019 saw record FIDs with 71 mil tonnes of new capacity being sanctioned.

- **Record supply investment due to confidence in long-term LNG demand growth.**

European Commission Vision for Gas to 2050



European Commission Long-Term Strategy confirms role of gaseous fuels in the energy transition

There is a major development in hydrogen in Europe between 2030 and 2050

Source: European Commission Long-Term Strategy

Eurogas view of the future

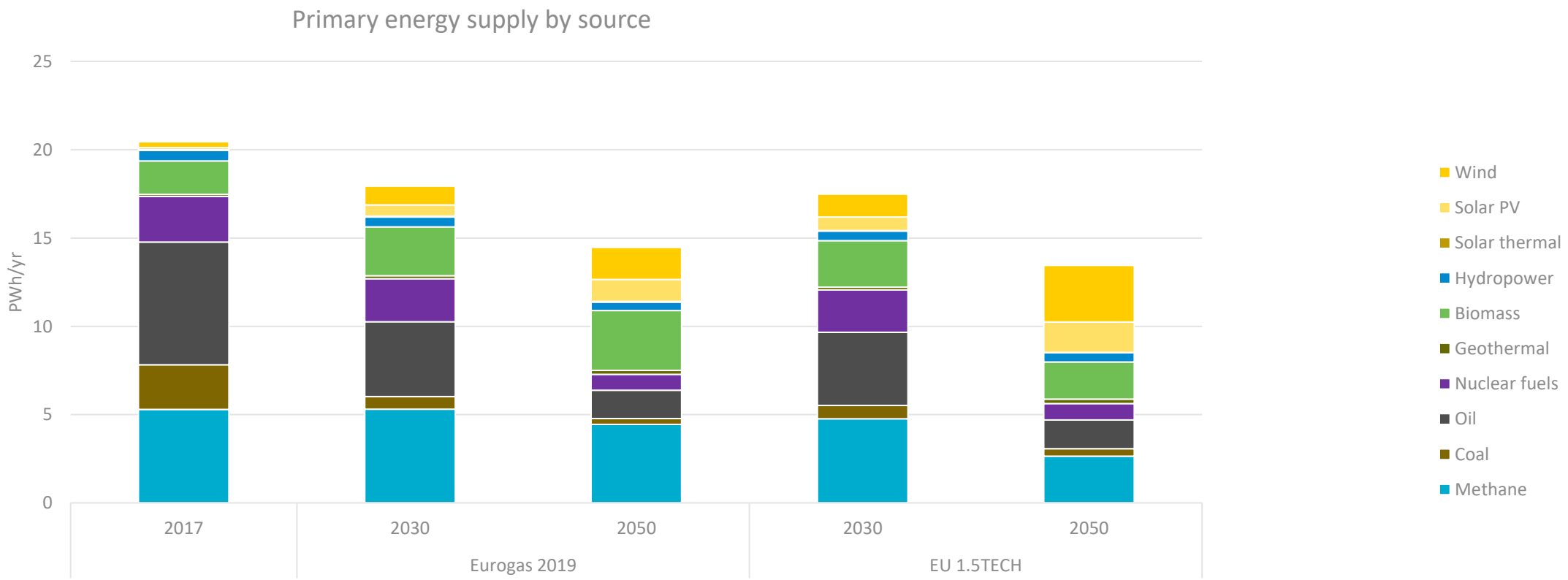
Eurogas has a pathway study to a carbon neutral future, comparing it to the European Commission's 1.5TECH

Commissioned DNV to carry out the study

To provide estimates of any cost savings associated with a transition utilising a multi-vector approach

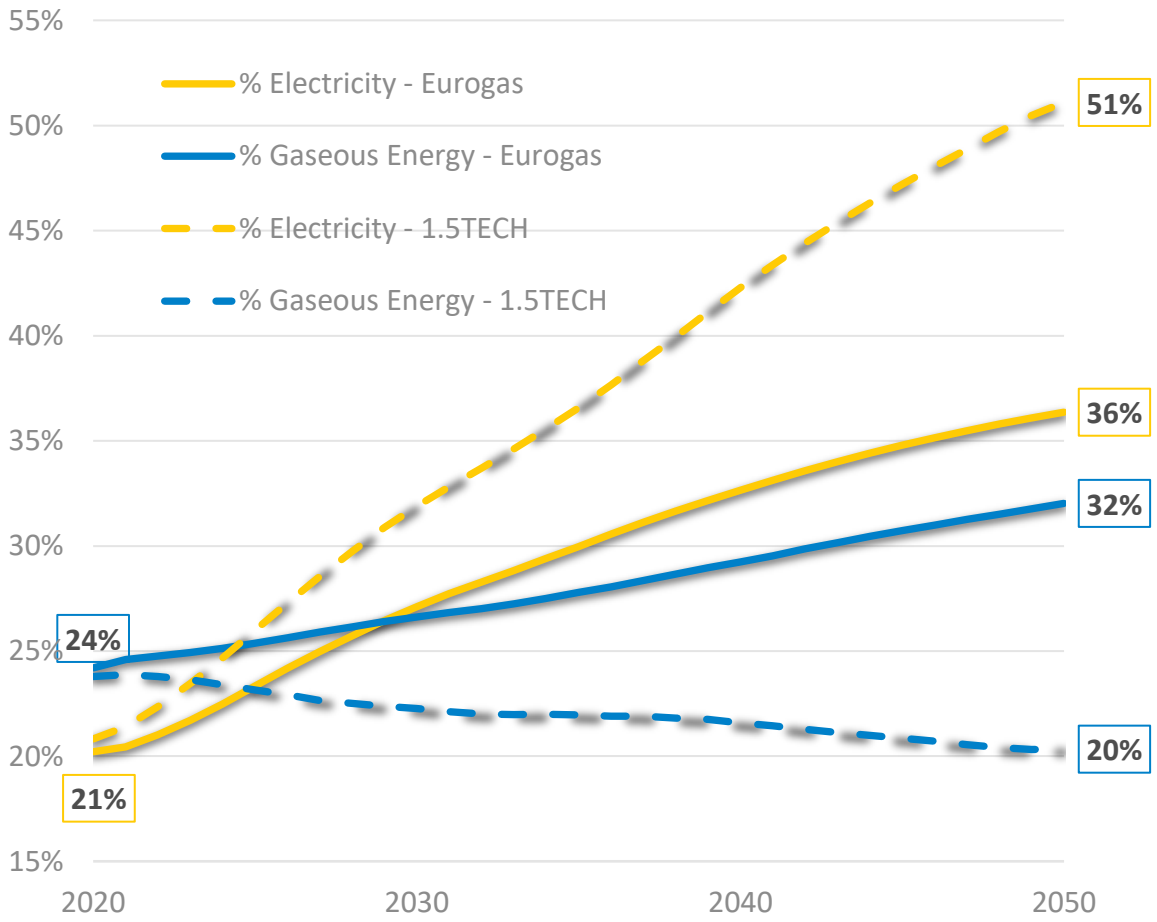
To outline at what point, and under which conditions, renewable and decarbonised gases will be available in Europe

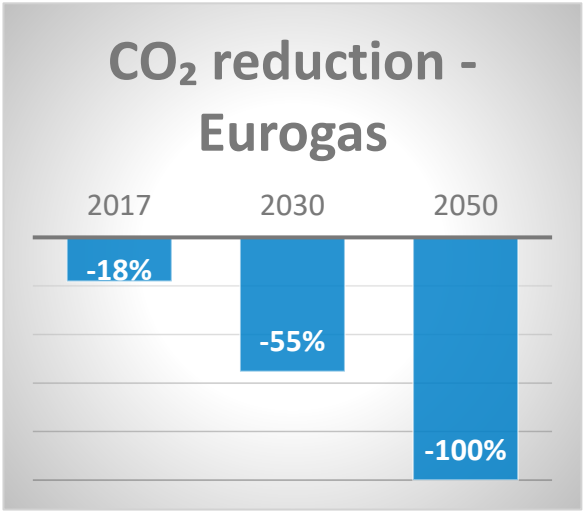
A Eurogas Vision for European Energy in 2050

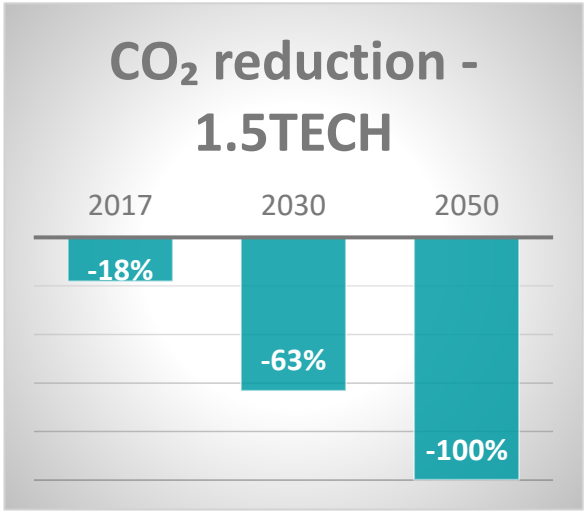


Eurogas Study compared to Commission 1.5 Tech 2018 LTS scenario

Share in final energy demand







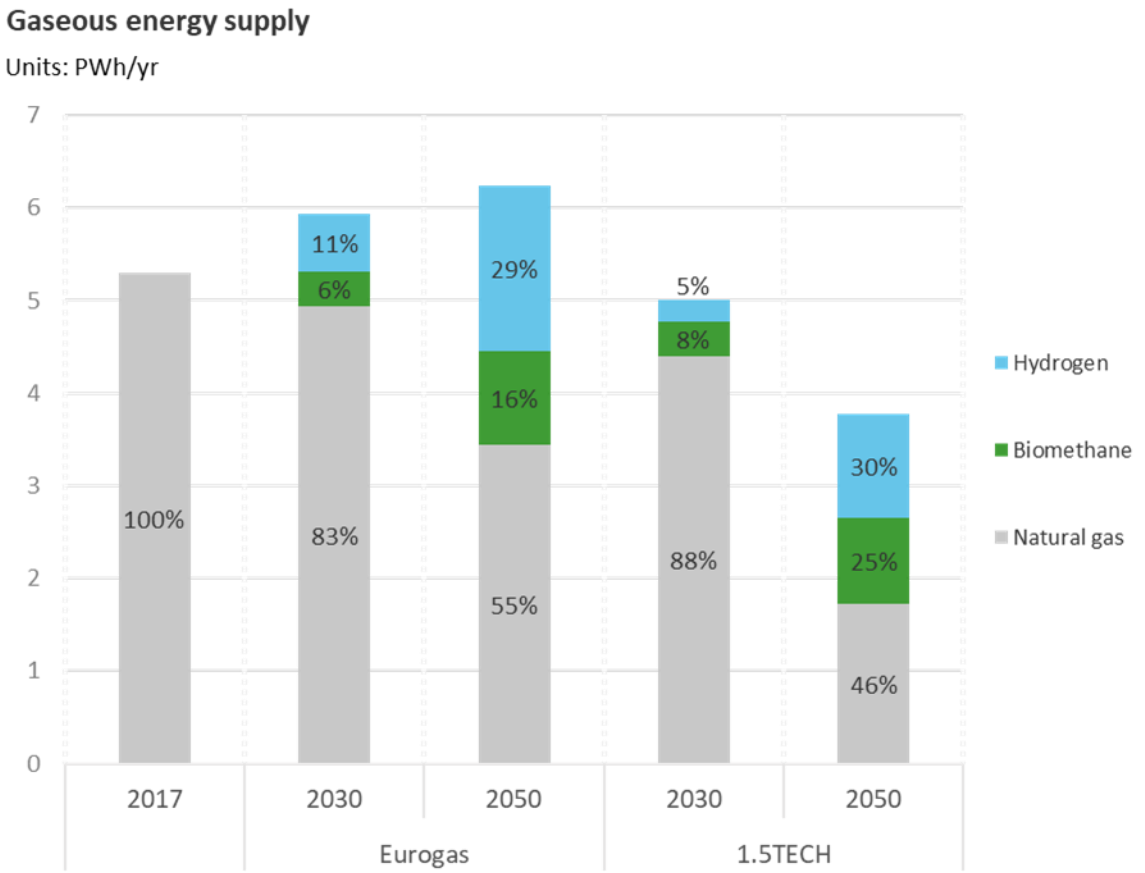
Eurogas scenario delivers decarbonisation at lower cost

130 billion per year ➔ 4.1 trillion by 2050

More efficient use of gas and electricity infrastructure

The European gaseous energy supply chain to 2050

Gaseous energy supply in the Eurogas scenario increases by 18% over 2017 levels (natural gas supply reduces by 35%) – Hydrogen accounts for 29%

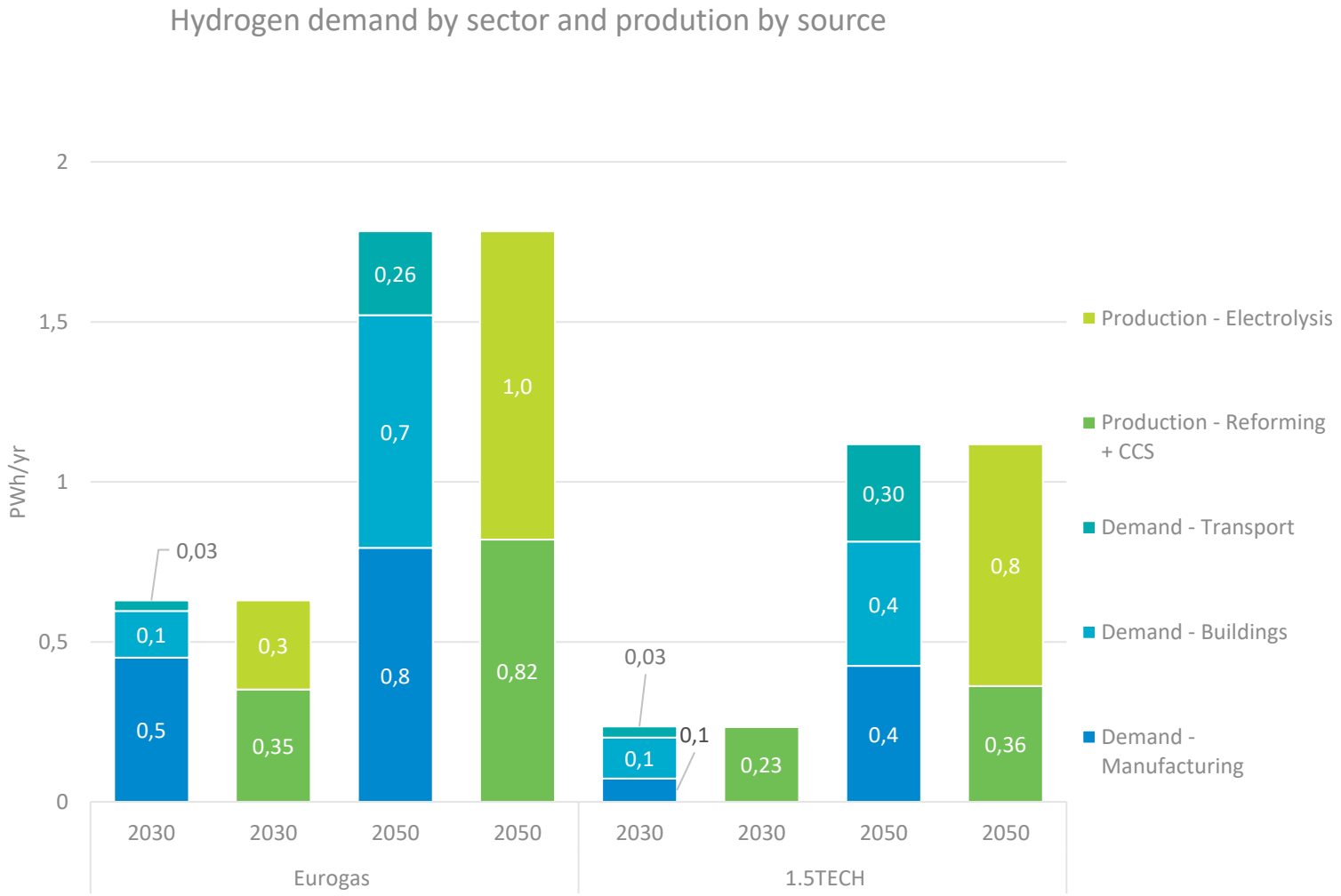


Eurogas Study: Hydrogen is a key fuel for decarbonising buildings, industry and transport

Eurogas scenario sees manufacturing lead hydrogen uptake until 2030

Both scenarios show an important role for hydrogen in the 2020s to build scale

The share of hydrogen from electrolysis overtakes hydrogen from reformed natural gas by 2050



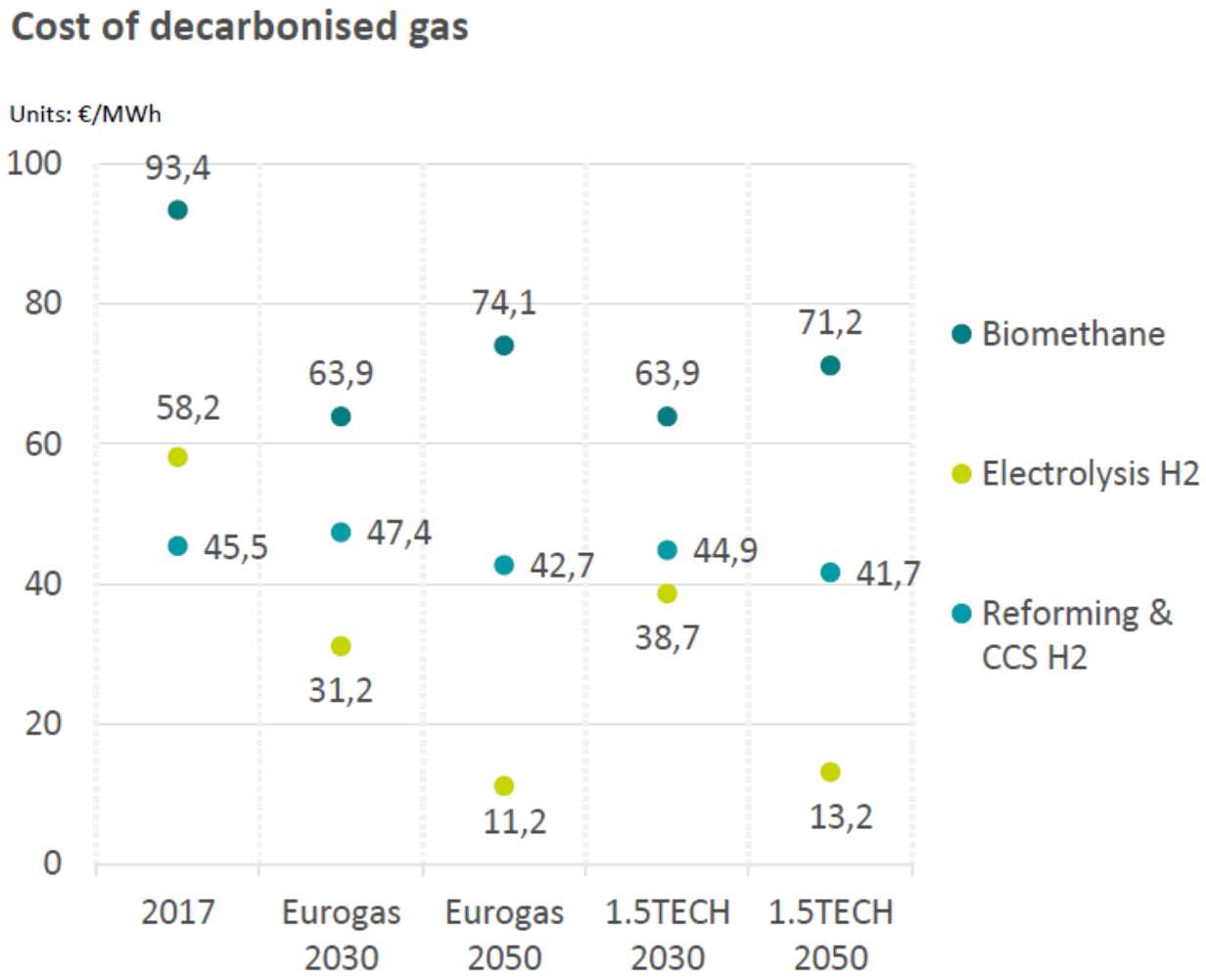
Technology cost development for Biomethane and Hydrogen

OPEX and CAPEX benefit from regional and global cost learning

Carbon price causes natural gas to become less competitive, but also pushes cost escalation in feedstock

Cost of electrolysis for hydrogen decreases faster in Eurogas scenario than in 1.5 TECH more cost learning due to higher installed capacity

Costs of reforming with CSS are relatively stable, as CCS is a minor part of total cost, while reforming is a mature technology with limited cost learning

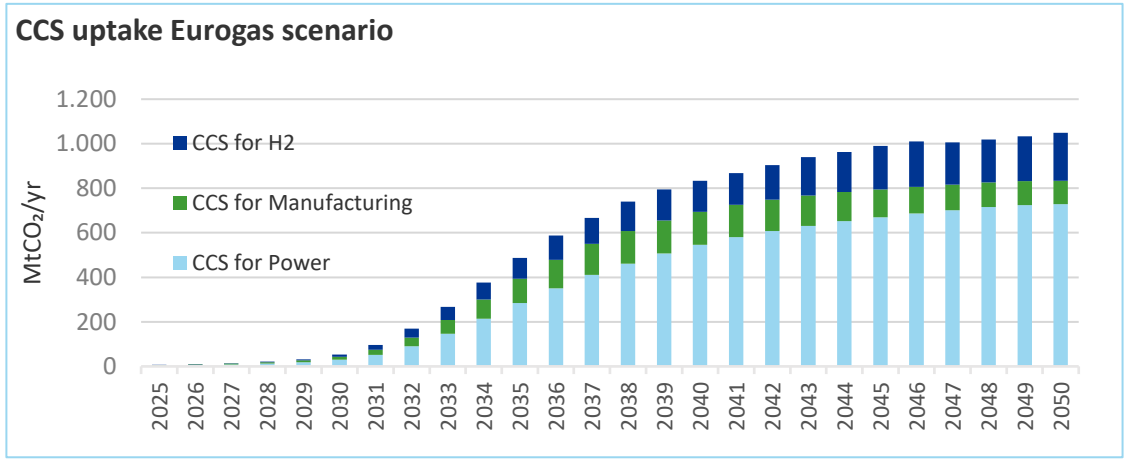


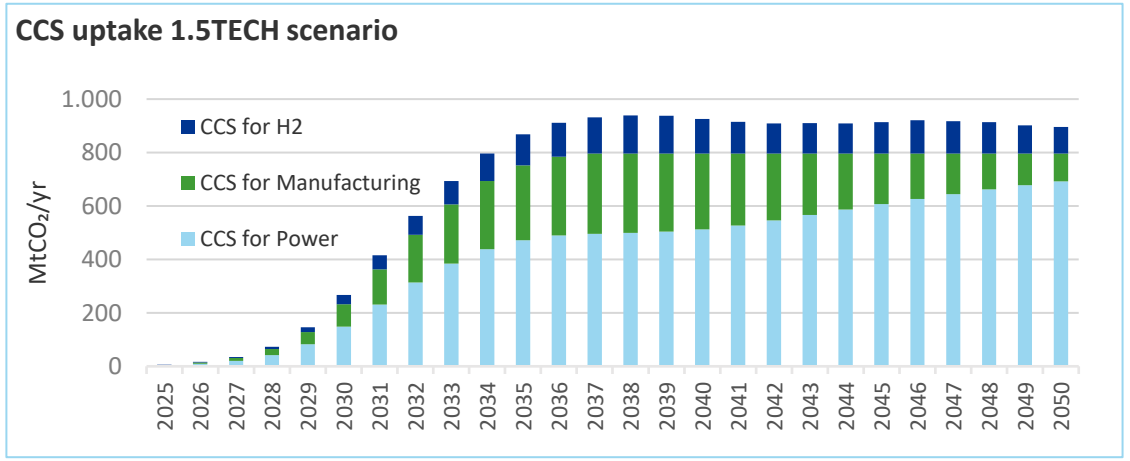
Whatever scenario we choose. CCS is not an option. It is a necessity.

Both scenarios rely on CCS, especially to decarbonize the power and manufacturing sector

Although the Eurogas scenario has a higher share of natural gas, it decarbonizes the energy system with 15% lower cumulative CCS deployment towards 2050 than 1.5TECH

Under conservative assumptions and restrictive policies, both scenario's use 11-13% of available storage capacity, and have between 114-130 years of storage left in 2050





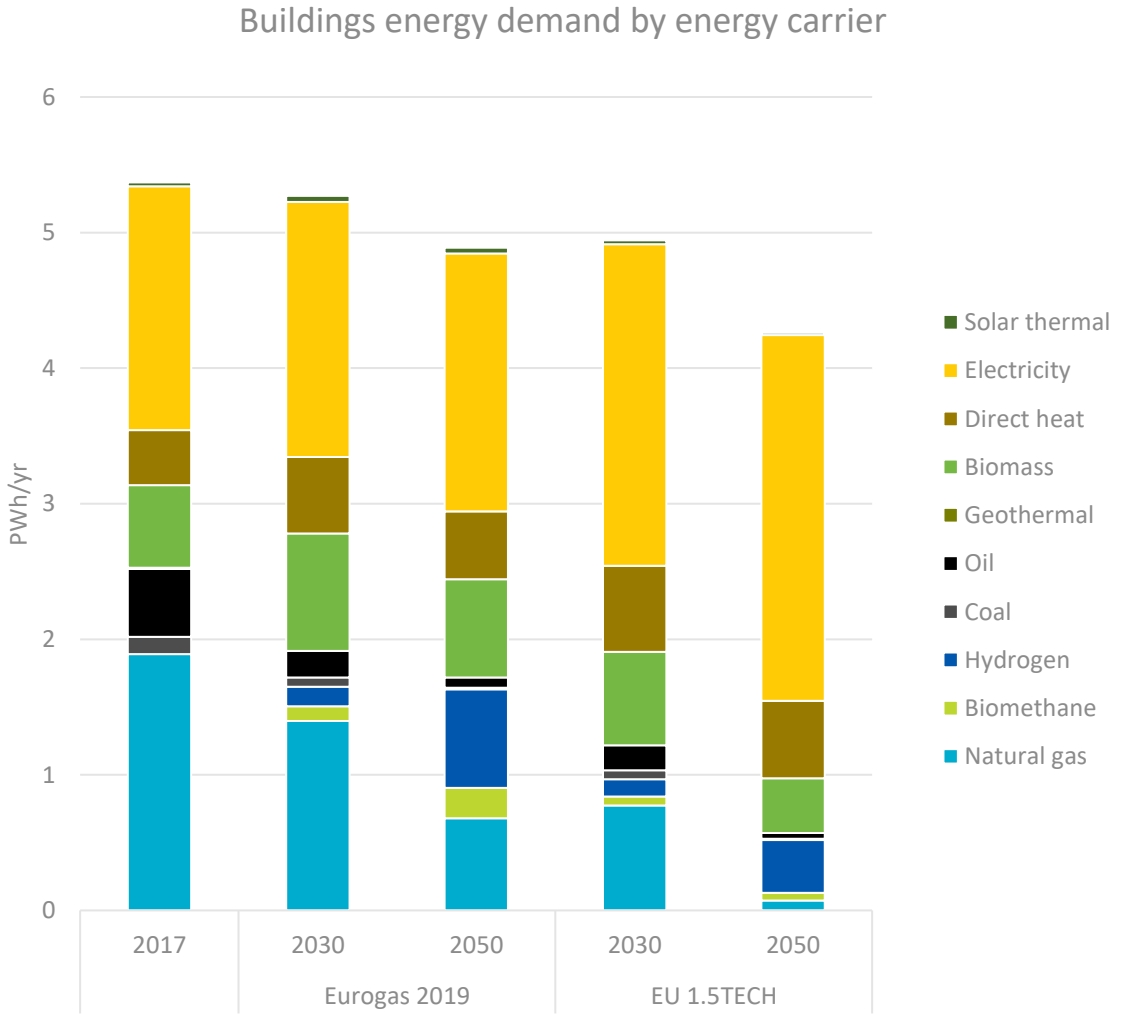
Gas is still needed in the building sector

Gaseous energy, delivers a more cost-effective pathway

True: Electrification of heating can reduce energy demand compared to gaseous solutions

Also true: **over €10 trillion in subsidies needed to transform Europe's buildings stock** and replace appliances in 1,5 TECH

Social acceptance is a barrier that should not be underestimated – gaseous solutions are easy to implement and affordable for households across Europe

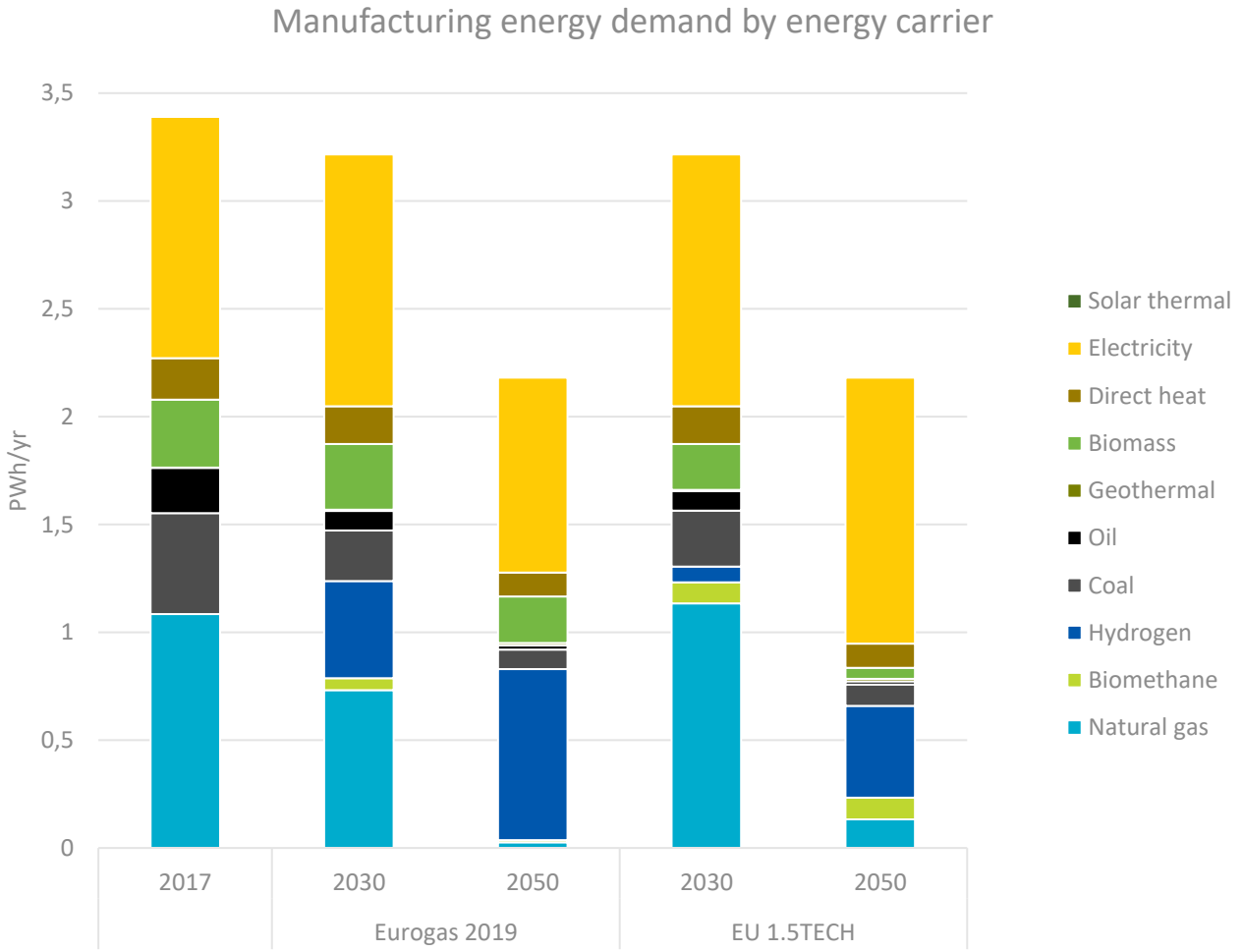


Manufacturing leads the uptake of hydrogen until 2030 according to Eurogas

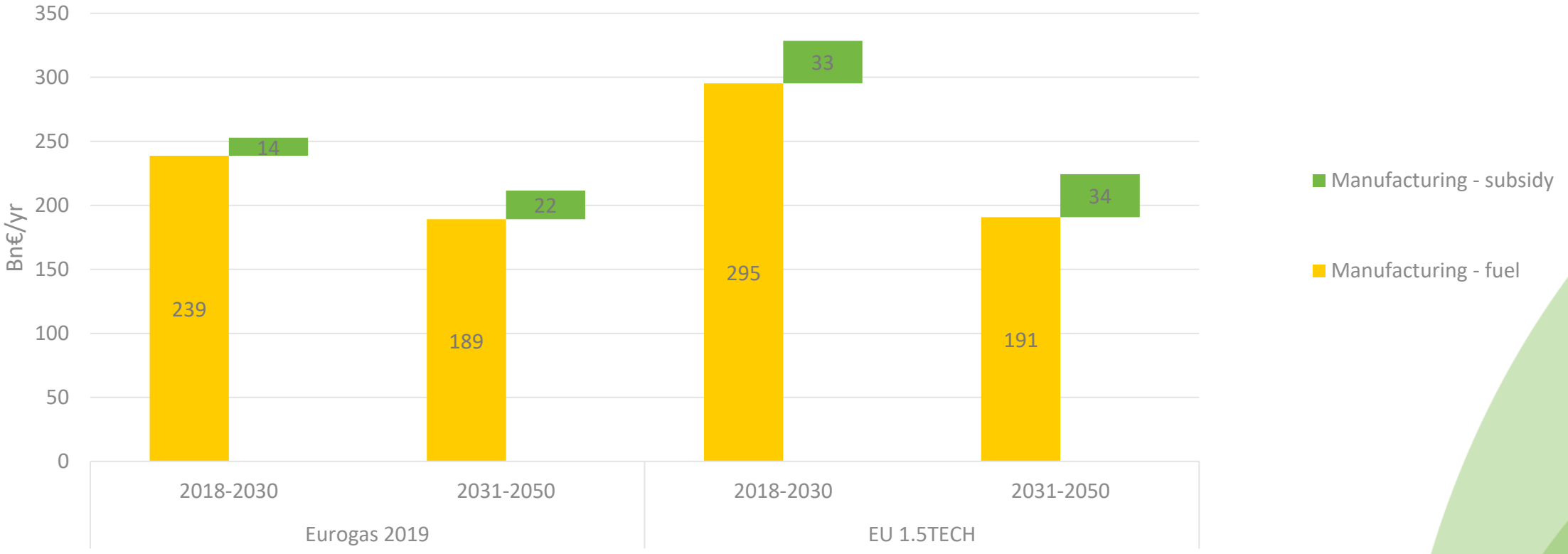
Manufacturing sector is the main driver for initial large-scale hydrogen demand

These volumes lead manufacturing to trigger the necessary infrastructure investments

Using hydrogen in manufacturing requires less subsidies and has lower energy costs than the strong electrification seen in 1.5TECH



More affordable to decarbonise manufacturing sector with hydrogen than electricity – save EU competitiveness



Hydrogen will be supplied blended and unblended

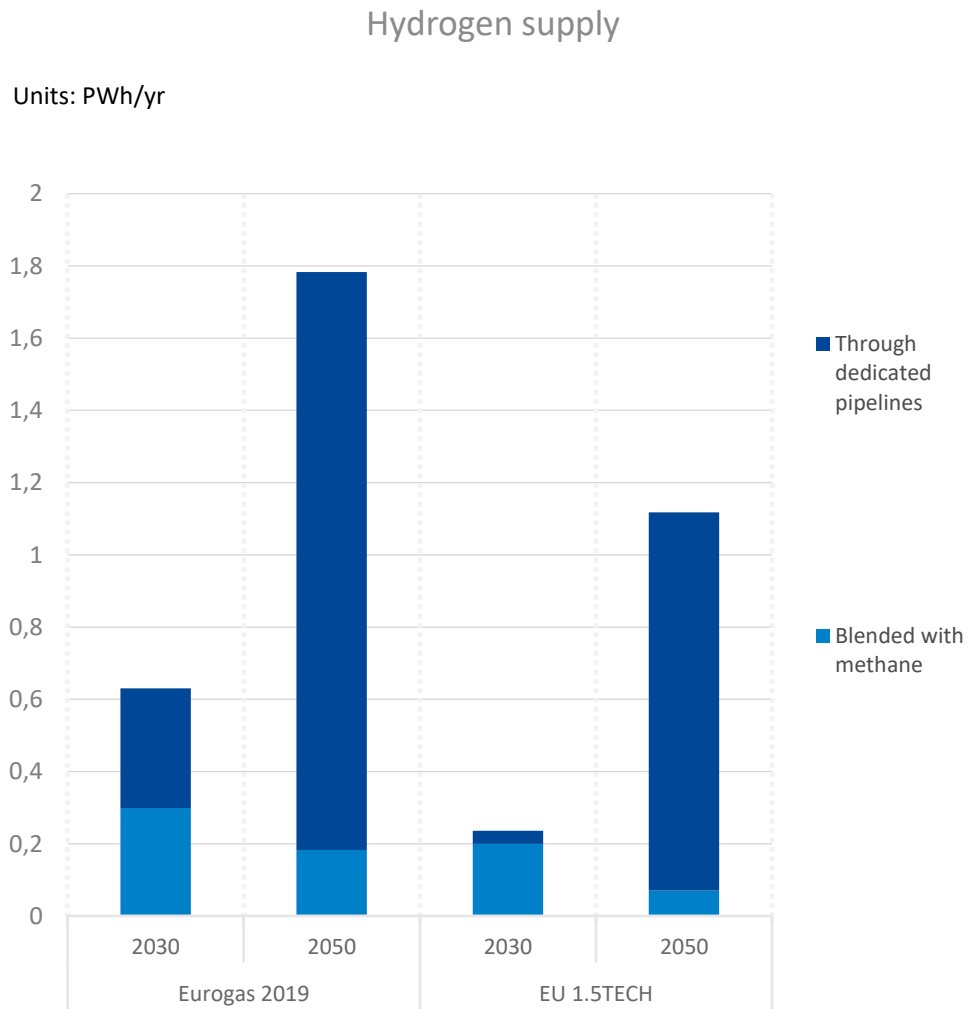
Pure hydrogen networks develop in specific demand sectors (e.g. manufacturing) already in the 2020s and become the norm by 2050

Initially blending will also play an important role to start scaling the hydrogen market without delay and optimise the use of existing infrastructure – mainly in distribution grid

In the Eurogas scenario, half of the hydrogen supply is delivered through blending in 2030

As there are technical limits that making continuously increased blending levels uneconomical, the share of dedicated infrastructure jumps to 90% by 2050

CAPEX in gas infrastructure to 2050 mainly required for decarbonised hydrogen supply



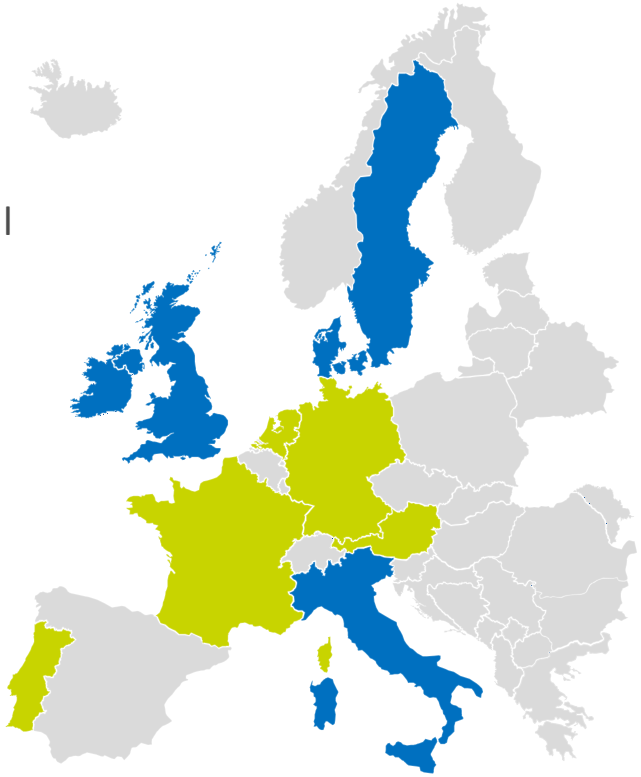
Several countries already leading the way in promoting renewable and decarbonised gas

Industry led initiatives

Denmark: 12% of gas consumption renewable in early 2020 - 100% by 2035

Ireland: 20% of gas consumption to be renewable in 2030, potential for 100% in 2050 (50 TWh)

Sweden: 15 TWh of biogas by 2030



Government led initiatives

France: 10% of all gas in the grid to be renewable by 2030 and 100%+ potential by 2050 (400+ TWh) and 6.5GW electrolyser by 2030

Austria: 5 TWh by 2030 of renewable gas injected, equivalent to 6% of its natural gas consumption in 2018

Germany: 5 GW electrolyser capacity and 20% of all H_2 production to be renewable by 2030

Portugal: plans 2,5GW electrolyser by 2030

Poland: plans 2GW of electrolysers by 2030

Netherlands: plan 4 GW of electrolyser by 2030

Spain: plan 4 GW of electrolyser by 2030

United Kingdom: hydrogen to be used for heating by 2030

Italy: 10 bcm in 2030 = 13% of 2017 gas demand. Plus 5 GW electrolyser by 2030