



CAN HYDROGEN SAVE THE GAS INDUSTRY?

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FLAME Conference
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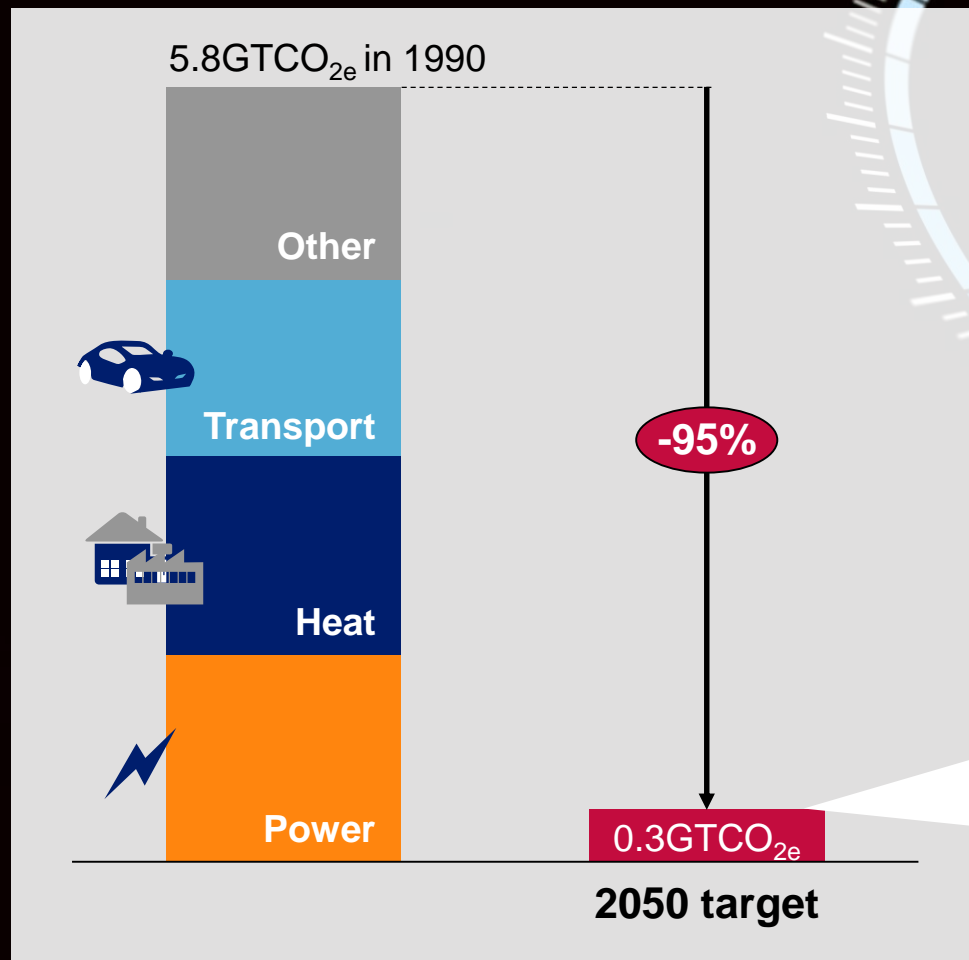
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The scale of the decarbonisation challenge is unprecedented



"Did you know?"

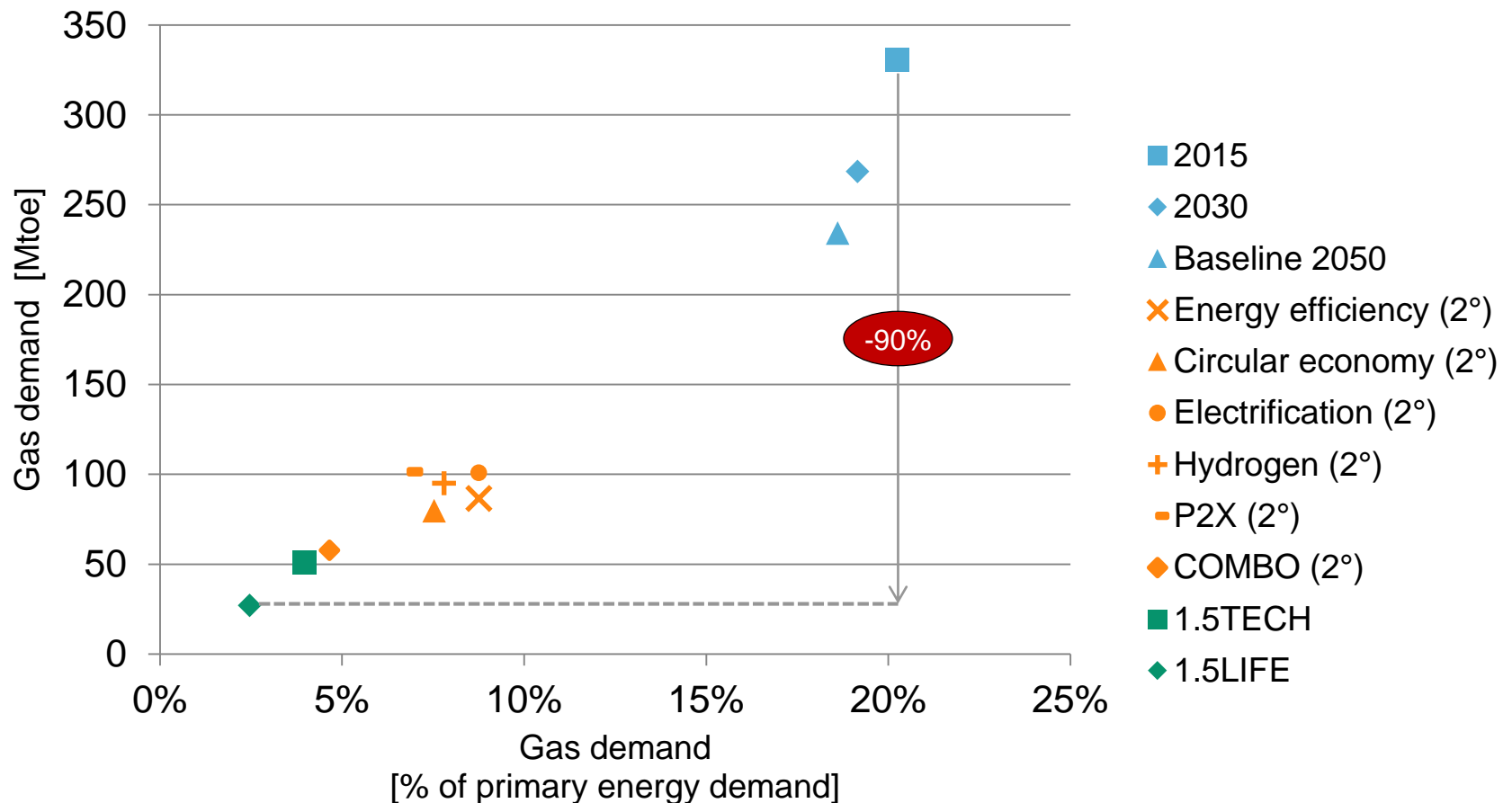
- 2014 emissions from **natural gas** exceeds the 2050 target by **250%**
- 2014 emissions in **heat and process output** from industry exceeds 2050 by **320%**
- 2014 emissions from **coal** usage exceeds the 2050 target by **375%**

A close-up photograph of a gas burner. A black, circular burner cap is centered in the frame. Below it, a bright blue flame is visible, consisting of many small, pointed tongues of fire radiating outwards. The background is dark, making the blue flame stand out.

**What could
this mean
for gas
demand?**

EU vision – ‘A Clean Planet for All’

All scenarios presented by the European Commission envision a significant contraction of gas demand by 2050 relative to the business as usual baseline



Source: European Commission, 'A Clean Planet for All' Impact Assessment – COM(2018) 773
Figure 18, Page 69.

A future that relies on almost full electrification may entail significant delivery and economic risks



Whilst an all-electric future may be attractive there are **significant issues**



Generation will have to increase significantly and be very low or zero carbon



Enormous investment requirements in networks and SMART systems



Policies towards nuclear power likely to need to be reconsidered



Technological advances required in batteries and other flexibility technologies. Seasonal flexibility is an issue

A future with **low or zero carbon gas** could be more achievable and may be delivered at lower cost than an all-electric future

Decarbonising Europe's energy system - Pöyry's ground-breaking 2018 study examines pathways to 2050



Key features of the study

- Two pathways to decarbonisation
 - Zero Carbon Gas
 - All-electric
- Major modelling development project
- Examined 3 main sectors of power, heat and transport
- Scope included EU28 + Norway + Switzerland
- Multi-clients with a mix of oil and gas, infrastructure companies, TSOs and government departments
- Modelling suite is forming the basis of a number of projects to explore bespoke pathways, including hydrogen strategy and advocacy projects

<https://www.Pöyry.com/news/articles/fully-decarbonising-europes-energy-system-2050>

Hydrogen can play a significant role in a decarbonised future

Why hydrogen can be one of the key levers for decarbonization?



Industrial and residential heat can be decarbonised



Carbon free storage to improve integration of RES and provide flexibility



Transportable by shipping / piping / truck



Reliable alternative where direct electrification is not feasible esp. in some transport sectors



Feedstock to help decarbonize carbon intensive industries

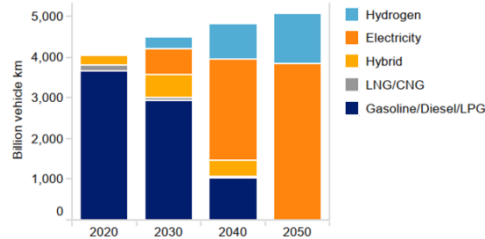


Allows existing gas infrastructure to be utilised

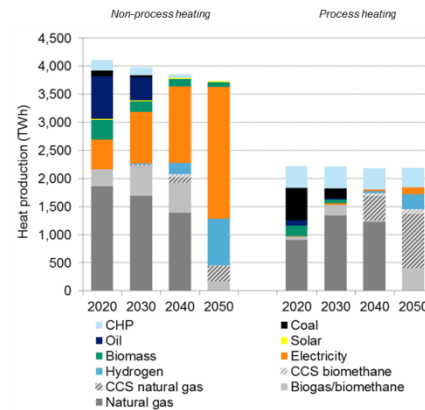
Hydrogen could **contribute to decarbonizing the energy sector** as well as some industry sectors

Zero Carbon Gas Pathway has a significant role for hydrogen by 2050

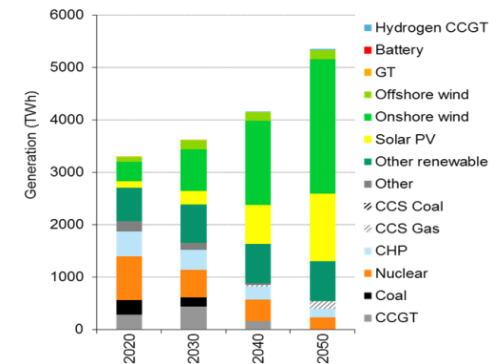
Transport



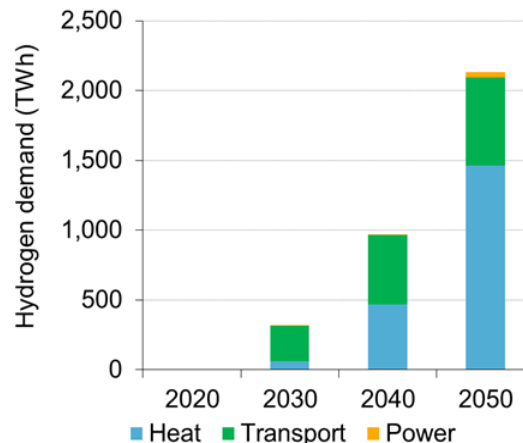
Heat



Power



Hydrogen



How could all this hydrogen be produced?



GREY

Steam Methane Reforming (SMR) – refers to a chemical synthesis that reacts steam at high pressure to produce hydrogen and carbon dioxide from hydrocarbons such as natural gas.



GREEN

Electrolysis – electricity is used to separate water into hydrogen and oxygen. Where the electricity is renewable the hydrogen is considered zero carbon.



BLUE

SMR with Carbon Capture and Storage (CCS) – where CCS is added to the SMR process to capture and prevent release of the carbon dioxide, the process can be considered as low carbon.



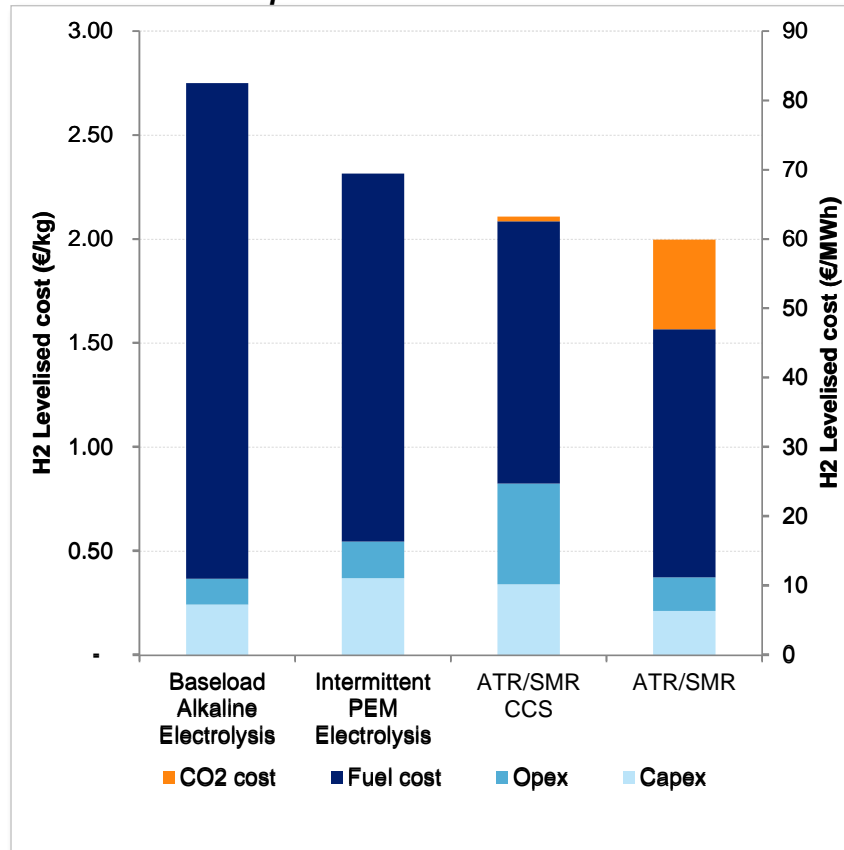
Thermal Methane Pyrolysis (TMP) – this involves natural gas and a low-temperature, high-pressure reaction with no oxygen present to produce hydrogen and solid carbon. Also low carbon.

What are the production costs of hydrogen?



Fuel costs are the major cost element in hydrogen production

Levelised cost comparison in 2030



Comments

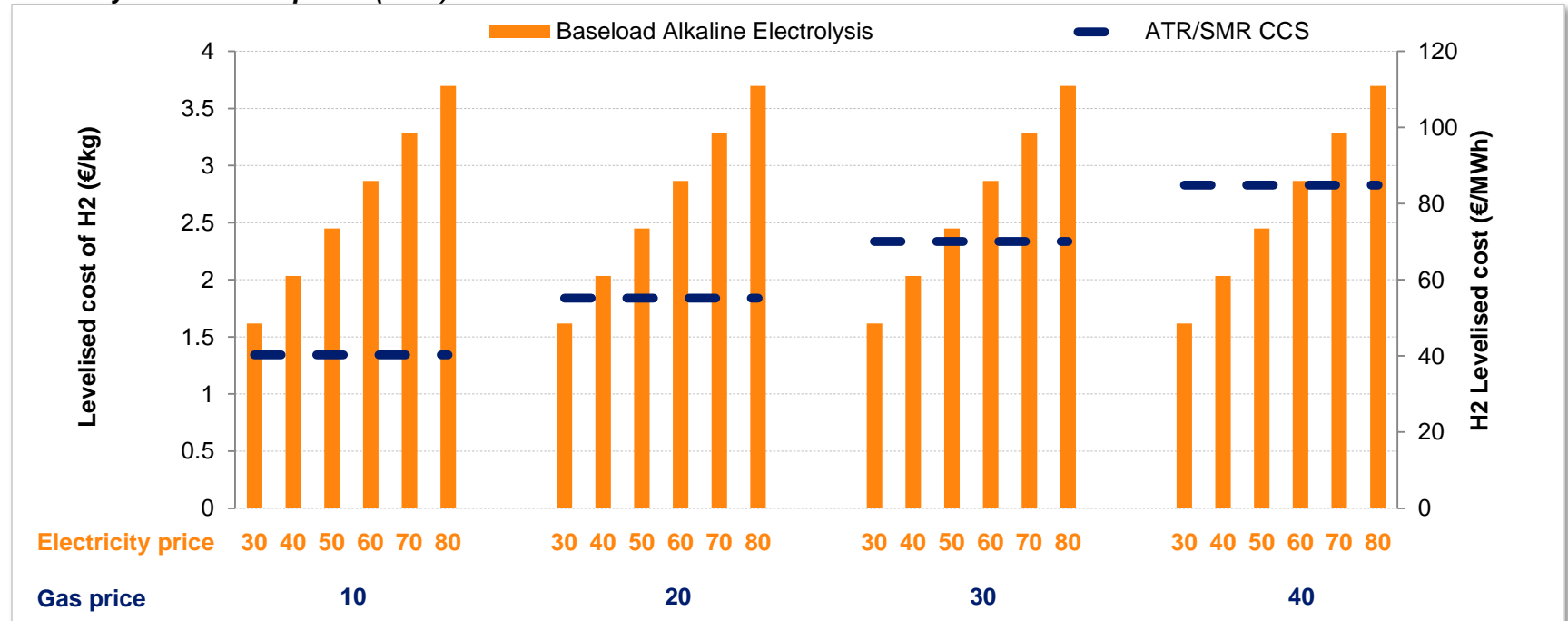
- Baseload Alkaline electrolysis is based on a 99% availability assumption
- PEM electrolysis capturing the lowest 70% (lower priced hours) leads to **lower hydrogen production costs than ALK** running at baseload, but CAPEX costs are relatively higher
- ATR / SMR production costs **are cheaper in this scenario with CCS and a €50 carbon price**
- The analysis is referred to a specific geographical context (the Netherlands). In geographies where **power and gas prices are different the results would be different**
- Although Pyrolysis is not included in this analysis we expect the production cost to be **higher than SMR/CCS but lower than electrolysis**

Case developed for the Netherlands
with Pöyry Central hourly electricity prices




At low gas prices SMR/CCS is cheaper, the trend is reversed if gas prices are higher and electricity prices are lower than a certain threshold

Relativity between fuel prices (2030)

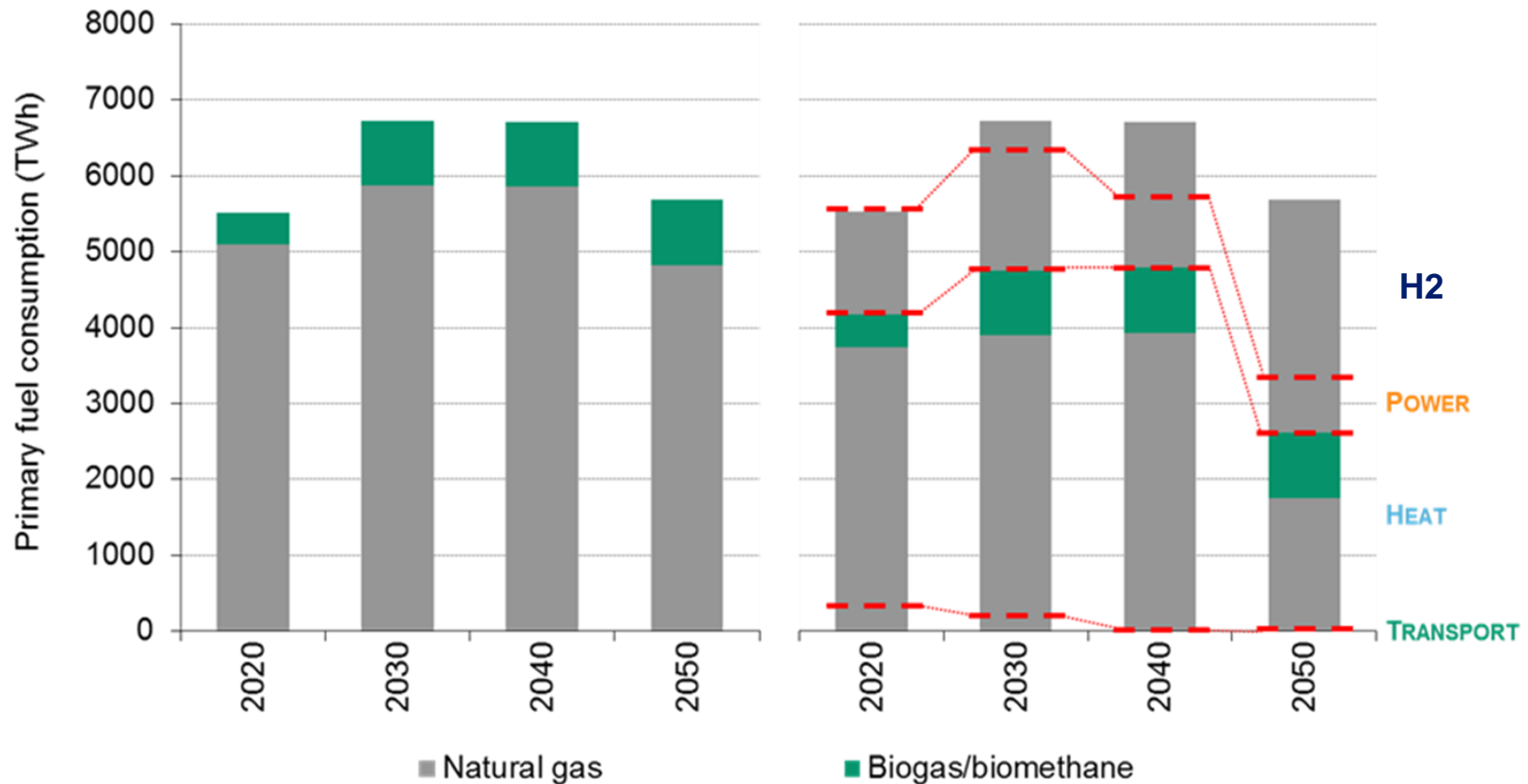


- At low gas prices (€10/MWh), ATR/SMR is always cheaper
- At gas prices of €20/MWh, it is possible for electrolysis to be cheaper, but only if electricity prices are €30/MWh or less



**What could
this mean
for gas
demand?**

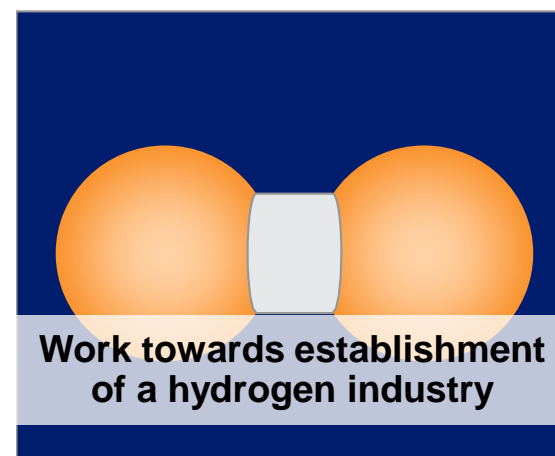
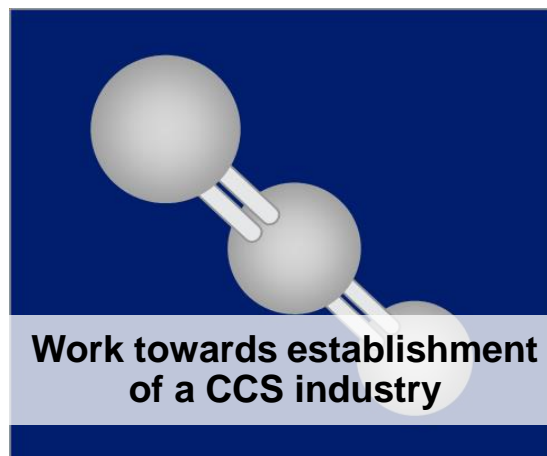
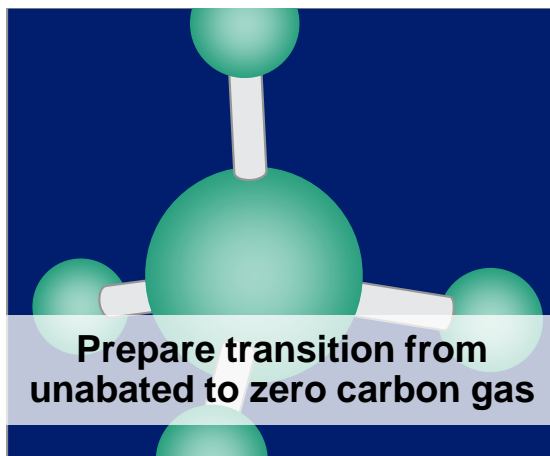
Gas demand in our Zero Carbon Gas Pathway



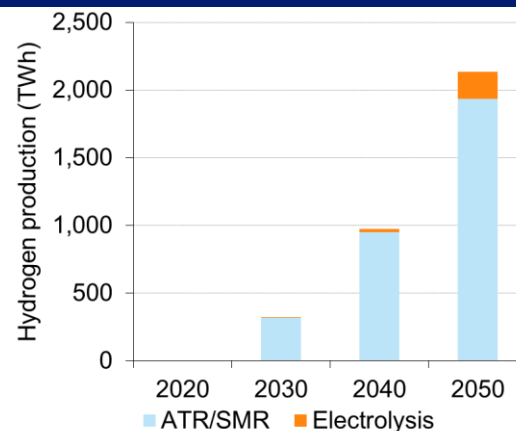
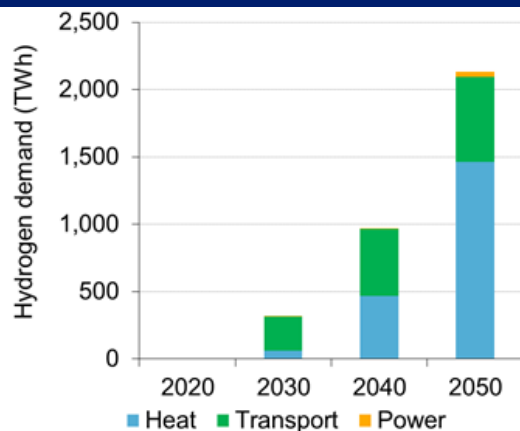
Whilst this looks very different to the EU's vision, **decarbonisation can be achieved**

Gas industry has an important role in achieving decarbonisation

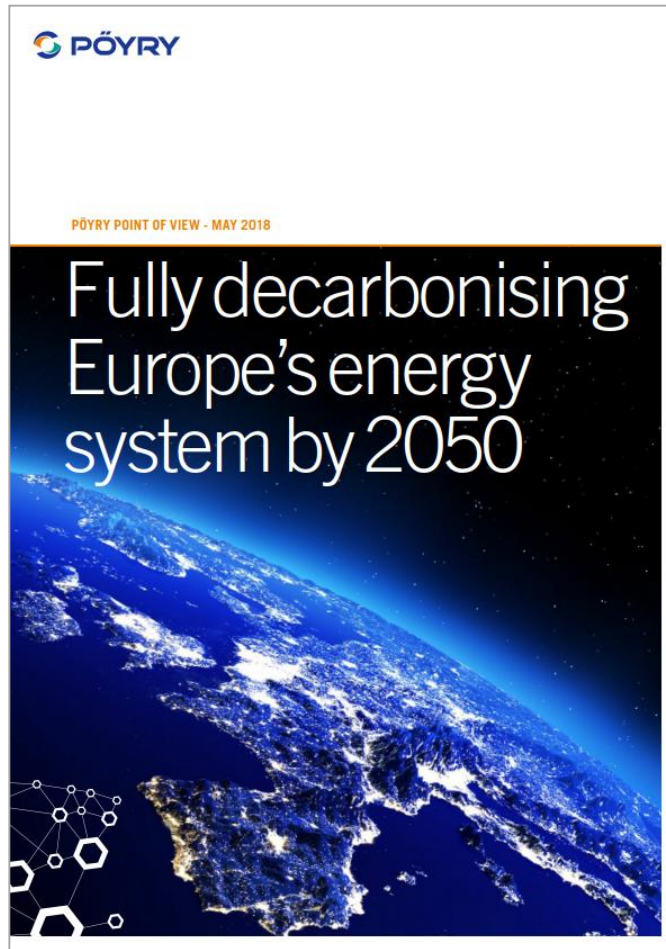
But, it must face the challenge head on and



Zero Carbon Gas Pathway - demand and supply of hydrogen



Decarbonising Europe's energy system - Pöyry's ground-breaking 2018 study examines pathways to 2050



<https://www.Pöyry.com/news/articles/fully-decarbonising-europes-energy-system-2050>



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