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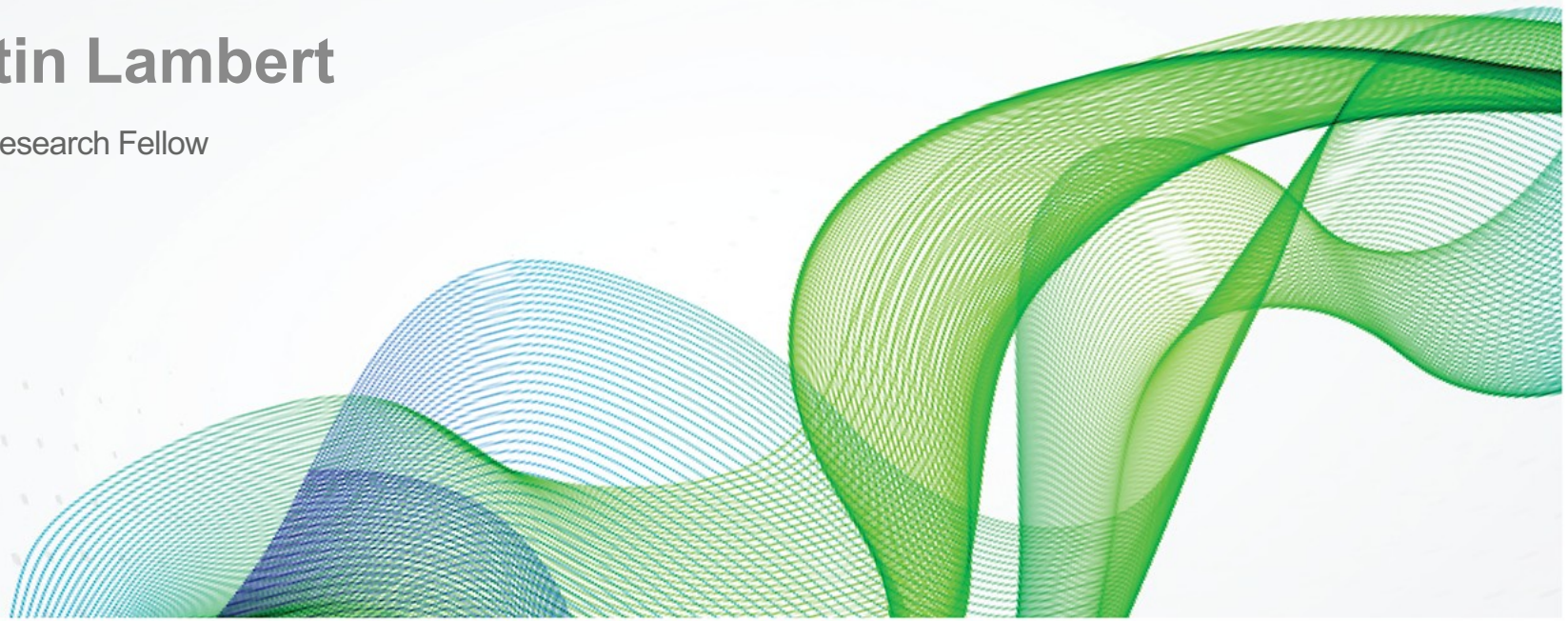
Pathways to low-carbon gas: A European Perspective

Martin Lambert

Senior Research Fellow



IEF-KAPSARC ROUNDTABLE 28TH FEBRUARY 2019

NATURAL GAS PROGRAMME

Key Messages

- European policy makers strongly focussed on achieving 80-95% reduction (from 1990 level) in CO2 emissions, by 2050
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- All renewable gas more expensive than fossil gas, so dependent on government support
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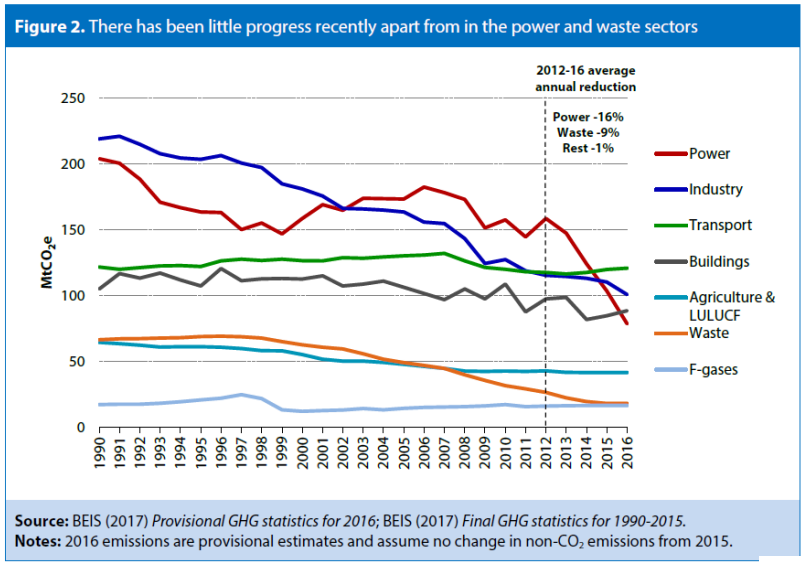
- Biomethane is lowest cost "green gas option" constrained by availability of acceptable feedstocks: around 50 Bcm/year potential in Europe
- Hydrogen will play a role, but challenging to convert existing methane customers
- Many European countries focus on hydrogen from electrolysis ("power-to-gas")
- Upstream suppliers promoting methane reforming with CCUS or methane cracking

Coal to Gas switching helps, but is not enough

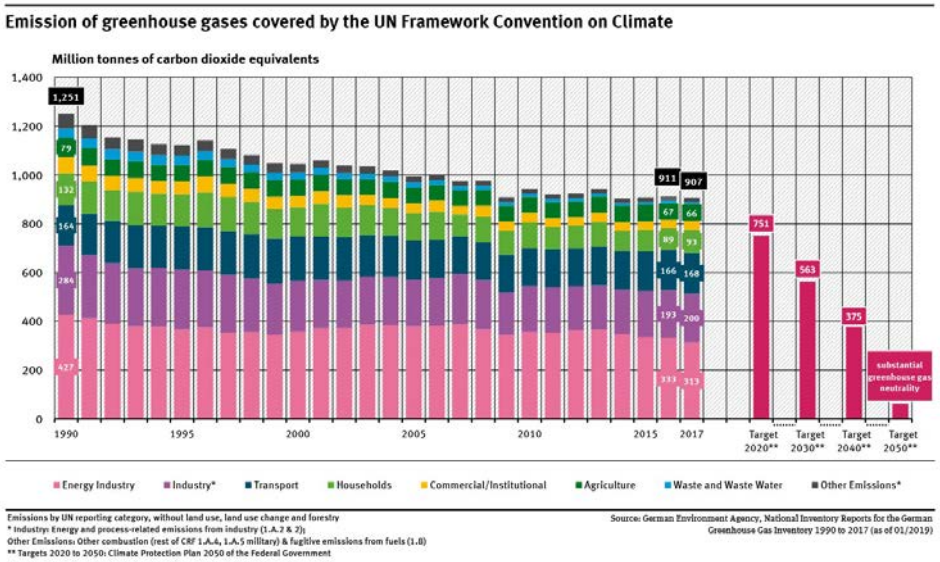


Source: UK Committee on climate change

UK carbon price floor has encouraged coal to gas switching in power generation, and increasing share of wind and solar.

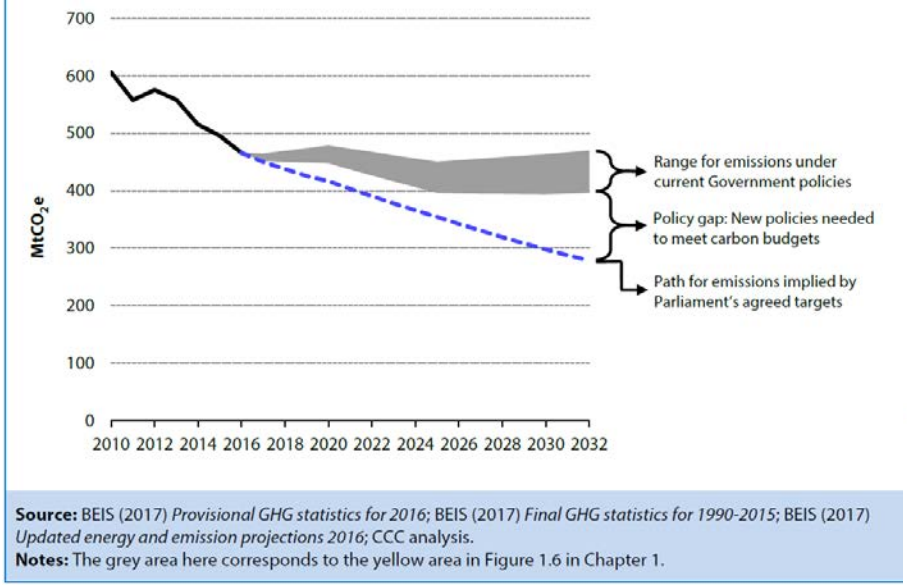
Power sector has clear path to decarbonisation. Other sectors have barely started

Germany struggling to meet climate targets:
share of renewables in power generation capacity around 50%, but significant lignite burning continues.



Current Policies are insufficient to meet 2050 targets

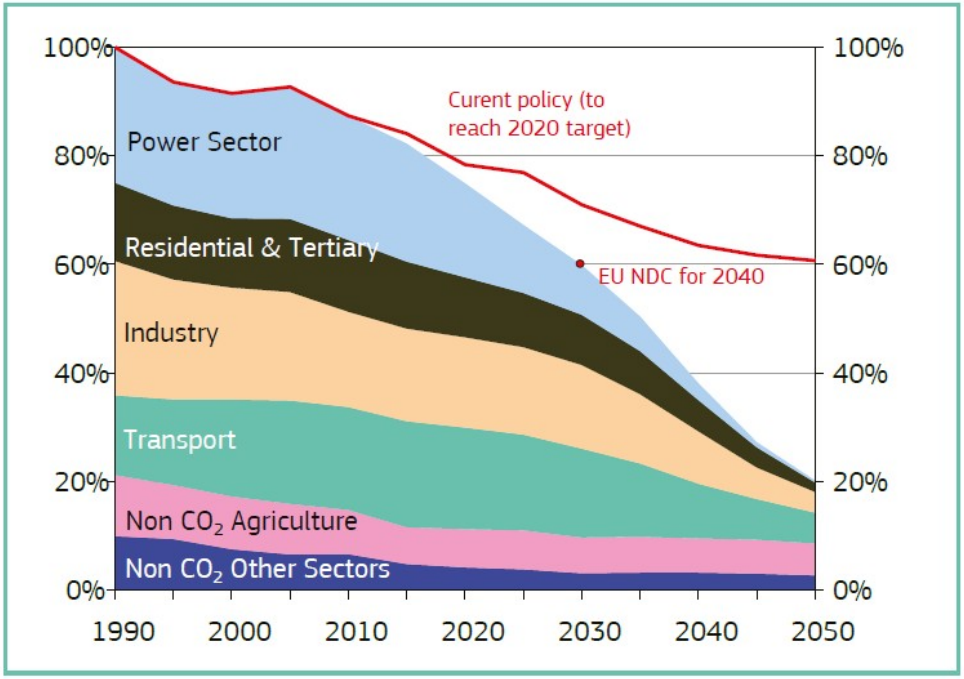
Figure 3. Current policies fall far short of what is needed to meet the fourth and fifth carbon budgets



Source: BEIS (2017) *Provisional GHG statistics for 2016*; BEIS (2017) *Final GHG statistics for 1990-2015*; BEIS (2017) *Updated energy and emission projections 2016*; CCC analysis.
Notes: The grey area here corresponds to the yellow area in Figure 1.6 in Chapter 1.

Despite UK making good progress exceeding initial carbon budgets – need to address policy gap to meet 4th and 5th carbon budgets.

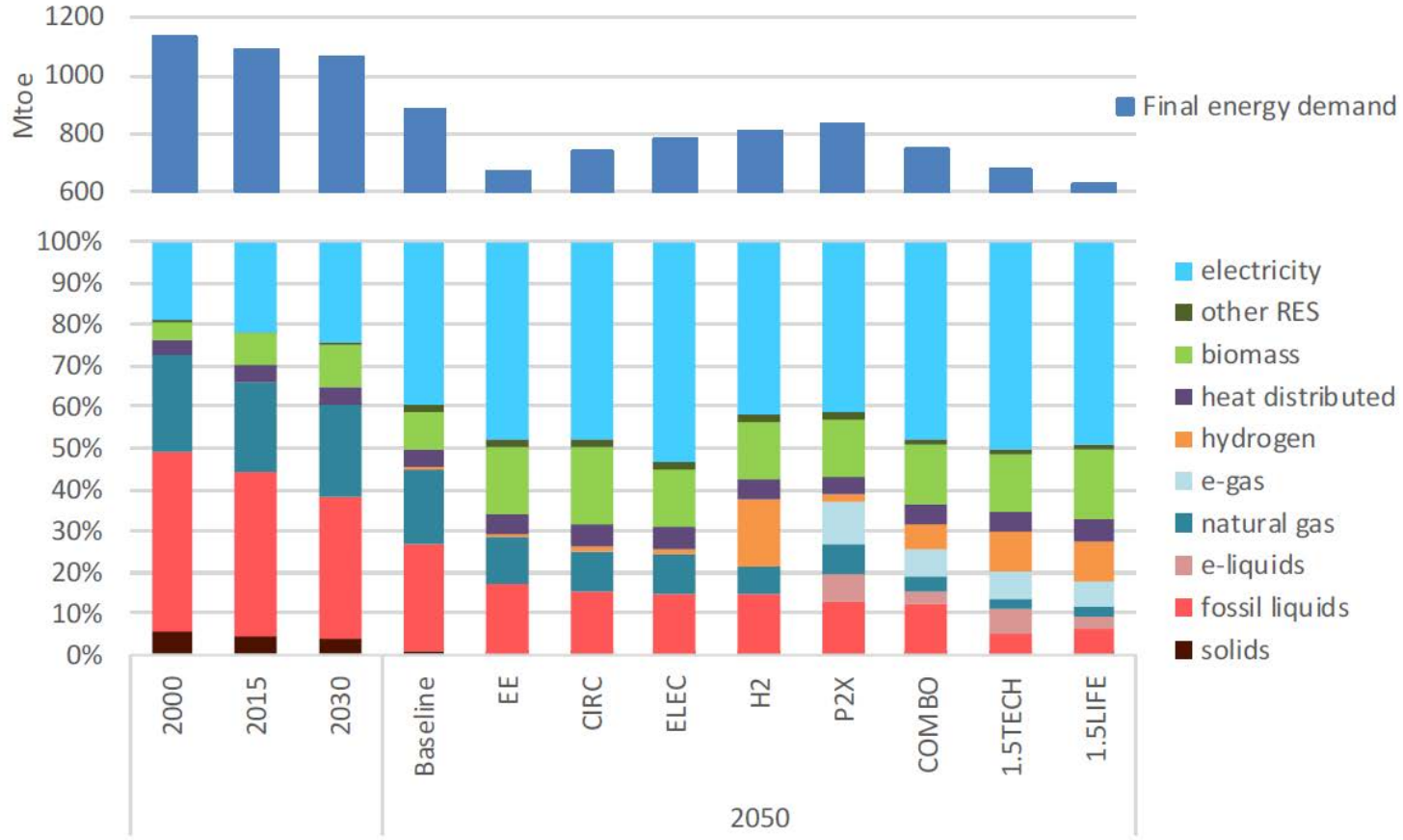
Similarly at EU level, further action required **across all sectors** to meet 2050 targets.



EU sees hydrocarbons at 10-30% of primary energy

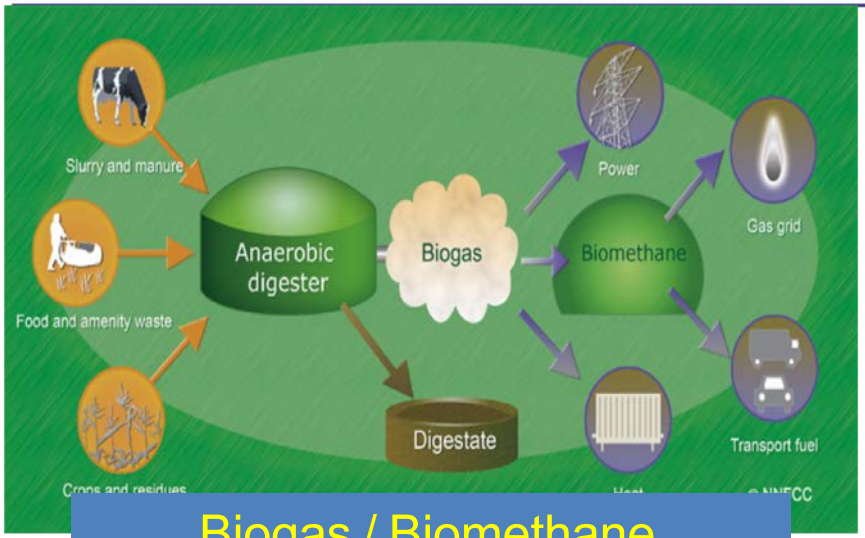
From November 2018 EU report "A Clean Planet for all":

Figure 20: Share of energy carriers in final energy consumption

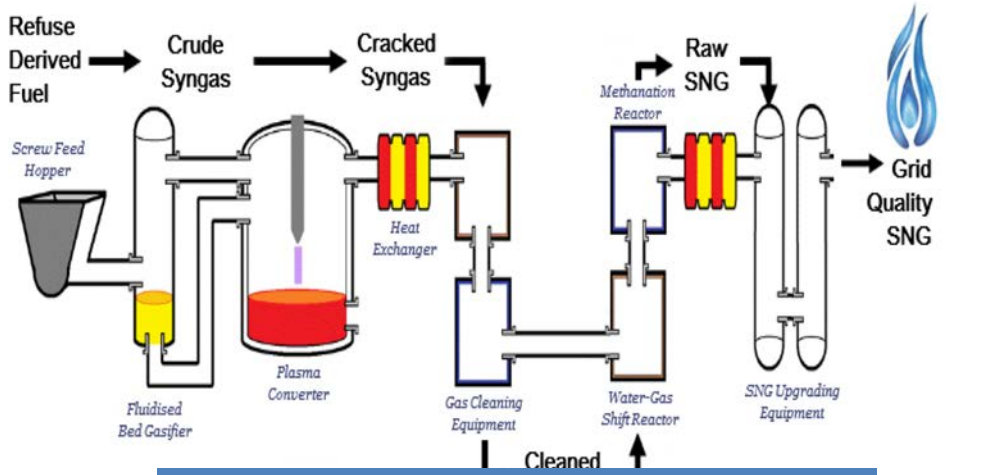


Source: Eurostat (2000, 2015), PRIMES.

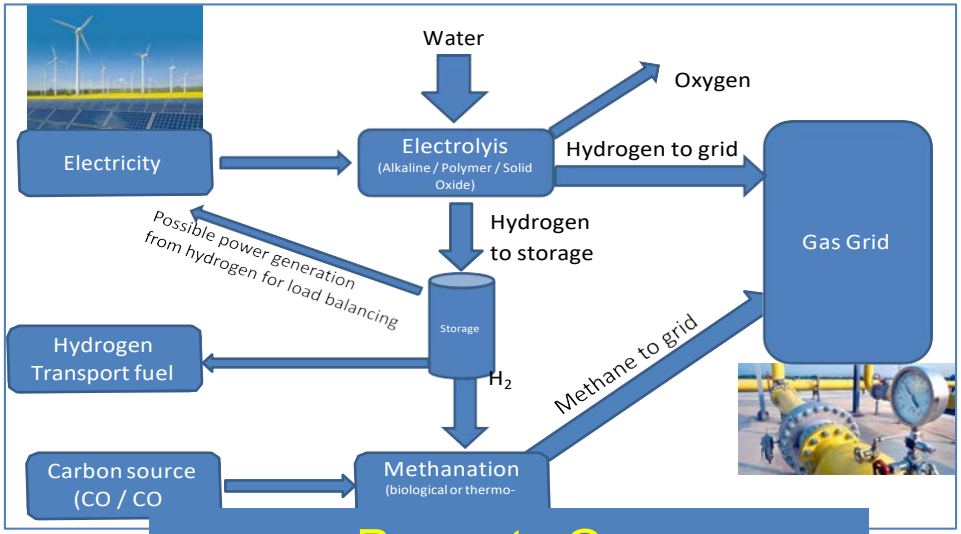
Gas can decarbonise – how, how much, how fast?



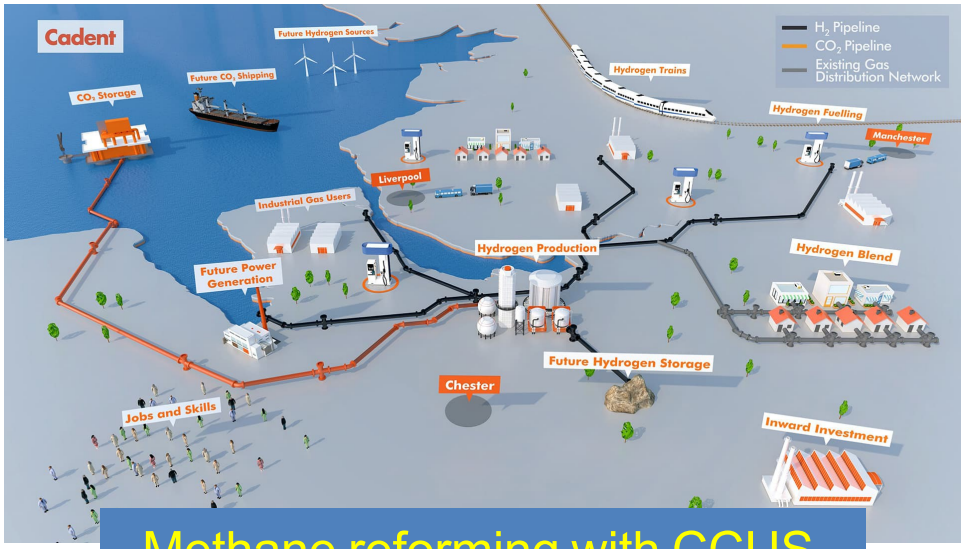
Biogas / Biomethane



Bio-SNG via Gasification

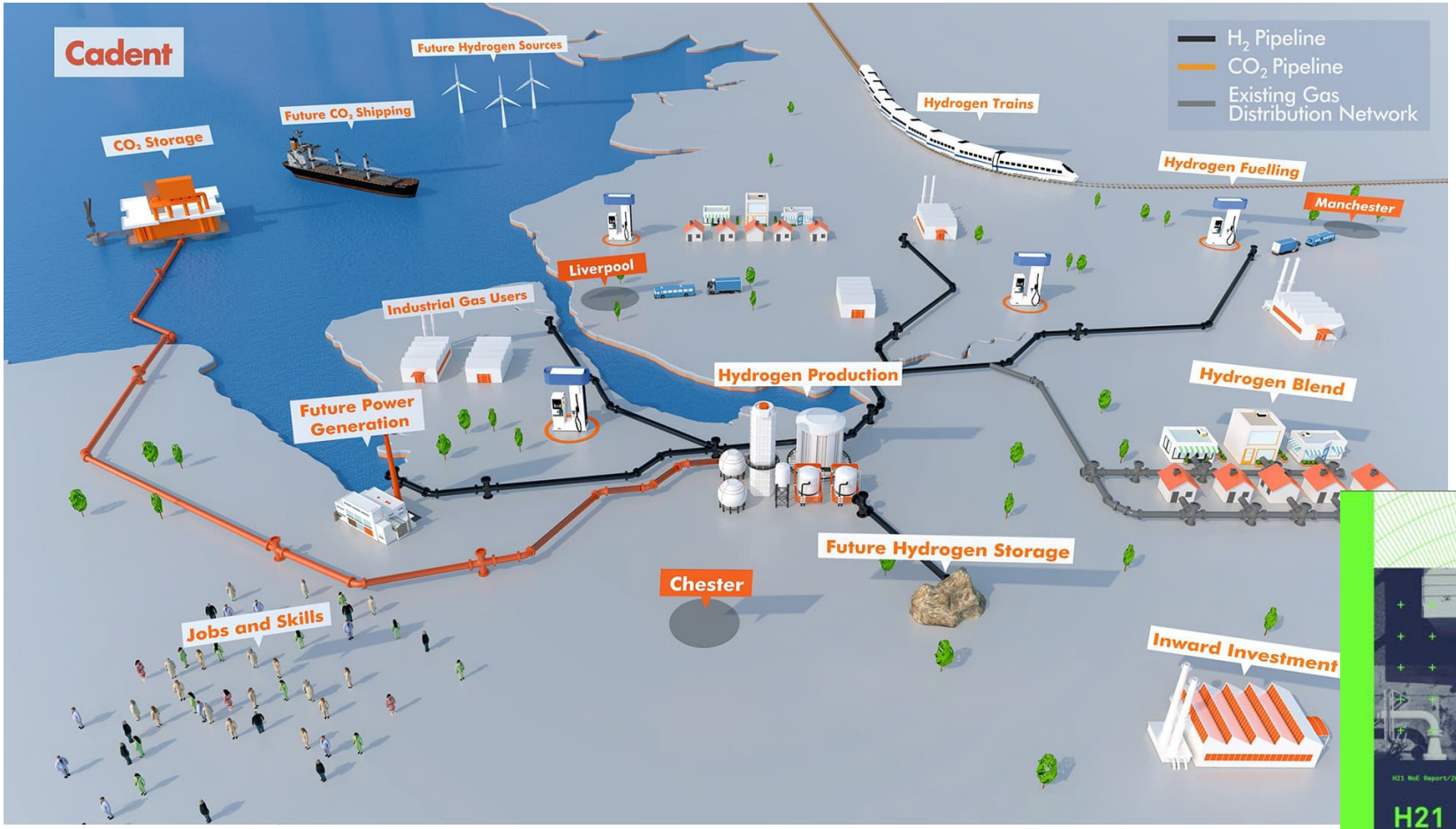


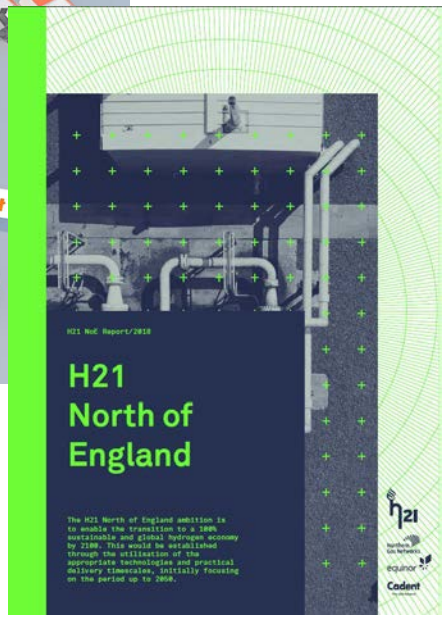
Power to Gas



Methane reforming with CCUS

Methane Reforming with CCUS – UK leading the way?





How to convert plans into action?

Hydrogen from methane cracking – new technology?

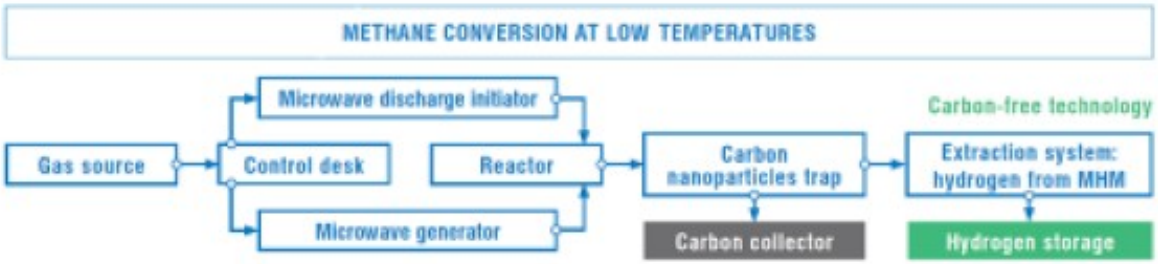
Potential decarbonisation technology:

- **Research led in Germany (Karlsruhe and Potsdam)**
- **Strongly supported by Gazprom for continued supply of methane to Europe.**

THE WAY IT COULD WORK TOMORROW
(Natural gas decarbonization technology)

$$CH_4 = 2H_2 + C$$

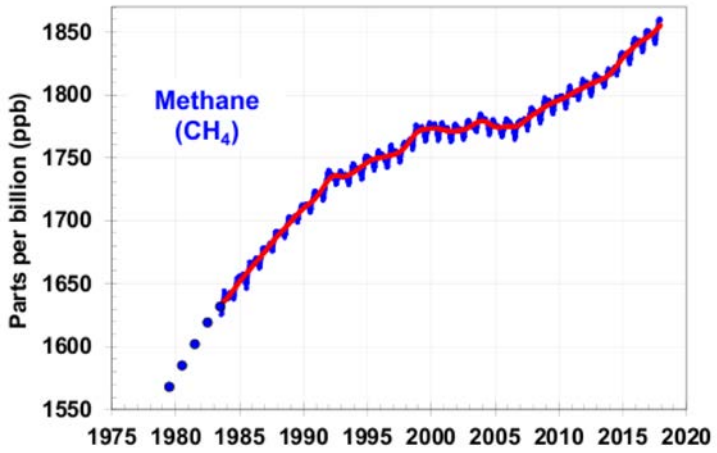
Research work led by the Gazprom Group in the field of hydrogen production from natural gas with possible solid carbon sequestration will open opportunities for cost-effective transition to a carbon-free economy in the future.



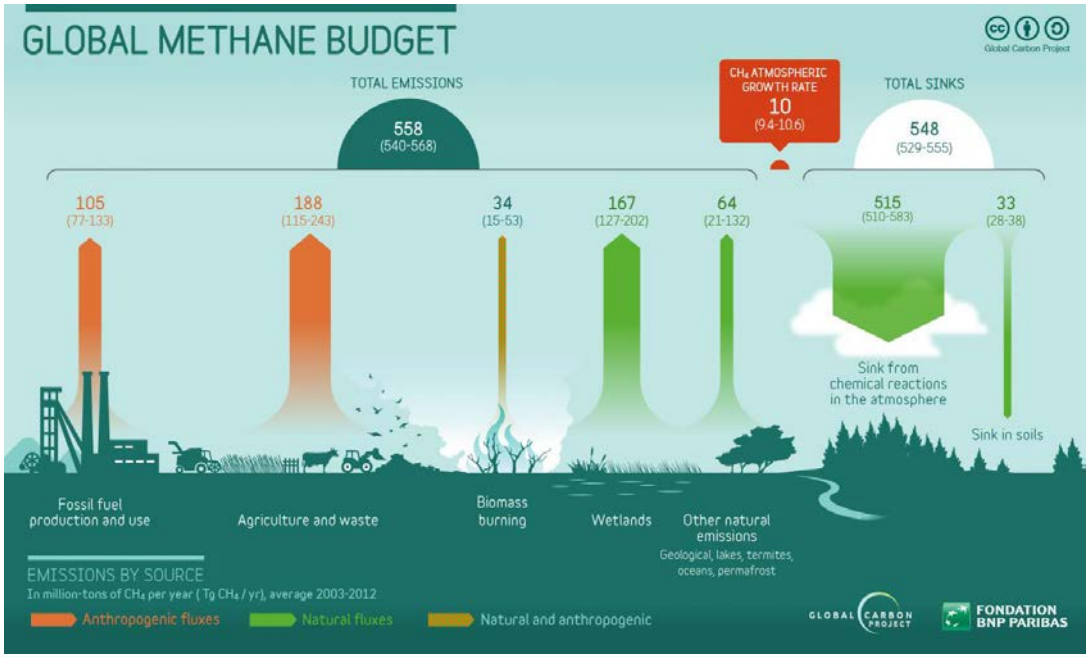
The gas conversion to hydrogen takes place in the low-temperature non-equilibrium plasma in the absence of oxygen and under atmospheric pressure

CARBON MATERIAL

Methane emissions need to be addressed

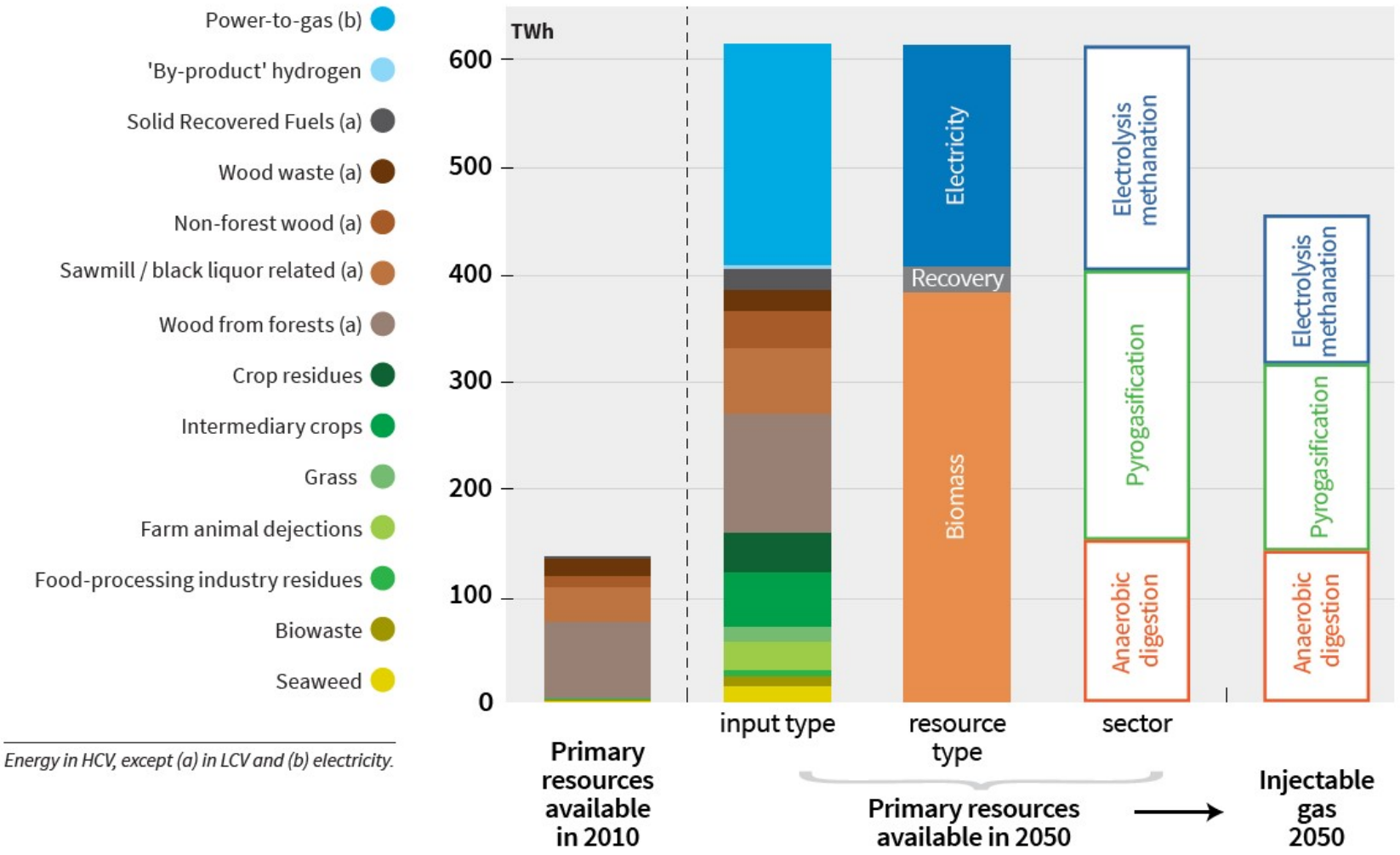


- Atmospheric concentrations of methane are rising steeply.
- The natural gas industry is only a (relatively small) part of the problem.
- Estimate 1.5 to 2% leakage across supply chain



- Need for much more clarity and transparency of reporting
- Methane emissions from agriculture and waste can present an opportunity for renewable gases

100% Renewable Gas in France by 2050?



… but massive scale up of these technologies is required

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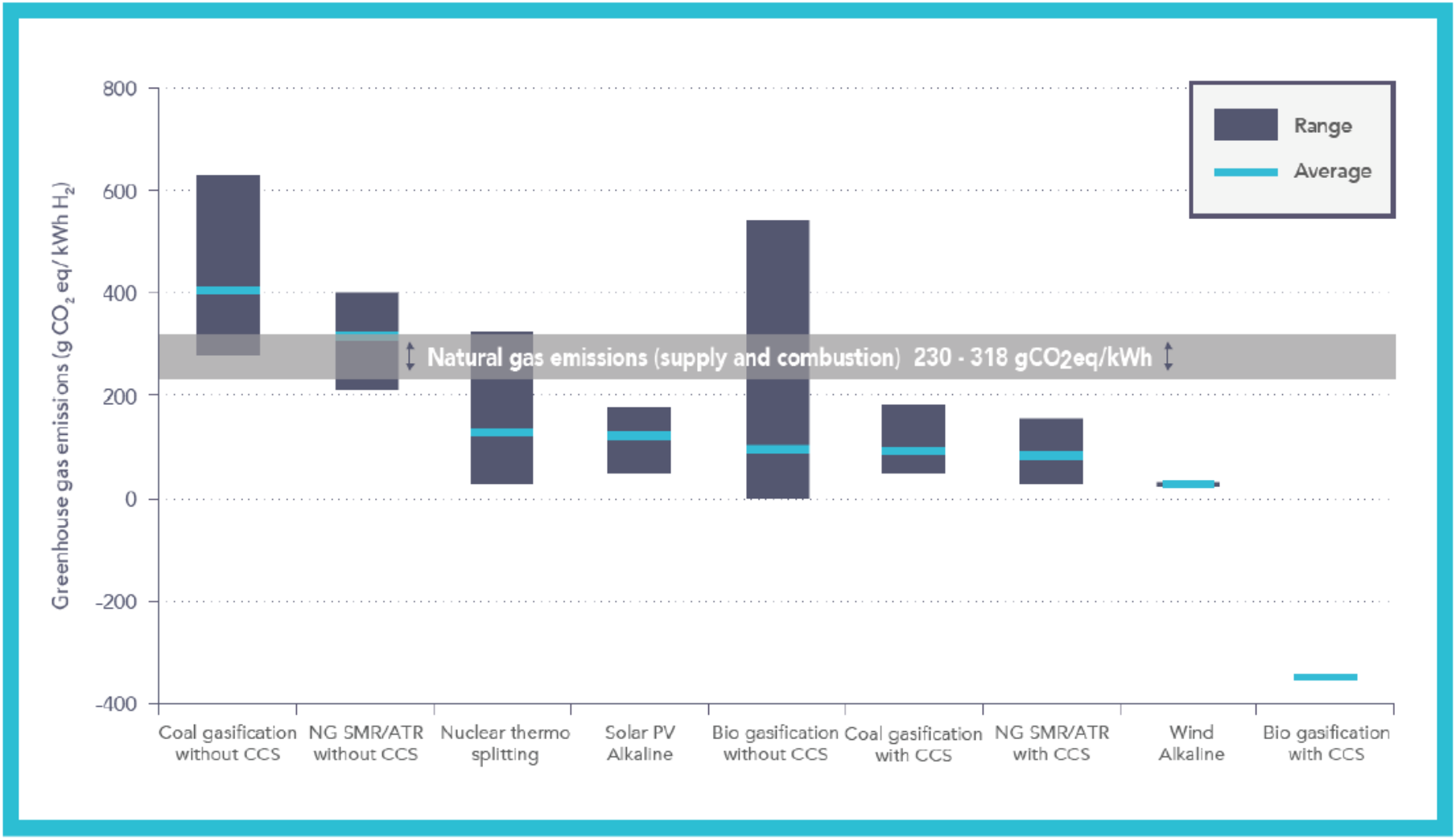
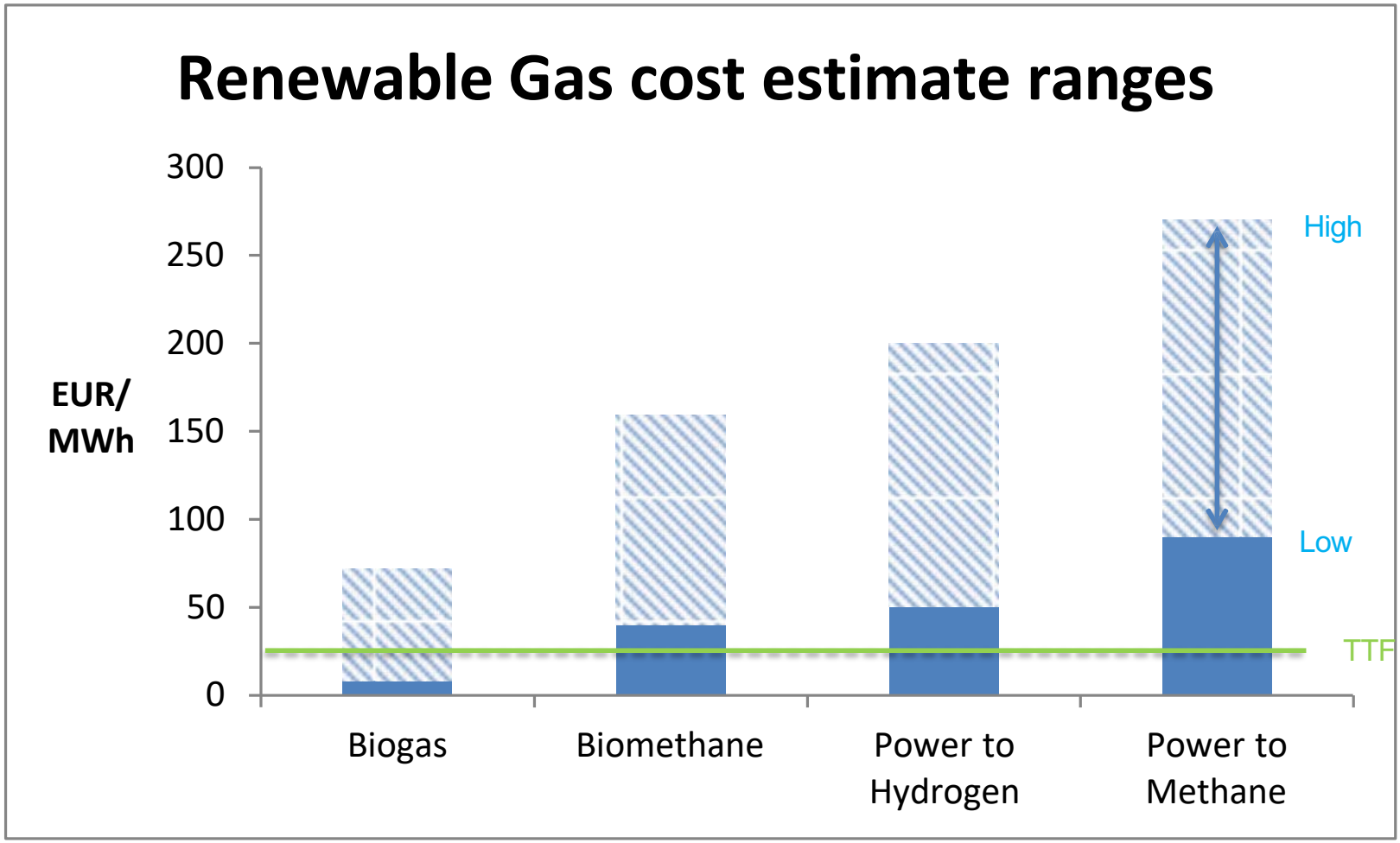
- Backup

Range of carbon impacts of renewable gas options



Source: SGI

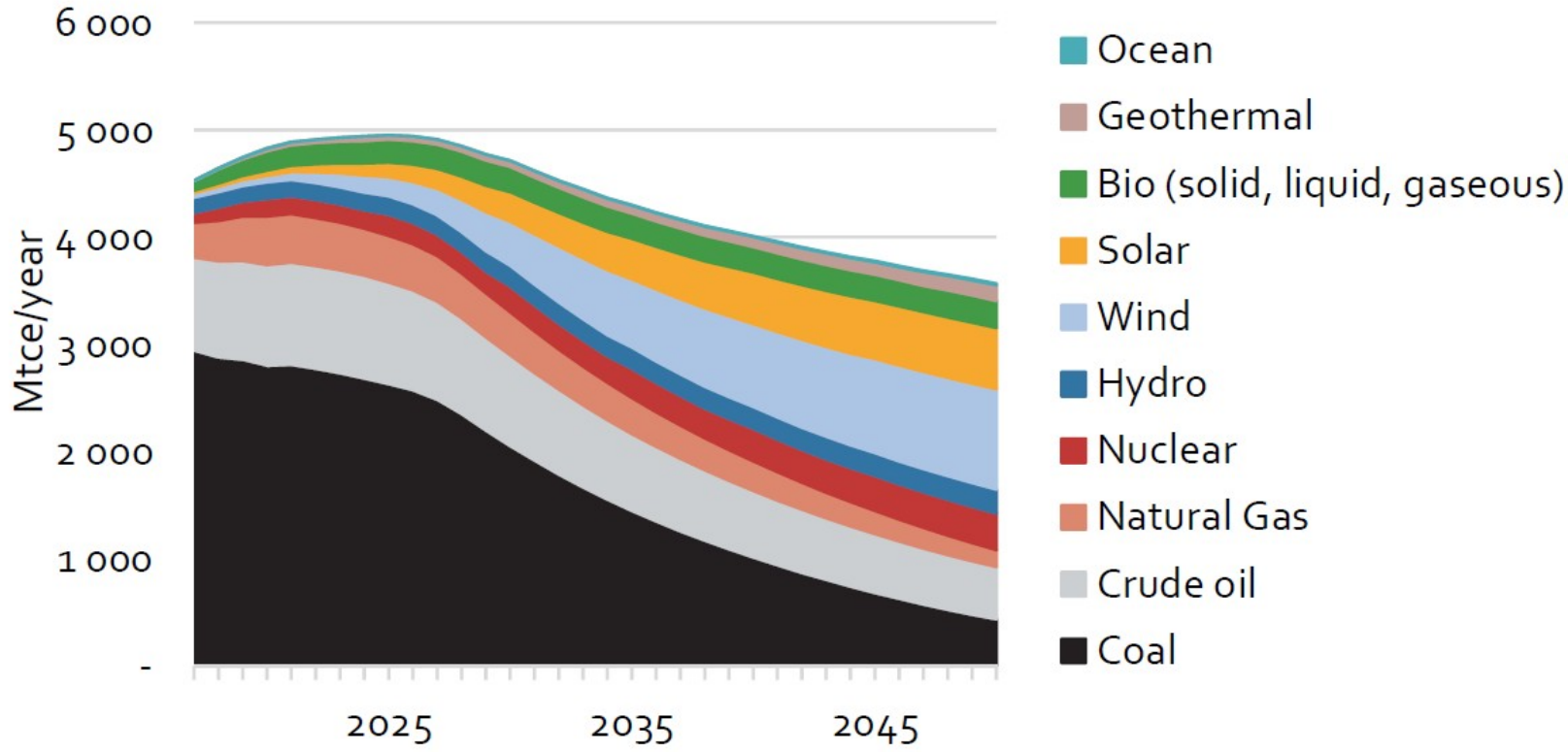
Wide range of renewable gas cost estimates



Source: Author's analysis

China starting to look seriously at decarbonisation

Figure 12: Total Primary Energy Demand (Mtce) from 2017 to 2050 in the Below 2 °C scenario



Source: China Renewable Energy Outlook 2018