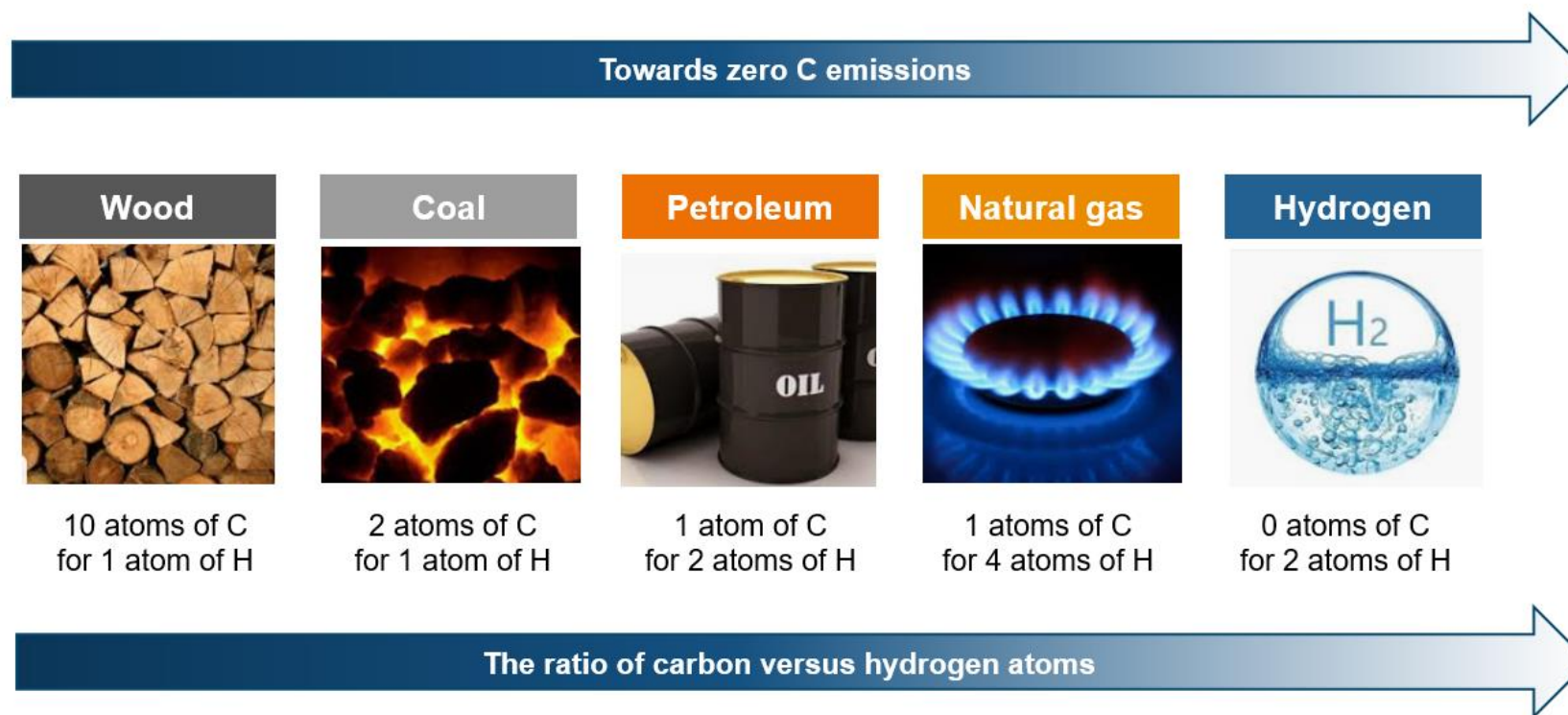


PHASING OUT CARBON

HOW TO DECARBONISE NORTH- WESTERN EUROPE'S ENERGY MIX IN THE RUN-UP TO 2050

The challenge is clear:

Taking out the last carbon atom from the energy mix



Some other things are clear as well:



Inevitable trend:

Prosperous but ageing population



Goal:

Meet the Paris Agreement objectives by 2050



Goal:

Maintain a substantial competitive industrial sector

Achieving these objectives requires three giant ifs



1

Energy efficiency improvements – all across the board



2

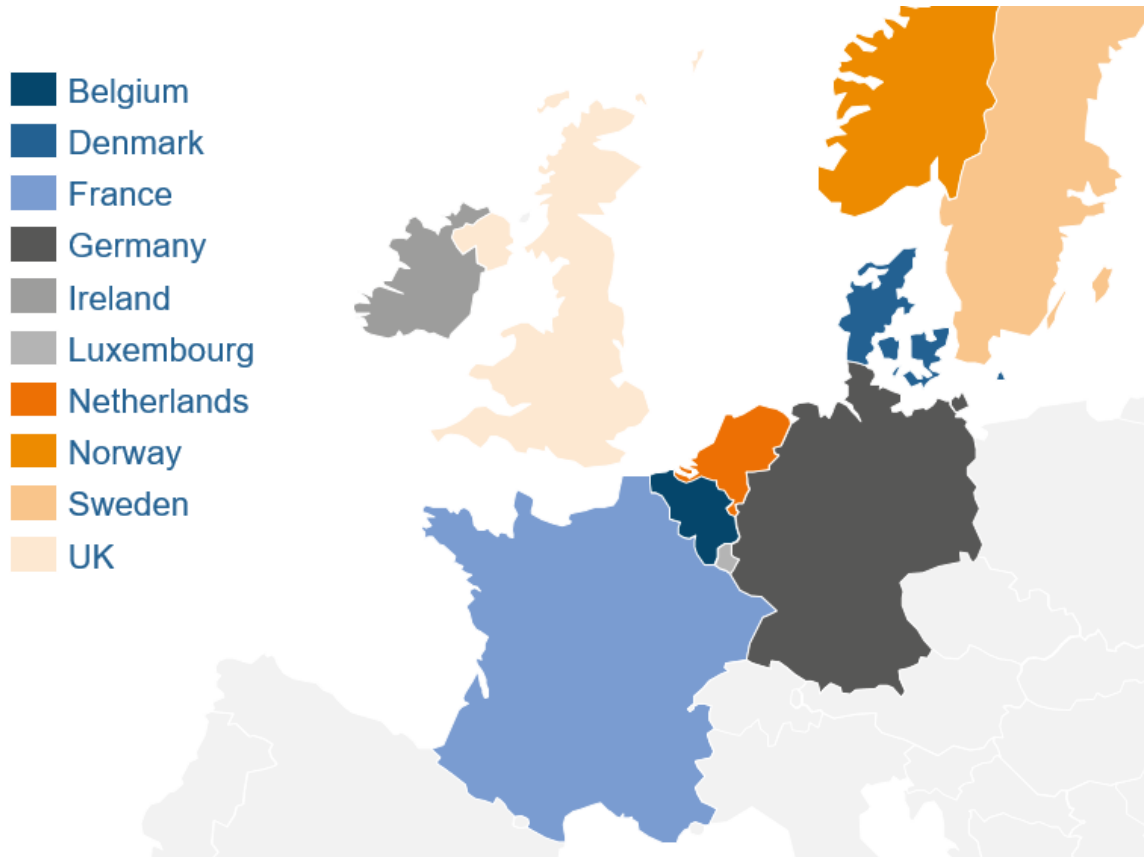
Electrification - where we can



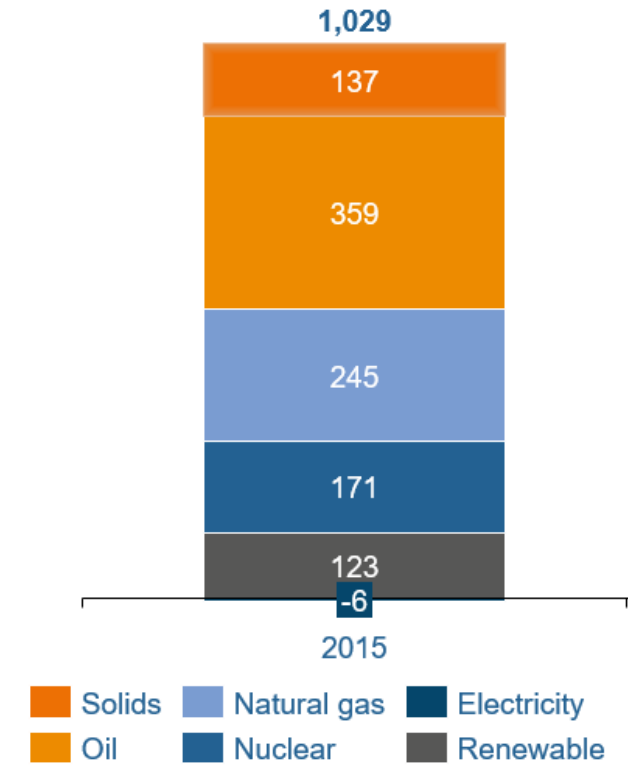
3

Decarbonisation - fuels and gases

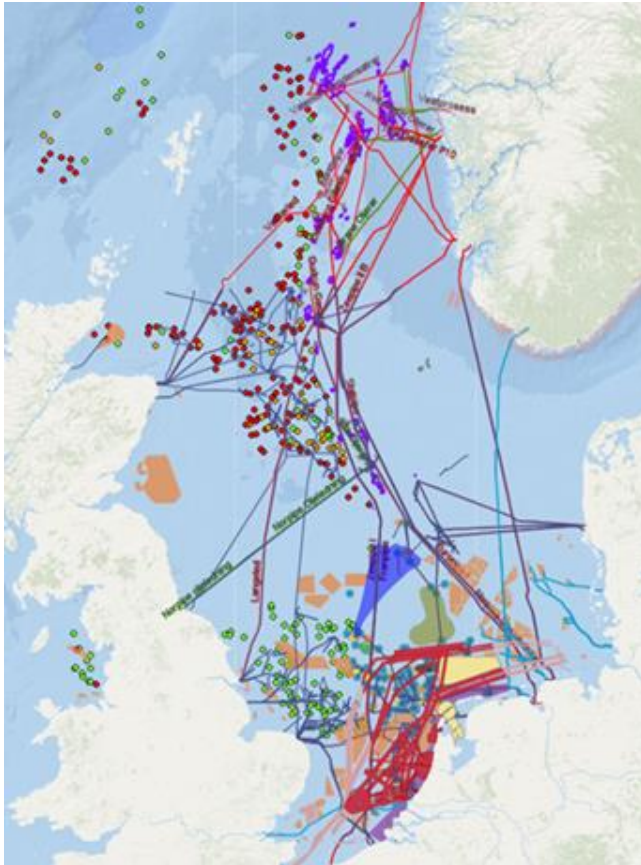
The achievability of the objectives is tested in a model



Gross inland consumption by fuel in Mtoe



The vast infrastructure and the proximity to the rich markets make the North Sea a perfect spot



- The **offshore and onshore gas grids** provide north-western Europe with **great opportunities** to implement **hydrogen** and **power-to-gas** technologies to produce low-carbon fuels
- Furthermore, hydrogen and power-to-gas can provide **storage** and **back-up capacity**

It's all there

Using part of the **offshore wind power capacity** for these purposes **strongly limits** the required investments in **electricity grids**

Optimism around renewable electricity generation seems spreading – but how do we scale up?

Factors holding back investments:

- Uncertainty around support mechanisms
- Profitability paradox – more renewables lower returns
- Public resistance
- Grid connection costs



Actions to be taken:

- Capacity remuneration mechanisms
- EU wide long-term support mechanisms
- Regulation to support upfront grid investments
- Renewables locations aligned with network

Consumption and production of decarbonised fuels needs to be stimulated - in sync

Factors holding back investments:

- Biomass required for green fuels affects agriculture
- Public opposition to CCS
- Hydrogen and power-to-gas still in pilot stage
- So far little political focus on fuel decarbonisation



Actions to be taken:

- Demonstration projects for hydrogen and power-to-gas
- Regulation for low-carbon fuels
 - Harmonisation and standardisation
- Boost demand of carbon-neutral gas
- Prescribing admixing - guarantees of origin

Summing up

Seven key policy measures EU should consider ...

1. Set **milestones** and ultimate targets
2. Manage **simultaneous emergence** of demand and supply
3. Uphold **technology neutrality**
4. Ensure **markets** function well and playing fields are leveled
5. **Admix** carbon-neutral gases to stimulate use
6. Design support scheme to scale-up **hydrogen and PtG** production
7. Facilitate the **uptake demand for hydrogen** by:
 - Gradually discourage the industrial use of grey hydrogen or comparable feedstock
 - Incentivise a fuelling infrastructure for hydrogen and other green fuels
 - Tackle the greening of aviation and shipping

... to realise a decarbonised energy mix for north-western Europe in 2050



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