UK Energy Research Centre

Research aspects on the transition to net zero emissions for UK industry

BIEE webinar

Ahmed Gailani, with thanks to Peter Taylor, Sam Cooper, and Imogen Rattle

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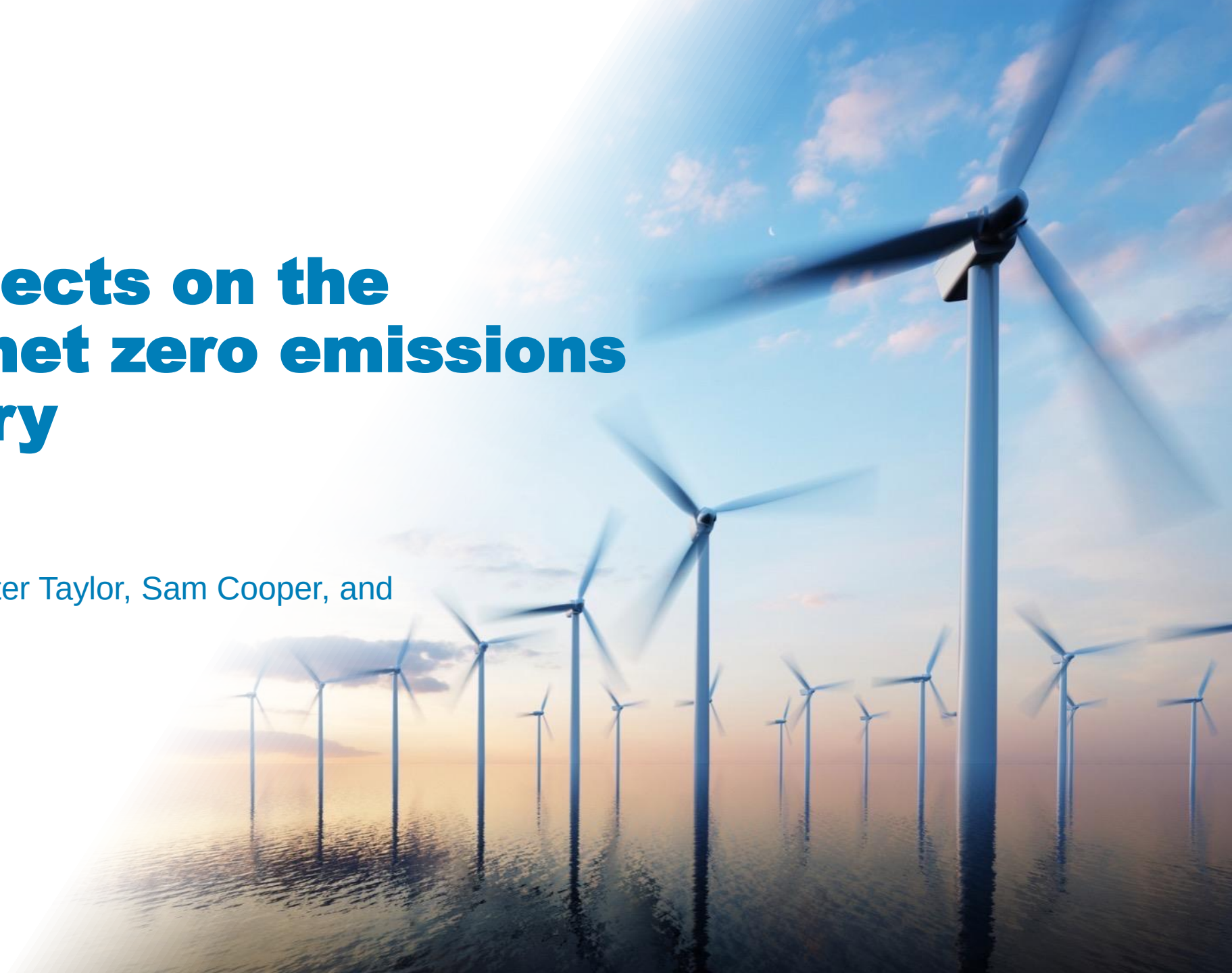
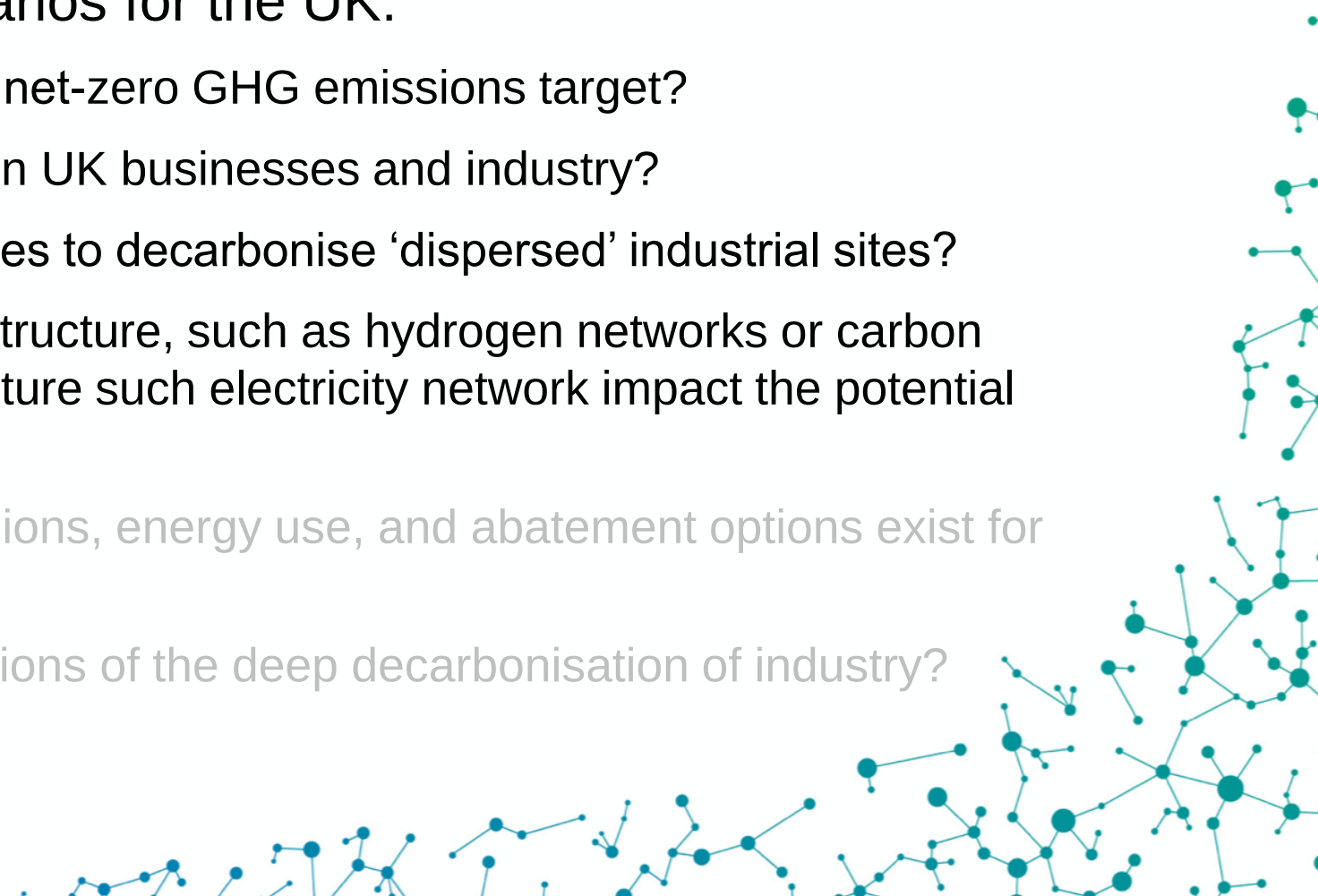


Overview of UKERC research on industry

Explore low carbon industrial scenarios for the UK:

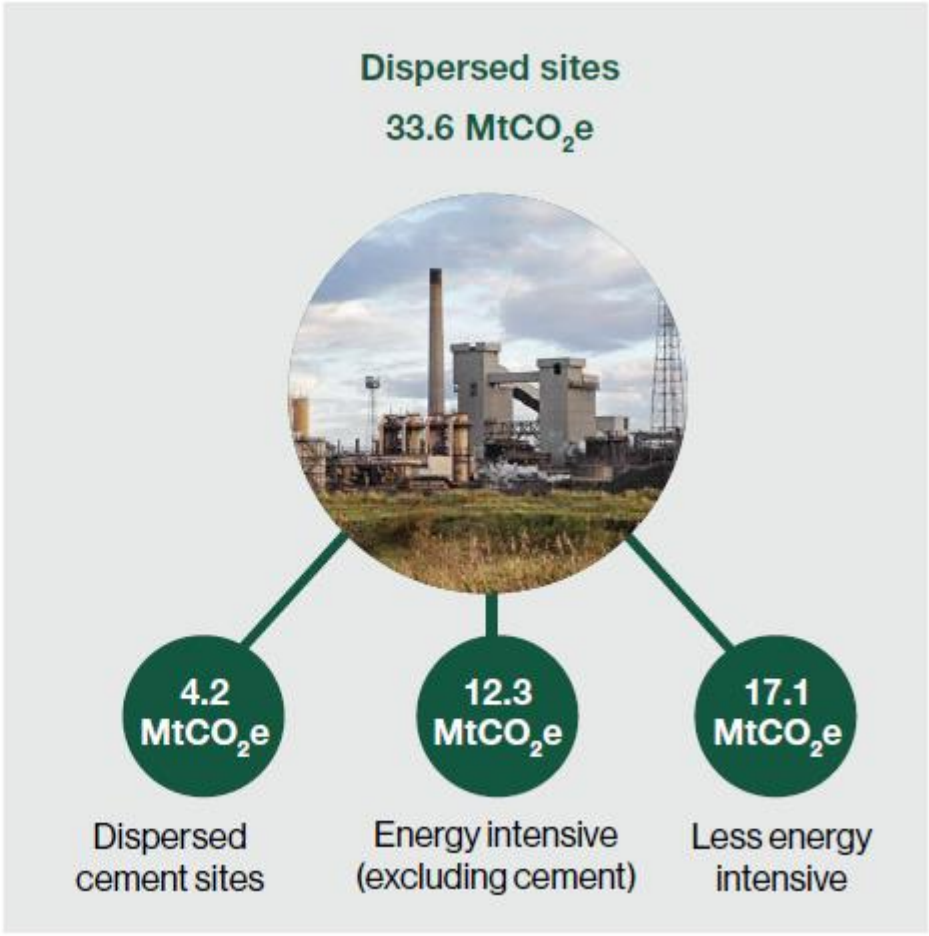
- How can industry contribute to the UK's net-zero GHG emissions target?
- What is the impact of the energy crisis on UK businesses and industry?
- What are the challenges and opportunities to decarbonise 'dispersed' industrial sites?
- How does the availability of future infrastructure, such as hydrogen networks or carbon dioxide pipelines, and existing infrastructure such electricity network impact the potential for abatement?
- What are the baseline processes, emissions, energy use, and abatement options exist for industrial sectors?
- What are the broader economic implications of the deep decarbonisation of industry?



The complexity in decarbonising the industrial sector

- The demand for, and production of, industrial products has increased significantly over recent decades.
- Heterogeneous range of processes and products.
- Long investment cycles.
- High energy use.
- Low profit margins and trade exposure

GHG emissions from UK industry



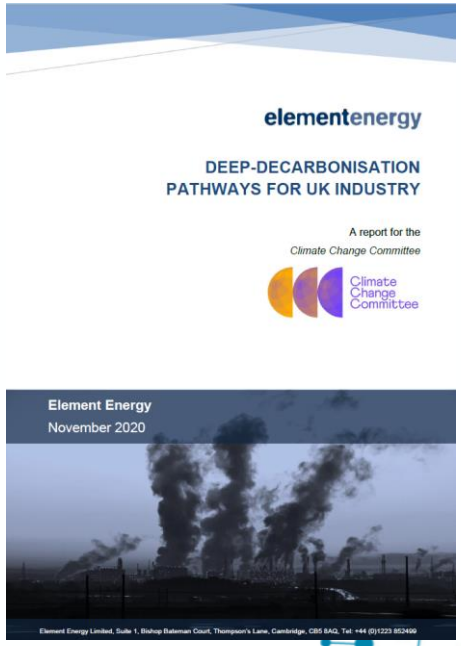
Plus around another 40 $MtCO_2$ from refineries, other fossil fuel production, offshore installations etc.

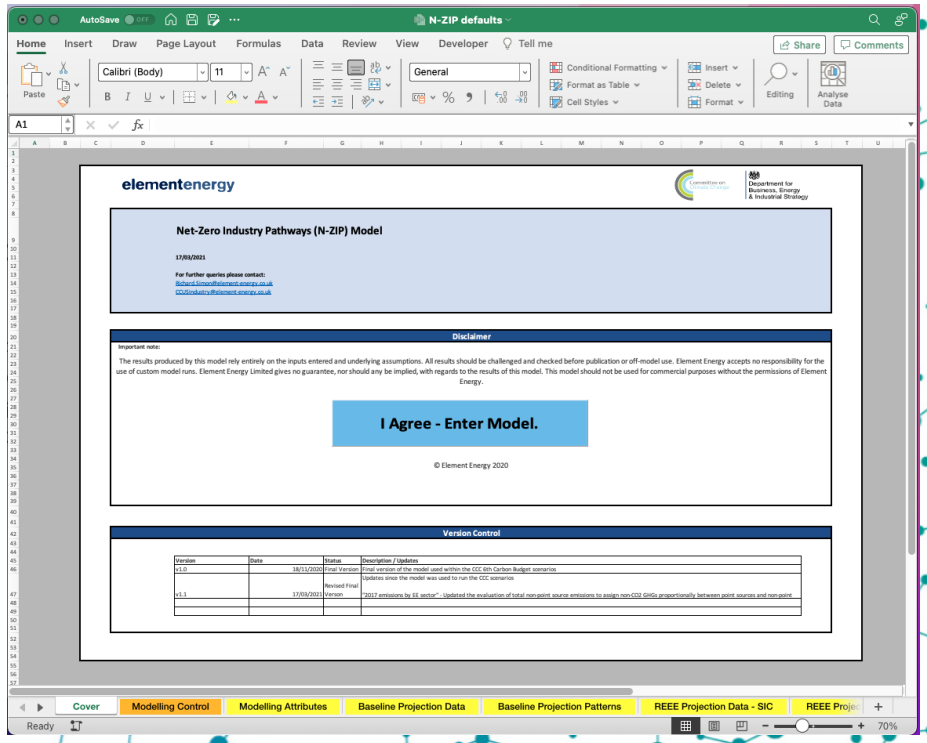
Source: HM Government (2021)

Net-Zero Industrial Pathways (N-ZIP) model

- N-ZIP is a spatially disaggregated, bottom-up model.

- It estimates the economic value of different options to decarbonise industrial processes across UK industrial sites.





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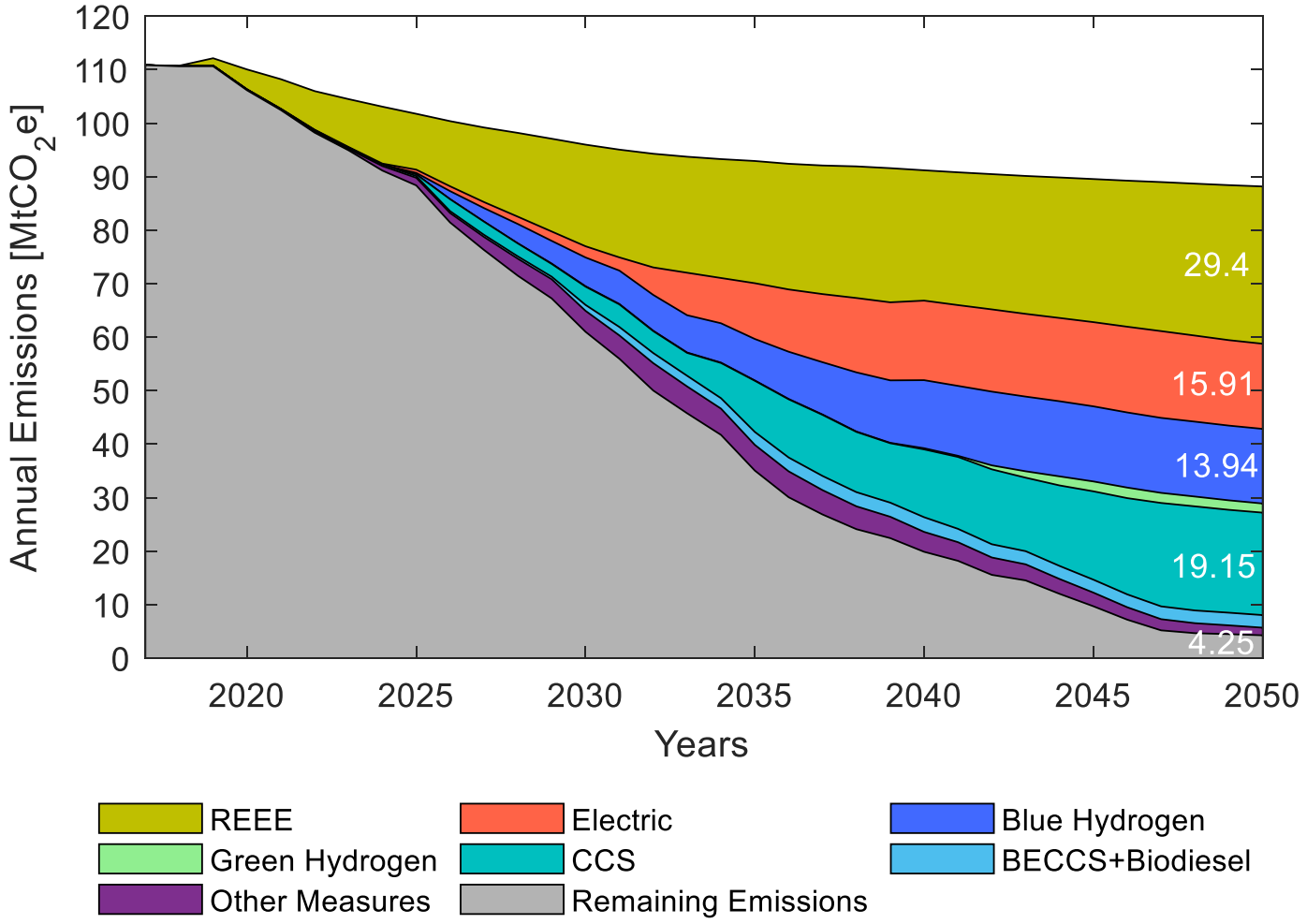
N-ZIP results

https://ukerc.ac.uk/publications/sensitivity-nzip/

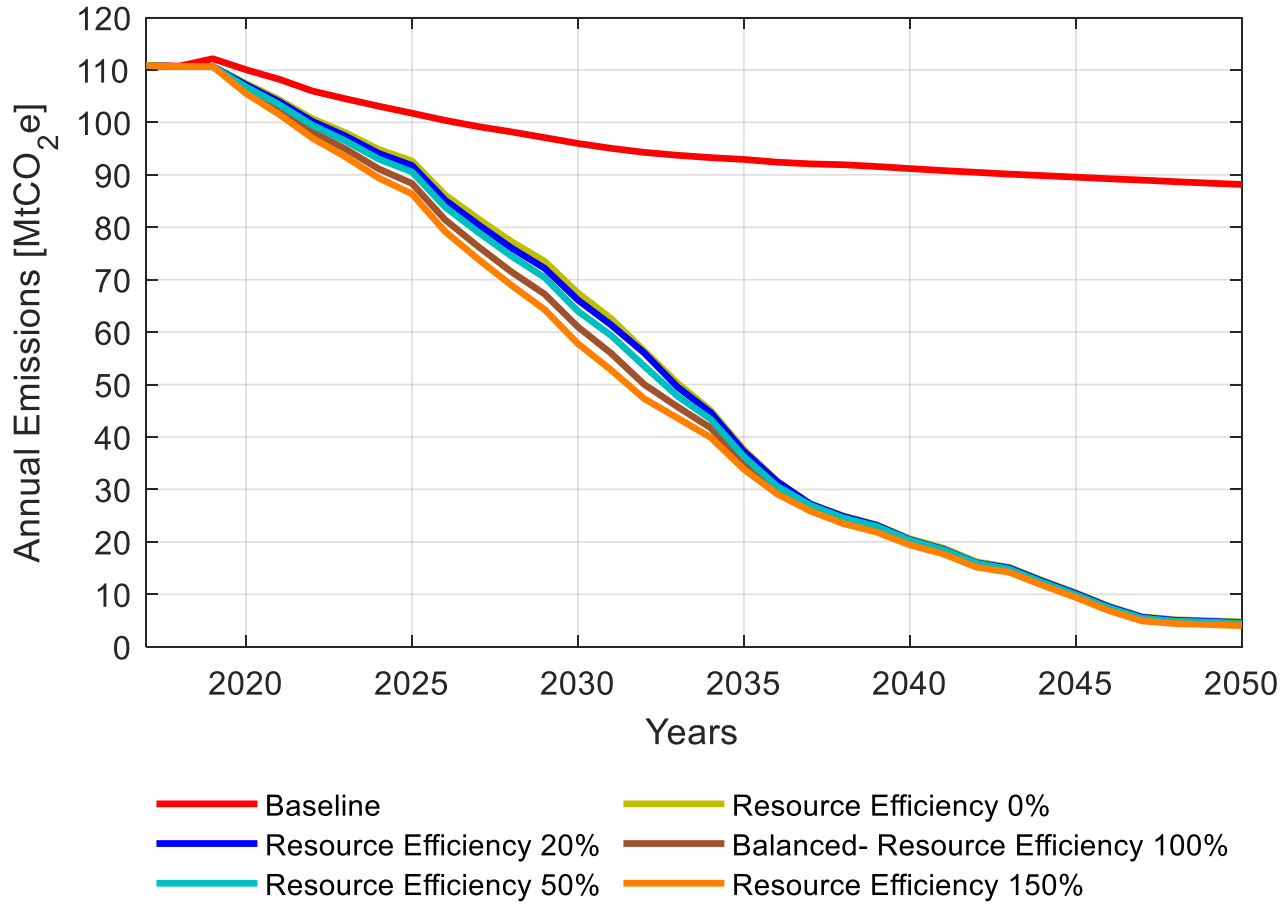


but what if we change ...

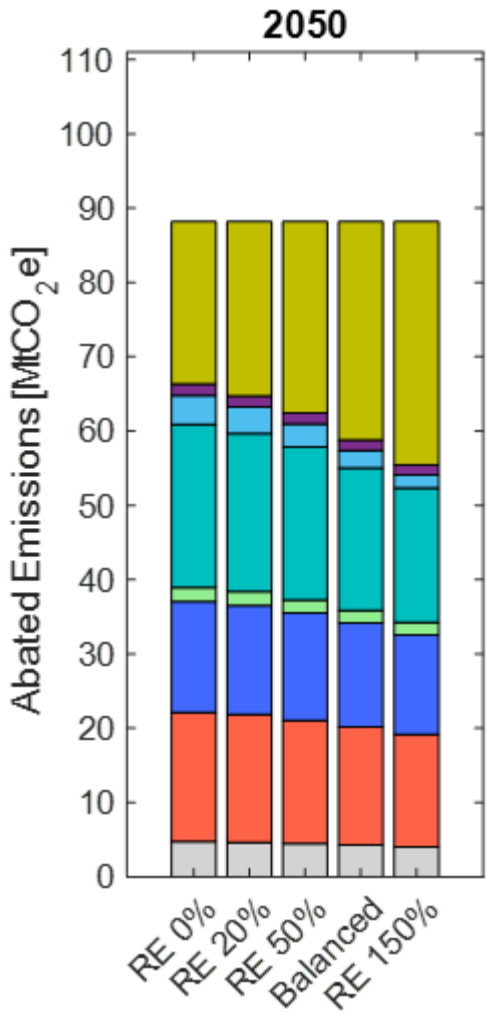
- Resource efficiency
- Discount rate
- Energy costs
- Carbon price
- CCS availability
- H_2 availability
- Supply chain constraints

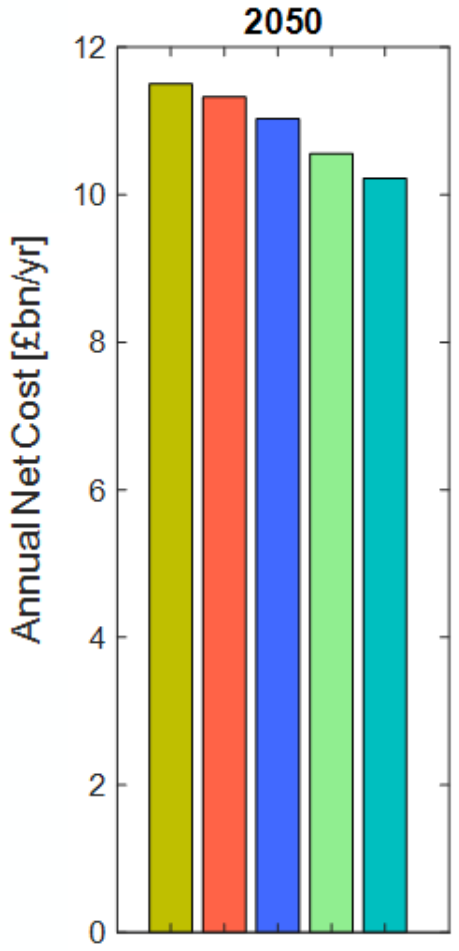
...?

N-ZIP results: Effects of Resource Efficiency

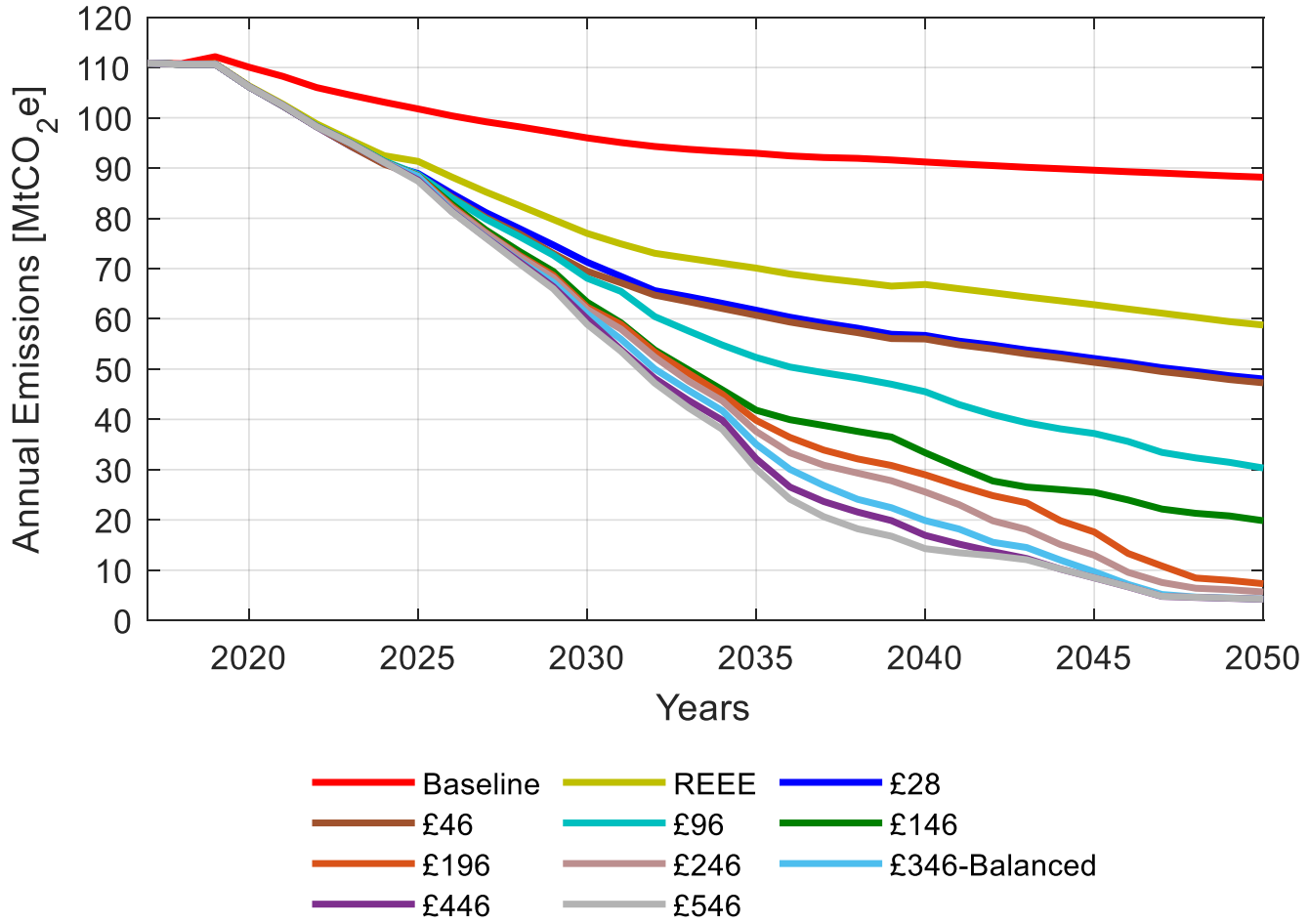


N-ZIP results





N-ZIP results: Effect of carbon prices



The impact of increased energy costs on UK businesses: short-term

- Uncertainty around prices put additional **strict energy contract requirements** to businesses.
- Companies trapped in **fixed-term contracts**

Small business

More than 1m UK small businesses 'trapped in high-cost energy tariffs'

Trade groups say many firms had to renew contracts at market peak in 'biggest mis-selling scandal since PPI'

Source: the guardian

- **Company insolvencies**: **highest** level since September 2009
- **Make UK**: found that **6 in 10 companies** said high energy costs were **threatening** their business.
- As a consequence, 13% of companies had **reduced their hours of operation**, or avoided production at peak hours and 12% had already made **job cuts.**

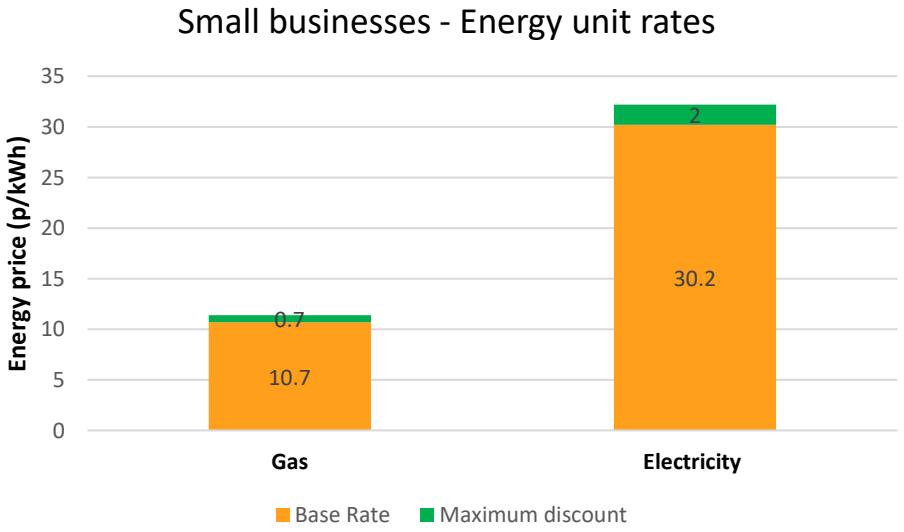
Government response

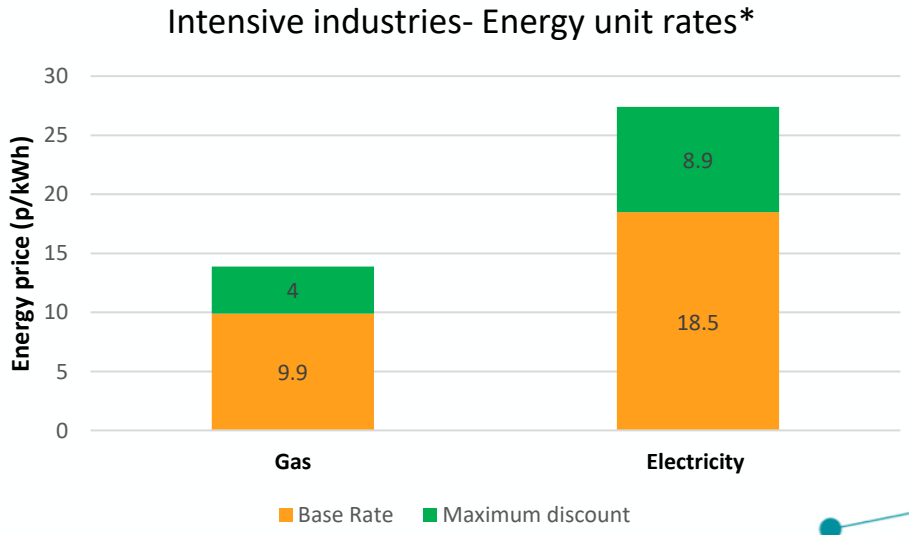
- The government firstly introduced the **Energy Bill Relief Scheme:**

Price cap: gas 7.5 p/kWh **Electricity: 21.1 p/kWh**

Reduction of total energy bills **between 20 and 40%.**

- The government then introduced **Energy Bills Discount Scheme:**





* Discount is on 70% of total energy use only

Long-term impacts

- Emissions pathway: total cumulative industrial emissions would be **155 MtCO2e higher** over the period 2020-2050.

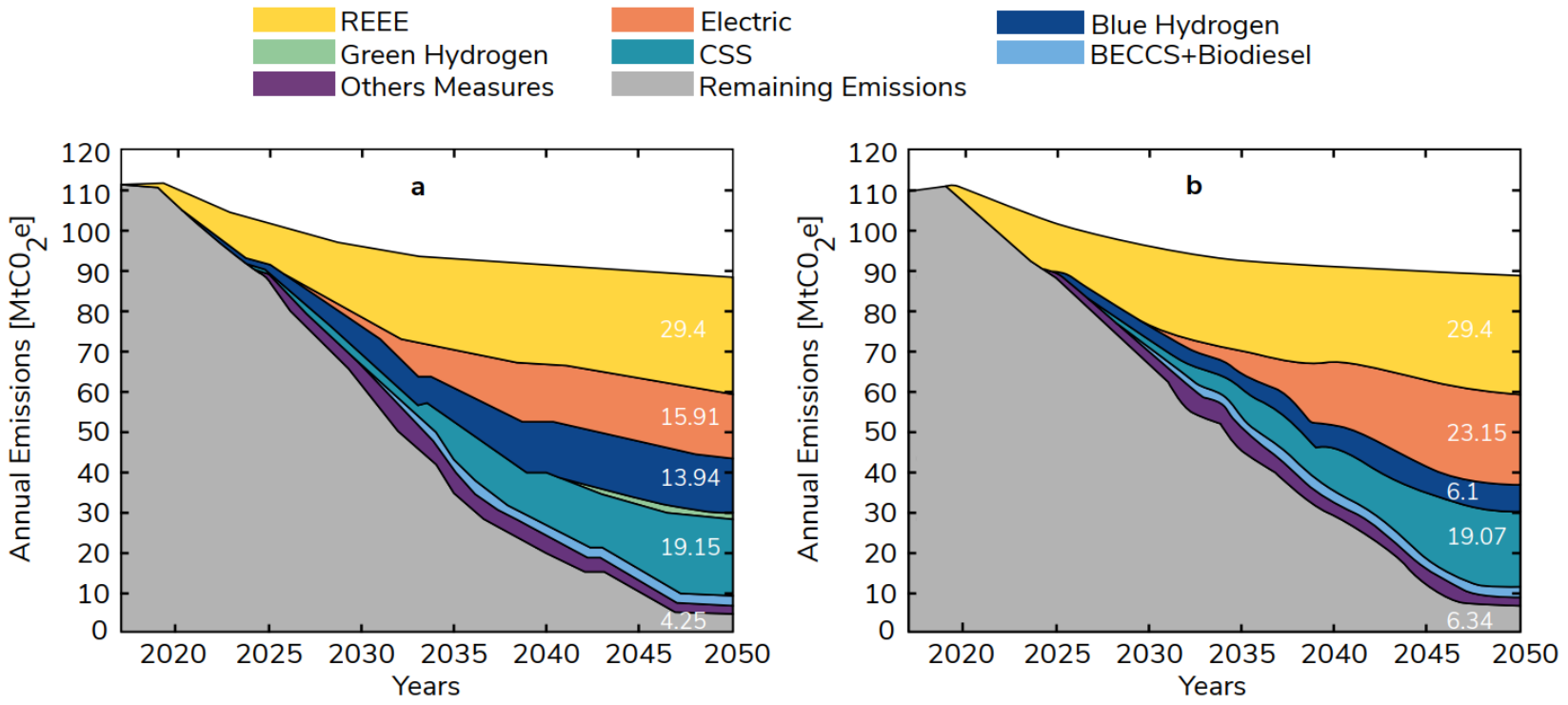


Figure 1 Emission abatement by technology (a) default scenario, (b) high energy cost scenario

Source: Gailani et al. 2022

Long-term impacts

- Investment in decarbonisation technologies: **delay** by at least **five years**
- Industry point out that these high prices are an obstacle to decarbonising industry and may lead to **carbon leakage**
- **Energy affordability and security**

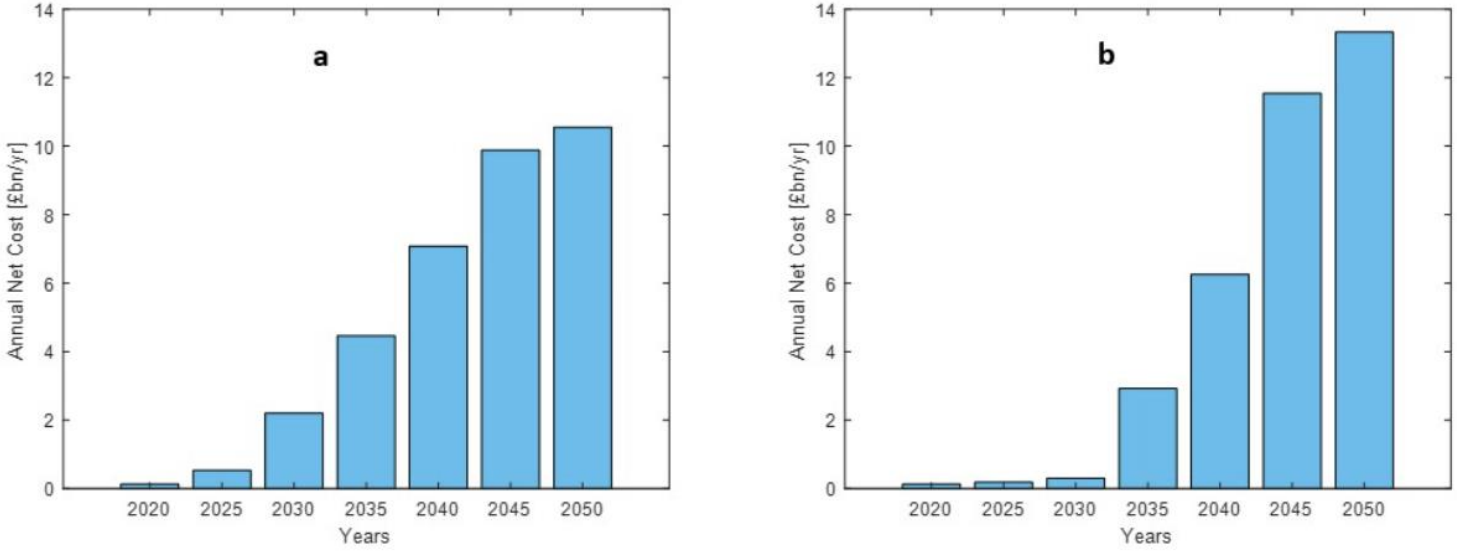
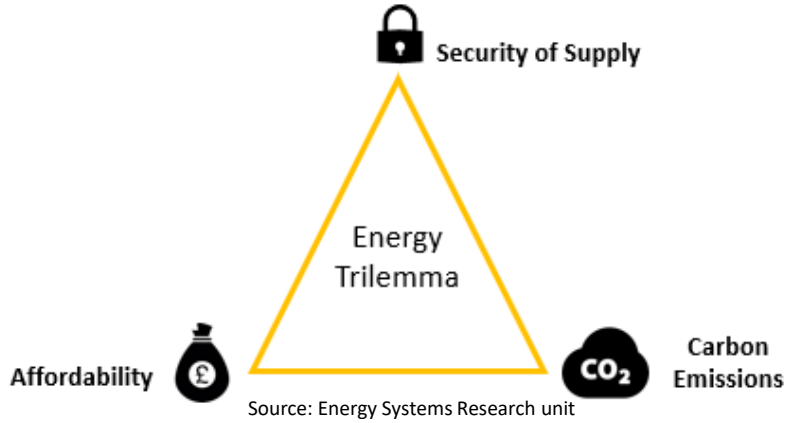


Figure 2 Annual abatement measures net cost (a) default scenario, (b) high energy cost scenario



Source: Energy Systems Research unit

Decarbonisation of dispersed industrial sites

Lack of dedicated funding streams

Diversity makes it difficult for sectors to give a clear message when talking to policymakers

High prevalence of SMEs with limited expertise, capacity and capital to engage with industrial decarbonisation

A lack of institutions tasked with engaging with industrial decarbonisation and capacity not necessarily aligned with industry locations