Decarbonisation Options for the UK Dispersed Industry

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Introduction

- The UK industry is contributing £170 billion annually to the UK economy and providing 2.6 million direct jobs.
- However, the industry sector is responsible for more than 16% of the total UK greenhouse gasses emissions.
- Much of the current policy debate focus on deploying the necessary infrastructure to decarbonise industrial sites located near large clusters (cluster sites).

Dispersed industry sites (those located more than 30 km from a cluster point) emit more than 50% of the total industrial sector emissions and face significant decarbonisation risks compared to cluster sites due to the high costs and availability of the decarbonisation infrastructure. This poster gives the current decarbonisation options for the UK dispersed sites along with their enablers and barriers.

Methods

1- Use NZIP model defined processes for the sector as a baseline

N-ZIP model			
Sector	Process	Decarbonisatio Technology/Option	Category
Cement	Biomass Process	BECCS 1 - Advanced amines or blends	CCS
Cement	Biomass Process	BECCS 1 - Calcium Looping	CCS
Cement	Kiln - Cement	BECCS 2 - Advanced amines or blends	BECCS
Cement	Kiln - Cement	BECCS 2 - Calcium Looping	BECCS
Cement	Kiln - Cement	Biomass Kiln - Cement	Bio
Cement	Kiln - Cement	Blue H2 Kiln	H2
Cement	Kiln - Cement	Green H2 Kiln	H2
Cement	Kiln - Cement	Plasma Gas Technology	Electric
Cement	Process CO2 - Cement	CCS - Advanced amines or blends	CCS
Cement	Process CO2 - Cement	CCS - Calcium looping	CCS

2- Improve the process representation and search for decarbonisation options

Results

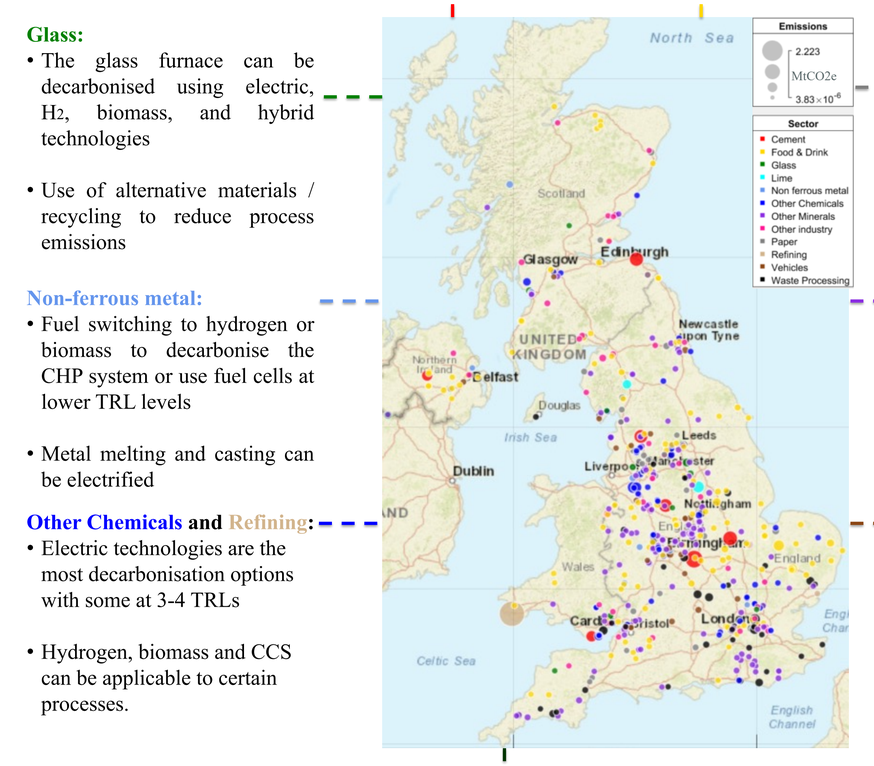
Cement and Lime:
- Kiln fuel switching (Elec, H2, biomass)
- Novel CCS for process emissions

Food & Drink:
- Demand side: change to electric alternatives (direct and indirect heating)
- Generation side: boilers and CHP fuel switching (Elec, Biomass, H_2) and Heat Pump

Glass:
- The glass furnace can be decarbonised using electric, H_2, biomass, and hybrid technologies
- Use of alternative materials / recycling to reduce process emissions

Non-ferrous metal:
- Fuel switching to hydrogen or biomass to decarbonise the CHP system or use fuel cells at lower TRL levels
- Metal melting and casting can be electrified

Other Chemicals and Refining:
- Electric technologies are the most decarbonisation options with some at 3-4 TRLs
- Hydrogen, biomass and CCS can be applicable to certain processes.



Paper:
- Electric technologies are available (boilers)
- Fuel switching to biomass for the CHP
- Some novel technologies exists such as compressions refining and air-laid technology
- Microwave paper drying at low TRL level

Other Minerals:
- Electric, H_2, Green gas, and other options (process change, etc) but at low TRL levels
- Ceramics sector is hard to decarbonise

Vehicles:
- Decarbonising gas-equipment (CHP and boiler) with any of the options: biomass, H_2, and electricity
- Novel curing technologies exists such as infrared curing for some processes

Waste Processing:
- Waste gasification techniques (produce H_2)
- CCS is a must

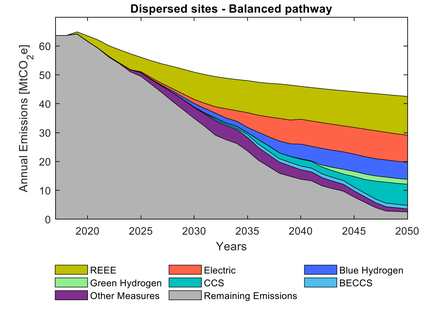
Dispersed sites UK map with the main decarbonisation options for each sector

Decarbonisation Challenges

- Many options at low TRL level
- Dispersed sites decarbonisation is dependent on electricity cost and the availability/investment of connection capacity
- CCS may not be economically viable for many dispersed sites

Future work

- Develop the N-ZIP model to create decarbonisation pathways for the UK dispersed industry



Current decarbonisation pathway using N-ZIP model (developed by Element Energy)

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