

From Technologies to Feasibility: Decarbonising Dispersed High-Energy Industrial Sites



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CENTRAL CLAIM



Dispersed industrial sites need decarbonisation decisions that start from process demand and infrastructure constraints — not from technology lists alone.

1 The Challenge

Same net-zero target. Different starting point.

Cluster decarbonisation often assumes shared hydrogen, CO₂ and grid infrastructure; many dispersed sites lack local access to these networks.

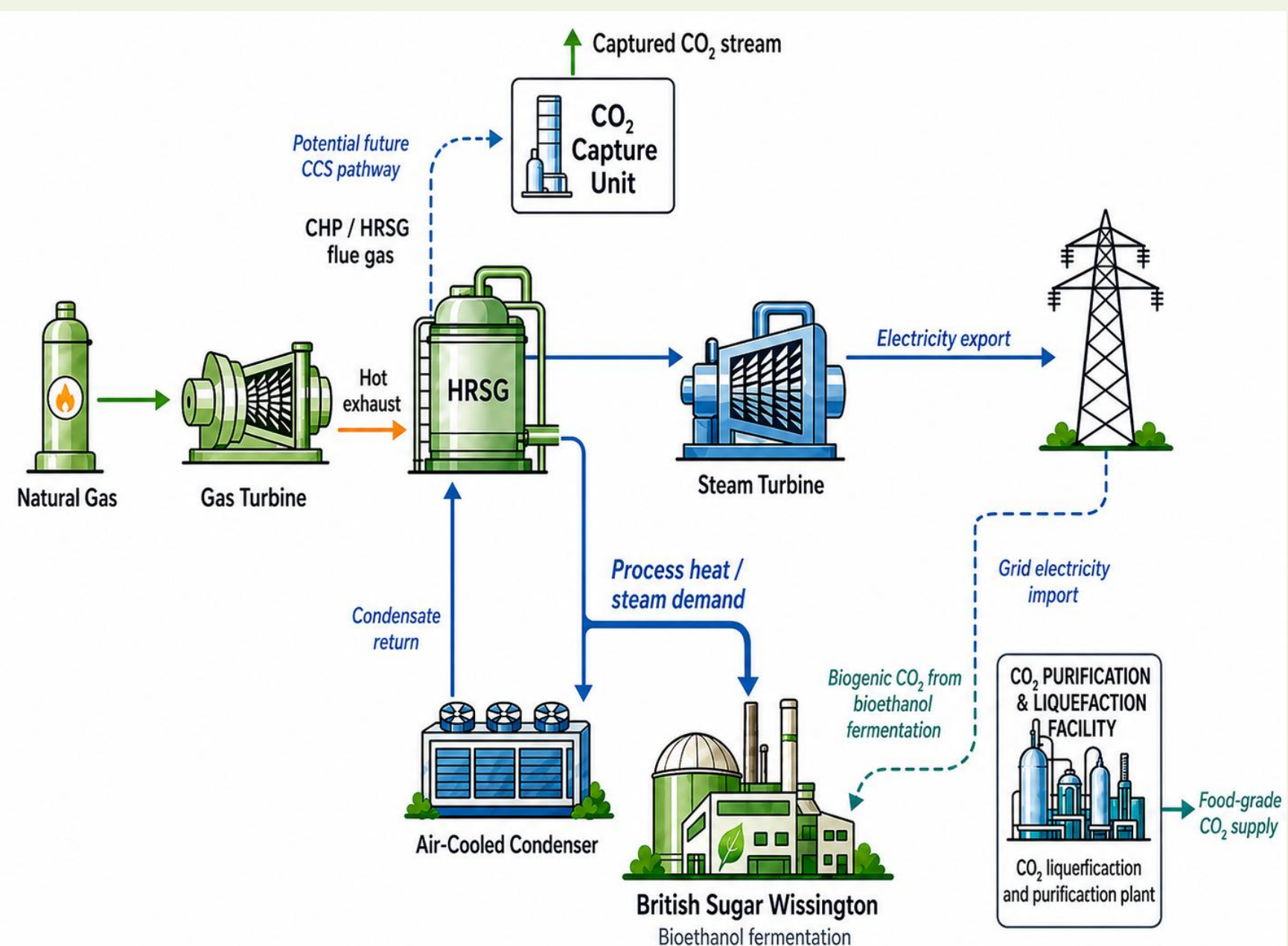
- Infrastructure access becomes a boundary condition**
- On-site heat demand shapes the pathway space**
- Grid capacity, seasonality and operations affect feasibility**

Research gap

Pathway studies often optimise cost and emissions while treating site constraints as secondary.

2 Case Lens: British Sugar

A representative dispersed, high-energy site with complex heat, power and CO₂ interactions.



Why this case matters

- ✓ CHP-based heat and power system
- ✓ High and continuous heat demand
- ✓ Medium-high temperature process requirements
- ✓ CO₂ present; H₂ and CCS routes remain infrastructure-dependent

Key Takeaway

British Sugar represents a broader class of dispersed, high-energy industrial sites.

3 Decision Lens

The key question shifts from 'which technology is cheapest?' to 'which pathway is feasible here?'

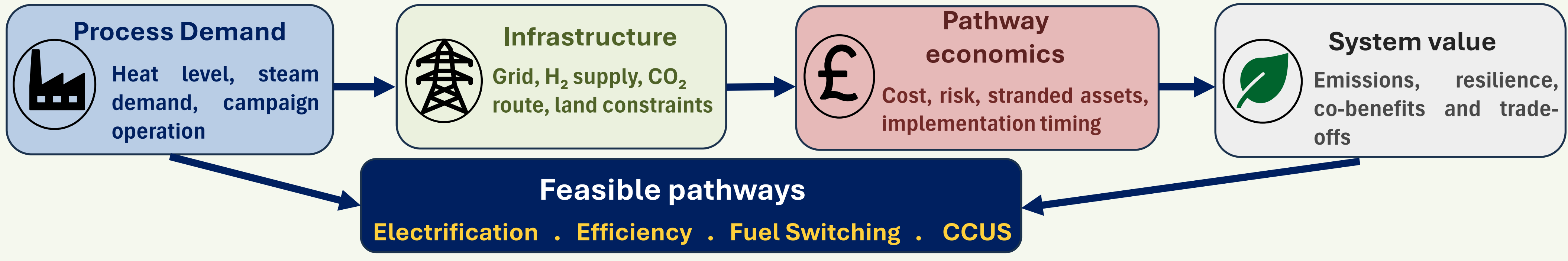
Key Feasibility Constraints to Include in the Model

- Infrastructure availability:** grid, hydrogen, CO₂ networks
- Process integration:** heat levels, steam balance, operational windows
- System Value:** emissions, cost, risk, resilience and co-benefits

Research Contribution

A whole-system decision-support framework for dispersed high-energy industrial sites

4 Whole-system Framework



The analysis connects technology performance to site-specific constraints, so options are assessed as pathways within an operating system

KEY MESSAGES FOR DISCUSSION

Infrastructure decides the feasible set
A route that works in a cluster may fail at a dispersed site.

Process demand explains emissions
CHP emissions are driven by heat and steam needs.

Decision support must be site-specific
The framework links emissions, cost, operations, risk and value.