HOISTED BY THEIR OWN PETARD

How "Carbon Prejudice" Against Natural Gas Undermines Decarbonization Goals

"For 'tis the sport to have the enginer
Hoist with his own petard"

— Shakespeare, Hamlet (Act 3, Scene 4)

Defining the Problem

Carbon Prejudice (n.)

Unjustified bias against an energy technology based on its molecular structure (e.g., CH_4) rather than *comprehensive lifecycle analysis, system efficiency, and contextual appropriateness.*

THE PREJUDICE

Natural gas (or even *Bio-Methane*) CHP/CCHP systems rejected purely because they use methane, despite superior outcomes

THE EVIDENCE

Manchester analysis shows CHP can deliver lower emissions, higher efficiency, and better resilience than heat pumps

Prejudice based on ignorance leads to worse climate outcomes

Their "Only Hope" Defence

THE COUNTERARGUMENT

"But the UK grid now has 40-45% renewables! Grid carbon intensity has fallen to ~170 gCO_2/kWh average. Heat pumps are now cleaner!"

Heat Pump (Annual Average Grid)

~68 gCO_2/kWh

170 gCO_2/kWh ÷ COP 2.5 (summer-winter - realistic average)

CHP/CCHP (Gas Direct)

~80-120 gCO_2/kWh

Net, after electrical generation credit

⚠ Their argument has ***some*** merit... but ignores a critical flaw

Based on 2024 UK grid data: ~40-45% renewables contribution, ~170 gCO_2/kWh annual average intensity

The Killer Blow: Winter Evening Reality

THE CRITICAL QUESTION

What's powering your heat pump at 6pm on a January evening in Manchester, when you actually NEED heating?

WIND	SOLAR	NUCLEAR	GAS CCGT
Variable	ZERO	Baseload	394 gCO_2
Low during high-pressure cold snaps	Sunset ~4pm in winter	Already running, can't ramp	FILLS THE GAP

MARGINAL CARBON INTENSITY: WINTER EVENING PEAK (4PM-10PM)

Heat Pump (MARGINAL GRID)

158-197 gCO_2/kWh

394 ÷ COP 2.0-2.5 (winter-degraded)

CHP/CCHP (GAS DIRECT)

80-120 gCO_2/kWh

Net, winter-peak efficiency 90-95%

Peak demand 4-10pm weekdays in winter. CCGT marginal intensity: 394 gCO_2/kWh. Sources: NESO Carbon Intensity data 2024

Hoisted By Their Own Petard

The Devastating Irony

Heat pumps during winter peaks are (effectively) gas-powered (via CCGT at 394 gCO_2/kWh) but with three conversion losses and degraded COP of 2.0-2.5. **Meanwhile, CHP operates at peak efficiency (90-95%).**

✗ HEAT PUMP REALITY

Gas → Power Station → Grid Losses → Heat Pump → **158-197 gCO_2/kWh**

✓ CHP/CCHP REALITY

Gas → On-site heat + electricity → **80-120 gCO_2/kWh**

THE DOUBLE WHAMMY

Heat pumps get WORSE in winter (lower COP) while CHP gets BETTER (peak efficiency). Yet, still, they promote the inferior technology!

Their "carbon prejudice" is mathematically counterproductive

Analysis: Manchester heating demand, winter 2024-25. Based on UK grid marginal intensity during peak heating hours.