

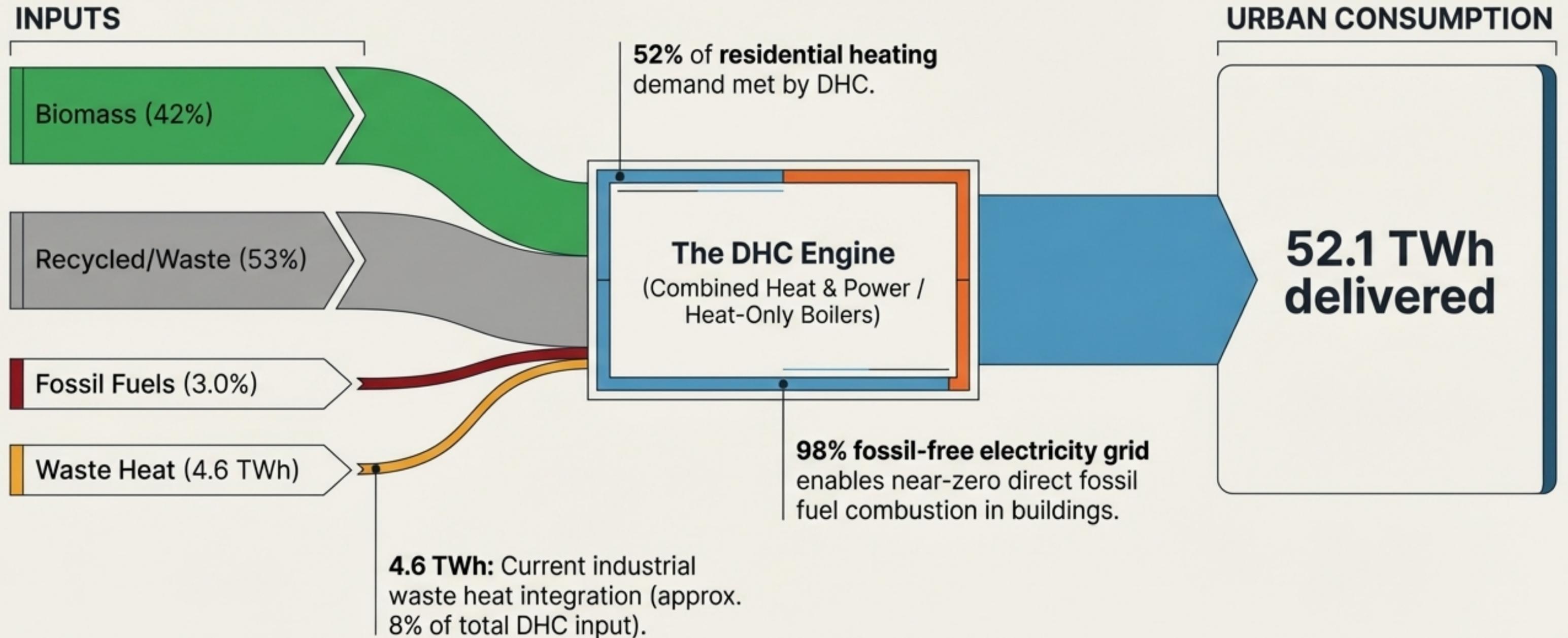
The 170 TWh Reserve: Reframing Sweden's Thermal Topography

A quantitative analysis of industrial waste heat and the strategic mandate for a circular national energy system.

110-170 TWh

The projected annual thermal surplus from Sweden's green industrial transition.

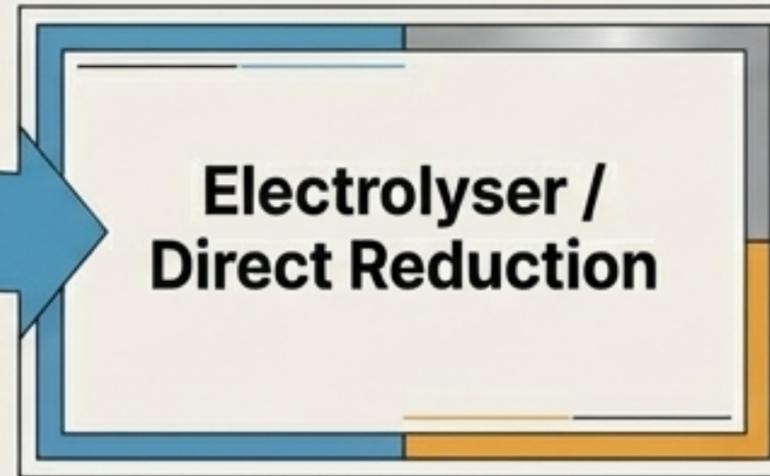
The Current Baseline: A World-Leading System Awaiting Its Final Evolution



The Hydrogen Engine: Why Decarbonising Industry Creates a Thermal Surge

Massive Clean Electricity

Inter
(e.g., LKAB mining
operations alone require
up to 55 TWh annually)



Fossil-Free Steel

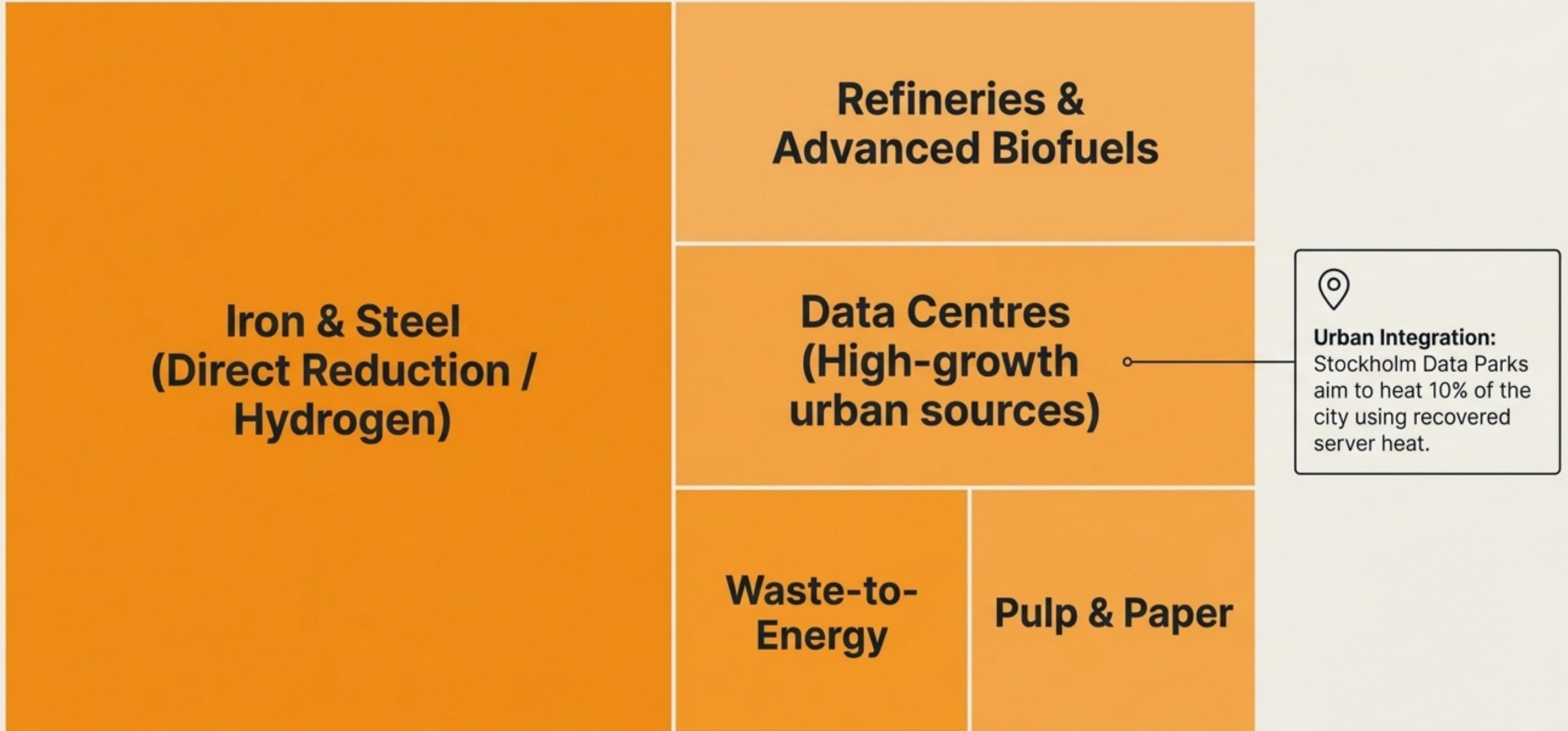
**Continuous High-Grade
Thermal Byproduct**

The transition from blast furnaces to green hydrogen is an electrochemical process. The byproduct of immense new electricity consumption is an equally immense, continuous wave of zero-carbon waste heat.

Mapping the Paradigm Shift: Two Scenarios of Supply

Scenario A: Existing Industrial Base	Scenario B: Future Green Transition
Volume: 10-25 TWh/year	Volume: <u>110-170 TWh/year</u>
Key Drivers: Traditional Refineries, Pulp & Paper	Key Drivers: Fossil-free Iron & Steel, Electrofuels, Data Centres
Nature of Source: Incremental, scavenged byproducts from legacy infrastructure.	Nature of Source: Core, continuous, massive outputs tied directly to national decarbonisation.
Strategic Paradigm: A supplementary efficiency measure.	Strategic Paradigm: A foundational national energy resource.

The Anatomy of the 170 TWh Surplus



The Quantitative Showdown: Supply vs. National Demand



The future potential of industrial waste heat is sufficient to cover Sweden's entire current district heating delivery 2 to 3 times over. The strategic surplus ranges from +57.9 to +117.9 TWh.

Evolving the System Architecture: Combustion vs. Recovery

Current State: Combustion Model



Future State: Recovery Model



Strategic Outcome: Transitioning the DHC system to a recovery baseline eliminates the final 3% of fossil fuel peak-load use and fundamentally upgrades national resource efficiency.

The Circular Symbiosis: Unlocking Higher-Value Bio-Economies

Green Industry
Electrifying industry generates massive zero-carbon waste heat.



Advanced Aviation/Chemicals

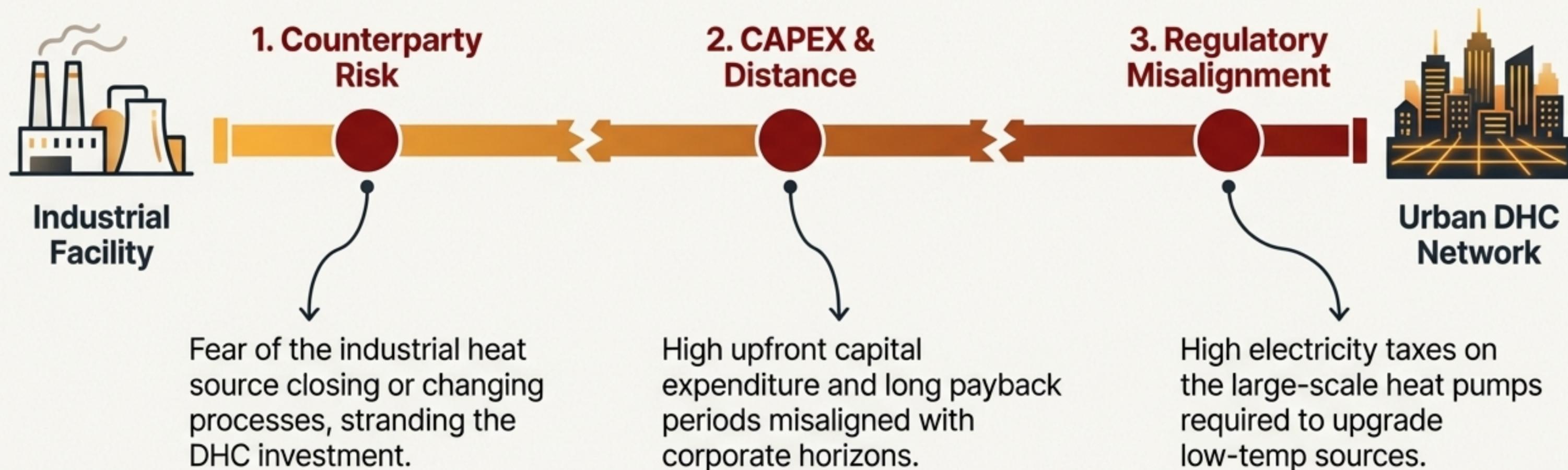
The freed 42% biomass is redirected to sectors lacking zero-carbon alternatives (e.g., aviation biofuels, sustainable chemicals).

Urban Heating

Waste heat entirely covers urban DHC demand, displacing currently combusted biomass.

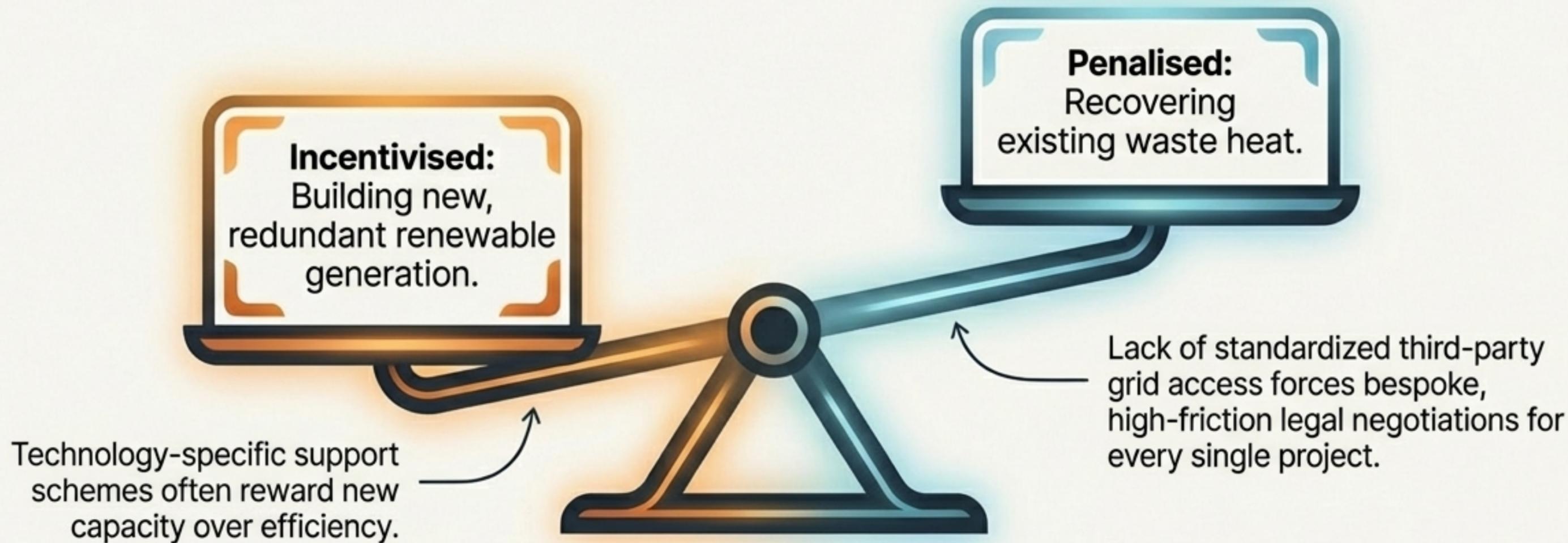
Investing in green steel simultaneously secures zero-carbon city heating. This is not just energy substitution; it is a macroeconomic resource reallocation.

The Anatomy of a Stranded Asset: Where the System Breaks



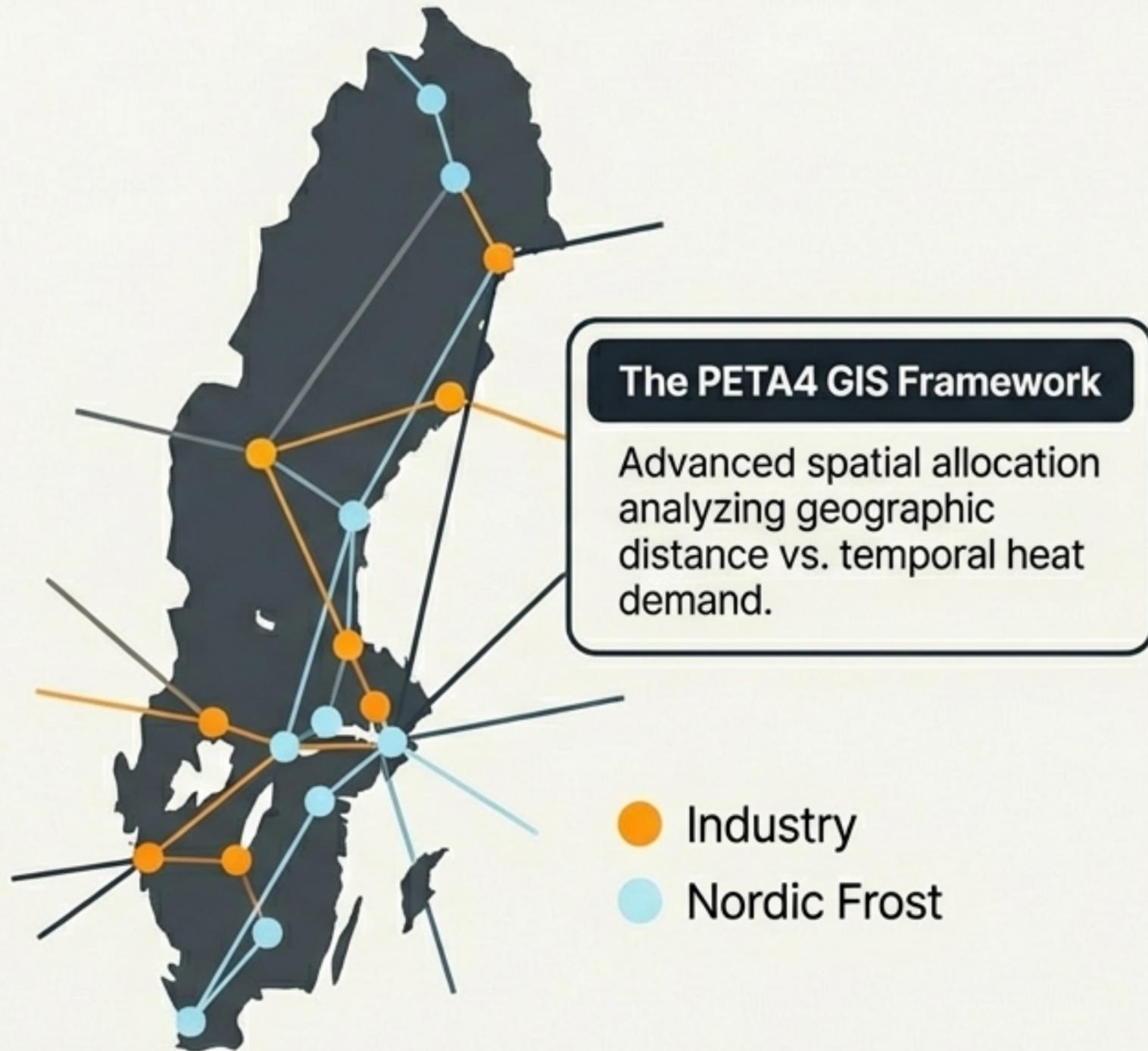
Despite a 3x surplus, systemic friction at the contracting, capital, and tax levels prevents the pipeline from being built.

The Regulatory Disconnect: Penalising Efficiency



Current frameworks support specific technologies rather than optimal carbon and efficiency outcomes.
Without standardisation, transaction costs kill viable recovery projects.

The Spatial Mandate: Co-Locating Supply and Demand



Actionable Recommendation: National Spatial Planning Strategy



Point 1: Establish a National Waste Heat Atlas.



Point 2: Mandate strategic co-location. Future energy-intensive green industries must be planned in geographic proximity to viable DHC network sinks.

The Strategic Mandate: Forging a Circular Thermal Economy



De-Risk the Capital

Deploy national financial instruments and public-private partnerships to underwrite counterparty risk and bridge CAPEX gaps for transmission pipelines.



Reform Market Rules

Implement standardized third-party access to DHC networks and eliminate tax penalties on heat pumps used for sector integration.



Mandate Symbiosis

Integrate urban spatial planning directly with green industrial zoning via a National Waste Heat Atlas.

Sweden's green industrial transition is already underway. The choice is whether to vent 170 TWh of energy into the atmosphere, or capture it to build the world's first fully circular thermal economy.