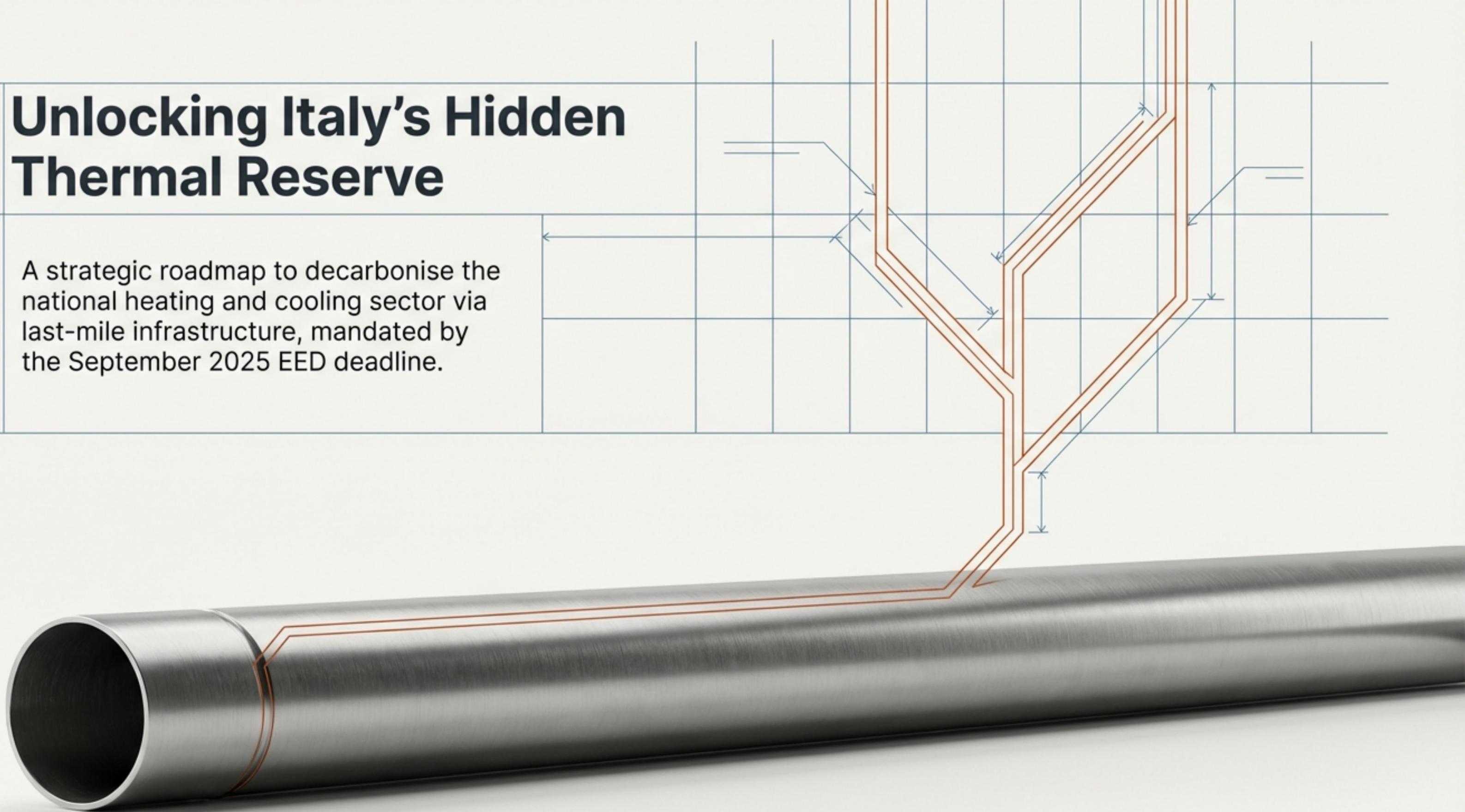


Unlocking Italy's Hidden Thermal Reserve

A strategic roadmap to decarbonise the national heating and cooling sector via last-mile infrastructure, mandated by the September 2025 EED deadline.



A System Weighed Down by Fossil Dependence

Italy's thermal energy system is structurally locked into imported combustion. Modern collective infrastructure—District Heating—supplies a mere 3.3% of total heating demand, leaving the nation vulnerable to price shocks and carbon penalties.



The September 2025 Regulatory Catalyst

The EU Recast Energy Efficiency Directive (Article 25.6) legally mandates heating and cooling plans for municipalities over 45,000 inhabitants. This transforms local energy planning from a fragmented, voluntary exercise into a coordinated national infrastructure obligation.

**September 2025
Deadline**



A Domestic Resource Smashing National Targets

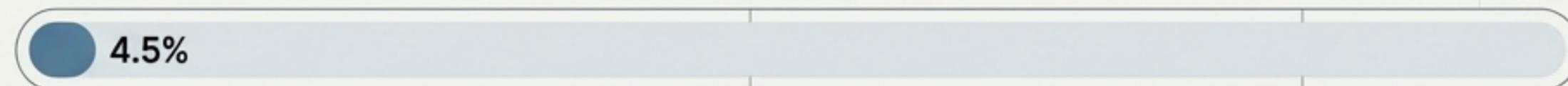
Italy possesses 18.1 PJ/a of technically recoverable industrial waste heat at $\geq 95^{\circ}\text{C}$. This indigenous asset can more than double the national expansion target without requiring a single new large-scale combustion plant.

Thermal Resource Benchmark Matrix

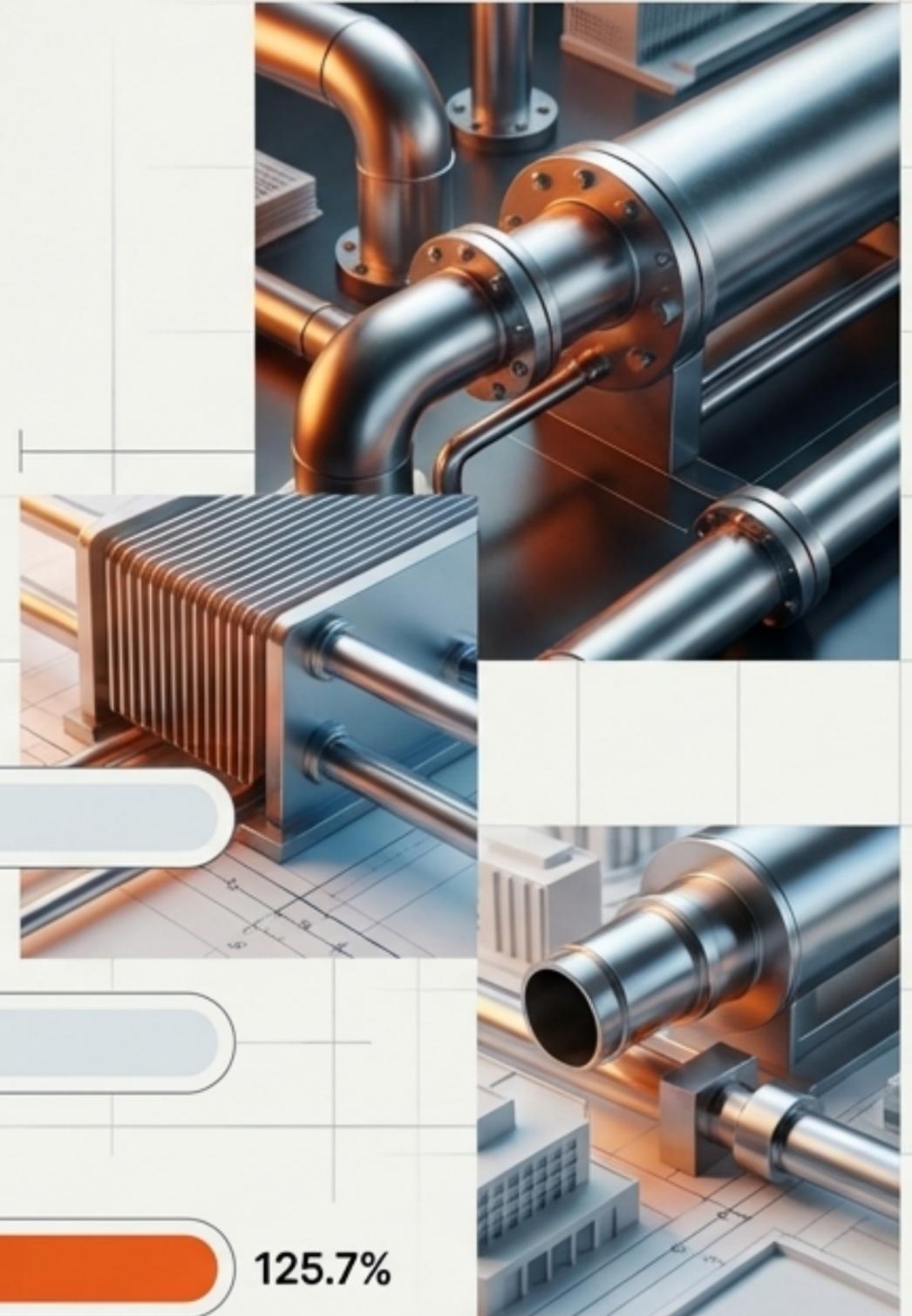
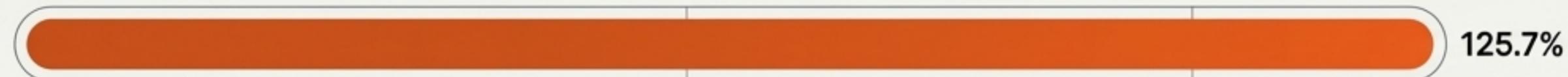
Waste Heat vs. Total Current DH Supply (35.02 PJ/a)



Waste Heat vs. Total Residential Demand (400.95 PJ/a)

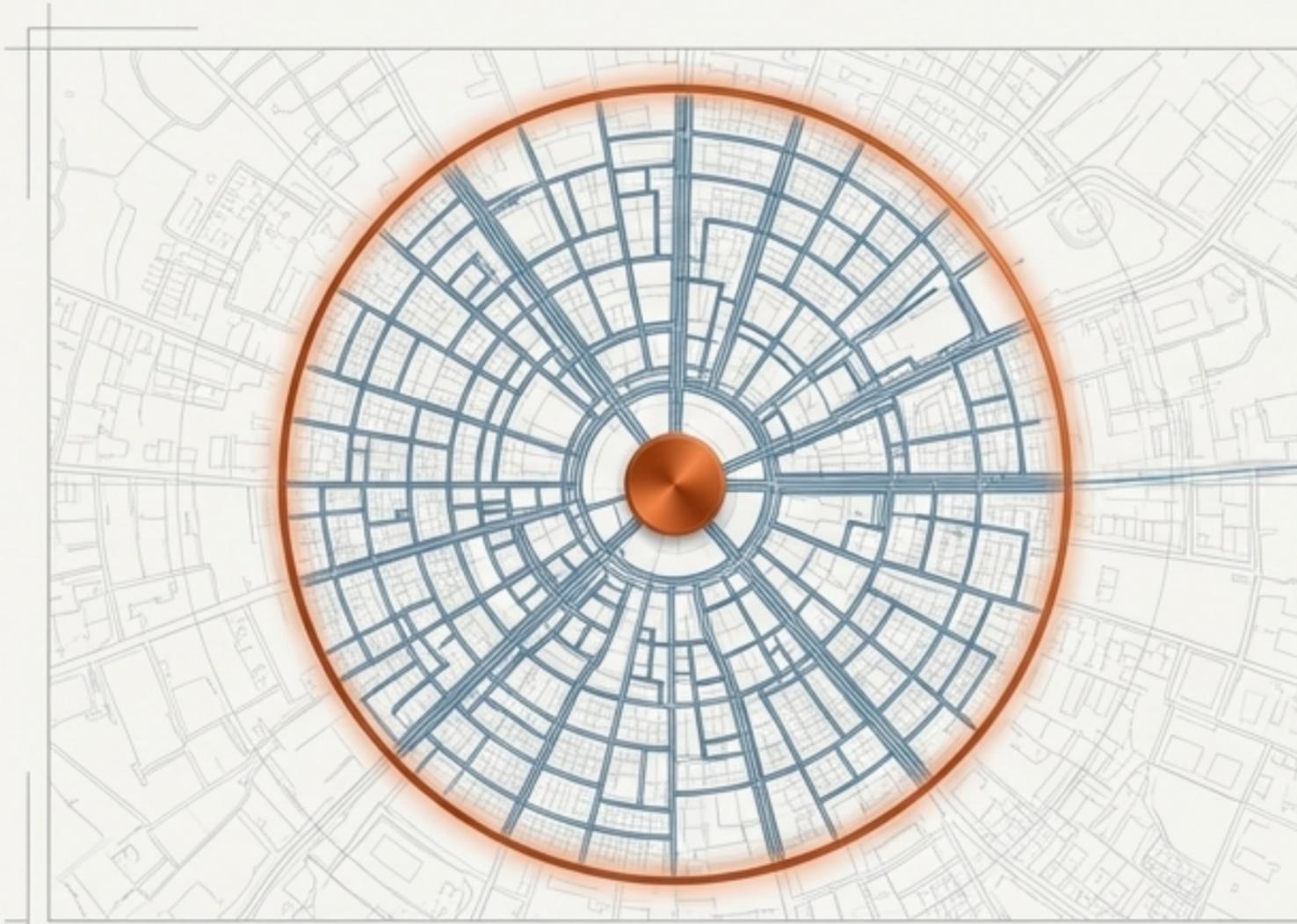


Waste Heat vs. National PNIEC Expansion Target (14.4 PJ/a)

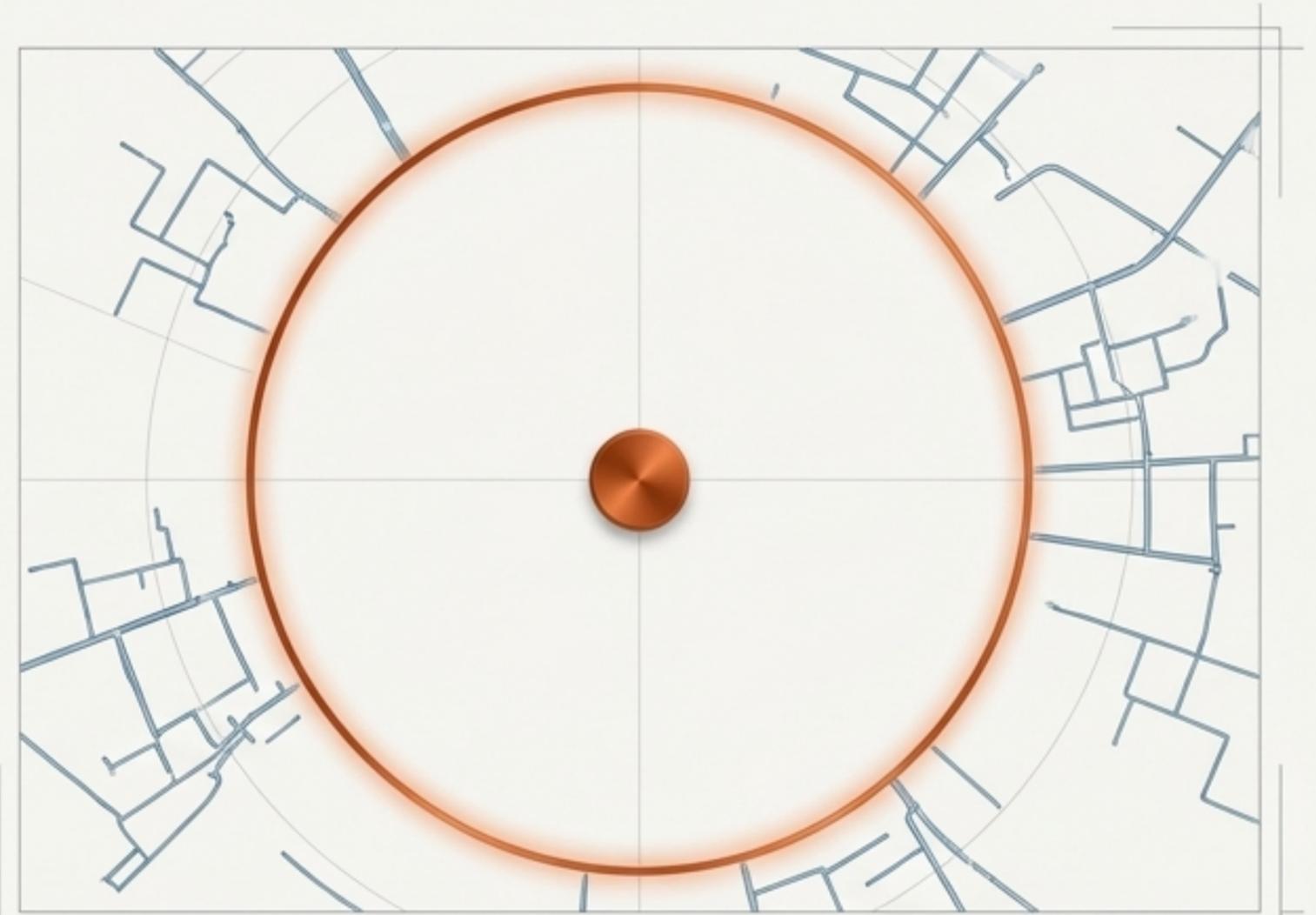


The Geographic Trap Surrounding Industrial Heat

The heat is exactly where it needs to be, but the pipes are not. Over 99% of high-grade waste heat sits within a 10km radius of viable urban demand, yet less than 5% is accessible by existing networks.



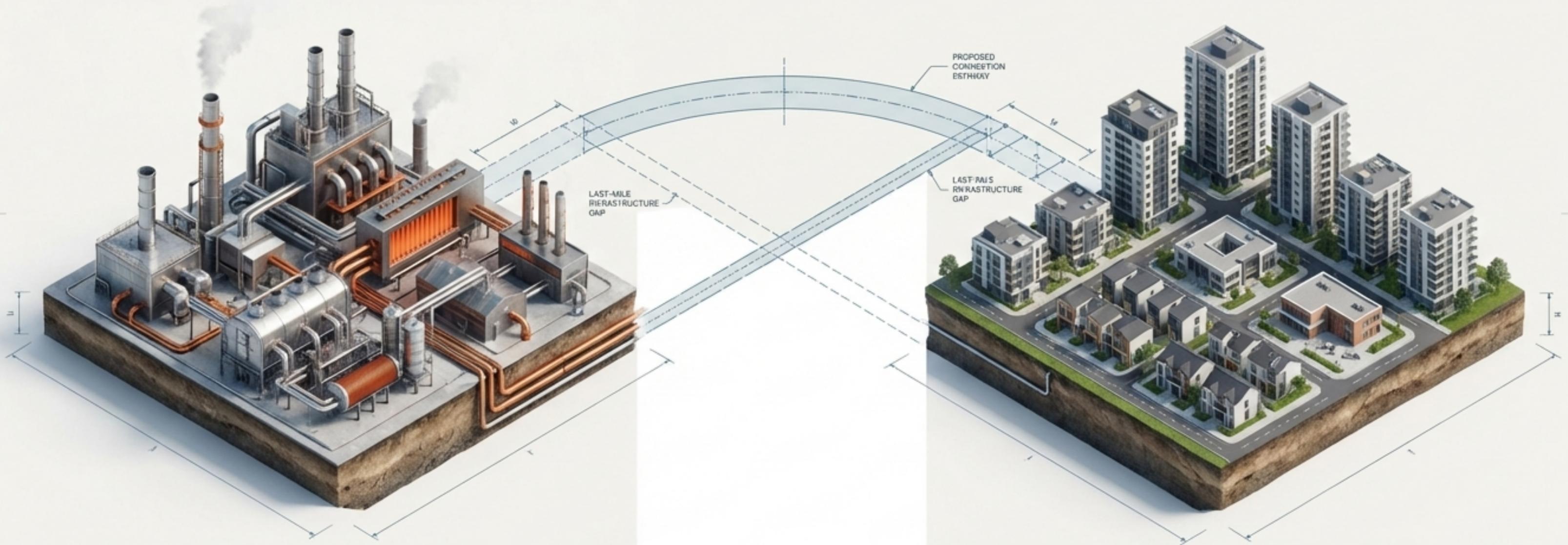
Potential near Expected DH Areas
Over 99% Match



Potential near Actual DH Areas
Under 5% Match

Bridging the Last-Mile Infrastructure Void

The primary barrier to decarbonisation is not a lack of green technology, but a deficit of connective logistics. Capital must be urgently deployed to bridge the physical gap between factory gates and building radiators.



Escaping the Policy-Infrastructure Lock-in

Fragmented policies create unstable subsidy environments, forcing capital toward the perceived safe choice of imported gas. Breaking this cycle requires levelling the **financial** playing field for capital-intensive thermal networks.

Decentralised Gas System

Policy path of least resistance

High consumer operating costs

Carbon-heavy emissions profile

Highly import-dependent

4th Generation DHC System

High upfront capital expenditure

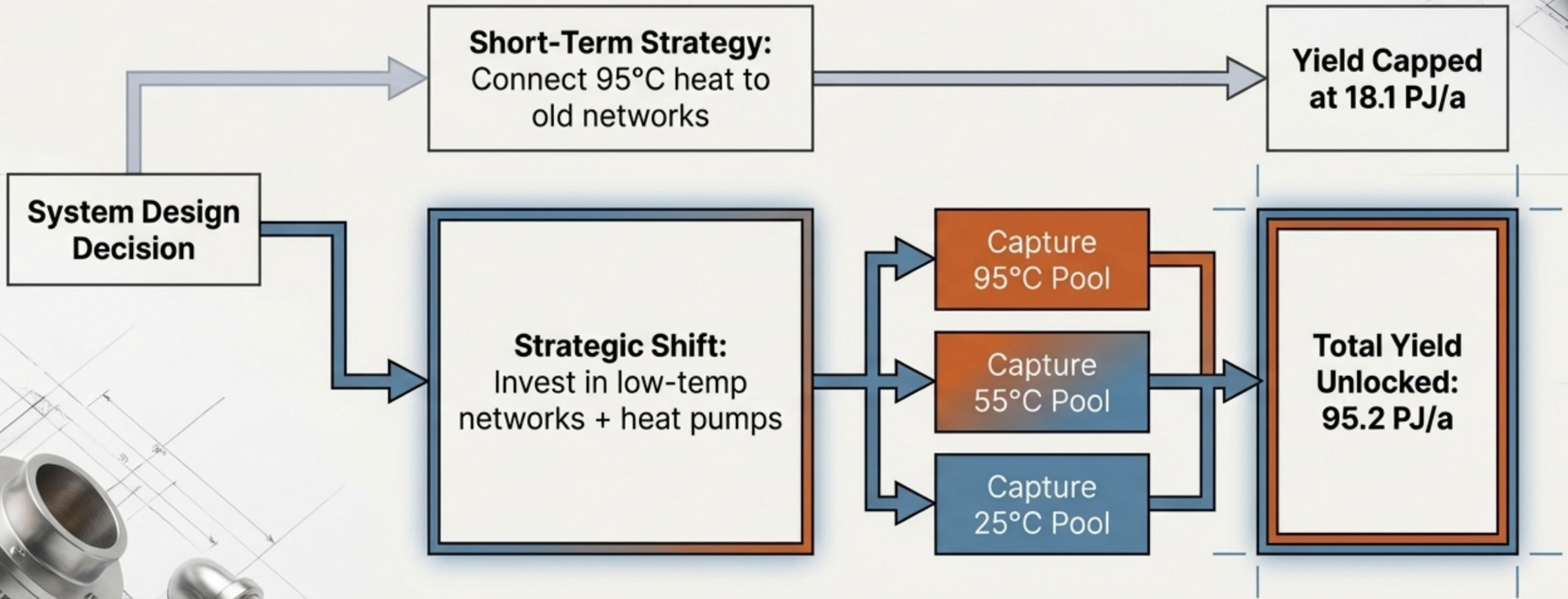
Minimal operating costs

Zero-carbon infrastructure

Utilises indigenous domestic resource

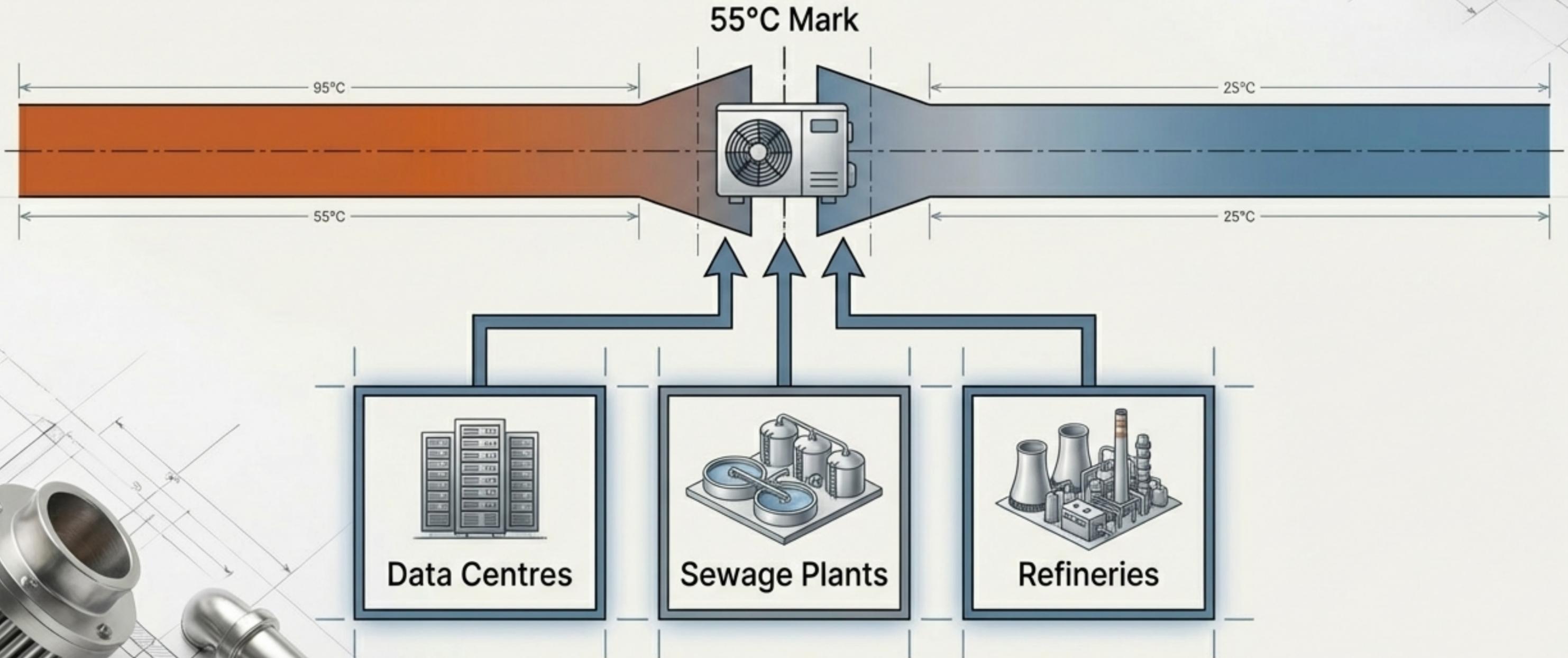
Resolving the Temperature Paradox

Aiming exclusively for the highest-grade heat limits total energy yield. Mandating low-temperature networks requires higher initial investment but future-proofs the system to absorb vastly larger pools of lower-grade waste heat.



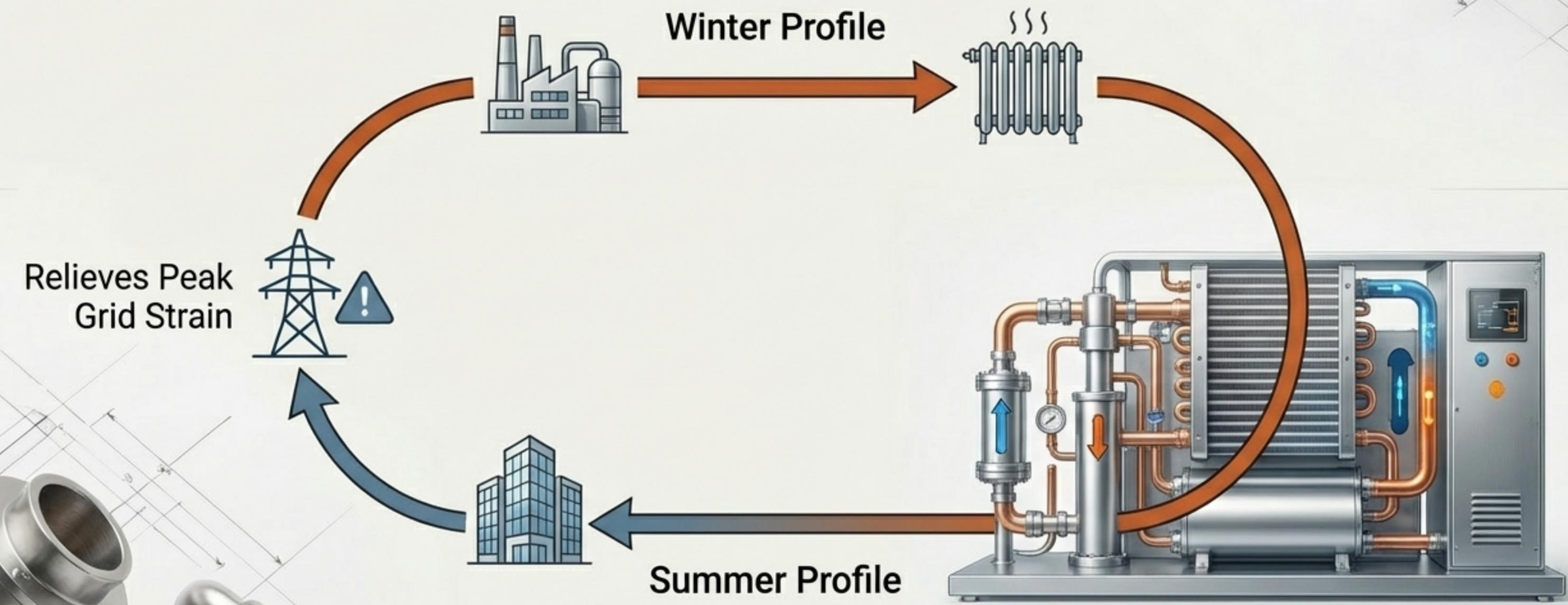
Future-Proofing with Fourth Generation Networks

Dropping network transit temperatures to 50-70°C drastically reduces thermal loss. Combined with large-scale electric heat pumps, the network can upgrade and integrate diverse, low-grade ambient energy sources alongside industrial heat.



Eliminating the Strategic Cooling Blind Spot

Industrial heat generation is year-round. Integrating District Cooling via absorption chillers transforms a summer disposal problem into a zero-carbon solution for peak electricity grid strain.



Phase One Requires Legislative and Financial Stability

01

Comprehensive EED Transposition

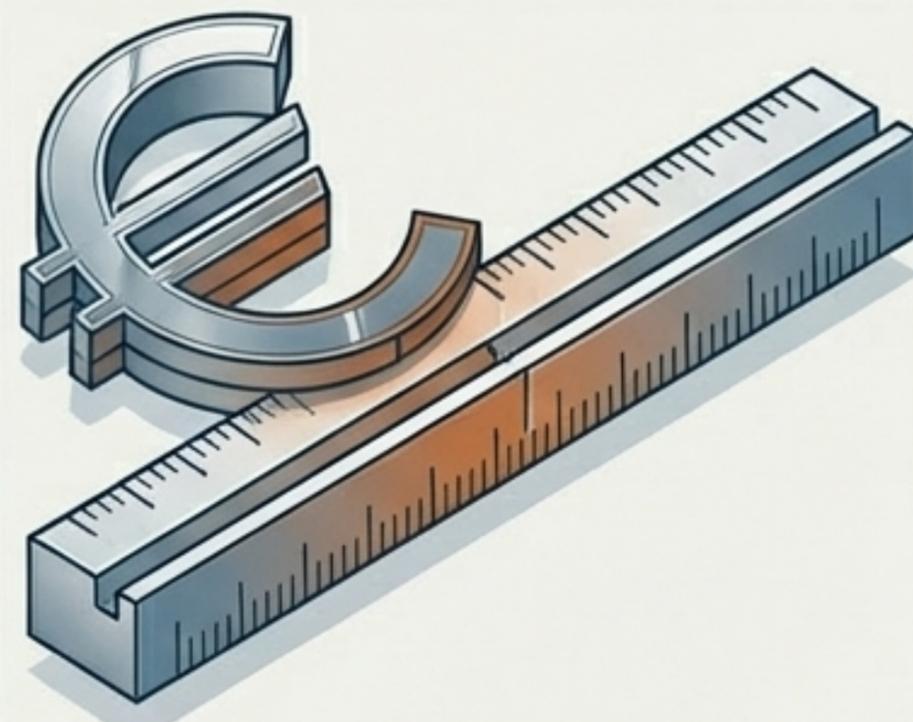
Move beyond mere legal compliance. Mandate standardised methodology and compel utility operators to share granular spatial data with local authorities.



02

Long-Term Financial Support

Replace unstable certificates with durable, government-backed low-interest loans and capital grants, paired with effective carbon pricing to level the economic playing field.



Phase Two Directs Capital to Geographic Synergies

03

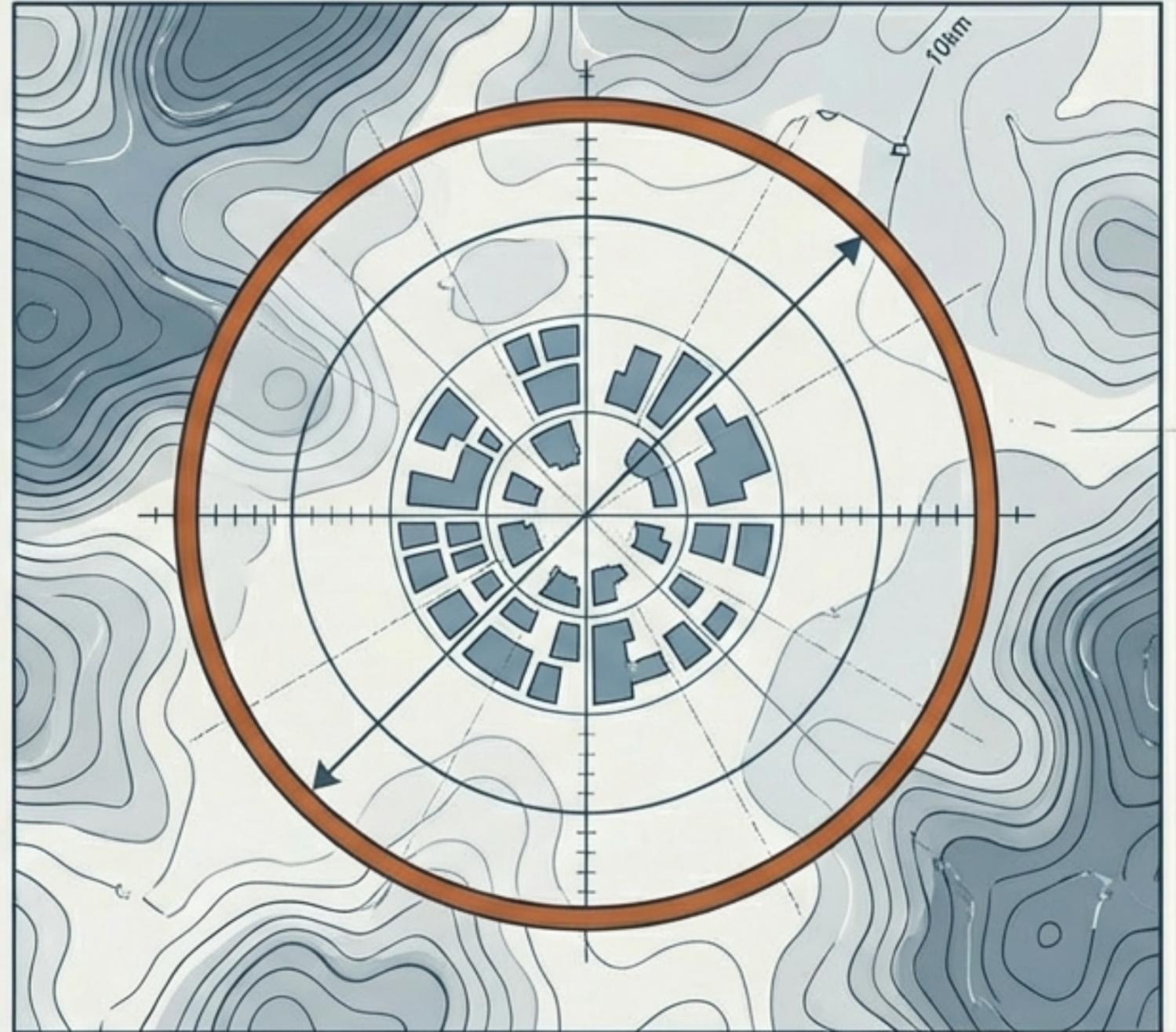
PETA-4 Guided Expansion

Launch a national co-financing programme aggressively targeting the heat synergy regions where industrial sources sit within 10km of viable urban demand.

04

Mandate Low-Temperature Design

Ensure all nationally funded expansions utilise 4th Generation network standards to maximise the long-term capture of low-grade thermal resources.



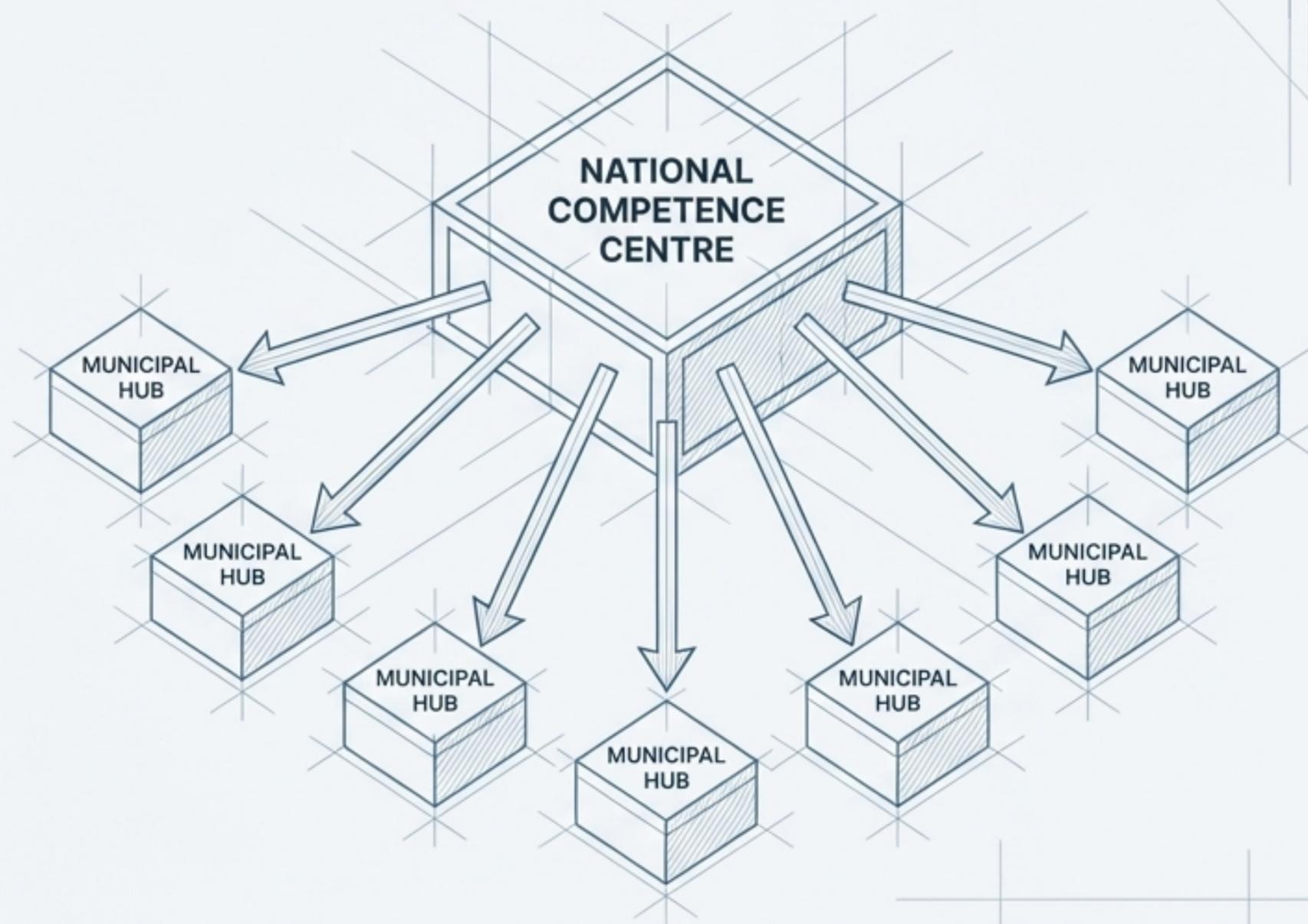
Phase Three Empowers Local Execution

05 Establish a National Competence Centre

Centralise open-access geodata platforms and technical expertise, equipping local planners with the tools to map their building stock and energy consumption accurately.

06 Integrated Cooling Strategy

Formally recognise cooling demand as an energy security risk, requiring municipal plans to evaluate combined DHC systems for year-round resilience.



The Mandate for Physical Infrastructure

The September 2025 EED deadline is a final window to abandon **fragmented, imported gas dependency**. Success will **not be measured** by the quantity of municipal paper plans generated, but by the kilometres of last-mile thermal pipe deployed to capture Italy's wasted indigenous energy.