

The Untapped Kilowatt

A Strategic Blueprint for Decarbonising Romania's Heating Sector Through Industrial Symbiosis



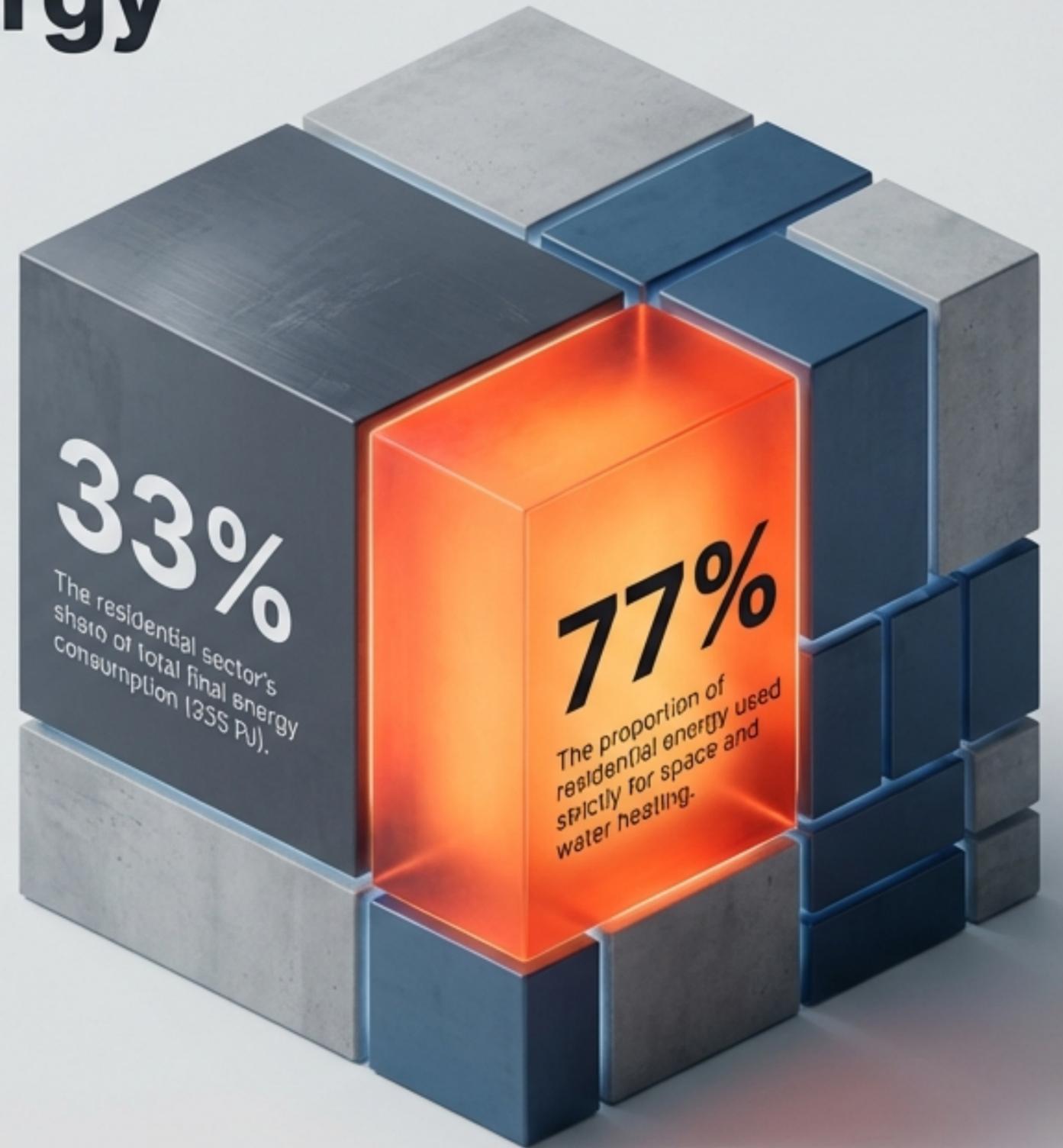
Navigating the EU 2025 Mandate & Unlocking 21.9 PJ of Circular Energy

Romania's Primary Energy Challenge is Thermal

Heating and cooling represent the largest segment of energy end-use in Romania.

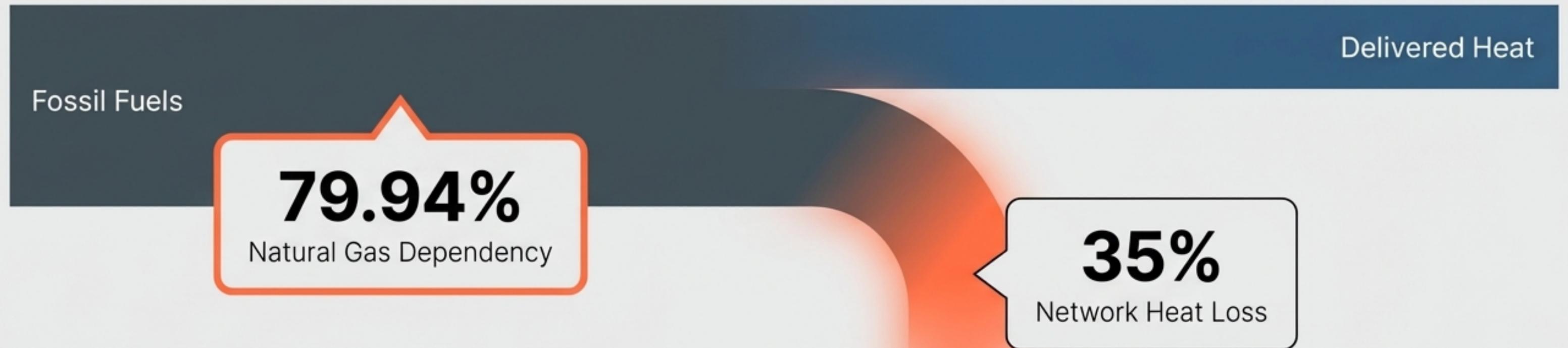
Any meaningful decarbonisation strategy must prioritise the heating sector.

Currently, this massive demand relies heavily on a fragmented mix of inefficient solid biomass (accounting for 48% of residential heating) and imported natural gas.



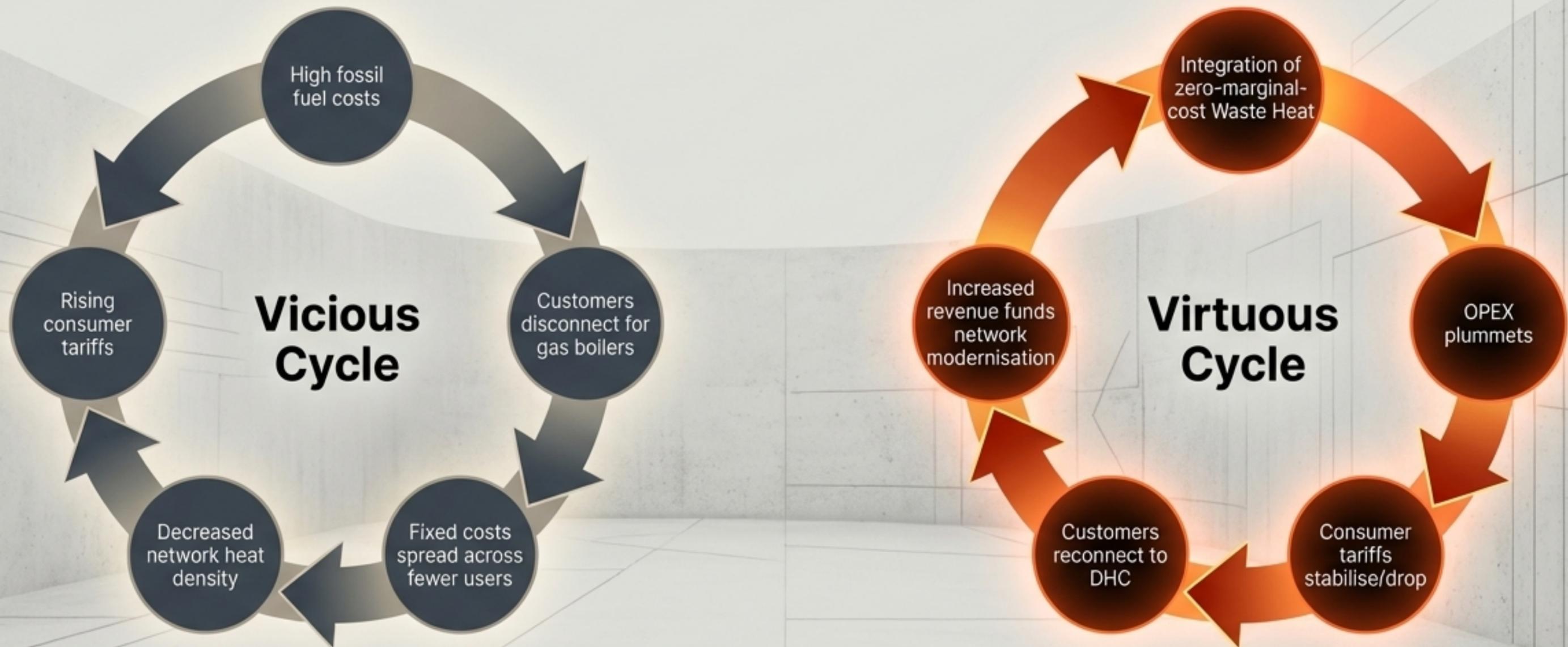
The Anatomy of Legacy Infrastructure

Romania's 50 district heating systems serve over one million residential clients. However, decades of underinvestment have left these third-generation networks in a precarious state. For every 100 units of heat produced, 35 are lost to the environment before ever reaching a consumer.



Breaking the Dual-System Trap

Legacy networks are caught in a destructive feedback loop of rising costs and customer attrition. Revitalising this public infrastructure requires a fundamental shift in unit economics—a shift only possible through the introduction of low-cost, zero-carbon baseload heat.



The Hidden Kilowatt: Romania's Vented Resource

Deep within Romania's industrial heartland lies a significant, continuously generated thermal resource. Treated today as an environmental liability, this by-product of heavy industry is the strategic lever required to rescue the district heating economy.



21.9 PJ

Total technical waste heat potential vented annually by 36 major industrial sites.

13.4 PJ

Heat available even if industries maximise internal efficiency first.

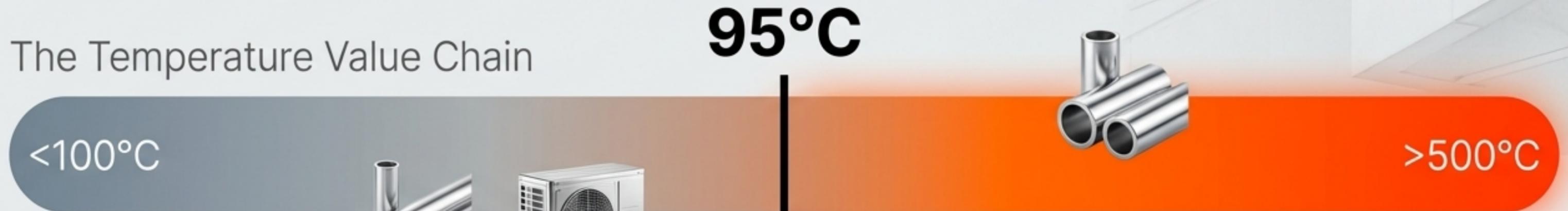
11.8 PJ

High-grade heat immediately compatible with legacy pipes.

The 95°C Threshold

Temperature dictates deployability. While lower-grade heat requires capital-intensive 4th-generation network upgrades, heat **above 95°C** is a **drop-in replacement**, capable of being **injected directly into existing urban thermal grids without upgrading via heat pumps.**

The Temperature Value Chain



4th-Gen & Heat Pump
Upgrades Required

Plug-and-Play Integration

Contains 11.8 PJ of
the potential.



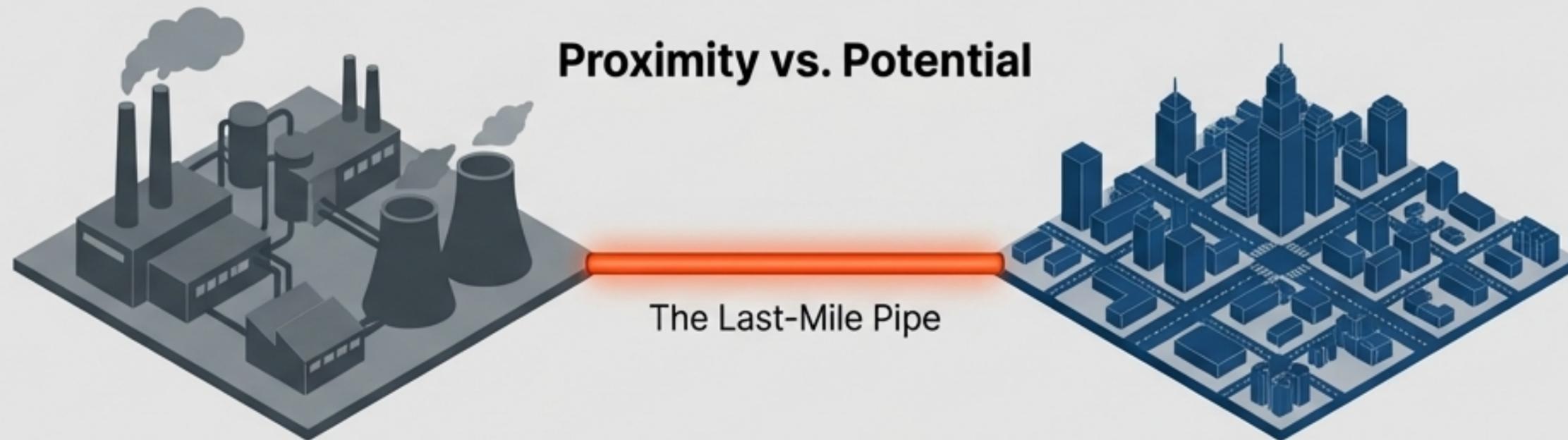
Sectoral Targeting for Industrial Symbiosis

High-temperature heat from steel and cement is prime for immediate legacy DHC integration. Medium-to-low temperature output from chemical and food sectors provides a massive baseload for future low-temperature (4th-generation) municipal networks.

The Sectoral Thermal Matrix	<100°C	100-200°C	200-500°C	>500°C
Iron & Steel				4.43 TWh/a
Chemical	0.88 TWh/a	0.82 TWh/a		
Non-metallic minerals (Cement)				1.67 TWh/a
Food & Beverage				
Paper & Pulp				

The Last-Mile Geography

Extensive, prohibitively expensive cross-country pipelines are not required. Romania's industrial sites perfectly overlay its urban demand centres. This transforms an abstract national resource into a portfolio of localized, highly de-risked infrastructure connections.



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Major industrial facilities located strictly within or adjacent to Expected District Heating (DH-E) areas.

94%

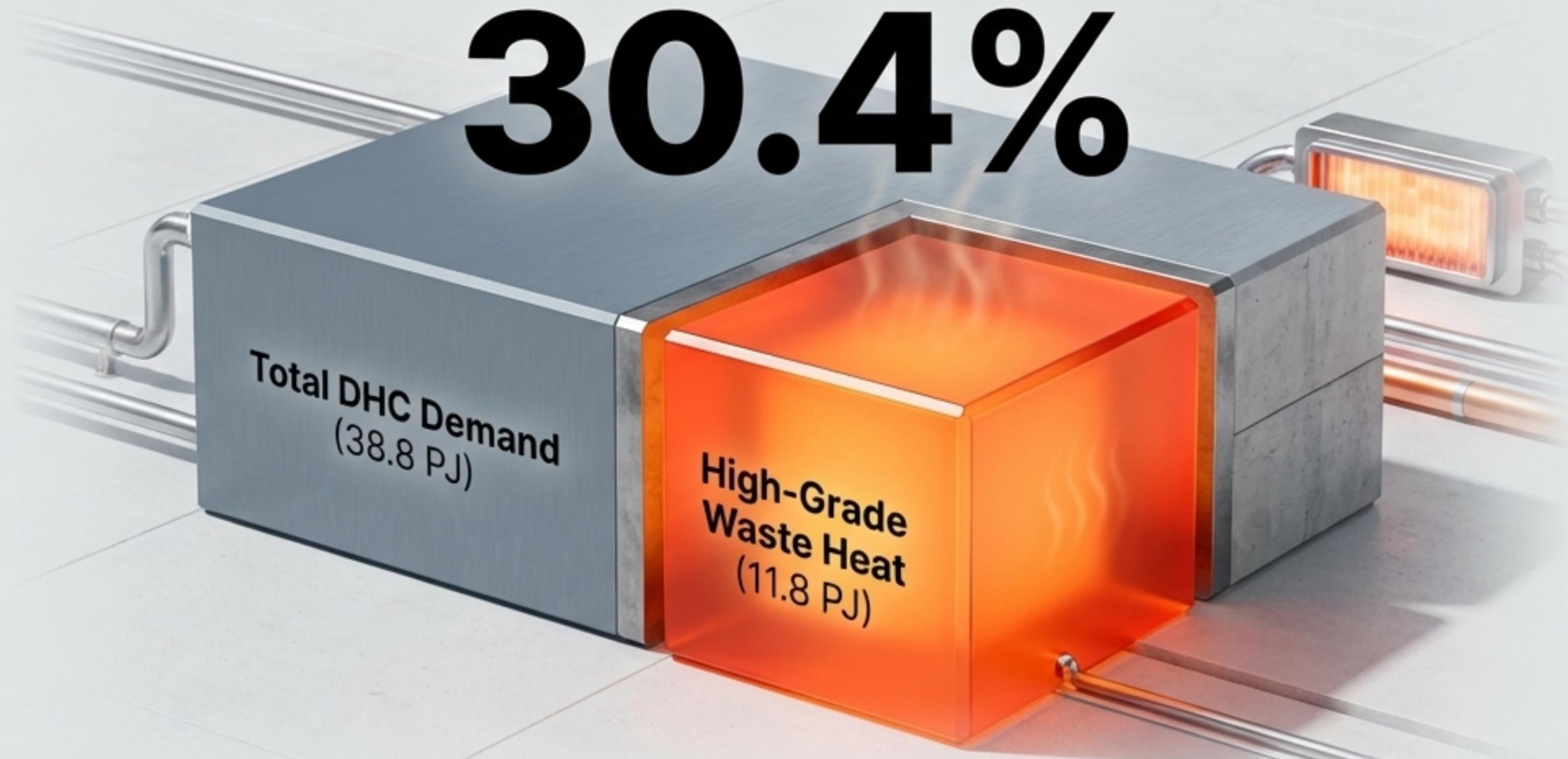
The proportion of the total waste heat resource (20.6 PJ) that is already co-located near end-users.

13

Major sites situated directly beside existing, active DHC networks (DH-A).

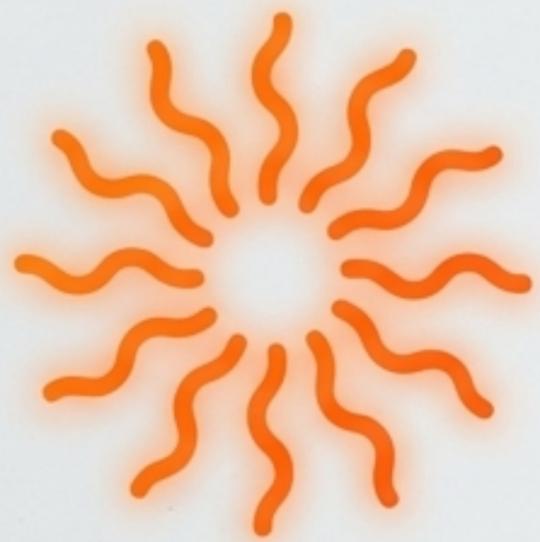
The 30% Solution

Technically available, high-grade industrial waste heat ($>95^{\circ}\text{C}$) is sufficient to cover nearly a third of all heat currently sold and delivered by Romania's district heating networks. This single, zero-carbon source fundamentally rewrites the national heating equation.



The Decarbonisation & Security Dividend

Waste heat recovery is not just an efficiency measure. By directly substituting natural gas, it provides an immediate, cost-effective pathway to meet EU climate obligations while simultaneously shielding the domestic economy from international fossil fuel price volatility.



11.8 PJ Heat

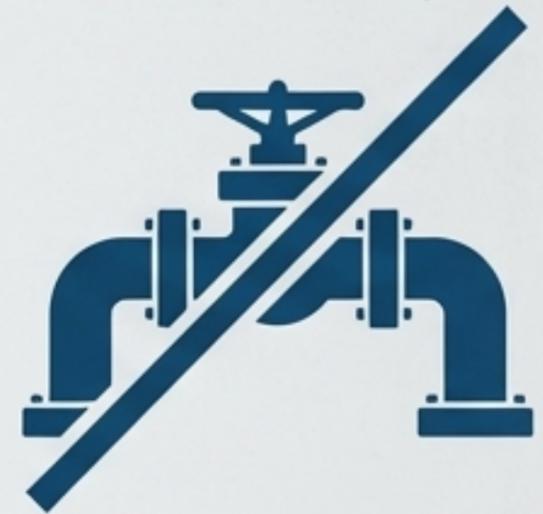
=



662,000 Tonnes

CO₂ emissions
avoided annually.

+



**328 Million
cubic meters**

Displaced imported
natural gas.

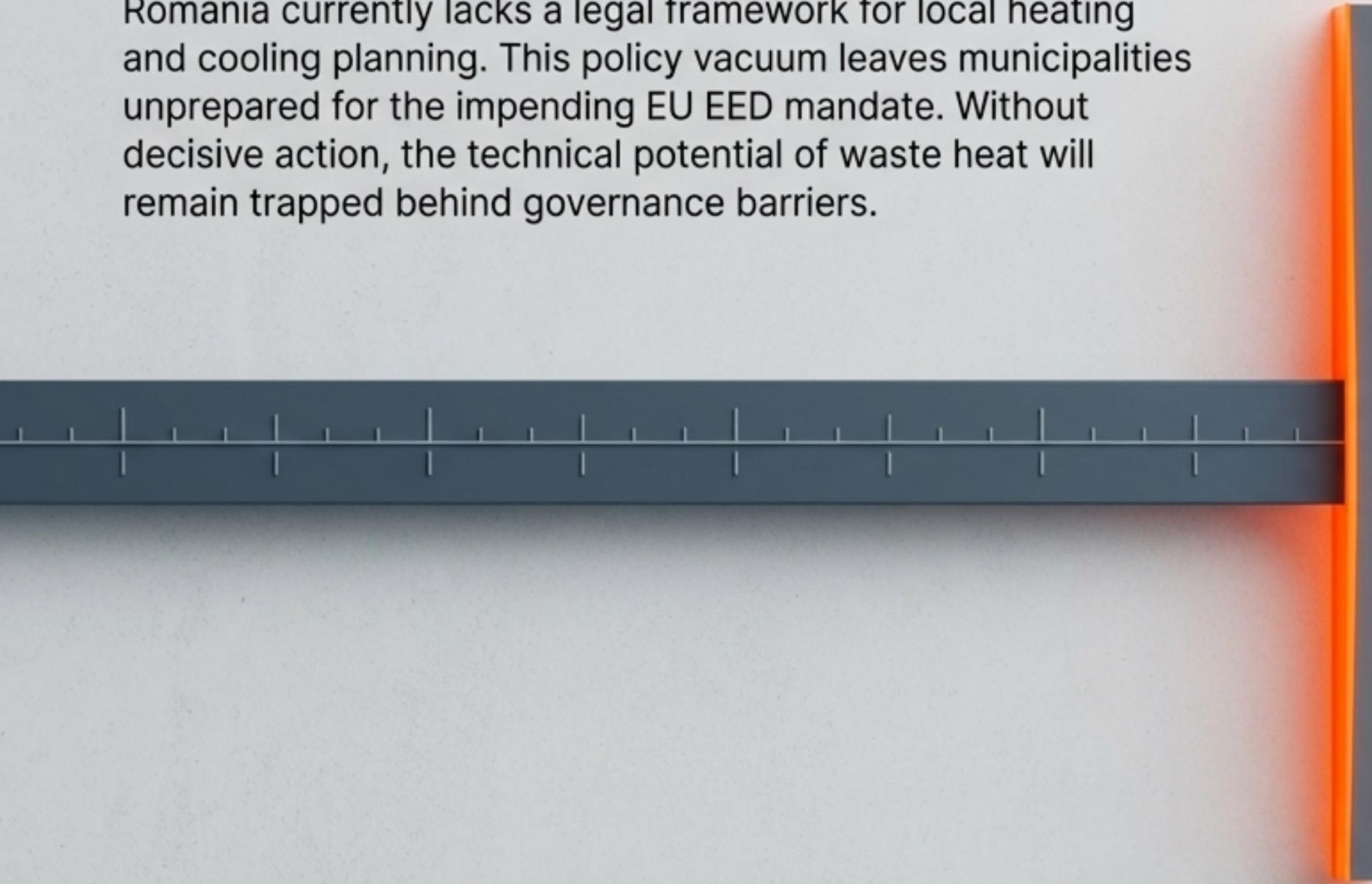
A Paradigm Shift in Urban Energy

Connecting industrial emitters to municipal grids changes the fundamental DNA of the district heating operator, transitioning it from a vulnerability into a resilient, publicly vital asset.

	Current DHC Model	Circular Heat Economy	
Heat Source	Fossil-reliant (80% Gas)	Symbiotic (Zero-carbon baseload)	
OPEX Profile	Highly volatile (market-linked)	Stabilised (near-zero marginal cost)	
System Viability	Destructive feedback loop	Virtuous cycle of reinvestment	
Energy Security	Dependent on imports	100% Domestic utilization	

The Looming Regulatory Imperative

Romania currently lacks a legal framework for local heating and cooling planning. This policy vacuum leaves municipalities unprepared for the impending EU EED mandate. Without decisive action, the technical potential of waste heat will remain trapped behind governance barriers.



September 2025

The mandatory transposition deadline for the recast EU Energy Efficiency Directive (EED).

Roadmap Pillar I: Modern Governance

Establish the foundational framework required to plan and execute municipal-level energy transitions.

1



Legislate Mandatory Planning

Transpose EED Article 25.6, requiring municipalities >45,000 inhabitants to map thermal demand and waste heat sources.

2



Create a National Competence Center

Centralise technical support, providing standardized modeling tools and cost catalogues to local authorities.

3



Mandate Data Accessibility

Legally oblige utilities and industrial facilities to provide high-resolution, geo-referenced thermal data to city planners.

Roadmap Pillar II: Incentivising the Market

Create commercial conditions where venting heat is economically penalised, and capturing it guarantees long-term returns.



Reform Taxation

Internalise thermal pollution costs. Implement a national carbon price or ETS adjustment that explicitly credits verified heat recovery.



Targeted CAPEX Support

Deploy EU Modernisation Funds to provide investment grants and Contracts for Difference (CfDs) to de-risking high upfront infrastructure costs.



Standardise Agreements

Deploy state-backed, standardized Heat Supply Agreements to slash legal friction between utility off-takers and industrial producers.



Roadmap Pillar III: Infrastructure for the Future

District networks must be repositioned as the primary vectors for distributing low-carbon heat to citizens.

Eliminate the 35% Loss

Prioritize immediate infrastructure funding to modernise legacy pipes, instantly improving utility creditworthiness.

Integrated Spatial Planning

Legally bind new Local Heating Plans to urban zoning, ensuring grid extensions route directly toward high-density anchor loads.

Foster 4th-Gen Pilot Projects

Prepare the grid to operate at 50-60°C, doubling the exploitable waste heat potential by unlocking low-grade (<100°C) industrial sources.