The Lithuanian Heating & Cooling Sector

A Quantitative Blueprint for Energy Sovereignty

The 41% Fulcrum of National Energy Consumption

25.7 TWh

Total Annual Heating & Cooling Demand

Heating and cooling accounts for 41% of Lithuania's total final energy consumption, driven by a climate with 42% more heating degree days than the EU average and a legacy building stock. It entirely dwarfs all other energy sectors.

The Demand Architecture

Households
51% / 13.2 TWh

The indisputable anchor load of the national thermal system.

Industry
32% / 8.2 TWh

Heavily reliant on high-temperature process heat.

Services
17% / 4.3 TWh

The fastest-growing segment, driven by future cooling demand.

The Dual Thermal Economy and the Decarbonisation Gap

Centralised District Heating (DH)

10.2 TWh (~40% of demand)

- Highly efficient and aggregated network.
- Successfully transitioned to >85% renewable biomass.
- Primary infrastructure asset for the future.

Decentralised Supply

15.5 TWh (~60% of demand)

- Fragmented and difficult to regulate.
- Reliant on 120,000 inefficient fossil fuel boilers.
- Highly polluting older biomass units.
- The primary target for future emissions reduction.

The Biomass Success Story and Its Strategic Limits

Securing Energy Independence

Over 85% of centralised DH fuel is now domestic biomass. This monumental shift secured national energy independence from imported gas and stabilised consumer prices during global shocks.

The Vulnerability of Monoculture

Biomass is a finite combustion resource with critical competing economic uses, including carbon sinks and timber. The next phase of decarbonisation requires a pivot to non-combustion thermal assets to diversify the national risk profile.

Modernisation in Practice: The Vilnius Benchmark

1. Generation

The new Waste-to-Energy CHP plant treats 160,000 tonnes of municipal waste annually, converting a disposal problem into a base-load thermal fuel asset.

2. Distribution

Systematic pipeline replacements have slashed network thermal losses from 24% down to a Scandinavian-standard 12%.

3. Recovery

The 9 MW absorption heat pump—the most powerful in the Baltics—recovers 17,000 MWh annually directly from CHP exhaust.

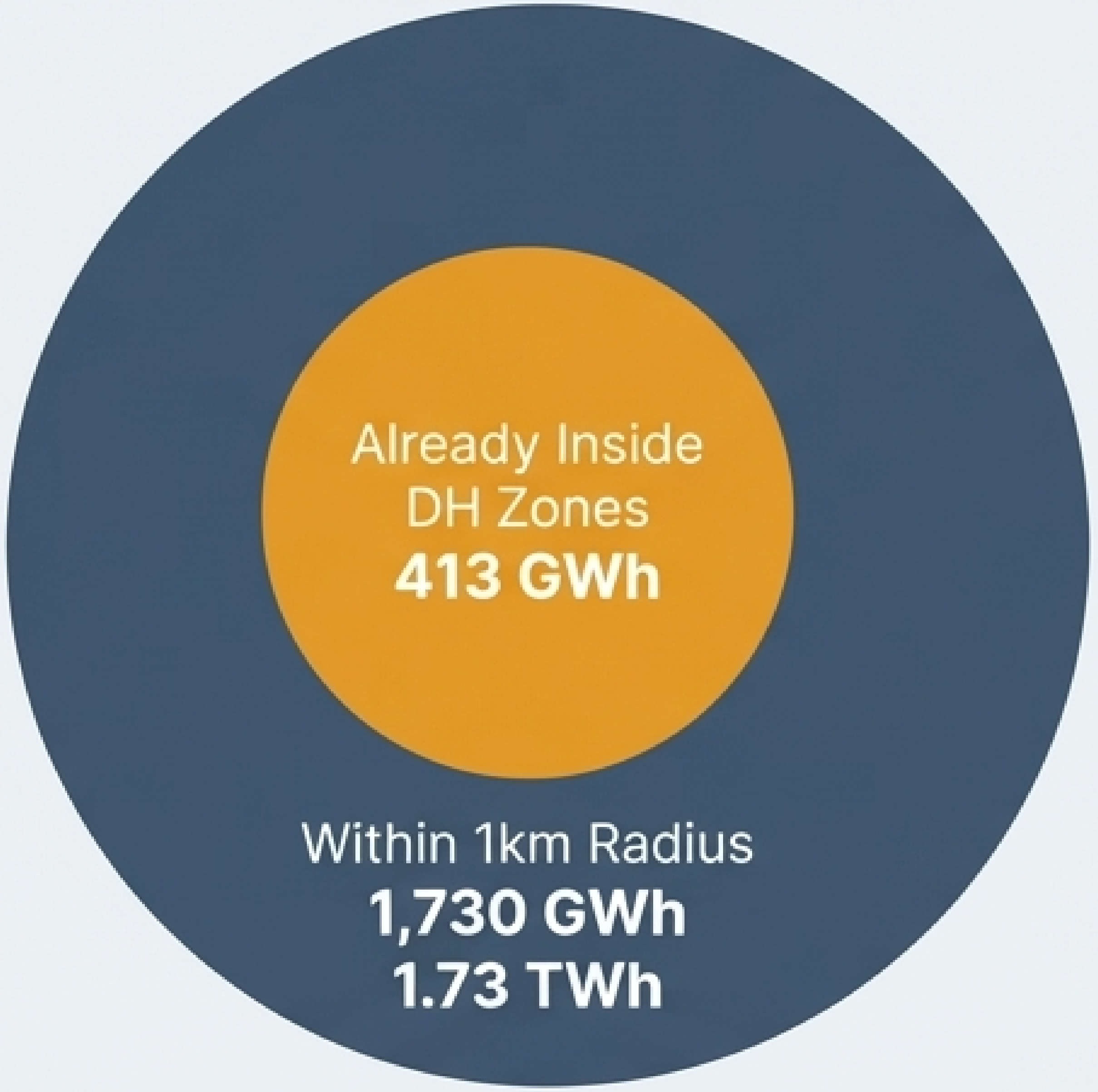
The Hidden Asset: Categorising Industrial Waste Heat

Heat Quality Spectrum

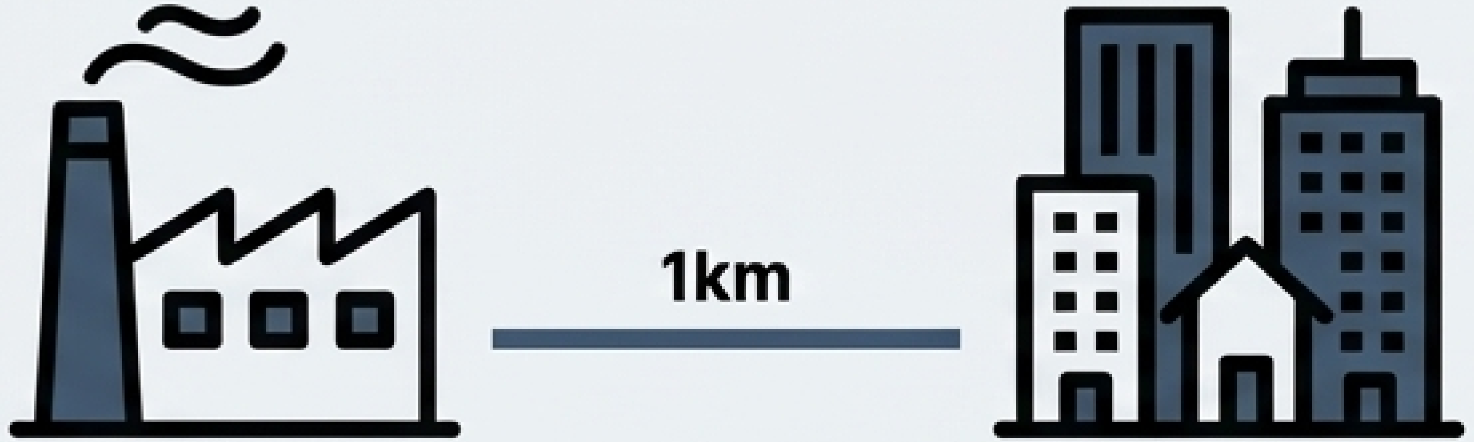
High-Grade (>500°C)	Medium-Grade (100-500°C)	Low-Grade (<100°C)
Found in steel, glass, and cement production. Possesses high energy density, but remains technically complex and highly costly to recover.	Common in chemicals and food processing. Prime candidate for direct steam generation or immediate district heating injection.	Generated by cooling water and drying exhausts. Historically discarded, but now highly economically viable for DH networks due to massive advancements in utility-scale heat pumps.

The Proximity Advantage: Redefining the Economics of Recovery

The Target



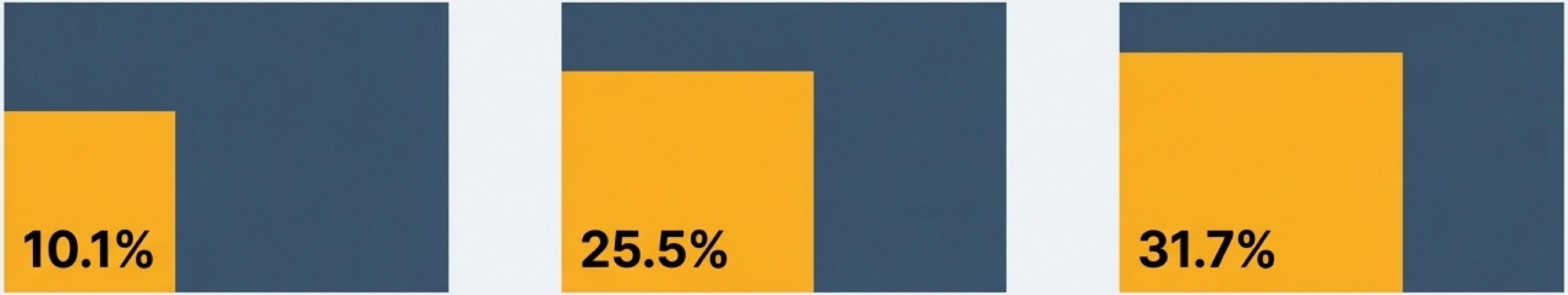
The Co-Location Engine



Total practical potential: ~2.6 TWh.

Capital expenditure goes into heat pumps and exchangers at the site, not massive transmission pipelines. The primary barrier is not geographic distance, but integrated policy.

Sizing the Opportunity: A Utility-Scale National Resource



of Total National H&C Demand

of Total District Heating Supply

of Total Industrial H&C Demand

Takeaway: This represents enough zero-carbon energy to displace one-quarter of the fuel currently burned in the entire national DH network.

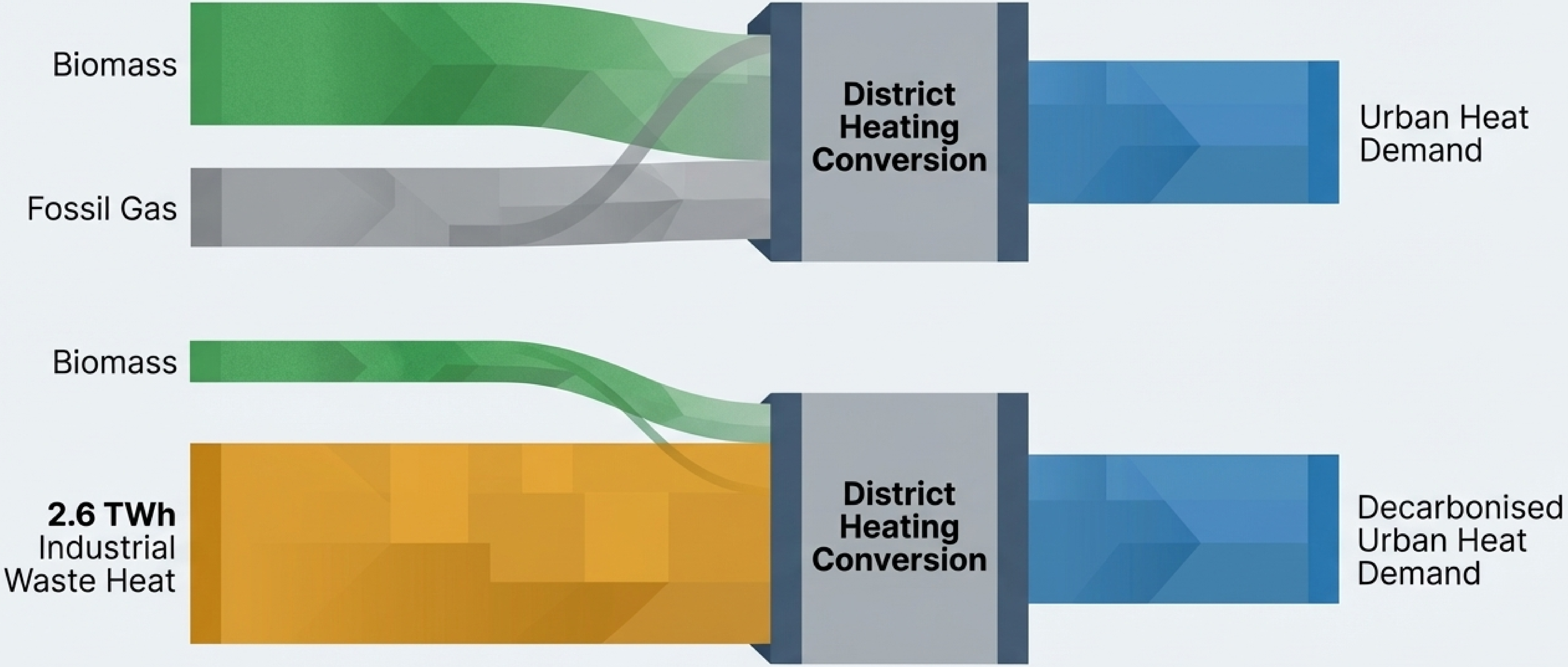
The Virtual Power Plant Equivalence

Single Centralised Asset
Annual Output: ~2.8 TWh

Decentralised Industrial Waste Heat
Annual Potential: ~2.6 TWh

Insight: Waste heat is not an incremental efficiency measure. Aggregated together, these scattered nodes constitute a **utility-scale national infrastructure asset** that is currently venting 100% of its capacity into the atmosphere.

Evolving the Energy Flow

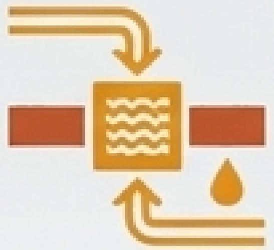


The Next Frontier of Urban Heat Recovery

Traditional heavy industry is just the baseline. Modernising economies constantly produce new, highly stable thermal assets.

Data Centres

Rapidly expanding digital infrastructure generates immense, continuous low-grade heat from server cooling. This provides a perfectly stable, year-round baseload suited for urban DH integration.



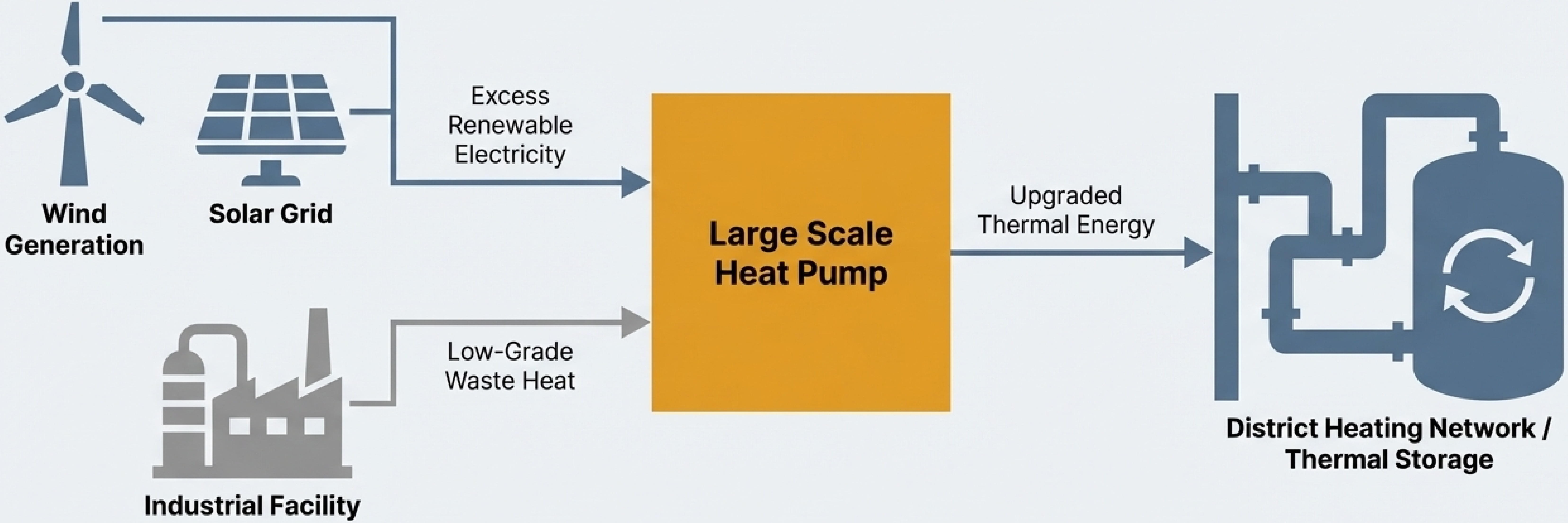
Wastewater Treatment (WWTPs)

Municipal water systems process vast volumes of water at stable temperatures (10-20°C). This creates a massive, reliable thermal reservoir for heat pump extraction.

Modern Incineration

Treating municipal refuse not as a disposal problem, but as an integrated cogeneration fuel source for the city, closing the loop on the circular economy.

The 2050 Vision: Sector Coupling and Smart Thermal Grids



The Endgame: Thermal grids become the 'battery' for the electricity grid. Large heat pumps act as the bridge—absorbing excess, cheap wind and solar power during peak generation times to upgrade industrial waste heat, storing that thermal energy in the DH network for urban use.

Bridging the Governance Gap

The barrier to integration is regulatory, not technological.

Step 2: The Legislative Catalyst

The recast EU Energy Efficiency Directive mandates that by September 2025, municipalities over 45,000 must produce integrated local heating and cooling plans. This is the unmissable window to fundamentally rewrite the planning framework.

Step 1: The Current Disconnect

The obligatory heat planning system suffers from a critical lack of integration. Municipal spatial zoning (deciding where factories are built) operates in isolation from energy planning (mapping where heat is needed).

Strategic Action Plan for Thermal Sovereignty

01. Recognise

Formally embed the 2.6 TWh industrial waste heat potential into the next update of the National Energy and Climate Plan (NECP). Treat it as a primary domestic energy resource on par with new generation assets.

02. Map

Commission and fund a dynamic, public 'National Waste Heat Atlas'. Making geographical thermal data fully visible is a prerequisite for municipal planners and private capital to initiate actionable projects.

03. Incentivise

Launch targeted financial instruments. Deploy CapEx grants specifically for industrial heat exchangers, and issue Contracts-for-Difference (CfDs) to guarantee long-term revenue for waste heat supplied to DH networks.