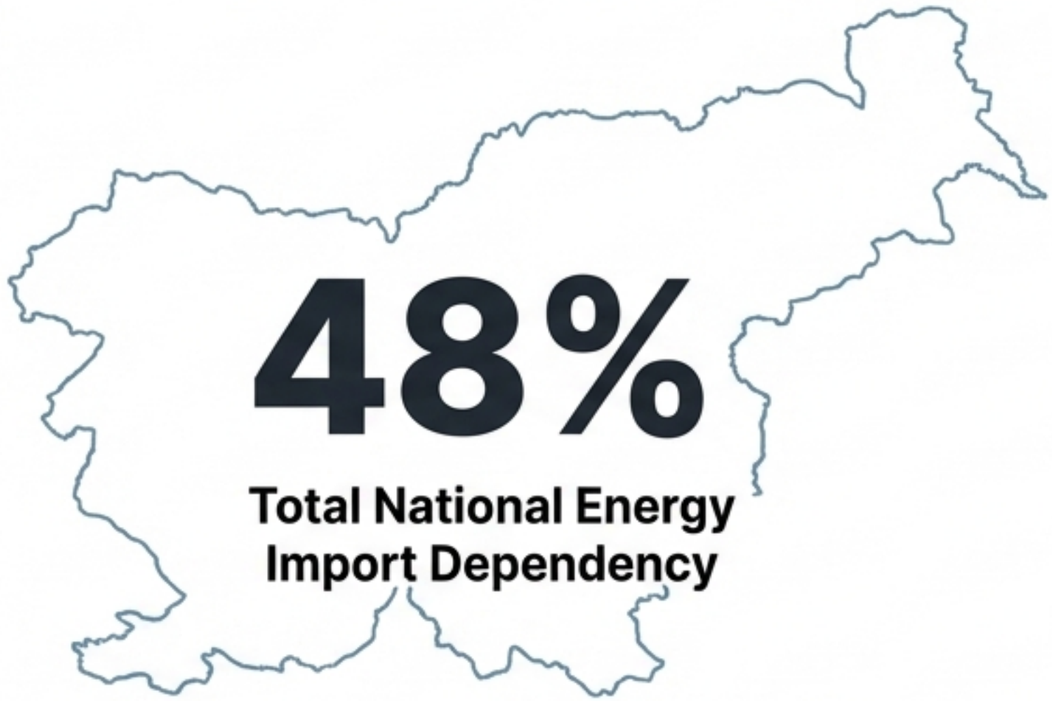
Unlocking Slovenia’s Thermal Vault

Reclaiming 3.7 Petajoules of industrial waste heat to engineer national energy security and bridge the implementation chasm.



48%

Total National Energy Import Dependency

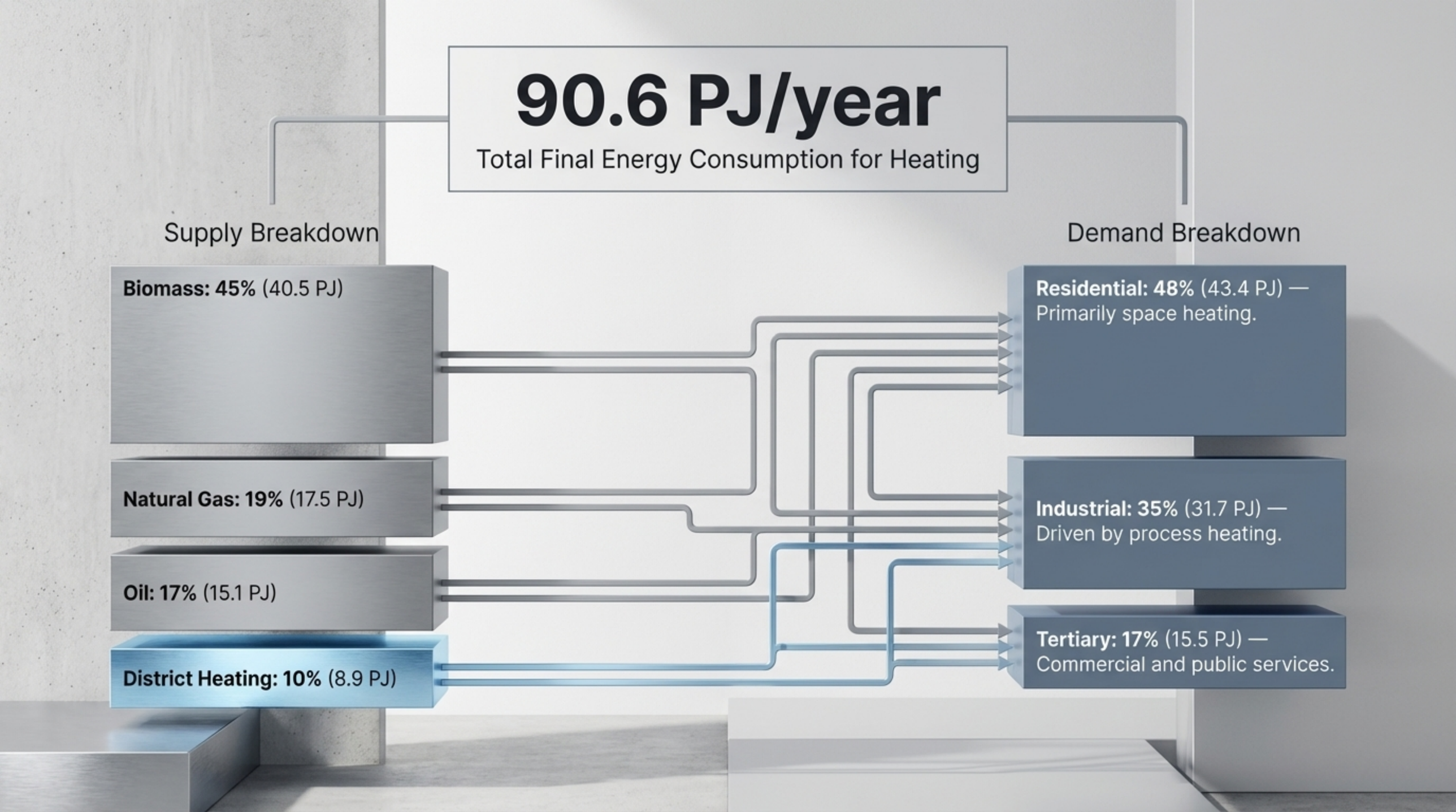
Slovenia imports 100% of its oil and natural gas, heavily exposing the economy to volatile international energy markets.

>80%

Fossil-Fuel Reliance in District Heating & Cooling (DHC)

56% Coal | 26.5% Natural Gas

Despite centralising urban energy, current DHC networks lock cities into high-carbon, imported fuels.


90.6 PJ/year
Total Final Energy Consumption for Heating
Supply Breakdown
Biomass: 45% (40.5 PJ)
Natural Gas: 19% (17.5 PJ)
Oil: 17% (15.1 PJ)
District Heating: 10% (8.9 PJ)
Demand Breakdown
Residential: 48% (43.4 PJ) — Primarily space heating.
Industrial: 35% (31.7 PJ) — Driven by process heating.
Tertiary: 17% (15.5 PJ) — Commercial and public services.

Top-Down Mandate

Recast Energy Efficiency Directive (EED) Article 25.6

Legal obligation for municipalities over 45,000 to prepare comprehensive local heating and cooling plans.

Local Execution Deficit

Municipalities face structural deficits in staffing, funding, and specialised technical support for energy modelling and GIS.

Bottom-Up Reality

The Implementation Chasm

The EU mandate risks becoming an unfunded administrative exercise without national intervention.

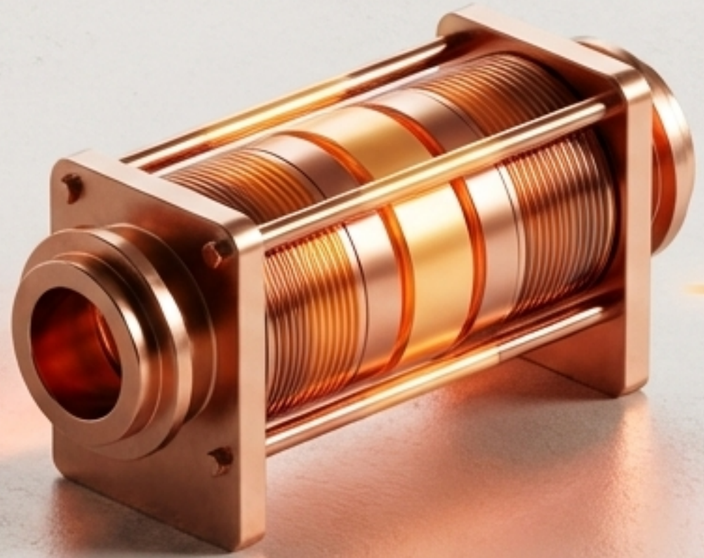
Local Execution Deficit

Municipalities face structural **deficits** in staffing, funding, and specialised technical support for energy modelling and GIS.

Hiding in Plain Sight

Industrial waste heat (IWH) is thermal energy discharged into the environment, accounting for 20% to 50% of all industrial energy consumed across Europe.

The Status Quo: Unavoidable industrial liability.



The Future State: Zero-emission, bankable domestic energy resource.

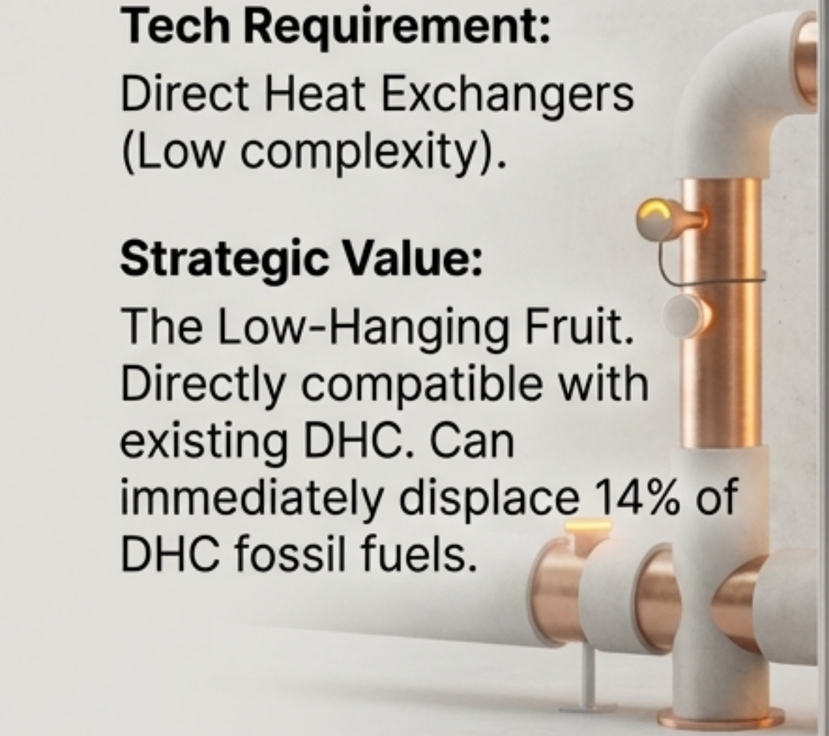
Slovenia possesses a proven, readily available resource capable of permanently displacing imported fossil fuels in DHC networks.

Tier 1: High-Grade (95°C)

1.0 PJ/year

Tech Requirement:
Direct Heat Exchangers (Low complexity).

Strategic Value:
The Low-Hanging Fruit. Directly compatible with existing DHC. Can immediately displace 14% of DHC fossil fuels.



Tier 2: Medium-Grade (55°C)

1.1 PJ/year

Tech Requirement:
Heat Pumps.

Strategic Value:
Mid-term expansion target.

Tier 3: Low-Grade (25°C)

1.6 PJ/year

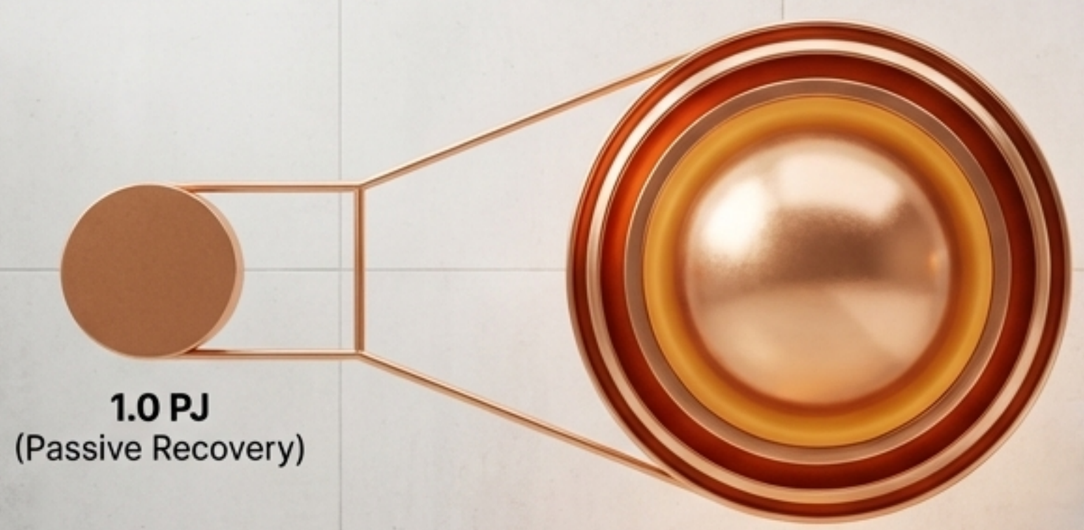
Tech Requirement:
Large-scale Industrial Heat Pumps.

Strategic Value:
The True Scale Opportunity. Upgrading this resource unlocks the vast majority of Slovenia's IWH.

The Multiplier Effect

Moving from passive recovery to active upgrading more than triples the strategic resource.

Energy Multiplier

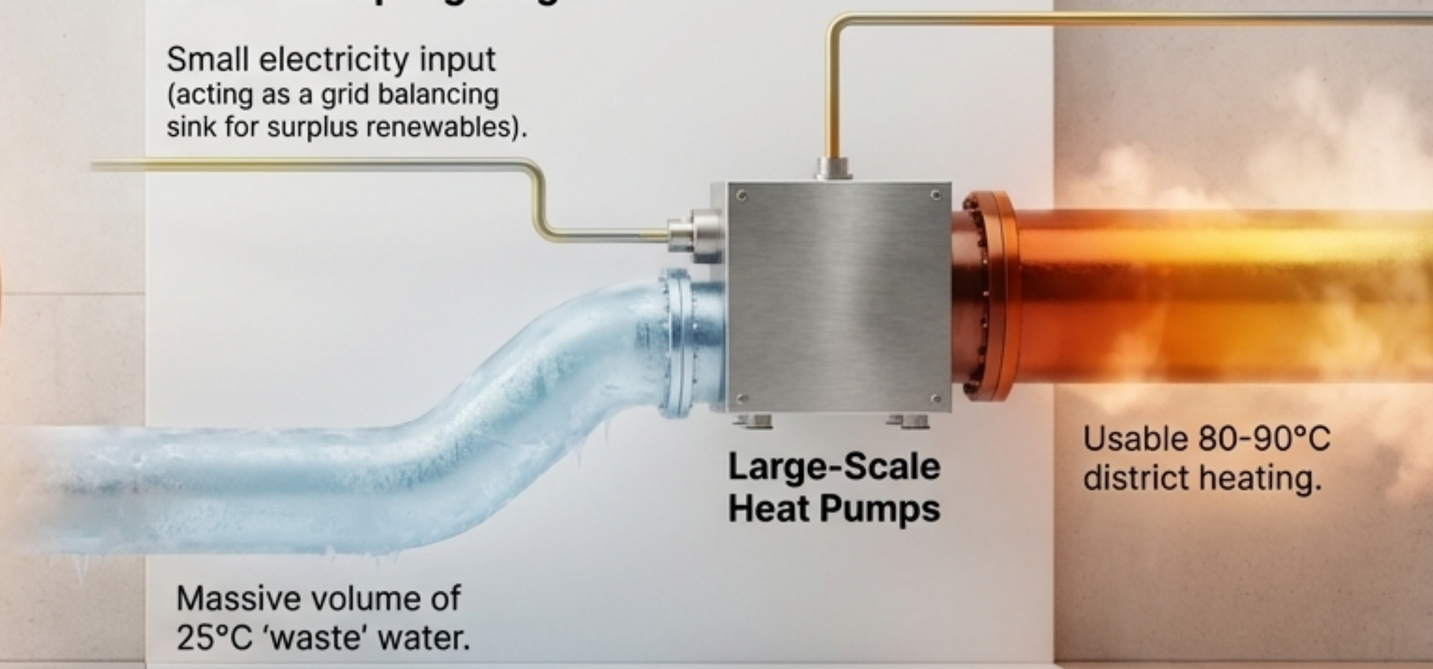


1.0 PJ
(Passive Recovery)

3.7 PJ
(Active Upgrading)

Sector Coupling Diagram

Small electricity input
(acting as a grid balancing sink for surplus renewables).

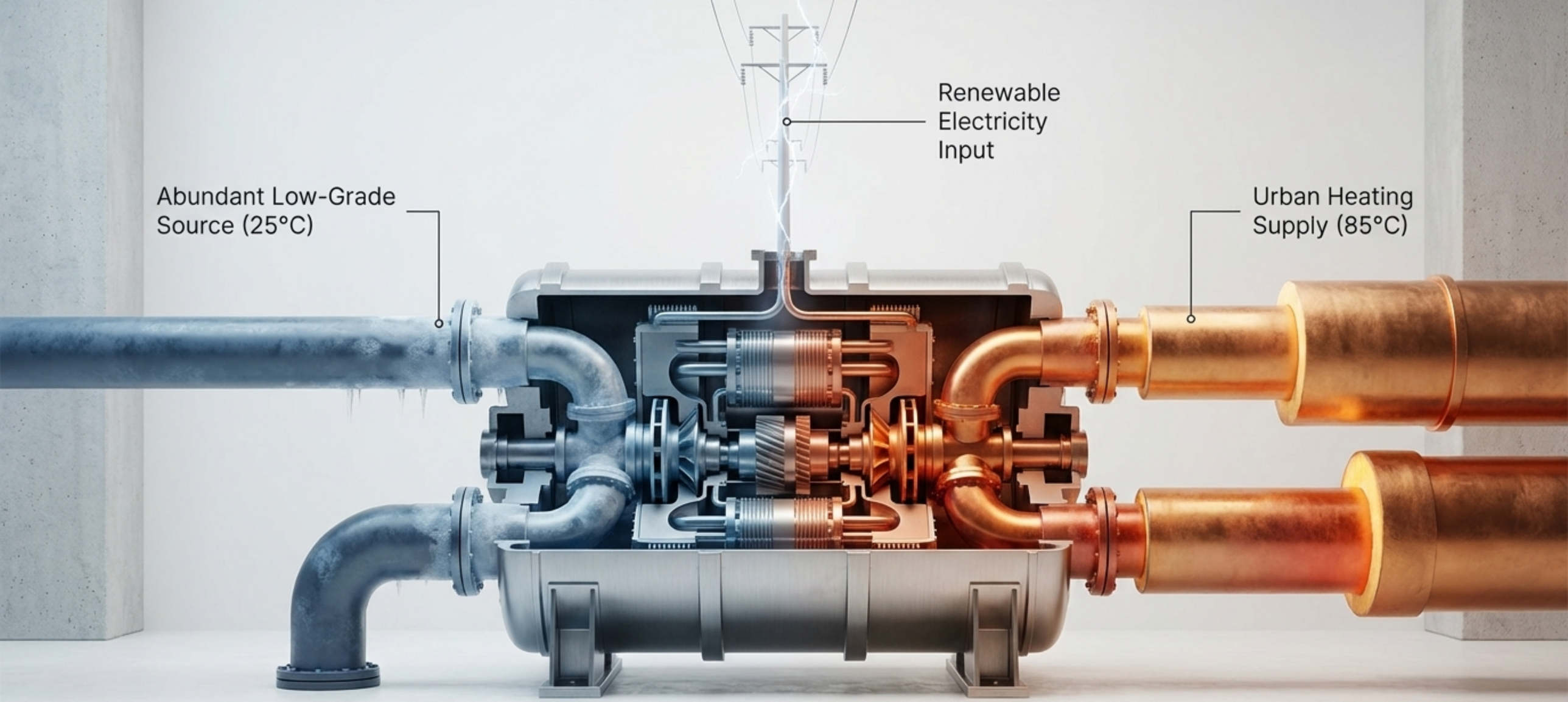


Large-Scale Heat Pumps

Usable 80-90°C district heating.

Massive volume of 25°C 'waste' water.

Takeaway: This transforms DHC from an isolated fossil fuel consumer into a flexible, grid-balancing anchor.



By applying a small electrical load, the heat pump elevates unusable thermal runoff into high-value urban heat, effectively coupling the electricity and thermal sectors.

The Spatial Proximity Guarantee

67%

10 out of 15 major industrial sites are already within a 10 km radius of **ACTUAL** existing DHC networks.

100%

15 out of 15 major industrial sites are within a 10 km radius of **EXPECTED** future DHC expansion zones.

The infrastructure and the resource are already co-located. The economic viability of transport is physically guaranteed.

Lek Pharmaceuticals (Ljubljana)

Urban industrial symbiosis capturing steam condensate.

Supplies Energetika Ljubljana DHC, heating ~300 homes and eliminating 1,000 tonnes of CO_2 annually.

SIJ Steel (Jesenice & Ravne)

High-temperature process heat recovery.

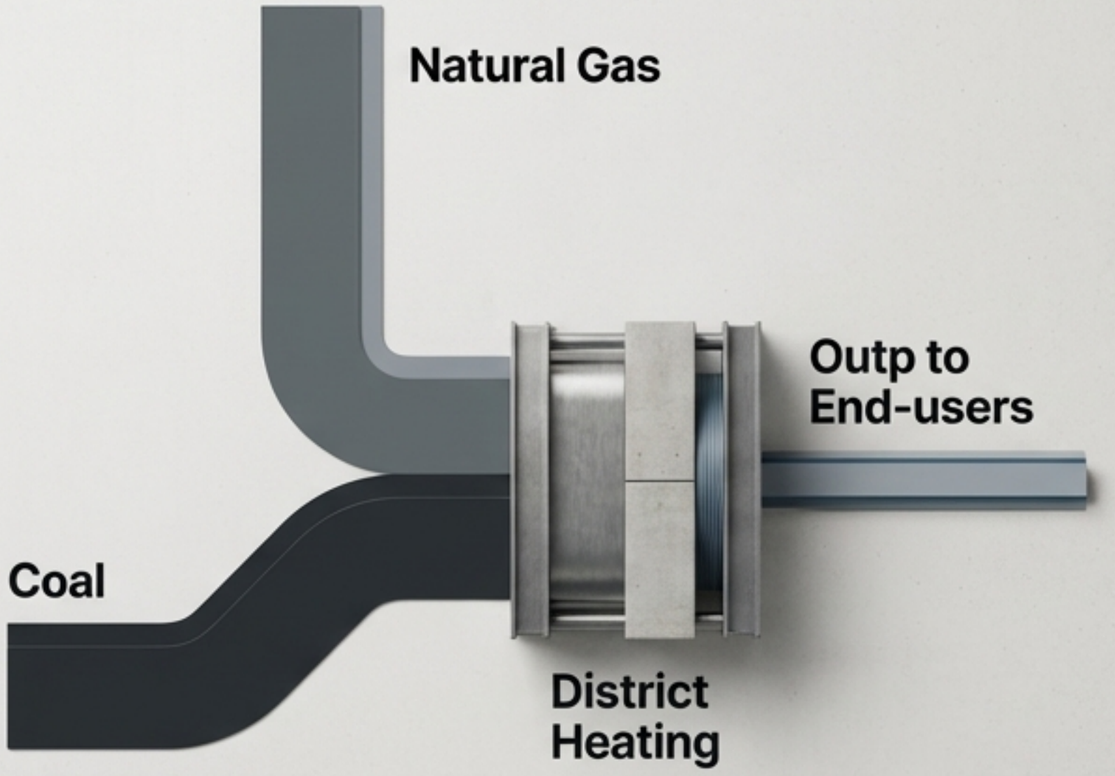
Improves internal efficiency while exporting excess to the local DHC network, replacing fossil fuels directly.

Lušt Greenhouses

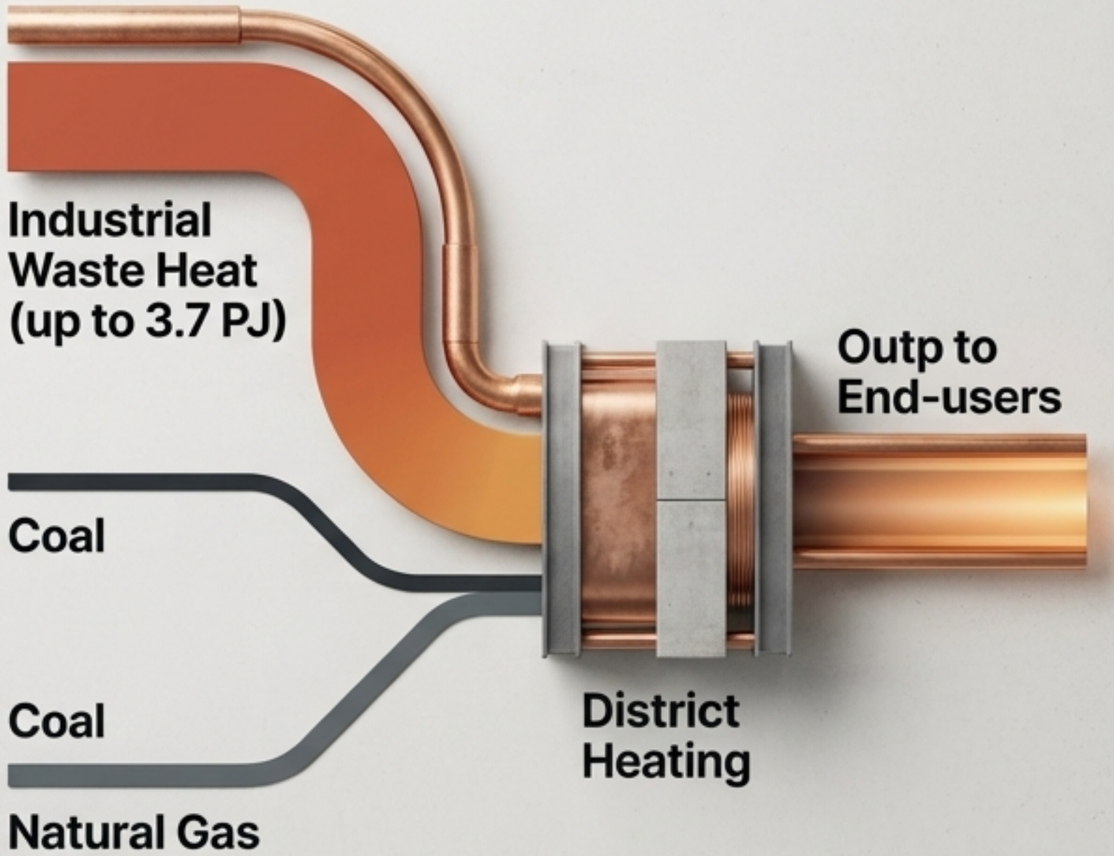
Proof-of-concept for the enabling technology. Installed a 2 MW heat pump system to upgrade low-grade geothermal water.

Achieved an investment payback period of less than one year.

The 2015 Baseline

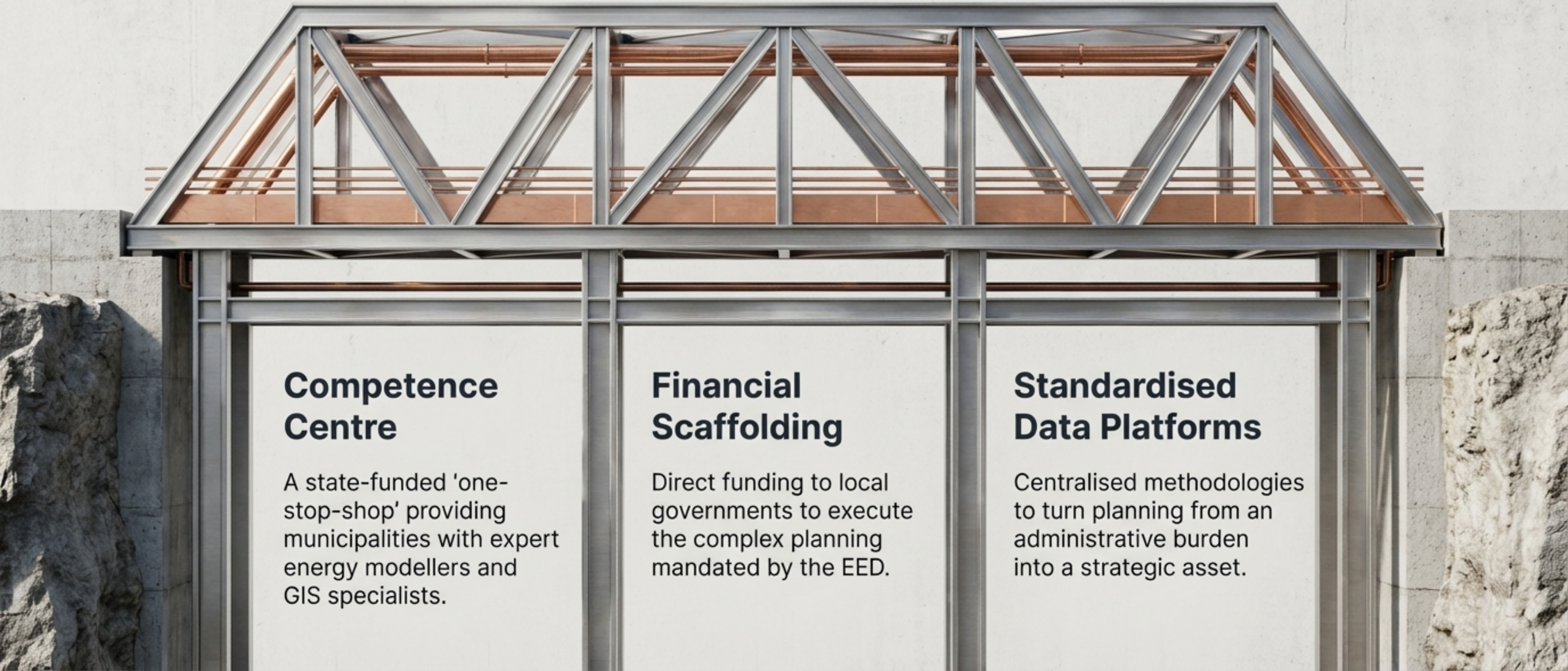


The IWH Integrated Future



Displacing external dependence with internal circularity.

National Support Programme



Competence Centre

A state-funded 'one-stop-shop' providing municipalities with expert energy modellers and GIS specialists.

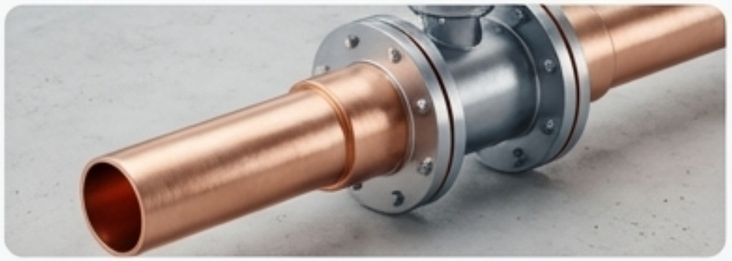
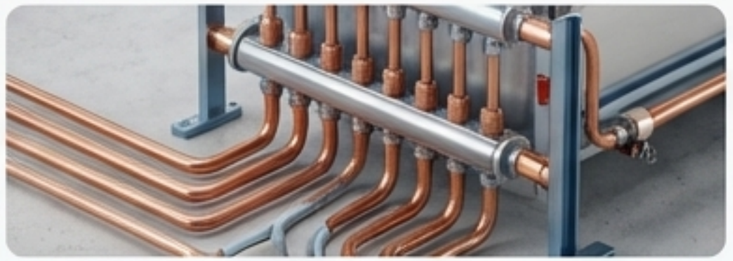
Financial Scaffolding

Direct funding to local governments to execute the complex planning mandated by the EED.

Standardised Data Platforms

Centralised methodologies to turn planning from an administrative burden into a strategic asset.

Stakeholder Playbook Matrix

National Policymakers	DHC Operators	Industrial Facilities
		
Enact supportive regulations (tax credits, capital grants for DHC connections).	Embrace sector coupling; invest in large-scale heat pumps and anchor network expansions to nearby industrial sites.	Conduct energy audits and negotiate long-term Heat Supply Agreements (HSAs).
		
Bridges local capacity gaps, hits NECP climate targets, and frames IWH as a core industrial competitiveness strategy.	Accesses low-cost baseload heat, enabling profitable network expansion while decarbonising existing supply.	Transforms a thermal liability into a bankable asset. HSAs pegged at a 10-20% discount to DHC fossil costs guarantee a stable, long-term revenue stream.

By reframing waste heat as a core domestic resource, Slovenia can permanently sever its reliance on imported fossil fuels, secure its urban heating networks, and engineer a highly competitive, climate-neutral industrial sector.

The Heat Vault Company — Engineering the Thermal Transition.