Decarbonising Greece’s Thermal Energy Sector

A quantitative analysis and the strategic imperative of industrial waste heat

The Ambition (National Climate Law)

Net-Zero by 2050

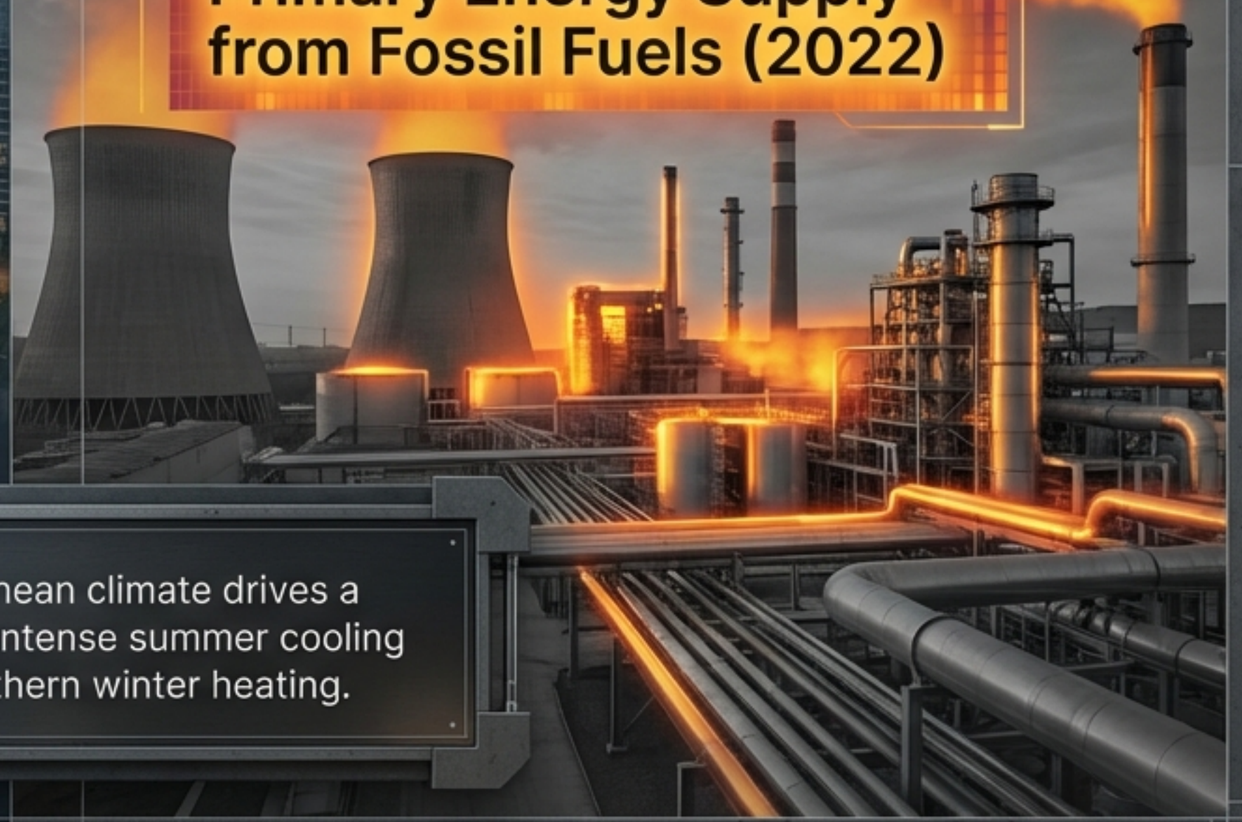
55% GHG reduction by 2030

80% GHG reduction by 2040

The Reality

80%

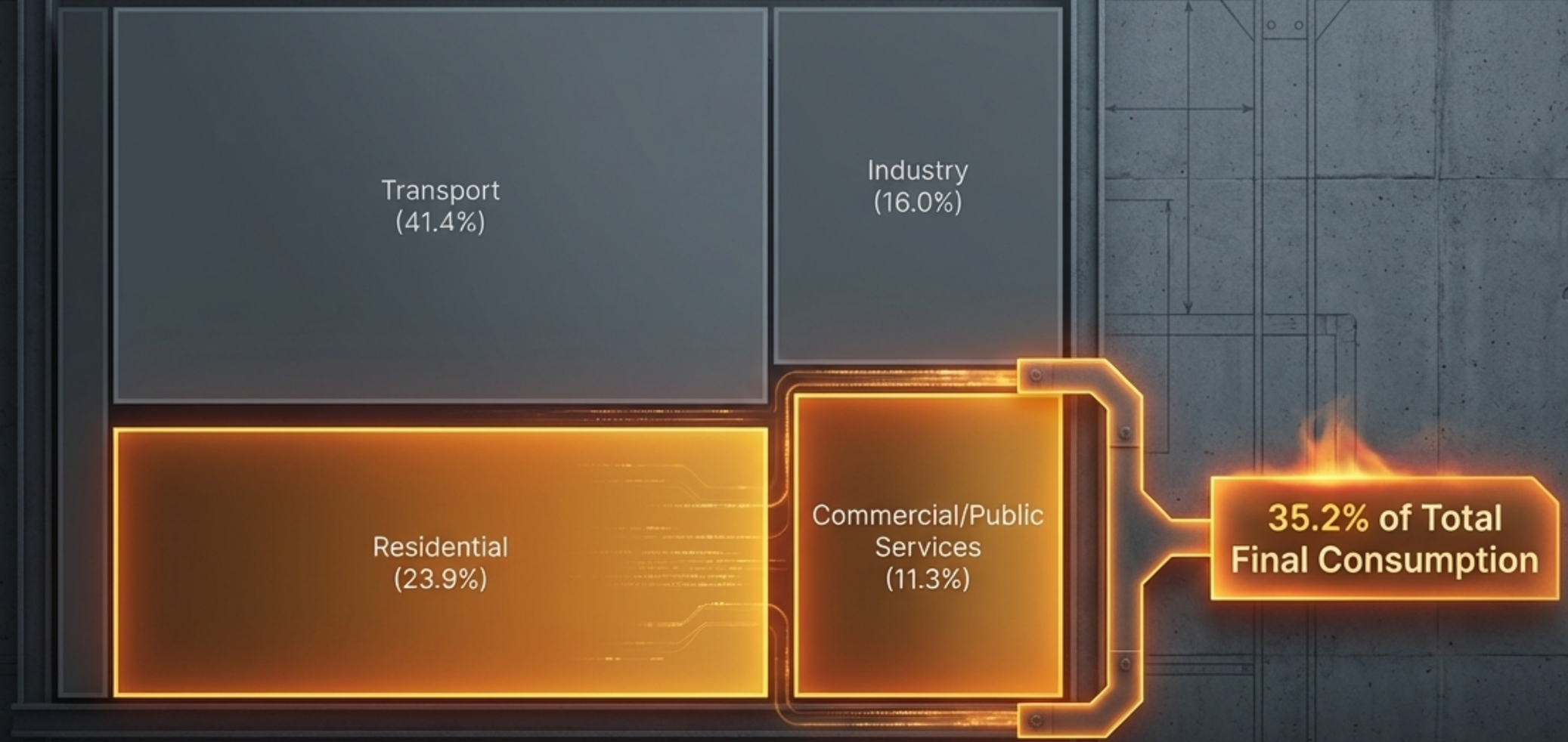
Primary Energy Supply from Fossil Fuels (2022)



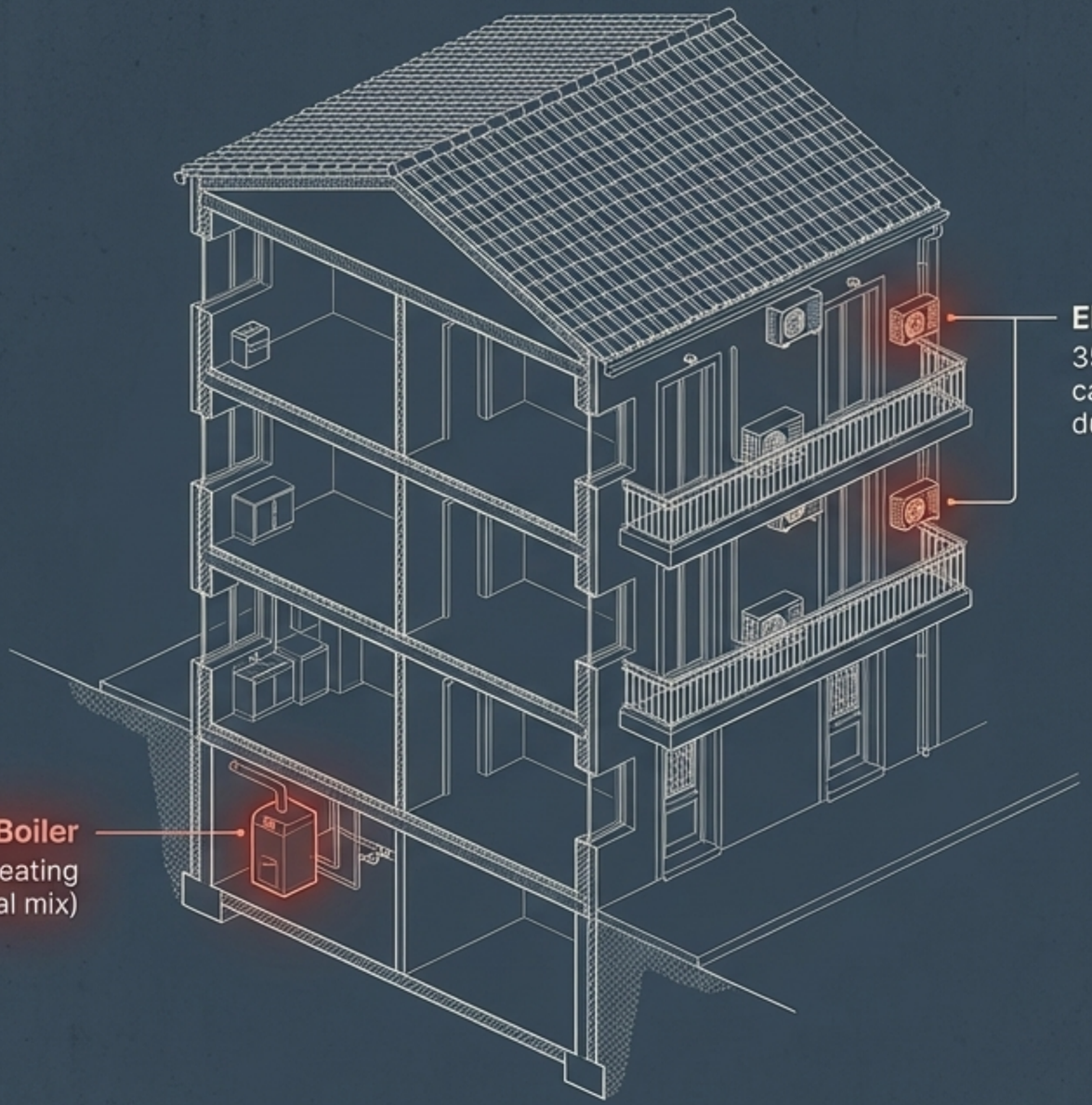
Greece’s Mediterranean climate drives a unique dual demand: intense summer cooling and persistent northern winter heating.

Energy Footprint

Greece's Total Final Consumption (801.4 TWh in 2023)



Building energy consumption represents over a third of national demand, overwhelmingly driven by thermal needs (heating and cooling) rather than standard electricity use.



Electric AC / Heat Pumps
35.5% of residential mix, causing peak grid strain during extreme weather

Individual Oil Boiler
Dominant fuel for heating (24.5% of residential mix)

2022 Residential Thermal End-Use

Space Heating: 58%

Water Heating: 15%

Space Cooling: 4%

The status quo is deeply fragmented. Over 99% of heating demand is met by building-level systems, exposing citizens to international oil price shocks and high emission rates.

Legacy State

The Required Future State

2028: National Lignite Phase-out

Agios Dimitrios plant

70 MWth Heat

City of Kozani (covering 95% of the town)

Asset Stranding
Impending Obsolescence

City (covering 95% of the town)

Existing Pipes

Waste-to-Energy

Biomass

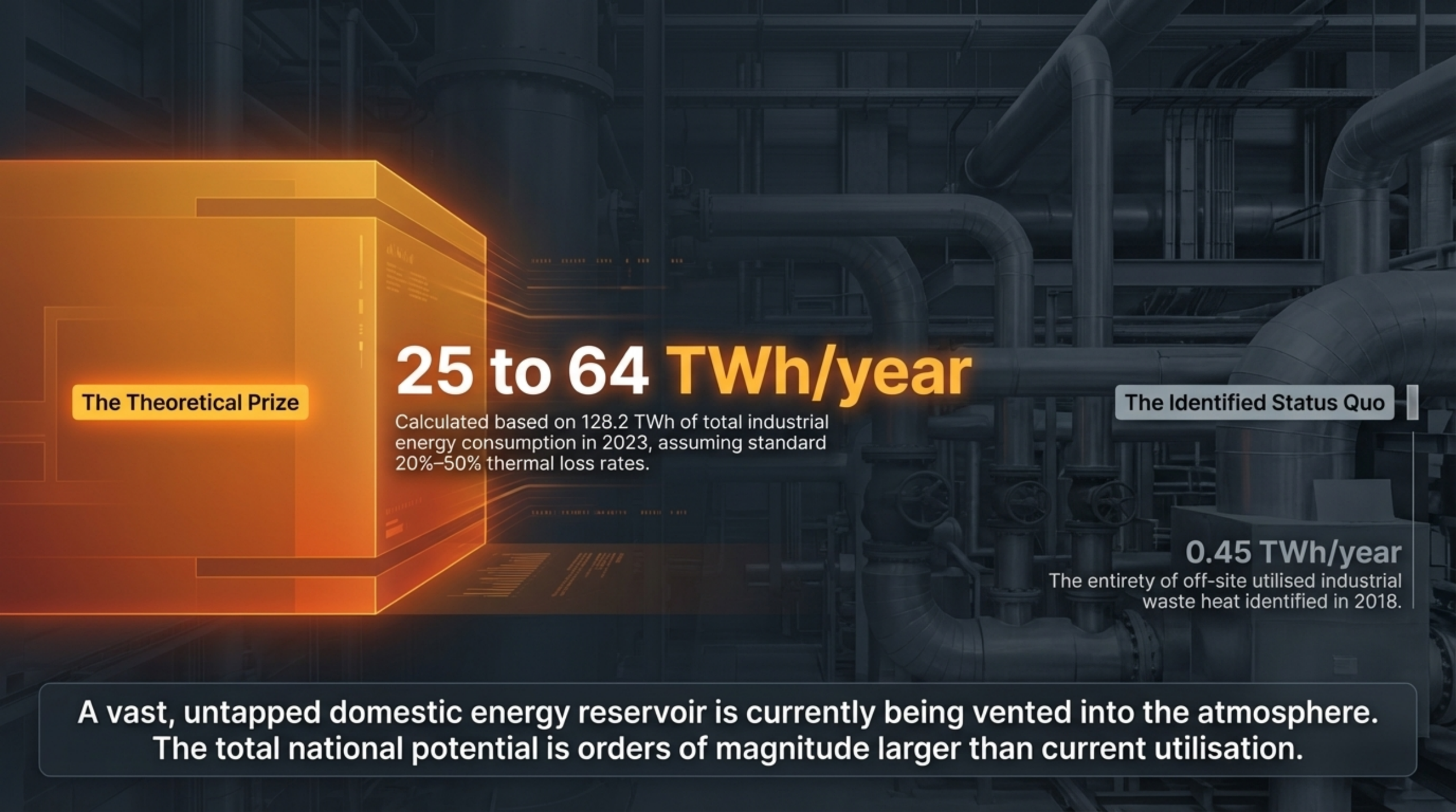
Industrial Waste Heat

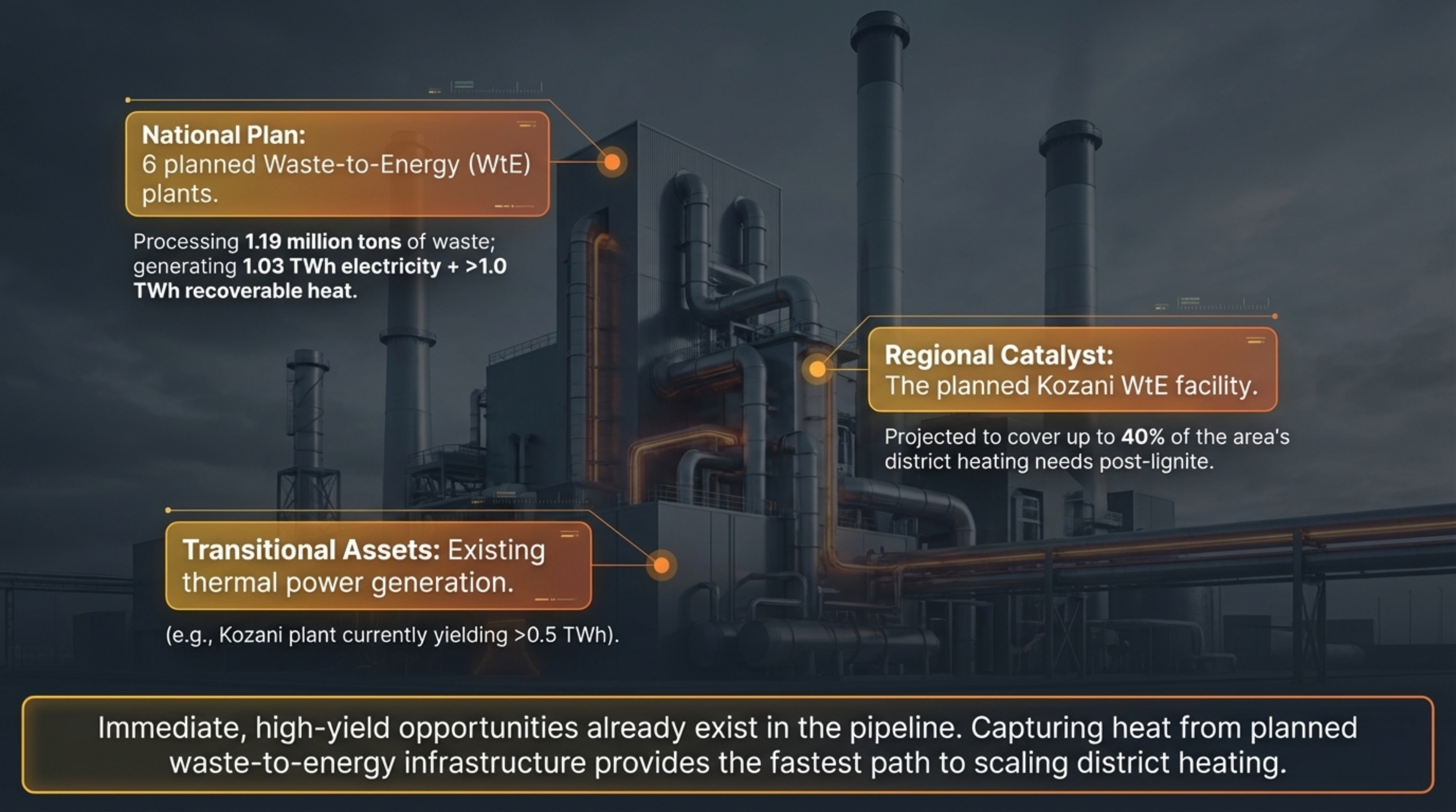
Greece's only significant collective heating networks (currently just 0.7% of national heat) face an existential threat. They must urgently pivot from lignite to modern, diversified thermal sources.

The Heating Infrastructure Diagnostic

Decentralised Oil/Electric (Status Quo)	Lignite District Heating (Legacy)	Waste Heat District Heating (Future)
Vulnerability: High (Import-dependent)	Vulnerability: Localised	Vulnerability: Zero (Domestic resource)
Emissions: High	Emissions: Very High	Emissions: Zero-marginal
Cost Burden: Individual citizens	Status: Facing total obsolescence by 2028	System: Circular economy

Industrial and municipal waste heat is not just an engineering option; it is the critical missing domestic asset required to replace imported fossil fuels.


The Theoretical Prize
25 to 64 TWh/year
Calculated based on 128.2 TWh of total industrial energy consumption in 2023, assuming standard 20%–50% thermal loss rates.
The Identified Status Quo
0.45 TWh/year
The entirety of off-site utilised industrial waste heat identified in 2018.
A vast, untapped domestic energy reservoir is currently being vented into the atmosphere.
The total national potential is orders of magnitude larger than current utilisation.



National Plan:
6 planned Waste-to-Energy (WtE) plants.

Processing **1.19 million tons** of waste; generating **1.03 TWh electricity + >1.0 TWh recoverable heat.**

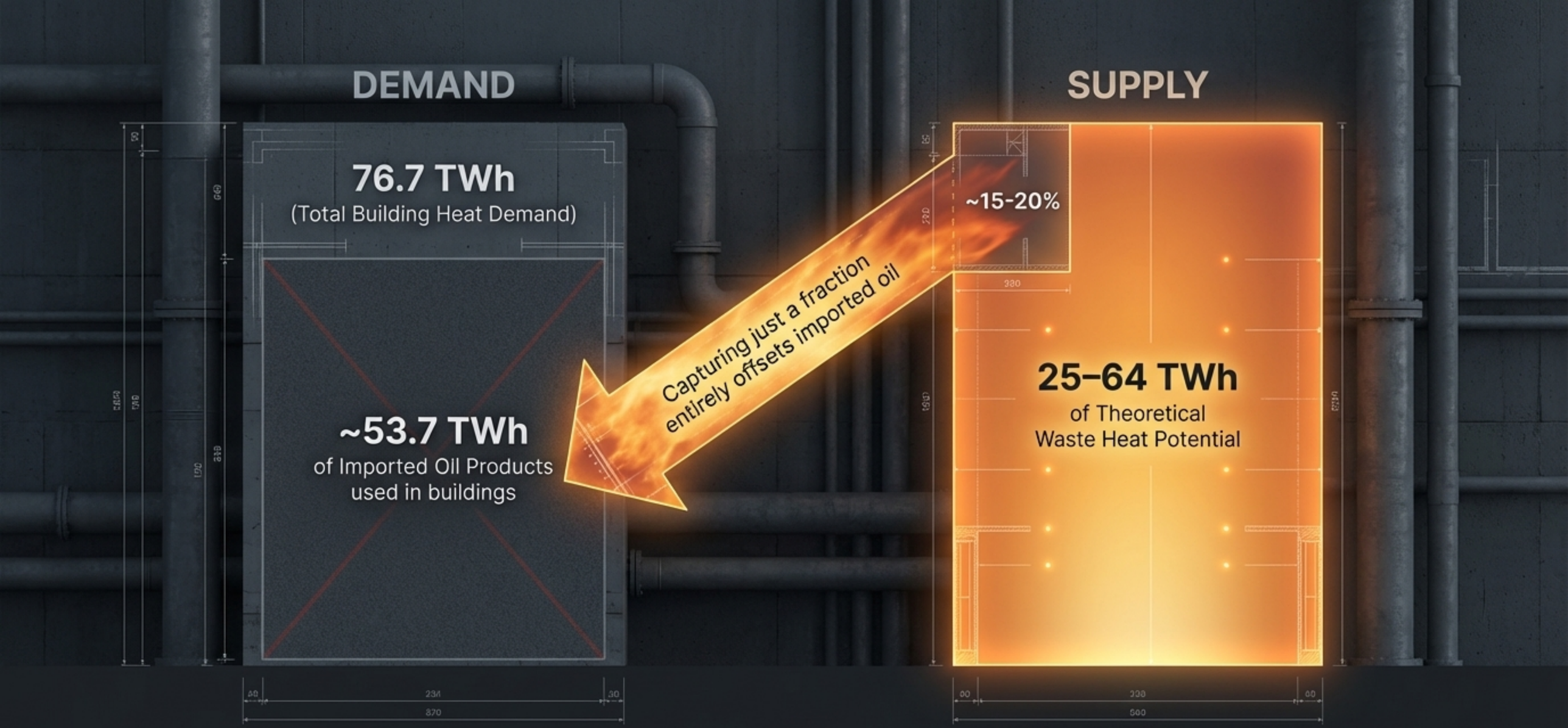
Regional Catalyst:
The planned Kozani WtE facility.

Projected to cover up to **40%** of the area's district heating needs post-lignite.

Transitional Assets: Existing thermal power generation.

(e.g., Kozani plant currently yielding >0.5 TWh).

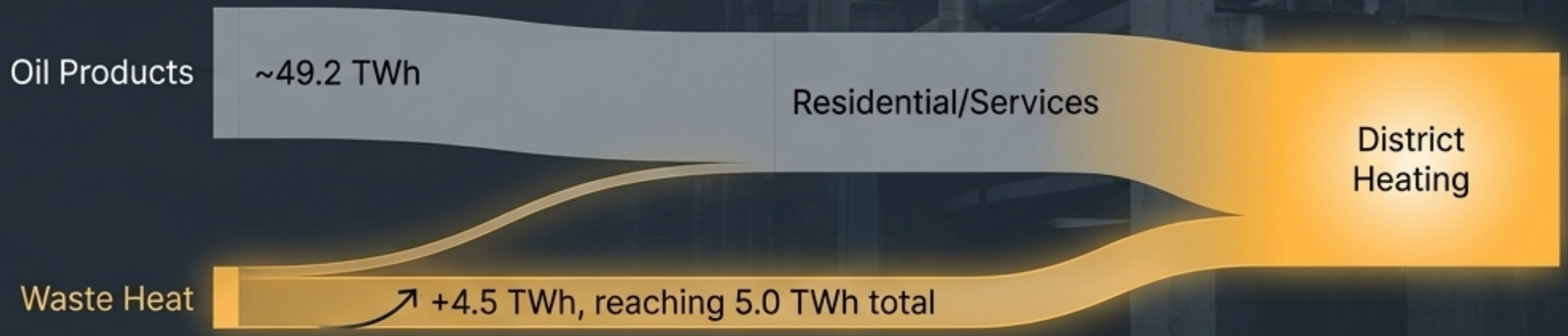
Immediate, high-yield opportunities already exist in the pipeline. Capturing heat from planned waste-to-energy infrastructure provides the fastest path to scaling district heating.



Capturing just a fraction of Greece’s unquantified industrial waste heat can entirely offset the imported oil products currently burned in Greek buildings.

Baseline 2023

2035 Transformation Scenario



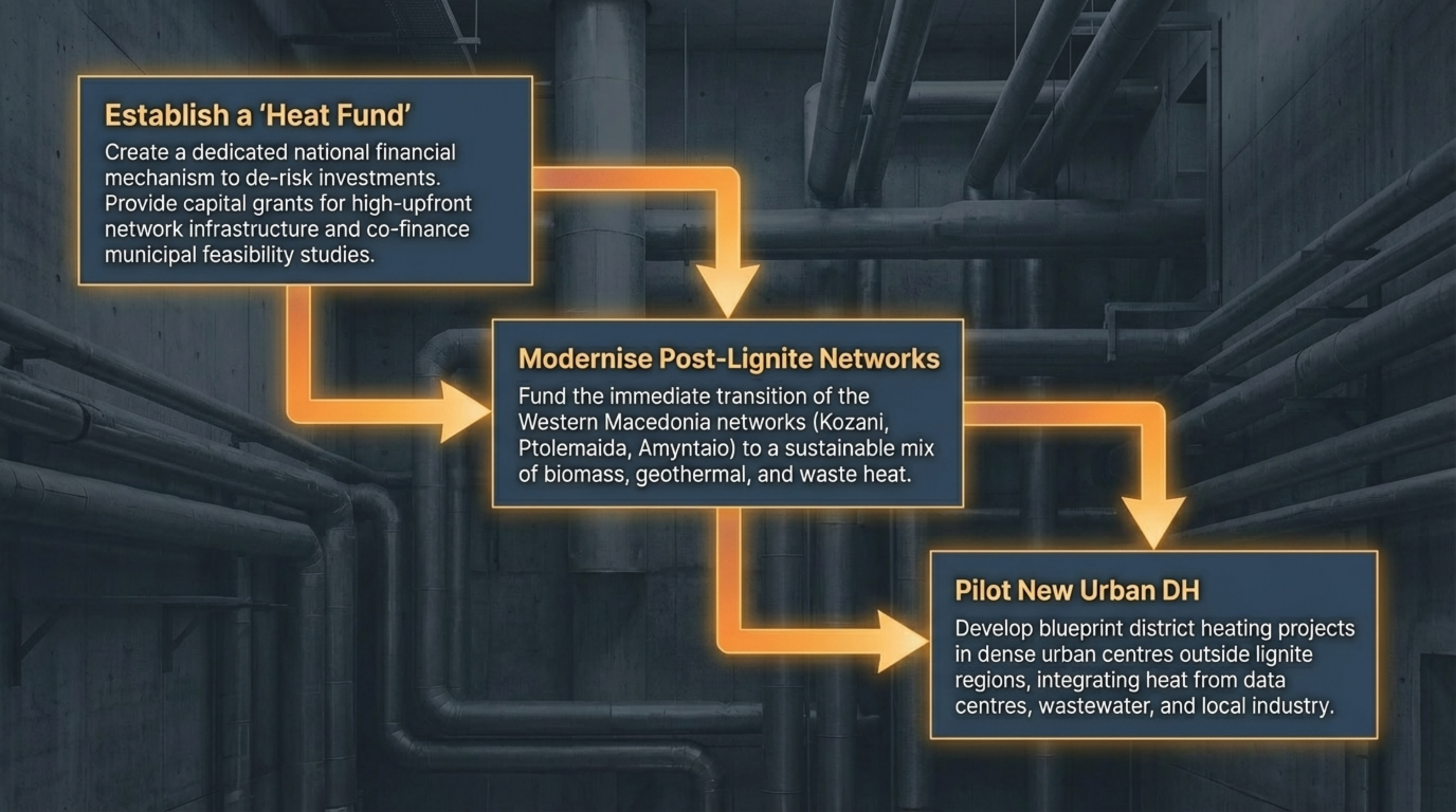
A targeted goal of integrating 5 TWh of waste heat by 2035 results in a 1:1 displacement of imported fossil fuels, structurally reducing emissions and price exposure.

Quantify the National Resource

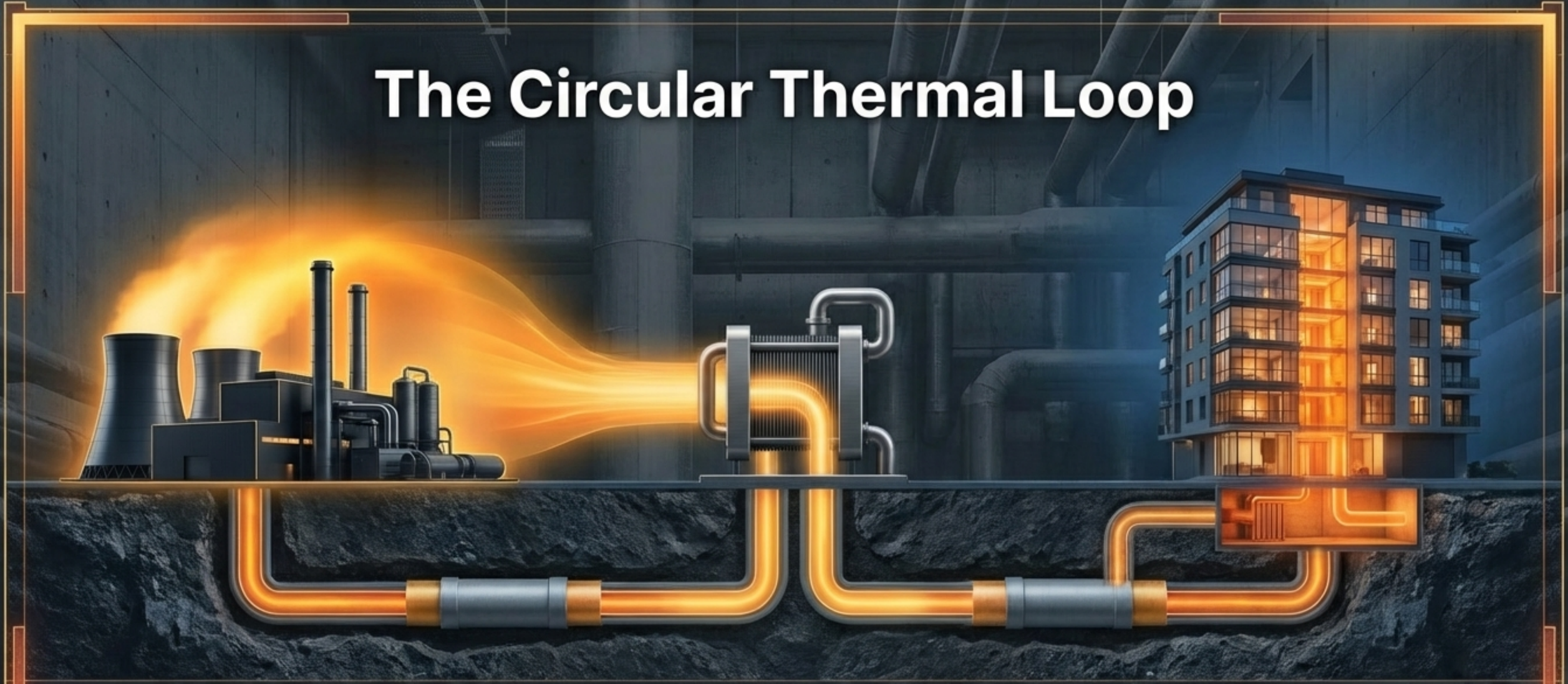
Mandate a comprehensive, nationwide technical and economic assessment of recoverable waste heat from all industrial, municipal, and commercial sources. You cannot manage what is not measured.

Establish a Legal Framework

Urgently transpose the EU Energy Efficiency Directive. Create a mandate and support structure for municipalities to draft local spatial heating and cooling plans, moving beyond basic public-sector emissions tracking.


Establish a ‘Heat Fund’
Create a dedicated national financial mechanism to de-risk investments. Provide capital grants for high-upfront network infrastructure and co-finance municipal feasibility studies.
Modernise Post-Lignite Networks
Fund the immediate transition of the Western Macedonia networks (Kozani, Ptolemaida, Amyntaio) to a sustainable mix of biomass, geothermal, and waste heat.
Pilot New Urban DH
Develop blueprint district heating projects in dense urban centres outside lignite regions, integrating heat from data centres, wastewater, and local industry.

The Circular Thermal Loop



By building the legal framework, quantifying the resource, and investing in modern infrastructure, **Greece can turn an overlooked industrial waste stream into the cornerstone of a secure, affordable, and zero-emission thermal future.**