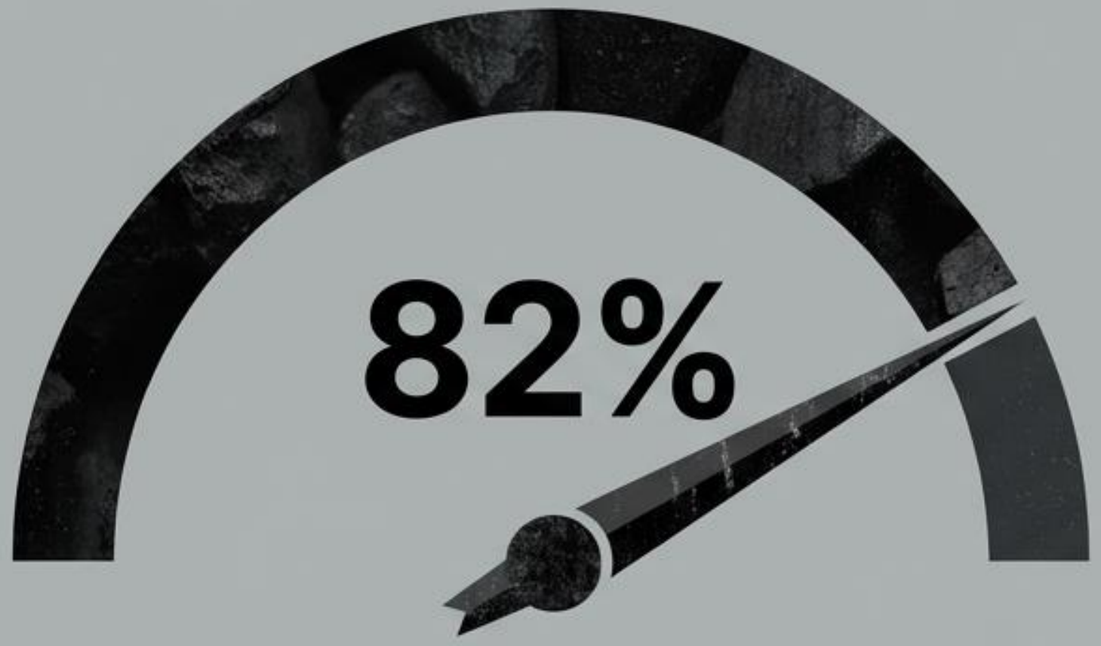
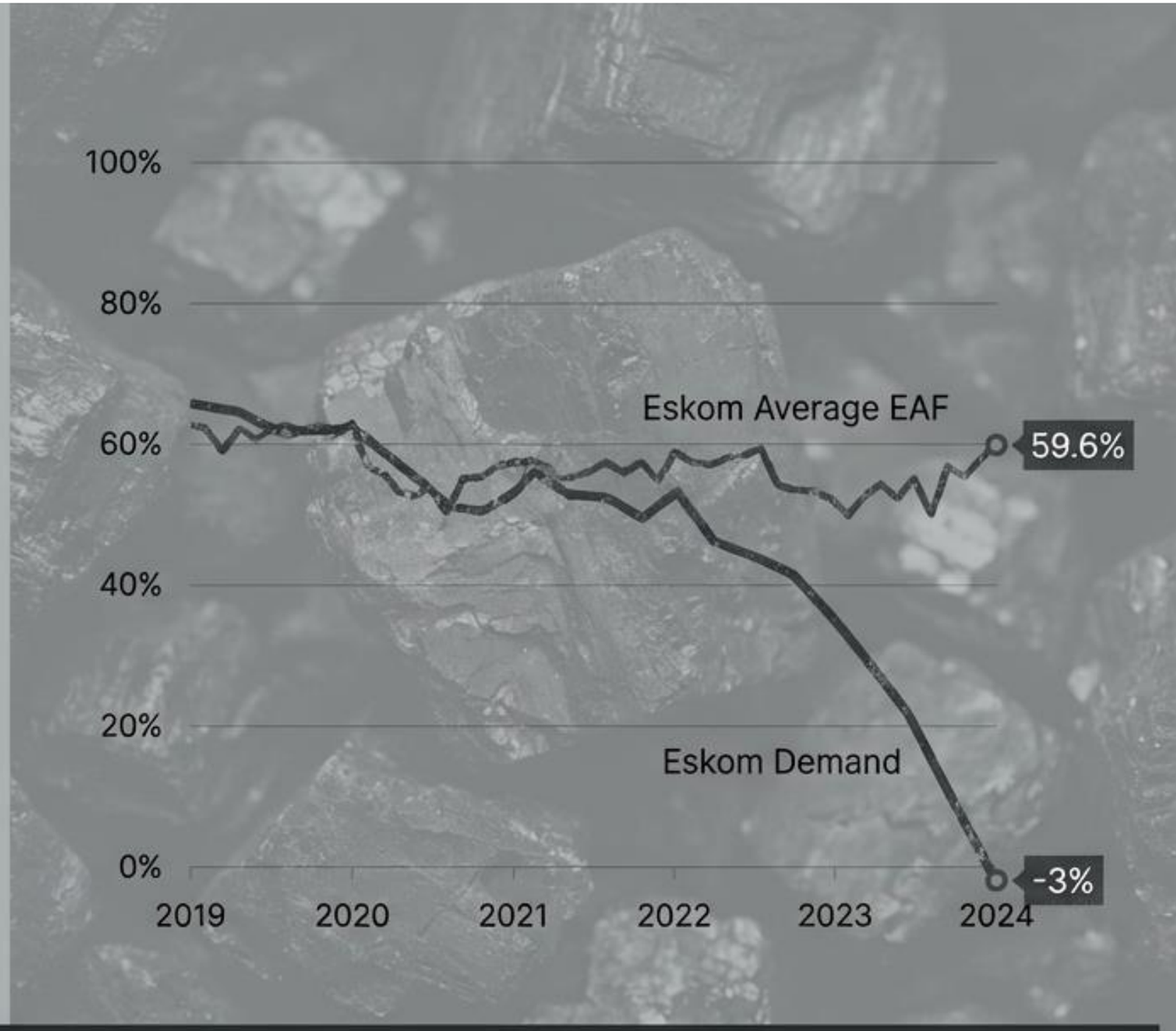
Circular Energy for a Resilient Industry

Decarbonising South Africa's Metallurgical Sector Through Waste Heat Valorisation

Industry Leadership | Policy Makers | Institutional Investors



The Structural Frailty: South Africa remains tethered to a legacy grid, with 82% of electricity generation reliant on an aging, carbon-intensive coal fleet."



The 2024 reprieve is not a utility turnaround—it is an **industrial exodus**.
Grid stability is currently propped up by a massive private sector off-loading (>4,500 MW of rooftop solar).
The root vulnerability remains.

R338 Billion

Estimated 10-year economic cost of load shedding to the South African economy.

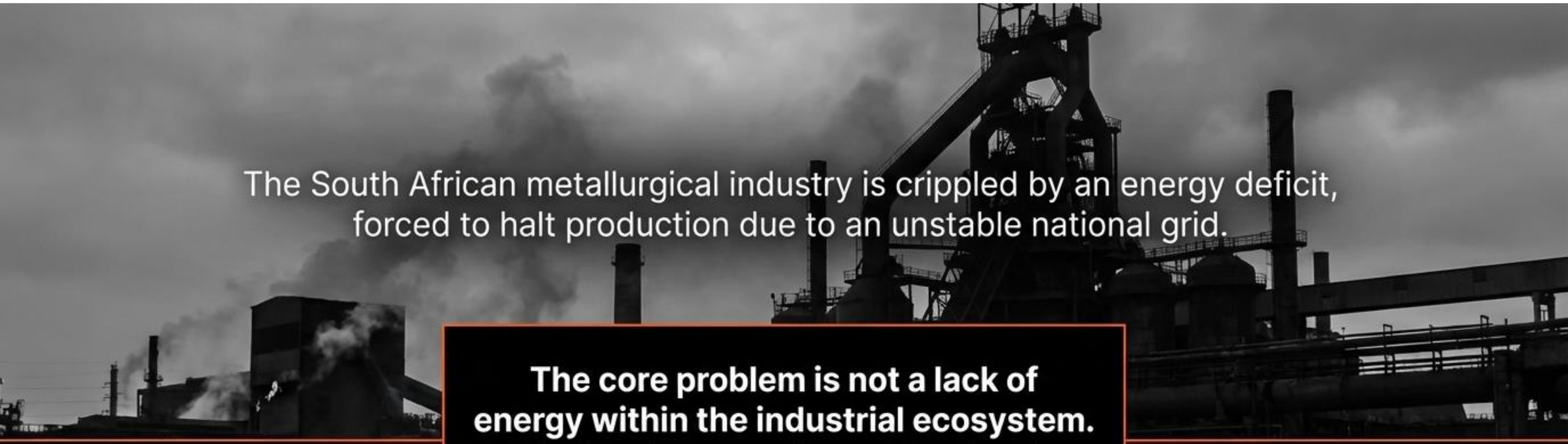
-2.3% GDP

Computable General Equilibrium (CGE) modelled reduction in national economic growth.

$24,000,000

Annual lost revenue from production downtime for a typical medium-sized metallurgical plant (6% of total revenue).

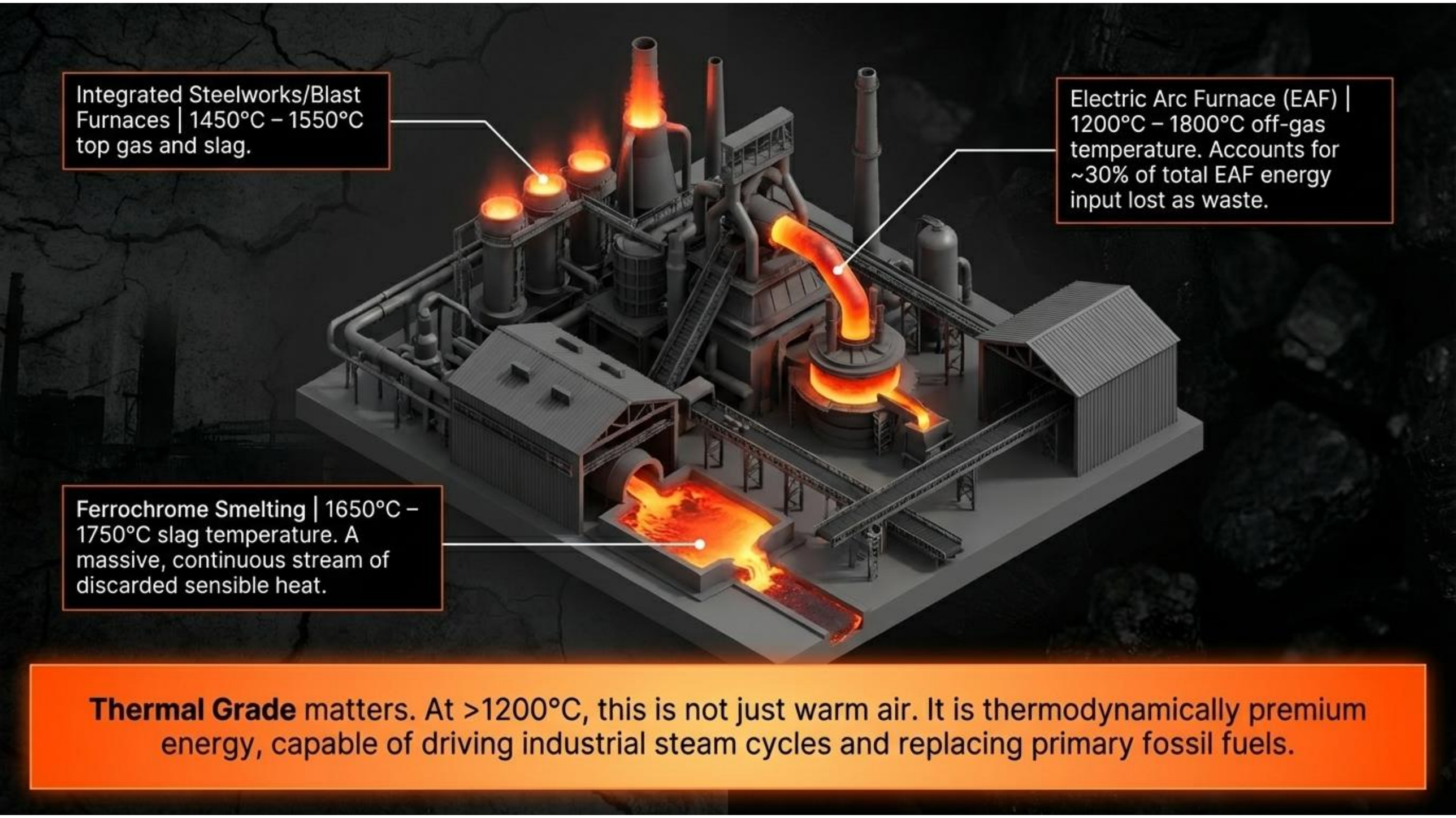
The Diesel Drain: Major retailers and industrials are burning up to R1 billion annually on diesel backup. A fundamentally unsustainable stopgap.



The South African metallurgical industry is crippled by an energy deficit, forced to halt production due to an unstable national grid.

The core problem is not a lack of energy within the industrial ecosystem. It is the absence of a mechanism to capture, store, and redeploy it.

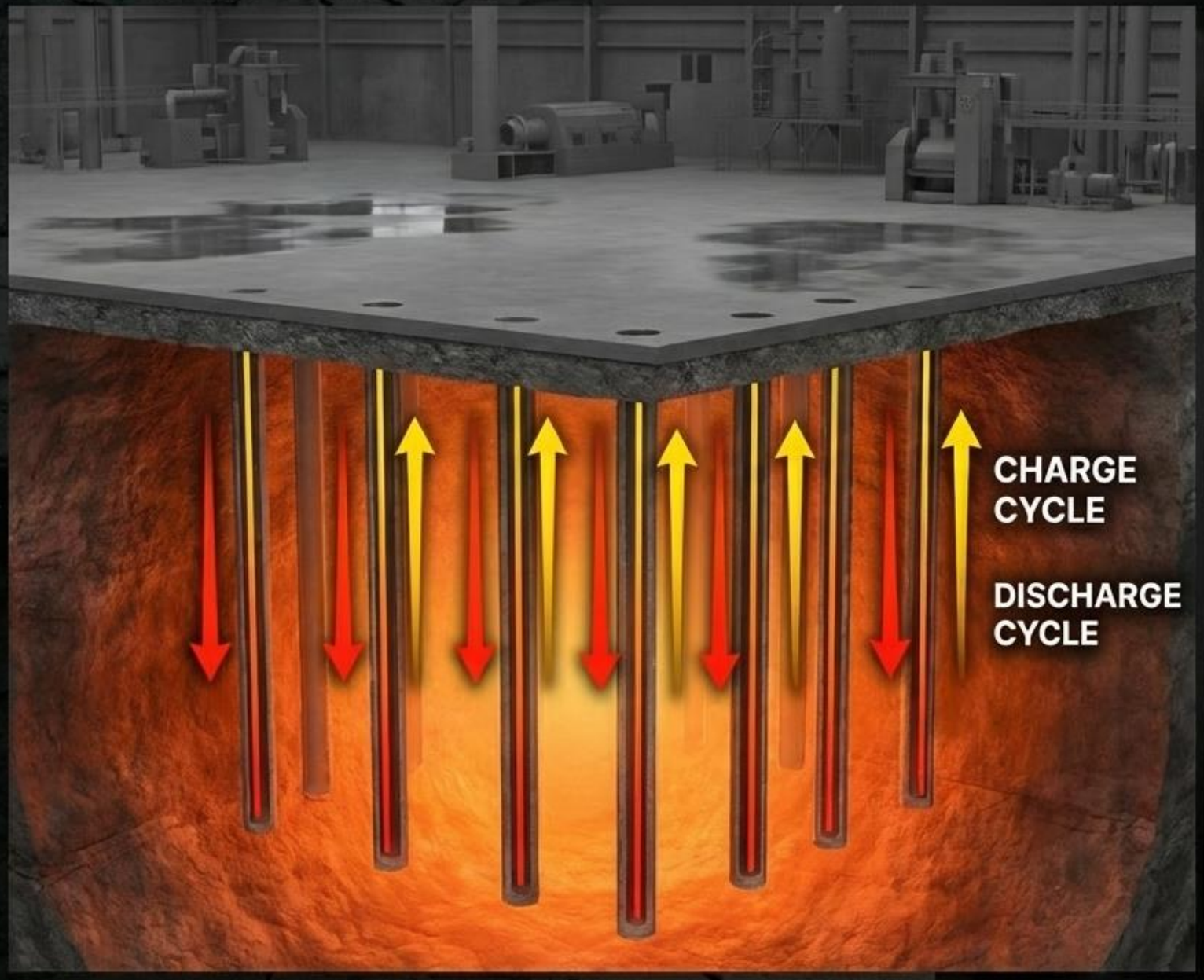
Yet, simultaneously, these exact same facilities actively vent gigawatt-hours of premium thermal energy into the atmosphere every single day.



Thermal Grade matters. At >1200°C, this is not just warm air. It is thermodynamically premium energy, capable of driving industrial steam cycles and replacing primary fossil fuels.

	Lithium-Ion	Pumped Hydro	Molten Salt / TES
Application Match	Short-duration grid balancing	Grid-scale load shifting	High-temperature industrial heat & dispatchable power
Scalability (GWh+)	Prohibitively expensive	Geography dependent	Highly scalable
Lifespan & Durability	10-15 years, degrading	50+ years	30+ years, minimal degradation
Suitability for >1000°C Process Heat	Cannot produce heat	Cannot produce heat	Explicitly designed for extreme thermal output

Electrochemical batteries store electricity. Metallurgical plants run on heat. The most efficient pathway is to store energy in the form it will ultimately be used.

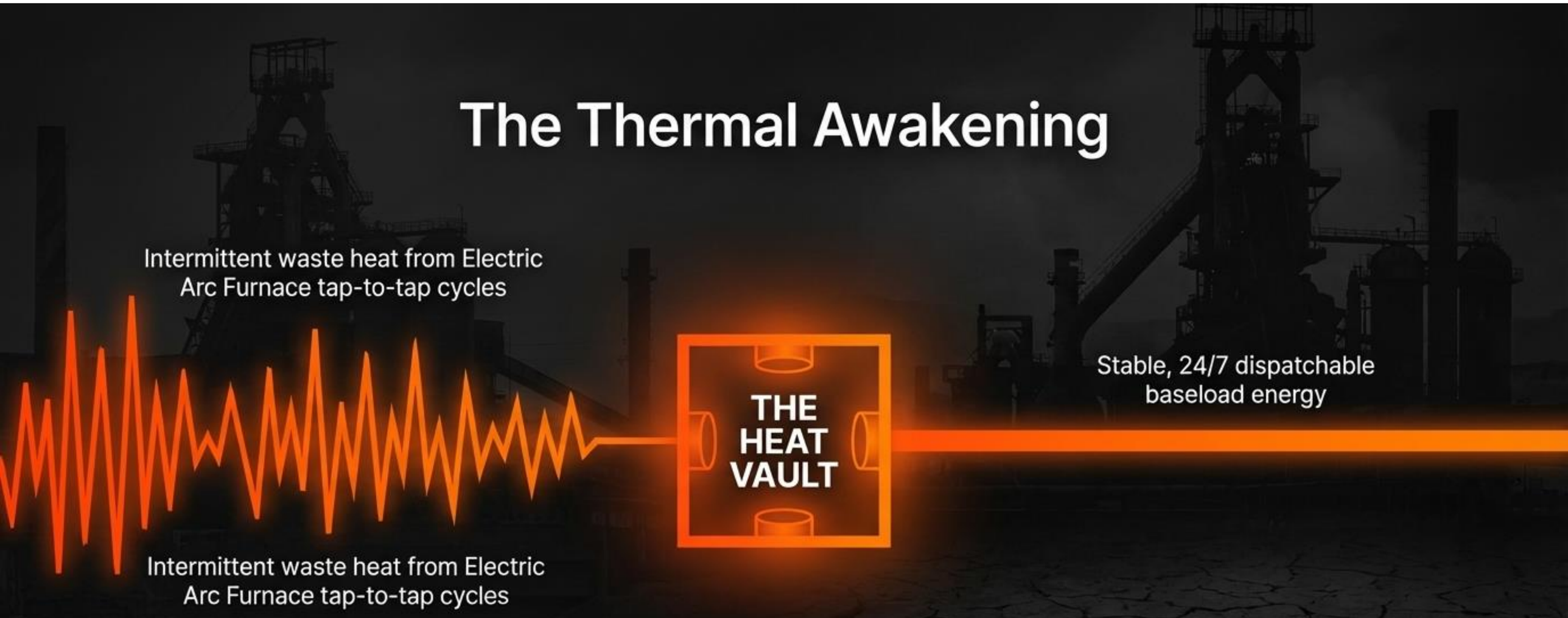


Zero manufactured storage media. By utilising the natural geology beneath the site, capital costs shift from expensive tanks and molten salts to mature, oil-and-gas-style drilling.

Capable of storing thermal energy for days, weeks, or even seasons, shielding operations from intermittent maintenance cycles.

Projected Levelised Cost of Storage (LCOS): As low as $0.03/kWh.

The Thermal Awakening



The Thermal Flywheel Effect. The Heat Vault absorbs the violent thermal spikes of metallurgical processes and smooths them into a continuous, predictable energy supply—decoupling the moment of energy capture from the moment of use

High-Grade Heat (>1000°C)

Pathway: Industrial Process Heat

Application: Direct routing to scrap metal pre-heating and re-heat furnaces, directly displacing primary fossil fuels.

Medium-Grade Heat (Steam Generation)

Pathway: Steam Turbine

Application: High-pressure steam drives a conventional turbine to generate 24/7 baseload electricity, eliminating Eskom grid reliance.

Low-Grade Heat (<300°C)

Pathway: Organic Rankine Cycle (ORC)

Application: Residual leftover heat vaporises organic fluids in a bottoming cycle to squeeze out final megawatts of supplementary electricity.

Maximising the thermal yield. Every ounce of thermal value is sequentially extracted.

The Circular Energy Ecosystem

From a linear consumer to a self-contained island. The plant is now a fully circular energy grid. The waste product of one cycle is the primary fuel for the next.

Before vs. After

The Linear Status Quo	The Circular Future
Grid Electricity: $52.8M ($0.11/kWh)	Grid & Diesel Reliance: ~~$0~~ ✓
Diesel Backup: $7.0M ($0.35/kWh)	100% Uptime **Downtime Losses: $0** (100% Uptime Guaranteed)
Downtime Losses: $24.0M	New System O&M: ~$2.0M
Total Annual Drain: ~$83.8M	**Total Annual OPEX: ~$2.0M**

Estimated CAPEX: ~$280M (Includes Vault & Heat Recovery).
Estimated Payback Period: ~3.25 Years. **Permanent immunity to Eskom tariff hikes.**

Deep Decarbonisation

Eliminates up to 436,800 tCO_2e annually by displacing coal-heavy grid power and diesel combustion.

The CBAM Shield

Proactively secures access to lucrative European markets by slashing embedded carbon, sidestepping the EU's Carbon Border Adjustment Mechanism (CBAM) tariffs.

The Carbon Tax Dividend

Erases over $4,300,000 in domestic South African carbon tax liabilities annually.

Investor Insight: A verifiable ESG asset that unlocks premium green financing and secures the social license to operate.

Industry Leaders (Metallurgical)

Commission Site-Specific Feasibility Studies. Quantify your plant's specific heat streams (temperatures/volumes) and initiate pilot projects to de-risk full-scale deployment.

Policymakers (DMRE, NERSA)

Fast-Track 'Waste-to-Power'. Create a distinct, incentivised regulatory category for industrial energy recovery to streamline environmental permitting and grid-integration approvals.

Institutional Investors

Pioneer the Energy-as-a-Service (EaaS) Model. Finance, own, and operate the Heat Vault infrastructure, selling reliable, discounted heat/power back to the plant via long-term PPAs, removing the upfront CAPEX barrier.


South Africa’s industrial future will not be defined by what we pull from the grid, but by what we refuse to waste.
Transform your greatest liability into your ultimate strategic asset.