



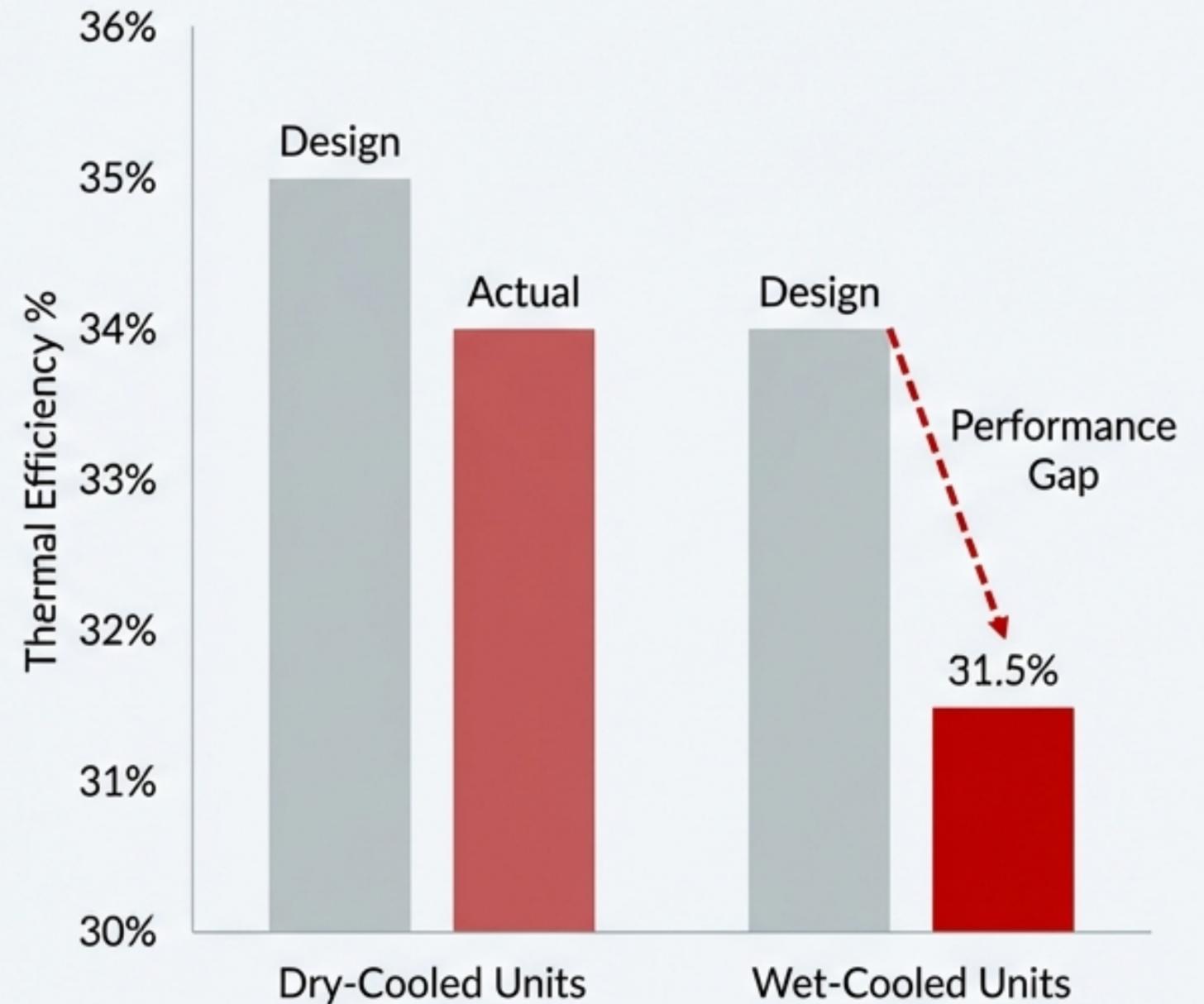
# Unlocking Hidden Performance: A Systemic Approach to Cooling Efficiency in South Africa's Coal Fleet

## South Africa's coal fleet is critical, but faces a persistent efficiency gap.

The performance of wet-cooled units, in particular, continues to underperform design expectations, impacting overall Energy Availability Factor (EAF) and operational costs.

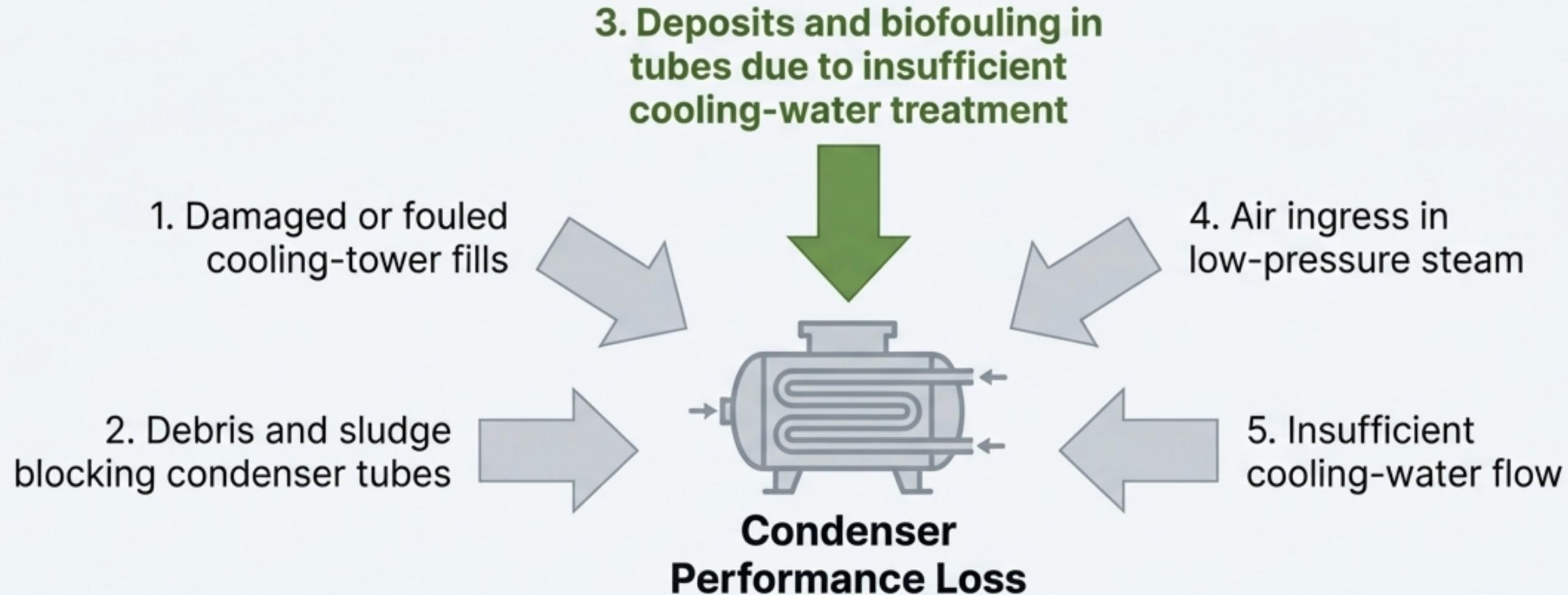
The thermal performance of the Generation fleet was reduced from an average of 34% (F2003-F2007) to approximately 31.5% in F2015.

### Typical Performance vs. Design



Source: Adapted from Eskom JET briefing materials and Process Engineering Strategic Report (2015).

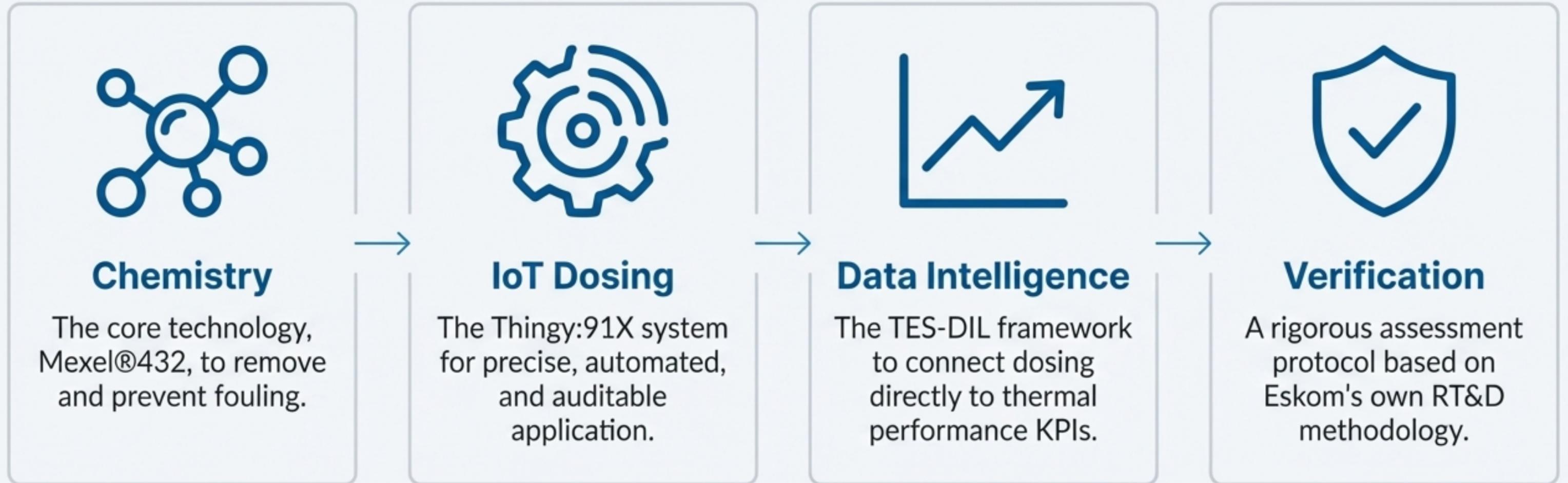
# The Cold-End Blind Spot: Efficiency losses are known, but their primary cause is not actively managed.



Source: VGBE/STEAG Technical Guidance

Eskom's Station Thermal Efficiency Performance (STEP) system provides detailed reporting, but currently lacks a dedicated KPI for condenser and cooling tower fouling. This means significant losses can persist without a clear operational signal.

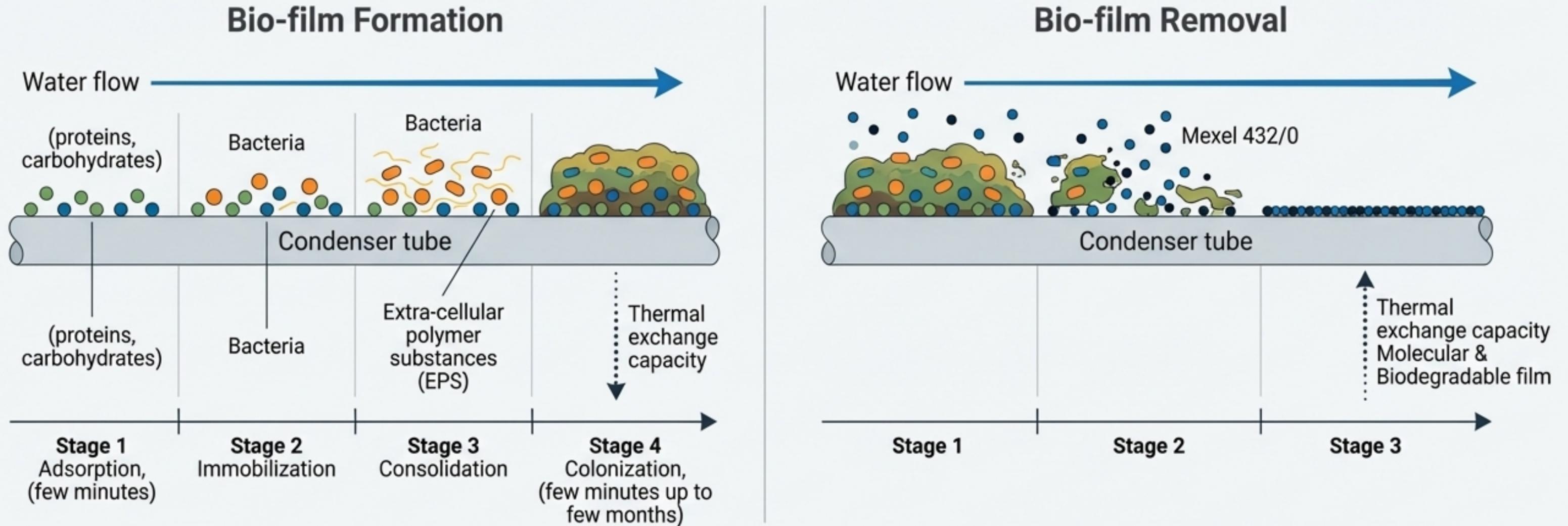
# The Thermal Efficiency Solution (TES): A Four-Layer System to Target the Blind Spot.

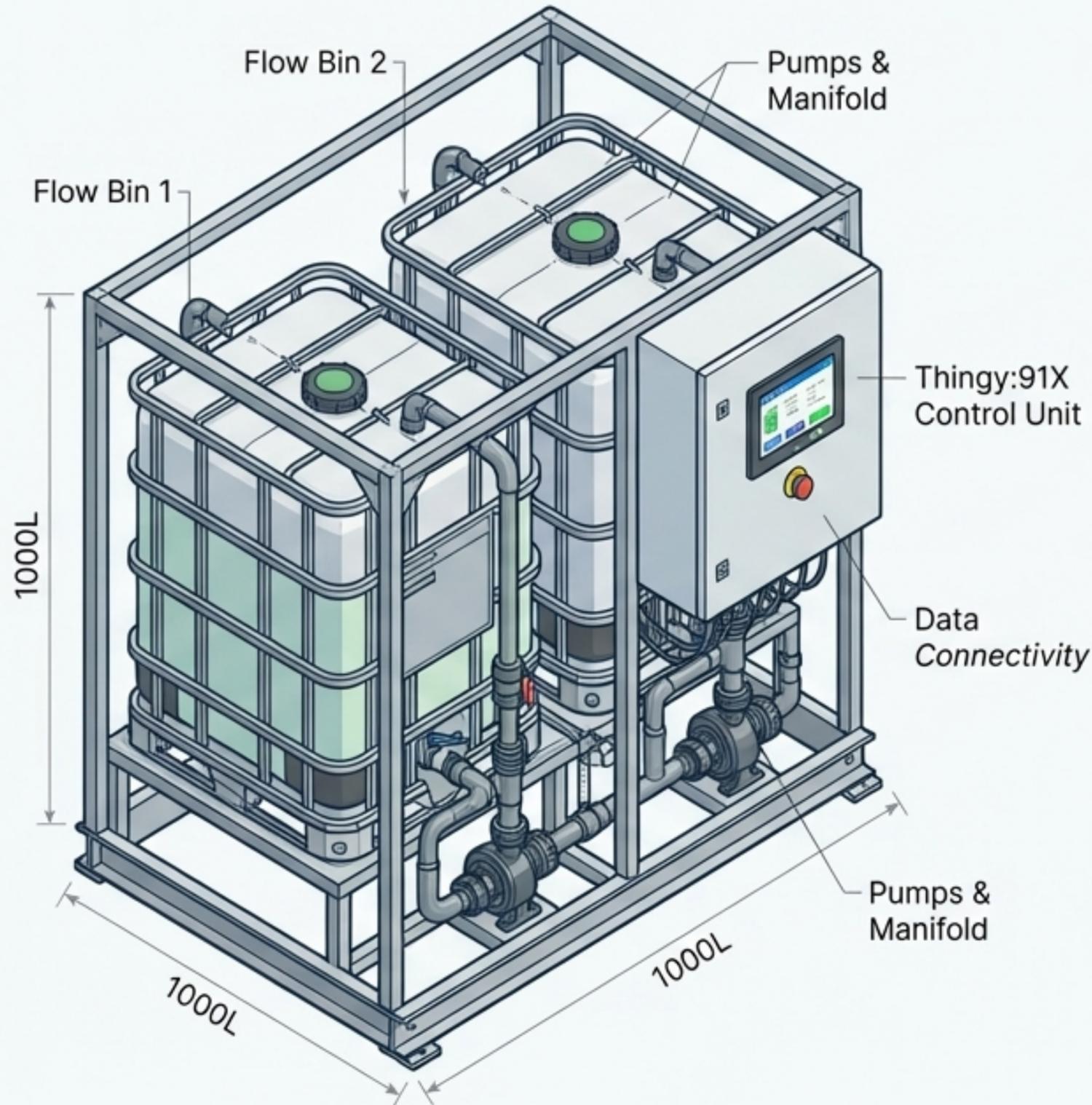


*TES systematically addresses condenser and cooling-water losses that are known and measurable, but not yet actively managed.*

# The Core Technology: How Mexel<sup>®</sup>432 Restores Heat Transfer Surfaces

It is more efficient to treat the surfaces in contact with water than the entire volume of water. Mexel<sup>®</sup>432 forms a protective molecular film (30 Angstrom), detaching existing biofouling and preventing its return.





# Precision & Accountability: IoT Dosing and Data Intelligence.



**Automated & Auditable:** Remote configuration of dosing times and volumes with >24h UPS backup.



**Data-Driven:** Integrates dosing logs with plant signals (TR, TTD) to create a Cooling-Water Efficiency View.



**South African Design:** Based on the Thingy:91X platform, ensuring local expertise and support.

**This system provides the missing link—connecting chemical application directly to thermal performance, closing the loop on the cold-end blind spot.**

# Credibility Through Verification: Built on Eskom's Own RT&D Protocol

Our verification process is not a proprietary black box. It is a transparent assessment based on the official “**Eskom RT&D Tutuka Surfactant (FFA) Testing Protocol Rev08.**”



## 1. Establish Baseline

Use agreed-upon KPIs to measure current performance.



## 2. Controlled Intervention

Deploy Mexel®432 with the IoT dosing system.



## 3. Post-Intervention Assessment

Compare performance against the baseline using the protocol's structure.

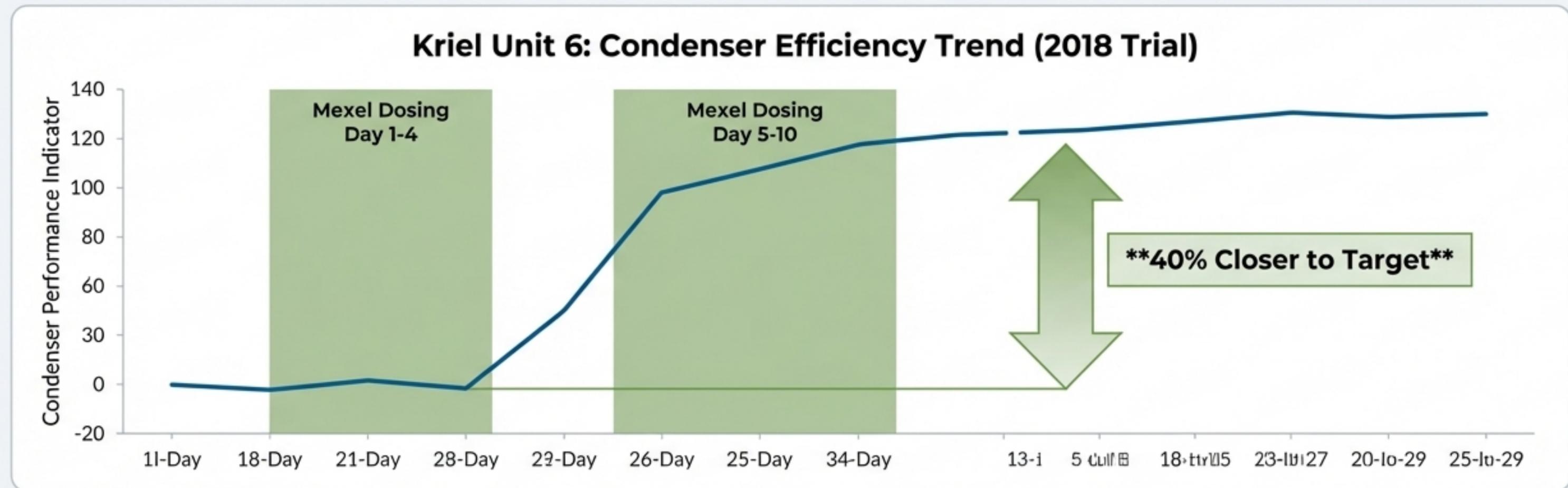
## Third-Party Validation

To ensure complete impartiality, an independent third party such as the **Water Research Commission (WRC)** can act as a referee, reviewing data and methodology.



# Demonstrated 40% Improvement at Kriel Power Station Unit 6.

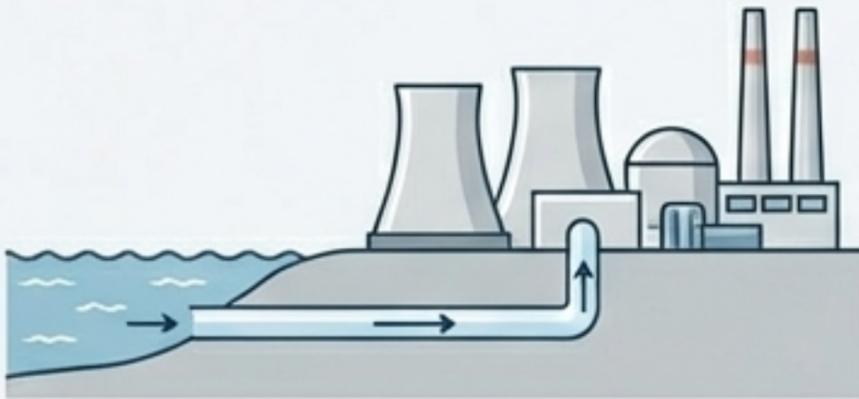
During the 2018 trial, dosing with Mexel®432 led to a significant improvement in condenser performance. **Temperature Rise (TR) moved 40% closer to the engineering target**, indicating substantial fouling removal and improved heat transfer efficiency.



Within day 3 of product application, condenser cleanliness had improved by approximately 30%.

# Globally Validated Across Diverse Industries and Water Conditions.

## Power Station (USA)



### Challenge:

Microfouling (slime) in a plant using seawater for cooling.

### Result:

The quadrant treated with Mexel 432 showed no increase in resistance to heat transfer... performance judged to be equivalent to chlorine.

## Food Processing (USA)



### Challenge:

Severe biofouling in the cooling tower of an orange juice concentration plant.

### Result:

After three weeks of treatment, an estimated 75% of the biofouling in the cooling tower had been dispersed.

## Global Regulatory Maturity



### Key International Registrations:

- U.S. EPA (Reg: 69100-1)
- EC (IPPC) BAT's
- OSPAR (HOCNF)
- France - EDF Process Qualification

# The Business Case: A Cost-Effective Pathway to Restore Lost Megawatts

TES is one of the fastest and most effective ways to extract more useful work from the coal and infrastructure Eskom already has.

# 0.5%–3%

Plant-level efficiency gains supported by international and local evidence for cooling systems treated with Mexel®432



## Lower Fuel Burn

Reduced coal consumption for the same net MWh sent out.



## Higher Net Output

More net MWh generated from the same fuel input.



## Reduced Maintenance

Lower costs associated with manual cleaning and corrosion

# Strategic Alignment: Directly Supporting South Africa's Just Energy Transition (JET)

Improving the efficiency of the existing fleet is a core pillar of the JET. TES is a practical, deployable solution that delivers on this objective.



## Reduces Emissions Intensity

Lowers the tCO<sub>2</sub>/MWh of retrofitted units by improving **thermal efficiency**.



## Improves Asset Utilisation

Extends the **useful life** of existing infrastructure by reducing **corrosion** and **thermal stress**.



## Protects Regional Jobs

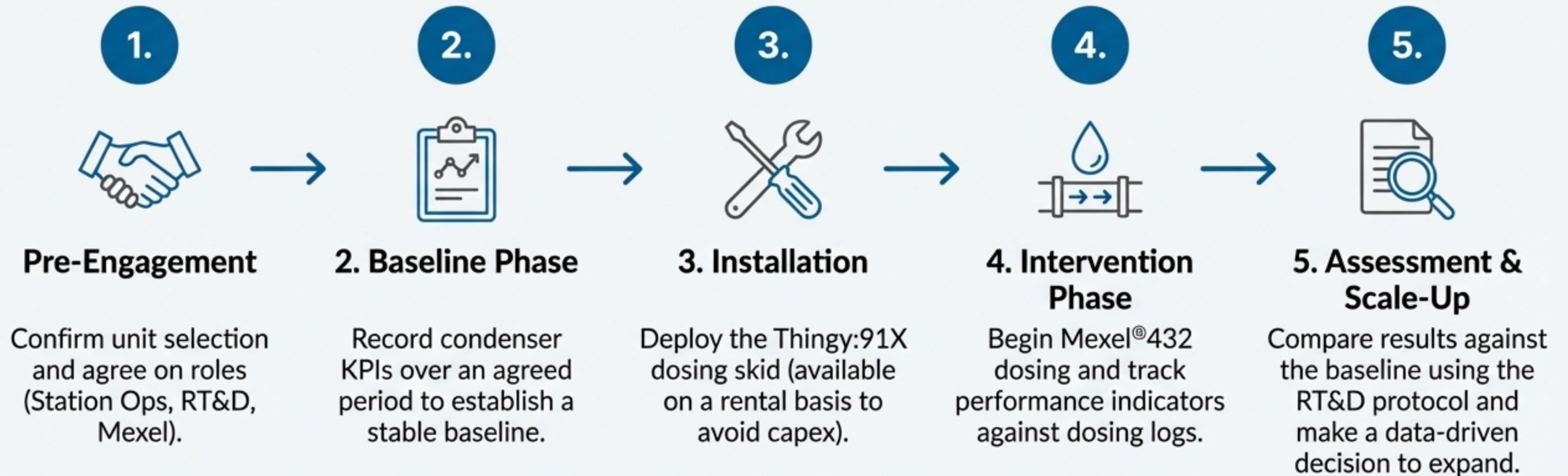
Makes the existing fleet more efficient and **economically viable, supporting the economy** in coal regions.

Proof of Alignment

### Official JET Recognition

The project is formally registered on the **JET Funding Platform** as an Energy Efficiency project (ID 20241127-881a32).

# The Path Forward: A Phased, Low-Risk Pilot Program



The rental model for dosing systems removes upfront capital expenditure as a barrier to adoption.

# About Mexel Energy Sustain



A leading service provider focused on environmentally friendly and sustainable solutions for the Energy and Water sectors in Southern Africa.

## Key Strengths



- Level 1 B-BBEE owned enterprise.



- South African registered company with local manufacturing and operations.



- Multi-disciplinary team of expert engineers.



- Promoting an ethos of mentorship and empowerment.

# Let's scope a pilot for your highest-priority wet-cooled unit.

We are ready to collaborate with your operations and RT&D teams to apply the official testing protocol to a unit where efficiency gains will have the greatest impact.

**Jurie Lombard**

Director: Mexel Energy Sustain (Pty) Ltd

Cell: +27 83 284 6312

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# Appendix: Supporting Information

## Section 1: Major International Regulatory Registrations

- MEXEL 432 conforms to New EC 98/8 Directive (biocides)
- OSPAR (HOCNF)
- U.S. Environmental Protection Agency (EPA); Reg No: 69100-1
- EC (IPPC): BAT's (Best Available Technique)
- Netherlands: Staatstoezicht op de Mijnen – Reg: 94074874
- France - EDF: process qualification based on 10 years of joined tests

## Section 2: Safety & Handling Summary (MSDS)

### Principal Hazards:

**H314:** Causes severe skin burns and eye damage



**H372:** Causes damage to organs through prolonged or repeated exposure



**H411:** Toxic to aquatic life with long lasting effects

