The Electrification of Heat

Re-Engineering Industrial Energy for Net-Zero Production

Heavy industries—particularly petrochemicals and refining—depend on ultra-high-temperature processes such as steam cracking, traditionally powered by fossil fuel combustion. These processes are among the largest industrial sources of carbon emissions. A leading petrochemical producer recognized that achieving Net-Zero would require more than efficiency improvements—it demanded a fundamental shift in how industrial heat is generated, moving from combustion to electrified, renewable-powered systems.

ELECTRIFIED HEAT | NET-ZERO PRODUCTION | CBAM-READY

90%

Carbon Reduction

Up to 90% reduction in emissions for heat-intensive processes

850°C+

Process Temperatures

Electrified systems sustaining ultra-high-temperature industrial heat

100%

Operational Uptime

Maintained plant reliability throughout the full transition

0

Combustion Dependency

Target state: zero reliance on fossil fuel combustion for heat generation

Fortis & Peak
Shaping What's Next

The Strategic Challenge

The operation was thermally efficient—but carbon-intensive and future-exposed. Petrochemical producers face a convergence of technical, regulatory, and financial pressures that make the status quo increasingly untenable. Dependence on fossil fuels to generate temperatures above 850°C creates deep carbon intensity across cracking and thermal processes, while rising exposure to carbon taxes and regulatory mechanisms such as the Carbon Border Adjustment Mechanism (CBAM) compounds financial risk. Existing plant infrastructure was not designed with electrification in mind, and any transition carries the risk of disrupting plant stability and uptime.

Fossil Fuel Dependency

Processes requiring temperatures above 850°C have historically been achievable only through direct fossil fuel combustion, locking in high carbon intensity at the core of production.

Regulatory Exposure

Carbon pricing mechanisms and CBAM create direct financial exposure for carbon-intensive producers, threatening competitiveness in global markets as regulations tighten.

Infrastructure Readiness

Existing furnace designs and plant energy infrastructure were not built for electrification, requiring significant engineering assessment before any transition could begin.

Operational Risk

Any transition to electrified systems must preserve plant stability and uptime—disruption to cracking operations carries severe production and financial consequences.

Transformation Powered by 3D&S + TECHNEXIS™

Fortis & Peak deployed its proprietary 3D&S execution framework—Define, Design, Deliver, Sustain—underpinned by the TECHNEXIS™ industrial energy engineering platform. This structured methodology ensured that every phase of the electrification journey was grounded in rigorous diagnostics, precision engineering, controlled deployment, and long-term resilience. The result was a phased, controlled transition from combustion-based heat to a fully electrified, renewable-powered industrial energy system.

1

DEFINE

Mapped the full thermal and energy ecosystem using TECHNEXIS™. Assessed cracking furnaces, quantified carbon emissions and fuel consumption, evaluated furnace suitability for e-cracking, and analyzed grid capacity constraints and regulatory exposure.

2

DESIGN

Engineered an Electrified Heat Architecture: retrofit designs for high-current electrical heating, renewable energy and storage integration, thermal process redesign, grid infrastructure modeling, and smart energy management systems.

3

DELIVER

Phased deployment of electric heating elements in cracking furnaces, integration with renewable energy inputs, synchronization of electrical load with operational demand cycles, and real-time temperature and energy performance monitoring.

4

SUSTAIN

Continuous optimization of energy consumption and thermal efficiency, real-time emissions and cost monitoring, ongoing upgrades aligned with renewable energy availability, and capability building in electrified process engineering.

TECHNEXIS™ served as the engineering execution platform across all four phases—ensuring thermal performance, reliability, and large-scale renewable energy integration throughout the transformation.

Transformation Architecture

The shift from a traditional combustion model to an electrified industrial energy system represents a fundamental re-engineering of how heat is generated and managed at scale. TECHNEXIS™ provides the engineering layer—spanning energy systems, thermal engineering, grid integration, and real-time optimization—while the 3D&S framework governs execution from diagnosis through sustained performance.

Traditional Model

01

Fossil Fuel Combustion

Direct burning of natural gas or fuel oil to generate industrial heat

02

Heat Generation

Combustion-driven thermal energy delivered to cracking furnaces

03

Industrial Process

High-temperature cracking and thermal processing—carbon-intensive

Electrified Model

01

Renewable Energy

Solar, wind, and stored energy feed directly into the plant grid

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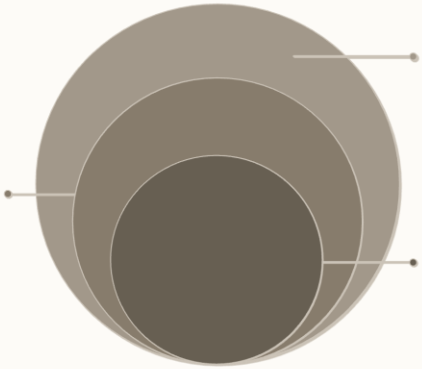
Electric Heating

High-current electrical systems deliver precise, controllable heat

03

Industrial Process

Same output quality and throughput—near-zero carbon footprint



Thermal Engineering

Electric furnace design and advanced heat management

Grid Integration

Large-scale electrical load balancing and stability

Optimization

Real-time smart energy management via TECHNEXIS™

Measurable Impact & Strategic Positioning

The electrification of heat delivers transformative, quantifiable outcomes for heavy industrial producers. Up to 90% reduction in carbon emissions for heat-intensive processes fundamentally changes the carbon profile of production. Reduced exposure to carbon pricing and CBAM regulatory risks improves long-term competitiveness, while improved energy cost stability replaces volatile fossil fuel markets with predictable renewable inputs. Critically, process performance and operational uptime are fully maintained—and the foundation for Net-Zero industrial production is firmly established.

> The future of heavy industry will not be powered by combustion—it will be driven by electrified, intelligent energy systems integrated at the core of production.

TECHNEXIS™

Fortis & Peak's advanced industrial energy engineering platform. Designs and integrates electrified heat systems, ensures thermal performance and reliability, and enables large-scale renewable energy integration into core operations.

3D&S Framework

Fortis & Peak's execution-driven transformation methodology. Governs the full journey from thermal diagnostics and electrification design through phased deployment and long-term performance optimization.

Deep Decarbonization

Fortis & Peak enables decarbonization of the most carbon-intensive core industrial processes—not just peripheral efficiency gains—positioning clients as Net-Zero, future-ready producers.

Fortis & Peak is the creator of TECHNEXIS™ and owner of the 3D&S methodology—a firm purpose-built to lead the electrification of heavy industry and build the Net-Zero industrial systems of the future.

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