Green Hydrogen & The "Electric Mine"

Engineering the Transition to Net-Zero Mining Systems

A large-scale mining operation faced a structural energy challenge: its core operations were heavily dependent on diesel-powered haulage and carbon-intensive energy sources. Rising fuel costs, increasing regulatory pressure, and global decarbonization mandates were putting both margins and market access at risk. Leadership recognized that achieving Net-Zero would require more than incremental efficiency improvements—it demanded a fundamental re-engineering of the mine's energy and operating model.

Carbon Emissions

Significant reduction across all operations

Electrified Fleet

Underground and surface mining operations

Cost Savings

Lowered diesel and maintenance expenditure

CBAM-Ready

Export compliance for global carbon regulations

> From carbon-intensive operations to engineered, net-zero mining systems — powered by TECHNEXIS™ and the 3D&S framework.

Fortis & Peak
Shaping What's Next

The Strategic Challenge

The mine was operationally strong—but energy-constrained and carbon-exposed. A confluence of structural pressures made the status quo untenable, demanding a bold and integrated response rather than piecemeal efficiency gains.

Diesel Dependency

Heavy reliance on diesel-powered equipment and fossil fuels across haulage, processing, and infrastructure created deep cost and emissions exposure.

High Operating Costs

Fuel consumption and maintenance demands driven by aging, carbon-intensive equipment eroded margins and limited reinvestment capacity.

Regulatory Risk

Growing exposure to carbon taxation frameworks, including the EU's Carbon Border Adjustment Mechanism (CBAM), threatened market access and export viability.

Remote Energy Constraints

Remote site locations limited access to stable, clean energy sources, making grid-based electrification impractical without purpose-built infrastructure.

No Integrated Strategy

The absence of a cohesive energy transition roadmap meant efforts were fragmented, reactive, and unable to deliver systemic change at scale.

Transformation Powered by 3D&S + TECHNEXIS™

Fortis & Peak deployed its proprietary 3D&S execution framework—Define, Design, Deliver, Sustain—underpinned by the TECHNEXIS™ engineering platform, to architect and implement a fully integrated Electric Mine. Each phase built on the last, creating a coherent pathway from diagnosis to long-term resilience.

1

DEFINE

Mapped the mine's full energy ecosystem using TECHNEXIS™. Assessed consumption across haulage, processing, and infrastructure. Quantified carbon emissions, evaluated equipment readiness, and analyzed CBAM regulatory exposure.

2

DESIGN

Engineered a fully integrated Electric Mine model: electrification of underground and surface fleets, hydrogen-powered heavy haulage, renewable microgrids (solar, storage, hybrid), and smart energy management systems.

3

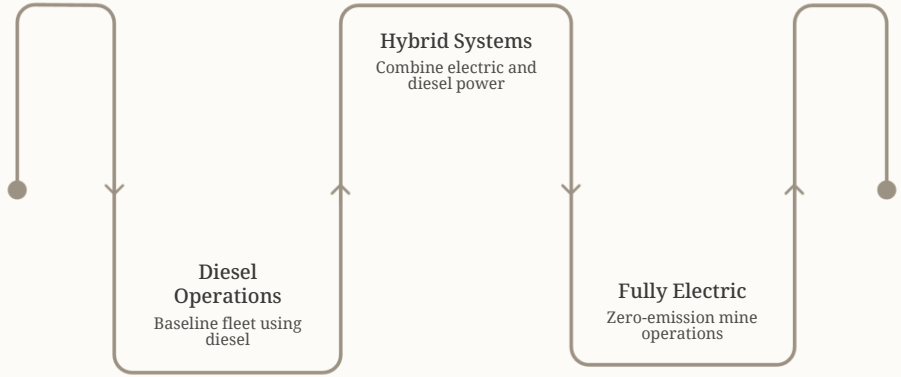
DELIVER

Phased deployment of electrified mining fleets, hydrogen haul trucks, renewable microgrids, and storage systems. Integrated energy infrastructure with operational workflows and real-time monitoring.

4

SUSTAIN

Continuous optimization of energy usage, real-time carbon and cost monitoring, ongoing hydrogen system upgrades, and capability building in clean energy operations and maintenance.



This phased transition architecture ensured operational continuity while systematically eliminating diesel dependency—

Core Platforms in Action

Two proprietary platforms sit at the heart of this transformation, working in concert to deliver engineering-led energy independence at industrial scale.

TECHNEXIS™ — The Engineering Engine

TECHNEXIS™ is the technical backbone of the Electric Mine. It designs and integrates renewable energy and hydrogen systems, enables the electrification of mining operations end-to-end, and ensures energy reliability in remote environments where grid access is unavailable. It is the platform that turns transition strategy into deployable, operational infrastructure.

3D&S — The Execution Framework

The 3D&S methodology provides the structured execution model that governs how transformation is planned, engineered, deployed, and sustained. By sequencing Define, Design, Deliver, and Sustain as distinct but connected phases, 3D&S ensures that every intervention is grounded in data, engineered for performance, and built to last. Together with TECHNEXIS™, it delivers end-to-end Net-Zero system design and deployment.

Renewables

Solar and hybrid microgrid systems designed for remote, off-grid mining environments with maximum reliability.

Storage

Advanced energy storage solutions that buffer supply variability and ensure continuous operational power availability.

Hydrogen

Green hydrogen production, storage, and distribution infrastructure powering heavy haulage and high-demand processes.

Electrified Fleet

Underground and surface mining fleets converted to electric and hydrogen-powered systems, eliminating diesel at the source.

Measurable Impact & Strategic Positioning

The Electric Mine transformation delivered tangible, measurable outcomes across emissions, costs, compliance, and operational resilience—establishing a replicable model for the future of sustainable industrial mining.

Carbon Reduction

Significant reduction in carbon emissions across all mining operations, directly improving environmental performance and regulatory standing.

Lower Operating Costs

Reduced diesel consumption and maintenance requirements translated into meaningful cost savings and improved long-term margin stability.

Energy Reliability

Increased energy reliability in remote mining environments through purpose-built renewable microgrids and hydrogen infrastructure.

CBAM Compliance

Full readiness for global carbon regulations including EU CBAM, protecting export market access and future-proofing commercial relationships.

> The future of mining is not just low-carbon—it is engineered energy independence, where operations are powered by integrated, intelligent energy systems.

Fortis & Peak — Strategic Positioning

This case establishes Fortis & Peak as the creator of TECHNEXIS™, an engineering-led energy transformation platform, and the owner of 3D&S, an execution-driven transformation methodology. The firm delivers end-to-end Net-Zero system design and deployment and is a recognized leader in building Electric Mines and sustainable industrial ecosystems at scale.

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A Scalable Net-Zero Model

The Electric Mine is not a one-off project—it is a scalable, self-sustaining Net-Zero operating model designed to be replicated across mining operations globally, wherever diesel dependency and carbon exposure create strategic risk.

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