Case History #7 – Affected Communities: availability and reliability of Green Energy

Case History: Our solution for Sustainable Gold Mining Operations

Empowering Energy Resilience and Sustainability at Mining Facilities
This case study highlights the successful deployment of a 40MW/160MWh Battery Energy Storage System (BESS) at Ergo Mining Pty in Brakpan, South Africa. Faced with significant grid instability and dependency challenges, Ergo Mining partnered with Nidec Conversion to integrate a BESS alongside a new 60MWp PV plant. This solution not only enhances the mine's energy resilience by mitigating loadshedding impacts but also significantly increases the integration of renewable energy, contributes to local economic development through job creation and local content collaboration, and sets a precedent for sustainable energy infrastructure in the South African mining sector.

The Challenge: Navigating Grid Instability and Energy Dependency
Ergo Mining, a key player in the gold treatment sector, was experiencing significant operational challenges due to an unstable national grid (TSO grid issues), including frequent loadshedding events. This dependency on an unreliable grid posed a direct threat to continuous production, operational efficiency, and overall economic stability. To address these critical issues, Ergo Mining sought a robust energy solution that would reduce their reliance on the main grid and enhance their energy independence. While specific sustainability goals were not formally declared, the decision to integrate a BESS and PV plant inherently aligned with broader environmental and operational resilience objectives. No specific regulatory requirements or incentives directly influenced the decision beyond the operational imperative for stable power.

The Implemented Solution: A Hybrid Renewable & Storage System
Nidec Conversion provided and delivered a comprehensive BESS solution designed to complement a newly installed 60MWp PV plant.

- A 40MW/160MWh AC Battery Energy Storage System.
- The system comprises 43 "AC Box" Battery Energy Storage containers, each including a water-cooling system, Power Conversion System (PCS), and advanced battery modules. Nidec Conversion also developed and provided the sophisticated control system for the BESS, ensuring optimal performance and integration.
- Integration: The BESS is strategically coupled with the 60MWp PV plant and connected to the existing 22KV grid. This hybrid setup allows for versatile energy management:
    - Nighttime Grid Charging: The BESS charges from the grid during off-peak hours (night).

    - Morning Peak Discharge: Discharges during the first grid peak period in the morning, reducing reliance on expensive or unstable grid power.
    - PV Plant Charging: Charges from the PV plant during the day.
    - Second Peak Discharge: Discharges again during the second peak period, maximizing the utilization of solar energy and further reducing grid dependency.
- Innovation: While the core BESS technology is a standard, proven solution, its innovative application lies in its strategic integration with a substantial PV plant within a complex mining operation. This tailored dispatch strategy allows Ergo Mining to maximize self-consumption of renewable energy and optimize grid interaction, providing a template for future large-scale industrial hybrid energy systems.

Environmental Impact: Enabling Clean Energy Integration

The BESS project at Ergo Mining represents a significant step towards a more sustainable energy future, primarily through its role in enabling large-scale renewable energy integration and enhancing energy efficiency.

- Emission Reduction Potential: While specific CO_2 emission reduction figures are not yet quantified, the project inherently supports a substantial reduction in the mine's carbon footprint. By integrating a 60MWp PV plant (producing approximately 100 GWh per year of clean energy - given South Africa's national grid carbon intensity, typically around 0.96 kg CO_2e per kWh due to a high reliance on coal-fired power(*), it means up to 96,000 tonnes of CO_2 equivalent emissions per year).
- Energy Efficiency & Renewable Integration: The BESS plays a crucial role in maximizing the effectiveness of the PV plant. It allows for the storage of renewable energy during periods of high generation and its discharge during peak demand, thereby increasing the overall energy efficiency of the site. This critical function significantly influences the increase of renewables in Ergo Mining's energy mix, making the 100 GWh/year of solar production a reliable and dispatchable power source. The BESS dramatically improves the management of peak loads and contributes to the overall stability of the internal network by buffering intermittent solar generation.
- Product Life Cycle: As a provider of BESS solutions, Nidec Conversion is committed to the long-term sustainability of its solutions. Our BESS technology is designed for longevity and its components are subject to ongoing research into advanced recycling and reconditioning strategies, aiming for a circular economy approach in battery technology.

Economic Impact: Enhanced Resilience and Future Opportunities

The BESS solution has delivered tangible economic benefits to Ergo Mining, primarily through enhanced operational continuity and resilience.

- Energy Resilience & Avoided Costs: The most significant economic benefit is the vastly improved energy resilience. Our BESS solution allows Ergo Mining to maintain operations during loadshedding events, preventing costly production losses and ensuring operational continuity. The ability to avoid disruptions during power outages represents a substantial indirect economic benefit and protects revenue streams.
- New Business Opportunities: At the time of project implementation, the regulatory framework in South Africa did not allow for other BESS use cases beyond internal consumption (e.g., participation in energy services markets). However, the project positions Ergo Mining to capitalize on future changes in energy policy that may permit grid services or other monetization strategies for their BESS asset.

Social Impact: Local Development and Skill Enhancement

The project has created positive social impacts, particularly within the local community in South Africa.

- Local Job Creation: The entire project, including the BESS implementation, significantly contributed to job creation for local communities where mining operations are conducted by the Client. This direct employment offers economic empowerment and skill development opportunities.
- Community Benefits: While the project does not directly supply energy to the local community, the enhanced operational stability and resilience of a major local employer like Ergo Mining indirectly benefit the community by supporting economic activity and local employment. The project's emphasis on local content also means a portion of the project's value remains within the South African economy.
- Training and Skills Development: Nidec Conversion provided comprehensive training to Ergo Mining's staff, ensuring they have the necessary skills to manage and operate the BESS system effectively and safely. This knowledge transfer builds local capacity and expertise in advanced energy technologies.

UN Sustainable Development Goals (SDGs) involved:

- **SDG 7**: Affordable and Clean Energy - By integrating a substantial PV plant and enabling its optimized use through BESS, the project significantly increases the share of renewable energy in Ergo Mining's energy mix, providing more stable and cleaner power.
- **SDG 8**: Decent Work and Economic Growth - The project created new jobs within local communities and contributes to the economic stability of Ergo Mining, a key local employer, by ensuring operational continuity.

- **SDG 9**: Industry, Innovation, and Infrastructure - The deployment of advanced BESS technology strengthens Ergo Mining's energy infrastructure, making it more resilient and sustainable, showcasing innovation in industrial energy management.
- **SDG 13**: Climate Action - By reducing reliance on carbon-intensive grid electricity and maximizing the use of solar power, the project directly contributes to efforts to combat climate change.

Innovation and Replicability

The Ergo Mining BESS project stands as a testament to practical innovation and offers significant potential for replication.

- Innovation: The project's most innovative aspects lie in the successful, fast-track implementation and strategic integration of a large-scale BESS with a substantial PV plant in a challenging grid environment. This demonstrates a tailored and highly effective approach to industrial energy management.
- Replicability and Scalability: This project serves as an excellent reference for Nidec Conversion both in South Africa and globally. Its success may encourage other mining operations and industrial clients facing similar grid challenges to adopt hybrid renewable and storage solutions. The model is highly replicable across various industrial contexts.
- Future Expansion: Current Ergo Mining's plans to potentially expand the duration of the BESS to reach 120MWh after 20 or 25 years underscore the client's satisfaction and the long-term vision for the system's role in their energy strategy.

Powering the change, Driving Sustainability

Nidec Conversion

The Ergo Mining project represents a transformative approach to energy in Africa's mining sector. Our 40MW/160MWh BESS installation doesn't just shield operations from loadshedding—it fundamentally reimagines energy infrastructure for the continent's industrial future. By enabling the full potential of their 60MWp solar plant, we're helping prevent approximately 96,000 tonnes of CO2 emissions annually while creating local jobs and transferring vital technical skills. What makes me most proud is seeing how this solution balances immediate business resilience with long-term sustainability goals. This model of integrated renewable energy and storage is precisely

> *what Africa, and many other countries need to power industrial growth while advancing its clean energy transition.*
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> Franck Girard, Senior Director

(*) see South Africa 2022 Grid Emission Factors Report issued by Ministry of Forestry, Fisheries, and the Environment on 1st November 2024.