

Competitive Off-Grid Efficiency Fekola Mine in Mali

CASE STUDY



Wärtsilä energy storage powers Fekola hybrid project

On a continent richly endowed with natural minerals, mining is one of the biggest trades in Africa. Remote, energy-intensive and fuel-dependent mine owners are dealing with high energy costs as a result of mining operations for a myriad of practical applications and infrastructure development, plus meeting global commodity demand. The active adoption of clean energy solutions—utilising greater amounts of renewable energy to dramatically reduce energy costs and dependence on heavy fuel power generation—offers a largely untapped reliable energy alternative for the mining sector.

B2Gold, a Canadian public gold-mining company, has taken to the adoption of storage and energy management technologies in their mining operations in Mali. Wärtsilä is delivering a hybrid solution at B2Gold's off-grid Fekola Mine in southwest Mali in late 2020. Wärtsilä's GEMS, an advanced energy management system, will integrate, control and optimise a 17.3 MW / 15.4 MWh energy storage system alongside a 30 MW solar photovoltaic (PV) plant onsite, in addition to the mine's existing 64 MW power generator.

ADDRESSING HIGH ENERGY USE IN A REMOTE OFF-GRID AREA

The project will hybridise the energy supply of Fekola mine, with a combination of renewables, storage, power generator, and energy management system. Hybridising the power supply at Fekola will reduce the facility's dependence on imported heavy fuel oil, saving operational and transportation costs, as well as reducing greenhouse gas (GHG) emissions.

"We chose Wärtsilä because of their experience in the region, and because of their capabilities in designing and managing hybrid plants. We wanted to optimise full electricity generation at the mine using solar and energy storage. A key part of this solution is Wärtsilä's state-of-the-art GEMS technology; it was an easy decision."

*Jan Clausen,
Project Manager, B2Gold*

KEY DATA

CUSTOMER: B2Gold

SITE SIZE: 17.3 MW / 15.4 MWh

SITE LOCATION: Mali, Africa

APPLICATION: Microgrid control

SCOPE OF SERVICES: EEQ with installation supervision

DELIVERY: 2020

B2Gold is one of the early mining companies to invest in clean energy power generation. GEMS and the storage system combine stable frequency and voltage with high utilisation of renewables in a reliable way.

This hybrid storage project is the first of its kind in Mali and in the mining sector, demonstrating the growing case for clean energy and its sustainable and economic potential for mines in Africa and beyond.

The main application of the Fekola hybrid project is to provide and maintain microgrid stability. This means dispatching energy storage and renewable energy (RE) generation assets (i.e. solar PV) with the right reserve level to maintain high grid reliability for a mine in a remote area with no connection to any larger grid.

The control and optimisation capabilities provided by GEMS are key to handling large load step changes and historic instability of RE generation assets. Wärtsilä's GEMS software will use artificial intelligence (AI) as well as automated and forecasted data, including load demand and weather, to optimally operate the system's assets and maximise efficiency. Specifically, GEMS can dispatch or draw energy according to conditions; for example, gensets are switched off as solar output increases, later they are restarted based on forecasting. The result: smoothed solar power fluctuations.

Further, the sophistication of GEMS to enable energy production optimisation ensures the lowest levelised cost of electricity (LCOE) for the Fekola mine. LCOE measures lifetime costs divided by energy production, so more efficient energy production and lower LCOE renders long-term savings. For instance, GEMS supports the starting of major mining equipment without the need to bring additional engine generating sets online, allowing operations to maximise the time that gensets are down. As a result, the project is expected to reduce gold processing costs by more than 7%.

GEMS will integrate and optimise RE generation assets in tandem with traditional fuel-powered gensets to deliver 18%+ of the total site power requirement for the Fekola mine. At the same time, the hybrid project will secure grid stability via the curtailment of asset performance fluctuations, including engine variations, and provide spinning reserves. There is also potential to incorporate additional assets or enable expansion of the PV plant in the future.

CLEAN ENERGY POWER GENERATION

Wärtsilä's energy storage solutions are both cost competitive as well as sustainable. For Fekola, project payback is expected in just four years, with projected long-term savings on mining operations to include 13.1 million litres or more of heavy fuel oil per year. The Fekola solution will also drive decarbonisation, with the mine's GHG emissions expected to reduce by approximately 86 million pounds of carbon dioxide emissions per year.

THE CHALLENGE	WÄRTSILÄ'S SOLUTION	BENEFITS
Ensure grid stability and provide energy security to a remote mine in Africa	Integrated hybrid energy solution, including storage, solar and energy management controls	Reduced carbon emissions, fuel consumption and mining operational costs
Integrate multiple renewable assets	Maximised asset efficiency and optimisation via GEMS solution	Improved power reliability
Optimise energy production at a fuel-dependent, energy-intensive operational mining facility	Sustainable clean energy solution	Short payback period with long-term savings



“Hybrid solutions with renewable energy-sourced power operations, are a realistic and effective means for increasing energy reliability and lowering operating costs for the mining sector. These remote locations are ideally suited for hybrid systems. Our extensive experience with microgrids in various climatic and geographical conditions will help the Fekola mine, and others of its kind, to achieve their sustainability and cost saving goals.”

*Risto Paldanius,
Business Development Director,
Energy Storage & Optimisation,
Wärtsilä Energy Business*