

Power solutions for mines in Sub-Saharan Africa – diesel generators, captive power plants and cross-border power trading



One of the key factors affecting the operation of mines in Africa is the availability of a reliable, uninterrupted supply of power. The importance of a stable power supply for mines is such that it is an integral part of investment decisions relating to the development of a new mine or the expansion of an existing mine. However, Sub-Saharan Africa has a severe power deficit which means that mines are often not guaranteed to receive a reliable supply from the national power utility.

Mines have therefore sought to secure alternative sources of power supply, rather than relying on national utilities. These alternative sources of supply have principally taken three forms: 1) diesel generators; 2) captive power plants; and 3) in the Southern African Power Pool (SAPP) region, cross-border power trading. We will briefly discuss each option in turn. We will also discuss the impact of energy transition in relation to some of these power solutions.

1. Diesel generators

Mines in Sub-Saharan Africa typically use diesel generators as a back-up for when supply from the utility is interrupted. However, in some circumstances, mines utilise diesel generators as the primary source of supply, including where the location of the mine is such that a grid connection is not feasible or reliable, or otherwise due to prolonged uncertainty of supply from utilities.

One of the key advantages of diesel generators is that they can be deployed to site in a matter of months, particularly where generators can be sourced from existing stock from a number of suppliers, such as Aggreko, Caterpillar, Cummins, etc. Diesel gensets can also be scaled up (and down) to meet fluctuating power demands of the mine.

Generators can be purchased but are more commonly leased or rented from, and operated by, the supplier of the generators. It would be customary for the mine owner (the “MO”) to take responsibility for sourcing the diesel for the generators.

A key disadvantage of diesel generators is that they are costly to run and, in circumstances where the MO is responsible for fuel, expose the MO to commodity risk.

It may become increasingly difficult for a mine to reconcile the use of diesel generators with its (and its stakeholders’) ESG and

energy transition agenda, as well as the Net Zero goals of the country the mine is situated in.

In this regard, the mining industry is making significant steps in energy transition, by moving from diesel to alternative, cleaner types of fuel, and implementing renewable energy or hybrid solutions. This opens up a number of opportunities for the power industry. We discuss a couple of key trends below.

2. Captive power generation

Captive power plants are generally only appropriate for mining operations with an extended mine life and significant long-term power demand, given the time and expense to develop, construct and finance such plants. The term “captive” refers to the fact that all or most of the output of the power plant will be used to supply the relevant mine. A captive power plant will typically, therefore, be located close to the mine which it is intended to supply (perhaps at the mine mouth), in order to reduce the need to build transmission infrastructure and to mitigate transmission losses.

Captive power plants may be developed by the MO in which circumstances, the generation assets would be owned by the MO. Operation can either be carried out by the MO or outsourced to an operation and maintenance contractor with appropriate experience. It would be customary for the power generated by the MO to be supplied free-of-charge to the mine and treated as a mine operating expense.

Alternatively, a captive power generation solution may be provided by an independent power developer (the “IPD”) and depending on the life of the mine, the generation assets may be permanently installed and power sold by the IPD to the MO pursuant to a power purchase agreement. If the generation assets are of a type that can be relocated or used to supply other off-takers at the end of the mine life, the IPD may instead consider leasing the plant to the MO, in a structure not dissimilar to that employed for diesel generators.

Captive power plants serving mines have historically been thermal, particularly coal mines where the mined coal can be used as a fuel source for the power plant. Gas and HFO may also be used as cheaper alternatives to diesel. However, as MOs are increasingly taking into account ESG and energy transition considerations in their operations, there has been a move towards renewable energy power solutions, such as solar PV with battery storage, or hybrid renewable/thermal generating solutions.

More complex technical / generation solutions increase the likelihood of the power plant being installed and operated by an IPD, as MOs may be reluctant to assume responsibility for a significant power project and associated capex, which is not part of their core business competence.

The owner of a captive power plant (either the MO or the IPD, as applicable) may consider utilizing limited recourse project finance so that the capex of the plant is off the balance sheet and also take advantage of cheaper long-term debt, particularly if the mine's requirement for power exceeds 10 years.

It should be noted that if a project finance option is used to finance the capex of a power plant, it is likely to take several months if not years before the financing is ready to be drawn down, due to lenders' due diligence, as well as the negotiation of a complex finance and security package. It is for this reason that project finance is generally not suitable for a captive plant that is required for a period of time that is lower than 10 years. Furthermore, following financial close, the construction period of the power plant must also be taken into account – this could be in excess of 12 months, depending on the type of technology deployed.

Where the plant is owned by the IPD, the debt will be repaid from the tariff earned by the IPD under the PPA. In circumstances where the plant is owned by the MO, as the power would customarily be supplied to the mine free-of-charge, the project finance debt would need to be serviced through the sale of the commodity that is being mined, over the life of the mine. This has resulted in an increase in the number of MOs seeking to outsource captive power generation to third party developers.

Given the shorter lead time, it is common to see diesel generators or similar temporary power solutions being sourced and implemented as an interim measure, pending the completion of a captive power plant.

3. Cross-border power trading

As mentioned above, national utilities are frequently unable to meet the power demands of mines within their countries. However, utilities in other countries may have a surplus of power. In such circumstances, power may be traded between utilities under the framework of a power pool, the Southern African Power Pool (SAPP) being one such established power pool.

Mines may take advantage of the trading arrangements of the power pool to secure supply from outside the country in which

the mine is situated. For example, the recent droughts across Sub-Saharan Africa had a particularly harsh impact on Zambia, which relies on hydropower for around 85% of its energy supplies. The curtailment of Zambia's hydropower capability led to a number of mines in the Copperbelt resorting to power imports from Eskom and other SAPP members.

Cross-border power trading in the SAPP region (particularly in the DRC) has historically been structured so that the utility in the country in which the mine is situated (the "Host Utility") will have or enter into a power supply agreement with the mine. The Host Utility will then enter into a power purchase agreement with a utility in the SAPP region which has a power surplus (the "Exporting Utility").

The MO will then enter into a tri-partite agreement with the Host Utility and the Exporting Utility, whereby the MO undertakes to pay for the power supplied by the Exporting Utility, either through direct payment to the Exporting Utility or by making payment to the Host Utility which will then transfer the payment to the Exporting Utility. The MO cannot purchase power directly from the Exporting Utility as SAPP members (i.e. the utilities) may only export and sell power to other SAPP members and not directly to non-accredited customers. The contracts for such power trading are specialised and need to cover issues such as dispatch, reconciliation, payment security, damages for non-supply (and establishing fault in such circumstances), etc. They would typically include a PPA and a payment security agreement. Power trading is potentially the quickest way for a mine to secure power, provided that suitable transmission infrastructure exists and a utility within the power pool has a surplus.

However, a recent development has been the rise of third party power traders such as Africa GreenCo, which is authorized to buy and sell power on the SAPP market or Enterprise Power, which has a license to import power into the DRC, enabling it to sell imported power directly to DRC mining customers. This allows mining customers to purchase imported power directly from the power trader, as opposed to having to purchase power through the Host Utility. In such case, the Host Utility's involvement would be limited to providing wheeling services, either to the mining customer or to the importing power trader.

MOs may also elect to buy from traders that secure their own supply from a renewable energy plant, thereby boosting the sustainability of their supply chain.



Lawyers at Hogan Lovells have market-leading experience in structuring, negotiating, and drafting the relevant agreements necessary to implement any of the solutions mentioned above. Select experience includes advising.

- Allied Gold on various power solutions across its African mine portfolio, including an emergency power / genset solution in Côte d'Ivoire and a captive power plant in Mali.
- Vivo Energy on the structuring, drafting and negotiation of the contracts required to provide captive power plant solutions to mining customers in West Africa.
- Enterprise Power in relation to the development, construction, and financing of an interconnector connecting Zambia to the DRC, in order to facilitate increased cross-border power supply and trading.
- Enterprise Power in relation to its sale of power to mining customer in the DRC, imported from Zambia.
- Advising lenders in relation to the financing of a solar PV plant in Zambia, whose offtaker will be a regional power trader.
- Eurasian Resources Group in the DRC in relation to its power purchase arrangements, including arrangements with the national utility and also purchasing power cross-border, from a Zambian power supplier.
- Frontier mine in relation to its power supply arrangements in Zambia and the DRC.
- An independent power developer in relation to the lease and operation of a hybrid captive power plant to a mine in West Africa.
- A mine operator in relation to power purchase arrangements from a semi-captive hybrid hydropower and solar plant in the DRC.
- Eurasian Resources Group in relation to its fuel supply arrangements and fuel storage infrastructure for generators.
- Copperbelt Energy Corporation in relation to its power sales agreements with mining companies in the DRC.
- A mining company in Ghana in relation to its power purchase arrangements with Genser Energy.
- A mining company in Nigeria in relation to its power purchase arrangements.
- A mining company in the DRC in relation to restructuring its power supply arrangements.



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