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On the Importance of Modelling







Otjikoto Mine



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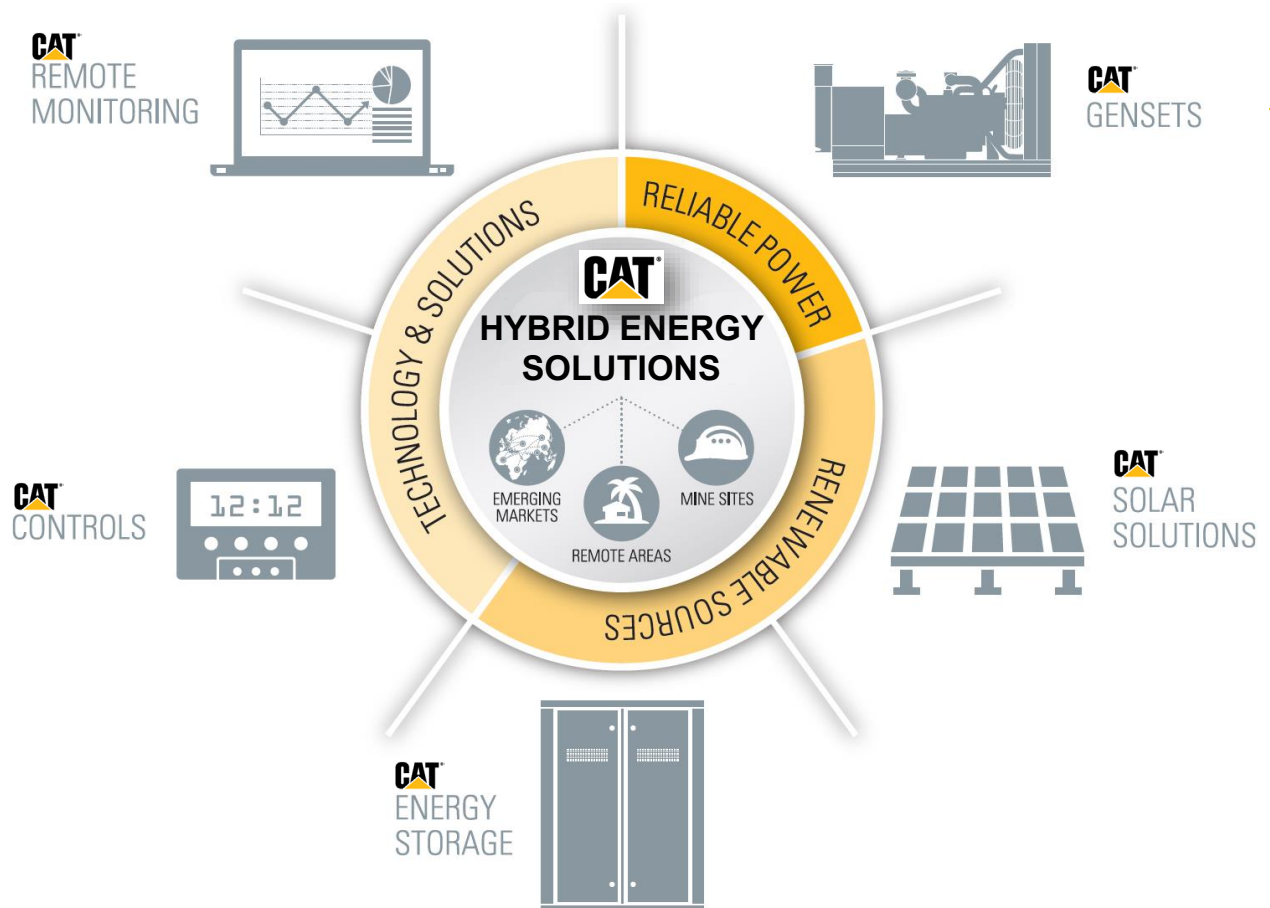
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Integrating renewables into a mine's power system, whether brownfield or greenfield, can bring many economic and environmental benefits. But the complexity of the endeavour should not be underestimated.

Cameron Sharp, Electric Power, Global Mining & Utilities Segment Manager at Caterpillar, explains that every project is different, and one technically feasible solution can deeply differ to another. "The potential of renewable energy penetration in the mining market is very high. In terms of Total Cost of Ownership (TCO) and Levelized Cost Of Electricity (LCOE), renewable sources can deliver better numbers compared

to both diesel and gas generator sets alone. But, although wind and solar are fantastic resources, they are by nature intermittent and can create at times, intricacies in the operation of an off-grid site.”

In the mining sector, Caterpillar’s renewable power equipment was most recently installed at B2Gold’s Otjikoto Mine in Namibia – a 7 MW solar plant that became operational in 2018. The hybrid project was expected to reduce Otjikoto’s heavy fuel oil consumption by approximately 2.3 million litres and cut power costs by approximately 10% in 2018 alone. The system met and exceeded expectations and Sharp will present results at the Energy and Mines Australia Summit this November. He will also outline the Kibali Energy Storage pro-



Graph 1: Hybrid energy solutions

ject in the DRC, Africa which is a very exciting BESS project for the mining industry.

If a project is sized correctly in all the system components, it is modelled with realistic and accurate inputs, mines that adopt a hybrid solution can see returns in a period of three to five years. “To assess the technical and, more importantly, the economic feasibility of a hybrid solution, miners should model their site, starting from the load profile, to identify the possible options and to take into consideration all the key elements of each one of the system components (wind, solar, controller, gensets and battery energy storage systems – BESS) both technically and economically,” he explains.

But while correctly modelled renewable hybrids can bring fast returns, it is worth noting that not all sites can benefit from being integrated with renewables: “Site conditions, life of mine and load profile are the key aspects in assessing the real feasibility of a hybrid application,” points out Sharp.

Greenfield vs brownfield

When it comes to renewable integration, there are significant differences between greenfield and brownfield sites. A new mine can design the hybrid solution with specific requirements, such as best TCO or minimum renewable penetration, and size correctly all the system components to deliver the required outcome.

“In brownfield systems, there are still multiple benefits in hybridizing the site, but the integration between the various system components can be very complex, especially with the genset sizing. Once again, the site modelling exercise is a key step in identifying correctly the best hybrid energy solution,” he adds.

Through his time at Caterpillar and in previous roles, Sharp is aware that reliability is a critical aspect for miners looking to hybridize their power systems, along with the economic returns on the invest-

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ment required. Of course, reliability and power quality are already a big issue for any off-grid power system installed at remote mine sites, but the addition of renewables can add some complexity. He explains: “When introducing renewable power sources, the situation can become tricky, due to the fact traditionally photovoltaic and BESS inverters do not offer high transient response rates or high fault current contribution.”

“Power grid stabilization services offered from BESS and a microgrid master controller are the key elements to improve the site operation conditions and to integrate efficiently the system components. BESS units designed for high transient off-grid applications such as Caterpillar’s solutions can, in fact, improve the reliability and power quality of the existing infrastructure,” he adds.

Complexity and costs

While it may be tempting, when trying to get investment approved for a hybrid power project, to find the lowest price for each element, Sharp warns that integrating pieces of equipment provided by a variety of suppliers may increase the financial burden on the project. “My personal advice would be to not underestimate the complexity and the integration challenges of hybrid energy solutions. If a hybrid system does not operate as expected a finger pointing exercise can ensue between the different parties if the project has been split up and the system aspects commoditized. This risk can be mitigated by having one overarching responsible party taking control and handling the integration aspects,” he says.

Once again, the project modelling exercise and the support of a fully integrated hybrid solution partner could simplify the assessment and allow the mine to get the highest benefit from the hybrid energy solution.

For Caterpillar’s hybrid power segment, the future is bright: “Caterpillar and Cat dealers have a very healthy pipeline of hybrid projects globally and a very exciting product roadmap, watch this space,” says Cameron.



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