



Exploring green mining initiatives

Traditional mining operations rely heavily on fossil fuels for power, donating bigger carbon footprints than the production itself. Recently green initiatives started to emerge in many forms such as captive solar, Big EV mining fleet, etc. In these initiatives, BESS can help to accelerate the growth with optimization. Capabilities like load shifting, peak shaving, and mobile charging can be explored to contribute on cost saving and reduction of carbon footprint.

Mining operations are energy-intensive endeavors, often located in remote areas. Lighting vast landscapes, pumping water, handling materials, and ensuring proper ventilation demand a constant and reliable power source. Traditionally, diesel generators have been the go-to solution, but they come with a hefty price tag – environmental damage and logistical headaches. Regular fuel deliveries can be challenging, and in underground mines, extensive ventilation systems are needed to remove harmful fumes.

However, the tide is turning towards cleaner and more efficient solutions. Even existing, electrified mining sites face power quality issues due to long cable runs, leading to voltage fluctuations that can damage sensitive equipment. This is where Battery Energy Storage Systems (BESS) step in, offering a range of benefits for the mining industry.

BESS: A Reliable and Sustainable Powerhouse

BESS acts as a giant battery, storing excess energy during off-peak hours when electricity rates are lower. This stored power becomes a reliable backup during grid outages, ensuring critical mining operations like ventilation and safety protocols continue uninterrupted. BESS also **smooths out fluctuations in power supply**, especially when integrating renewable energy sources

like solar or wind. This consistent power flow protects equipment and ensures smooth operation.

But BESS goes beyond backup. By reducing reliance on the grid during peak demand periods, BESS helps mining operations **shave peak energy costs**. Even more significantly, BESS offers a **cleaner alternative** to diesel generators, particularly for remote mines. This not only reduces dependence on fossil fuels but also shrinks the mining operation's carbon footprint, aligning perfectly with the growing green mining movement.



Pic 1: Power in mining

Green Mining Takes Root: EV Join the Mix

Green mining initiatives promote environmentally friendly practices throughout the mining process, and electric vehicles (EVs) are playing a key role in this transition. Big Electric Vehicle (BEV) like large electric haul trucks offer a compelling solution for a more sustainable future. Compared to their diesel counterparts, these EVs generate zero tailpipe emissions, drastically reducing greenhouse gasses and improving air quality, especially crucial in underground operations. Additionally, electric motors run quieter, creating a safer and more pleasant working environment for miners.



Pic 2: Mining Big EV

The benefits extend beyond just emissions. Electric motors boast superior efficiency compared to diesel engines, translating to lower energy consumption per haul and potentially significant cost savings on fuel. Regenerative braking systems in these trucks capture energy while traveling downhill, further boosting efficiency and extending their range. Electric vehicles also eliminate the risk of spills and scarcity of fuels.

A Symbiotic Future

The future of mining is a harmonious blend of BESS and electric vehicles. Mines with access to renewable energy sources like solar or wind can leverage BESS to charge electric trucks, creating a closed-loop system with minimal environmental impact. This not only reduces reliance on fossil fuels but also lowers energy costs and promotes a truly sustainable mining operation. Additionally, the reduced need for extensive ventilation systems in underground mines using electric vehicles translates to lower overall energy consumption.

In conclusion, BESS and electric vehicles are revolutionizing the mining industry. By offering reliable, clean, and cost-effective power solutions, these technologies pave the way for a more sustainable future for mining, ensuring a responsible approach to resource extraction while safeguarding the environment and the health of workers.

Easing fuel supply: Reducing of fuel usage at any given opportunity so fuel supply can be focused for more essential needs.

Reducing emission footprint: By reducing necessity to power up gensets just for lighting, and small ad hoc works, will have affect on mining activity carbon emissions.

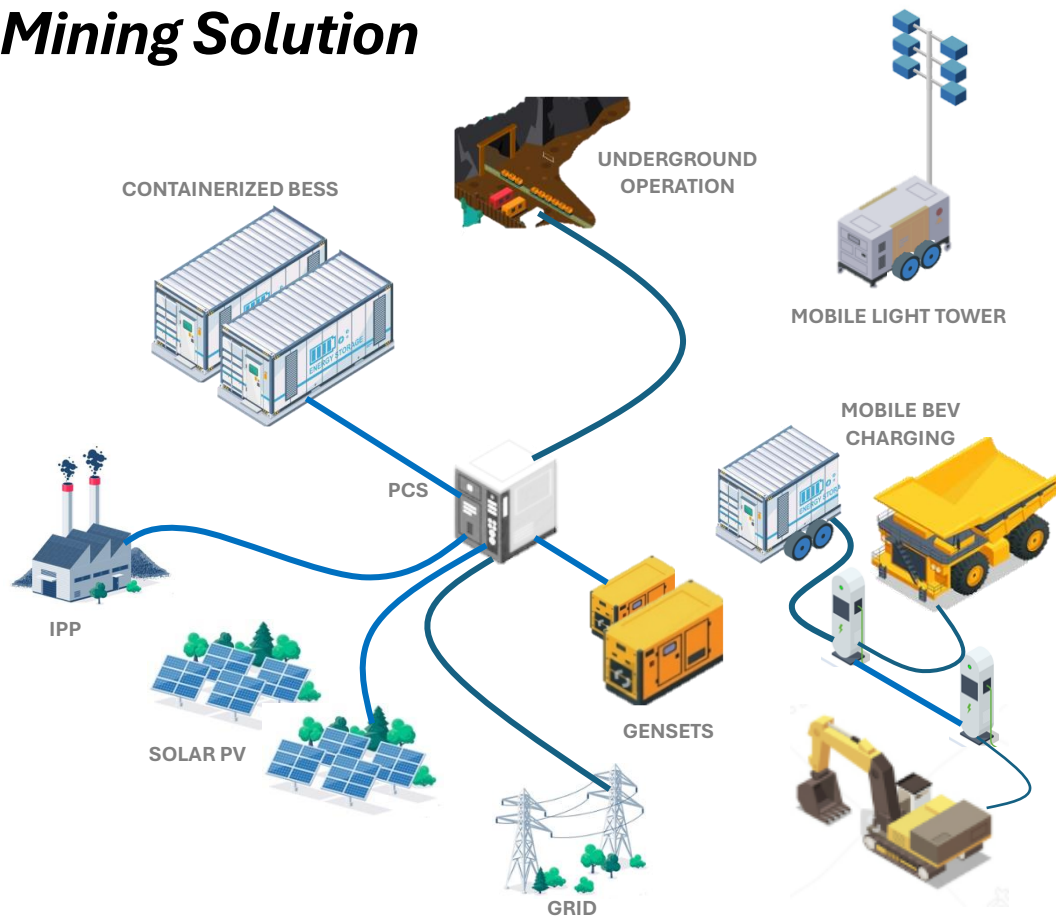
Reference:

<https://medatech.ca/case-study/battery-electric-underground-mining-truck/>

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At Renoz Energy we focus on delivering leading edge technology into battery energy storage application

Mining Solution



CONTAINERIZED & MOVABLE BESS



250 kWh – 1.2 MWh / block
7 / 10 / 20 / 40 ft insulated container
Selectable module option (from PCS range)
Grid forming / assisting
Transformer / transformer-less



Forced air w/ filtration / liquid cooling
Air filtration & pressurization system
For harsh environment (optional)
SCADA/DER controlled
CAN/RS485/Ethernet



Movable BESS
Wheel / wagon / truck mounted
100-200kWh
12 - 72 V DC mode
220(1ph) - 400(3ph) V AC mode
40 - 500 V DC MPPT*2 PV mode
Forced air cooling

PCS + BESS

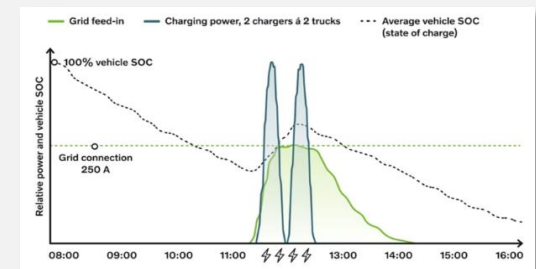
- ✓ **Emergency Backup & Power Quality.** Power generation in mining sometimes can experience surge or sags due to line installation in harsh environment. Power Conditioning System (PCS) safeguards critical equipment and people operation from issues with electrical supply. Integration with Battery Energy Storage (BESS), allows more resistance to **deep power disturbance, brownout, or blackout.**
- ✓ **Cost saving / Peak shaving.** PCS + BESS can act as buffering for onsite power generation. Allowing engineering to size them down for average demand calculation instead of peak demand. Saving Capex.
- ✓ **Integration with Onsite Renewable.** BESS & PCS can intelligently manage intermittency of onsite renewable generation e.g Solar PV or Wind, allowing low cost & green energy and improving carbon footprint.

BEV CHARGING

- ✓ **Mobile Charging.** Movable BESS enables charging of mining EV fleet nearby in-situ, instead of rolling them back to main station. Optimizing fleet operation.
- ✓ **Buffered Charging.** When it comes to charge BEV hauling trucks, the energy is extensive. If not considered properly, engineering does not have choice to sizing up power infrastructure for peak demand, wasting capex. While with BESS as buffer, sizing can use average demand instead.

Power generator / Solar PV can charge BESS slowly in lower power, and then when there is demand, releases the energy in high power in short periods.

Pic: Energy curve of only charging 2 BEV trucks sequentially



BEV CHARGING UNIT



Integrated Fast Charger
160 – 240 kW Capacity
300 – 1000 V charge
Liquid / conventional Cooling



Buffered Ultrafast Charger
200 – 480 kW Capacity
Multi outlet 100 – 1000 V charge
80 – 400 kWh Battery buffer
Liquid / conventional Cooling



Movable Charger
200 – 480 kW Capacity
100 – 1000 V charge
80 – 250 kWh Battery buffer
Liquid / conventional Cooling