



Renewables for Mines – Finding the best Path for Implementation



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Decarbonization is a Growing Priority for Mines

Investors and Stakeholders are increasing pressure on Mines to improve on:

- ESG criteria compliance
- Decarbonization targets
- Reach targets but keep profitability up

⇒ Renewables offer part of the solution:

- ⇒ Reduce Energy cost
- ⇒ Reduce Carbon Emissions
- ⇒ Hedge energy cost for operations

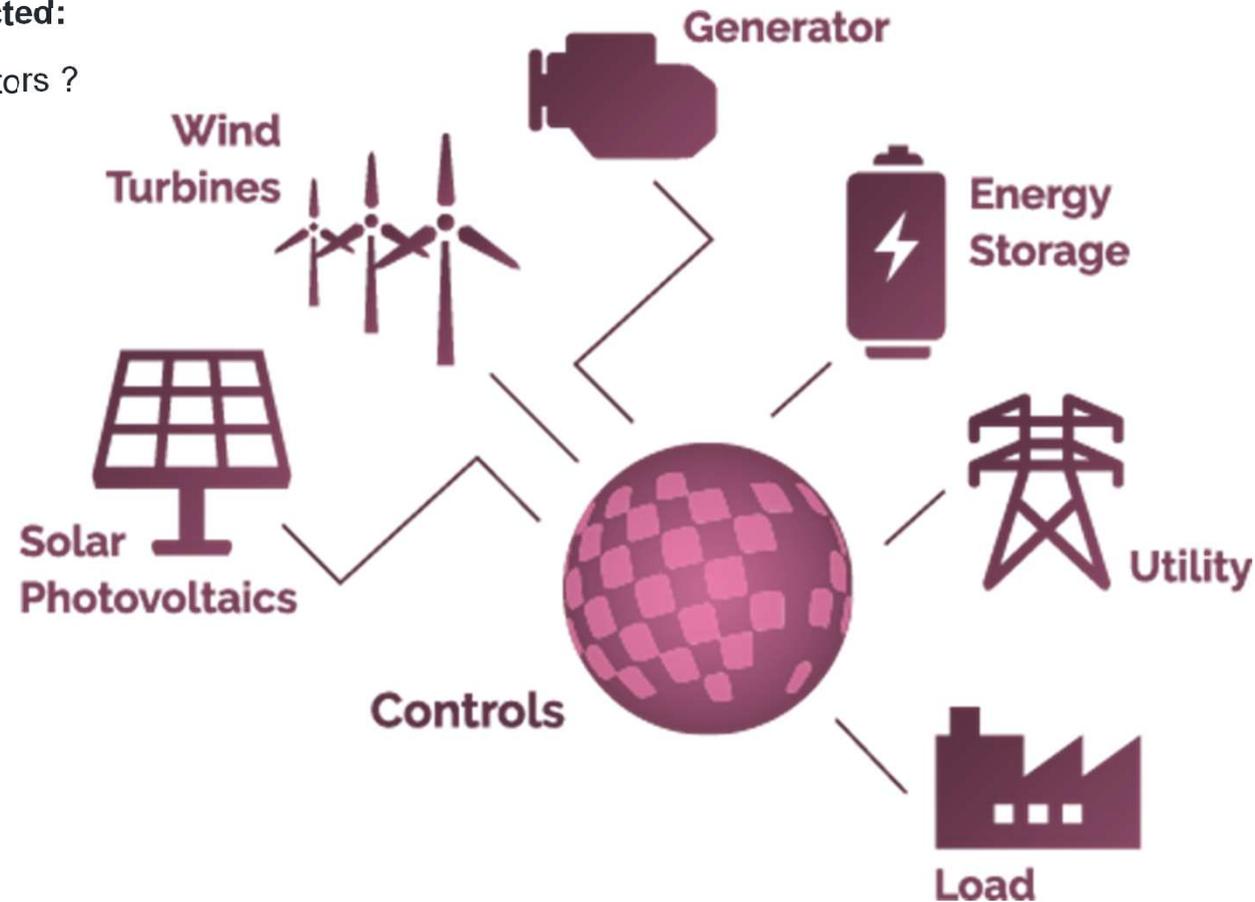


Example: Goldfields agnew Mine, Australia: PV+Wind+Battery >50% RE share

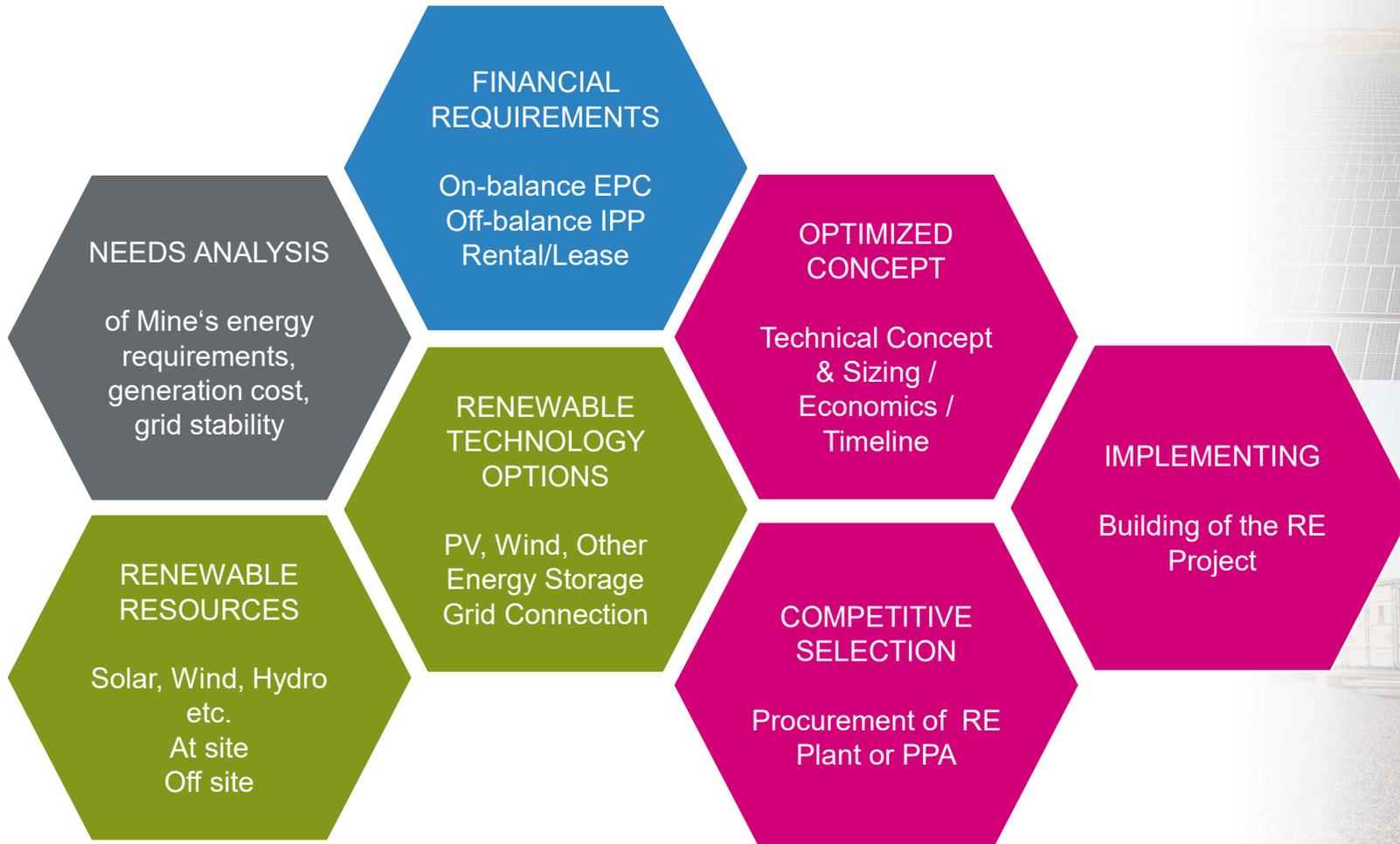
⇒ Finding the Best Path for Implementation

The market offers multiple heterogeneous solutions – difficult to compare and to choose the optimum

- **The right Technology for off-grid or grid connected:**
 - Wind, Solar, other renewables, thermal generators ?
 - Energy Storage?
 - Sizing?
- **The right approach to implement**
 - EPC or IPP or rental/lease ?
 - On balance sheet or off-balance sheet
 - Cost savings?
 - Amortization / NPV / IRR?
- **The right provider:**
 - Mining supply or specialized solar/wind firm
 - Equipment selection



The Path Towards Successful Implementation under the Guidance of an Independent Expert



Showcase: B2Gold Fekola Mine Solar Project, Mali



Largest PV-Battery Hybrid for Off-grid mines in operation:

- **36MWp PV and 17.3MW/15.4MWh Battery Storage**
- **13 Mio liter HFO saved** per year, equal to **19% of fuel consumption**
- Mine load of 40MW, **shutting down 50% of genset capacity** and reduce engine load to allow up to 75% of solar during clear sky days
- Feasibility Study Jan-May 2019, Investment Decision July 2019
- Hybrid System successfully commissioned and handed over to operations in March 2021

Implementation:

- On-balance
- B2Gold responsible for Implementation, no EPC
- Suntrace with BayWa r.e. acting as Owner's Engineering and Procurement (EP) Contractor, supervision of construction and commissioning



Achieve CO2 reduction in Stages (example: Target 30% by 2030) – benefit from early fuel savings and operational experience

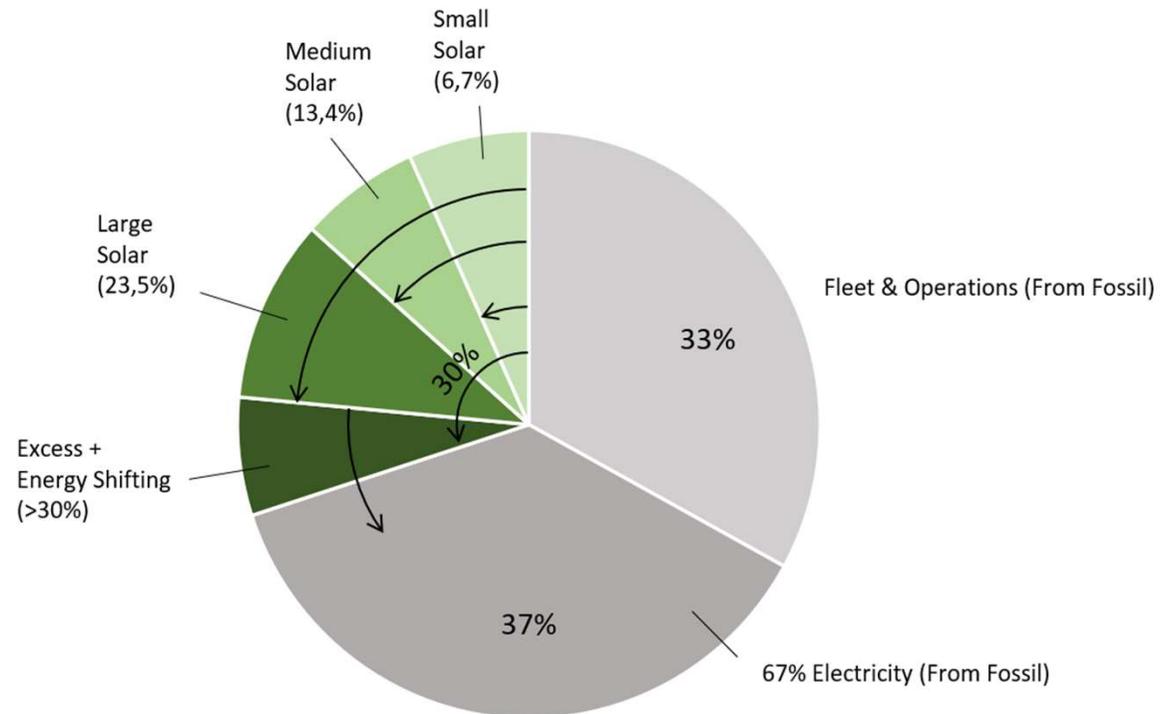


- More RE reduces genset operation
- Energy security is key requirement
- Battery energy storage is key technology
- Energy shifting to night hours required
- Wind may provide low cost option for higher RE shares
- Consider EV Mining fleet as future option

System Sizing	Electricity Share *	Total CO2 share **
Small Solar	approx 10%	6.7 %
Medium Solar & Battery	Approx 20%	13.4 %
Large Solar & Battery	Approx. 35%	23.5 %
Excess Solar & Large Battery	>45%	>30 %

Note: * Share is indicative, exact share requires specific analysis of mining location

** Assuming a 67% CO2 attributable to power generation, and 33% to Fleet and operations



What is the story for on-grid Mines?

- Economics: Savings on grid-tariff / hedge future rate increase
- Decarbonization: reduce CO2-footprint of grid electricity
- Challenges:
 - Obligations under the existing PPA?
 - Regulatory restrictions?
 - IPP or embedded generation or auto-consumption?
 - PPA mechanisms and wheeling charges?

Case Study:

6.5MWp PV for Ohorongo Cement, Namibia
embedded generation under a private PPA
COD in 08/2018, Suntrace was Owners Engineer
for IPP

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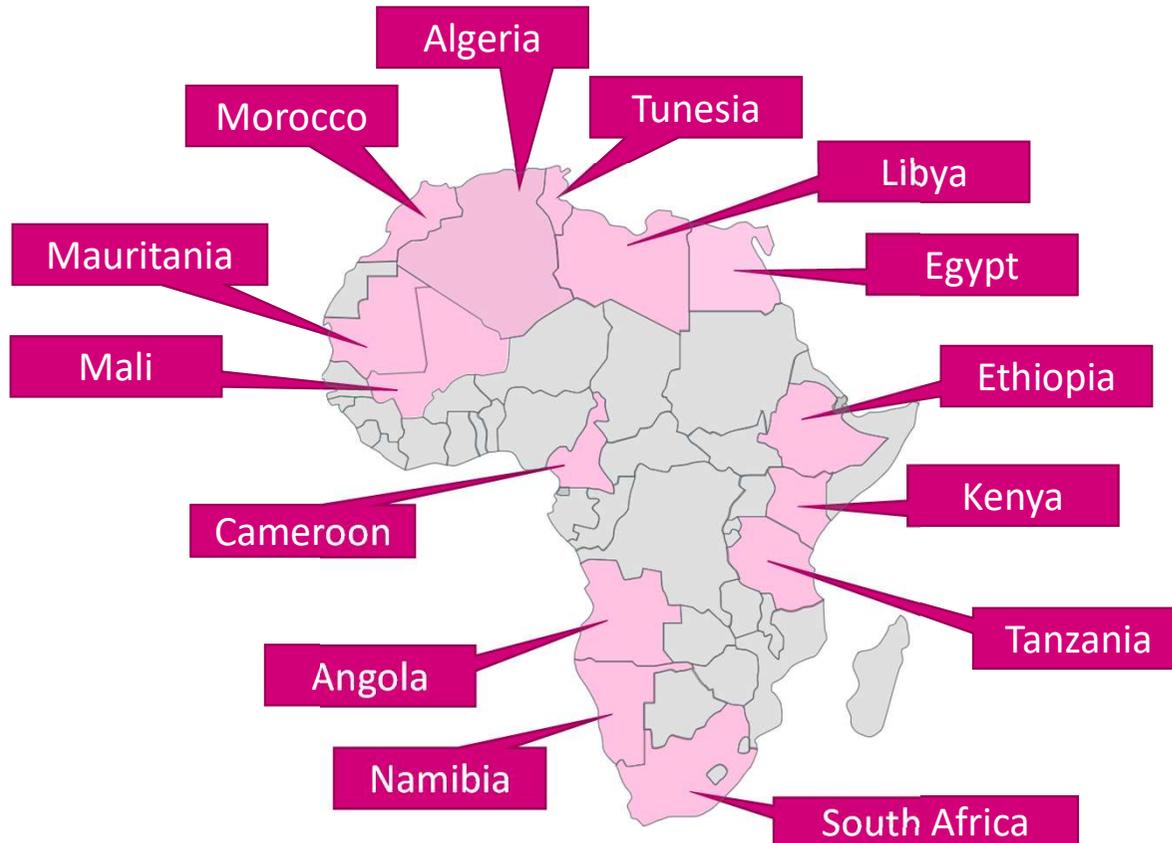
Roadblocks :	<ul style="list-style-type: none"> • Low tolerance for power supply disruption 	<ul style="list-style-type: none"> • High energy cost, especially in remote mining sites (offgrid) • Fuel price volatility 	<ul style="list-style-type: none"> • Displacing CO2 Emissions while complying with Energy Intensive Mining 	<ul style="list-style-type: none"> • Doubts over reliability of RES • Inexperience regarding the complexities of its financing
Value Added : by Suntrace	<ul style="list-style-type: none"> • Cost competitive solutions including solar, wind, storage & fossil hybrid 	<ul style="list-style-type: none"> • Value of Incremental hybridization (20-100% RES Share) • Side step fuel costs 	<ul style="list-style-type: none"> • Use of Mine specific Hybrid RES -Fuel saving and associated reduction in CO2 emissions & maintenance costs 	<ul style="list-style-type: none"> • Independent expert, develop individual solution for each case • Techno-economic support from concept to operation

Suntrace is an Independent Expert for Renewable Energy Active globally, with a Dedicated Commitment to Africa



Founded in 2009

Active in Africa since 2010



AFSIA Technical Advisor of the Year 2020



Africa Solar Industry Association (AFSIA)

Key Takeaways



Renewables offer solutions to:

- Decarbonize
- Reduce energy cost
- Stabilize electrical system

Best approach:

- Seek independent expert guidance
- Assess your options and needs
- Develop your mine-specific optimized solution
- Plan for expansion of RE share
- Procure through a competitive process
- Implement (in stages)

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or meet us at our Virtual Booth

