
Fulcrum3D
WIND SOLAR FUTURES

opinion

BLUE SKY MINING

Opinion piece from
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The mining industry is rapidly embracing wind, solar and green hydrogen in the pursuit of lower costs, lower carbon emissions and access to ethically invested capital. Energy is one of the highest operating costs for mining operations which is why the mining industry is starting to rapidly implement renewables into their energy mix.

Apart from lower operation and maintenance costs, renewable power generation adds a lot of financial value to mining companies in terms of cost certainty, lower carbon footprint and from a market perspective, access to ethically invested capital that is looking for socially responsible investments in the mining industry.

The number of successful hybrid renewable projects in the mining industry is growing as intermittency issues are overcome through complimenting solar with wind alongside batteries, diesel and gas to 'fill the gaps' so to speak.

Energy security is another factor driving adoption. When South Australia experienced an extensive blackout in 2016, BHP's Olympic Dam mine lost in excess of US$100 million when it was forced to shut down operations for close to two weeks.

Green hydrogen will be the next driving force in the mining industry's adoption of renewables as it looks to remove diesel as a fuel source altogether and head toward zero emission mining in the coming years.

The first step in implementing renewables into mining operations is resource assessment. Similar to geological mapping of an orebody, wind and solar resources need to be mapped to ascertain their potential, quality and yield.

Wind and solar resource assessment campaigns are generally conducted for a minimum 12-month period, to cover seasonality, however the longer the duration of the campaign the better.

Assessment data is used to establish the following:
- Generation potential
- Optimal generation mix
- Optimal location
- Project financing

Wind resource assessment can be achieved with a number of different technologies, including Sodar (sound detection and ranging), Lidar (light detection and ranging) and met masts. Each of these technologies has their own pros and cons. The table on the next page illustrates where each of them sits in terms of functionality and cost.

Solar resource assessment is more straightforward in terms of the technologies deployed. It typically includes the following measurement parameters:
- Global Horizontal Irradiance (GHI) – Total amount of shortwave terrestrial irradiance received by a surface horizontal to the ground
- In-plane Irradiance (POA) - Total amount of shortwave terrestrial irradiance received by a surface in the plane of array
- Albedo - Reflected solar radiation (required when installing bifacial panels)
- Temperature, Pressure, Humidity, Rain & Wind
- Back of module temperature

Less common but not unheard of in assessment campaigns is the use of soiling test stations (which measure PV array soiling losses)

WIND RESOURCE ASSESSMENT TECHNOLOGY	Sodar	Lidar (Doppler)	Met Mast
Bankable energy assessments	✓	✓	✓
Unit cost	$	$$$$	$$$$$
Insurance risk	Low	Low	High
Requires siting permit	No	No	Yes
Susceptibility to mechanical failure & lightning strikes	Low	Medium	High
Hub height temperature, pressure & humidity	✗	✗	✓
Wind data availability at 200m above ground	✓	✓	✗
Wind speed & wind sheer data at multiple heightS	✓	✓	✗
Measures swept area of blades	✓	✓	✗
Low power use	✓	✗	✓
Cost includes power supply	✓	✗	✓
Cost of maintenance	$	$	$$$
Ease of deployment & redeployment	Easy	Easy	Difficult
Cost of deployment & redeployment	$	$	$$$$
Optimised for complex terrain	✓	✗	N/A
Data correction required for complex terrain	No	Yes	N/A
Raw data captured for full traceability & upgraded processing	✓	✗	✓

and all-sky cameras, commonly referred to as CloudCAM's, which detect, track and predict cloud movement providing solar irradiance forecasts up to 20 mins in advance.

Not being able to forecast cloud impacts has historically caused issues for Solar PV integration on mine sites. Through predicting cloud shading and solar power output across the entire solar farm a CloudCAM enables higher penetrations of Solar PV, optimised ramp rate control, and reduced cycling and size of storage capacity (BESS) where implemented.

As the mining industry continues its rapid adoption of renewable energy to reduce operating costs, improve its resilience to commodity price fluctuations and reduce its carbon footprint, zero emission mining is well on its way to becoming a reality.