Renewables for Australian Mines: Market Overview and Next Steps

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Up to 15% of a mine's input costs can be attributed to energy, and that figure is expected to soar in the coming years. Australia's power consumption will grow by more than 40% between 2014 and 2050, the Bureau of Resources and Energy Economics (BREE) projects. The mining sector will take the biggest hit as it extracts deeper, lower-quality ore that requires more processing.

Jurisdictions are turning to low-carbon renewable energy to meet this ballooning demand. The federal Renewable Energy Target (RET) aims to generate 23.5% of the nation's power from renewable sources by 2020. States also have their own goals; energy-challenged South Australia plans to boost renewables from 43% of total generation to 50% by 2025.

Renewables can play a vital role in meeting demand, enhancing security, and guarding against price volatility when paired with energy storage. They're also well-suited to Australia's mining sector. On-site solar and wind generation can reduce or eliminate the need to haul diesel fuel to remote, off-grid areas—a logistically difficult endeavor.

"Some mines in Australia operate in incredibly remote locations, and the cost of electricity is upwards of $300/MWh," Australian Renewable Energy Agency (ARENA) CEO Ivor Frischknecht explains. ARENA launched the Regional Australia's Renewables Program in 2013 to provide funding to first-of-a-kind projects that demonstrate the cost of deploying and operating renewable energy in remote locations. "Supply chain issues, including having road access cut off for weeks at a time, are not uncommon. These mines are also located in areas with the best solar resources in Australia, and among the best in the world. Renewables can deliver cheaper and more predictably priced power, and reduce fuel supply risk to these sites."

Supply Challenges in South Australia

Still, questions remain about how to meet the nation's energy needs, particularly in the wake of South Australia's blackouts. Operations like BHP Billiton's Olympic Dam mine took large financial hits during the outages, prompting criticism of the state's RET. The Independent Review into the Future Security of the National Electricity Market, which was released in March 2017, was also panned by the Minerals Council of Australia as technology-biased in favor of renewables.

Storage: The "Silver Bullet" of Energy

While the recent blackouts have left some mining firms uneasy about renewables, the larger consensus is that more energy storage is the answer. In February, Prime Minister Malcolm Turnbull called on ARENA and the Clean Energy Finance Corporation (CEFC) to encourage the development of flexible capacity and storage projects. ARENA plans to solicit expressions of interest for $20 million of demonstration projects. Storage systems now have relatively short payback times, according to Juergen Zimmermann, Business Development & Technology Manager for ABB. Today, they "fit within a typical five-year contract term."

Companies like SolarReserve are already capitalizing on opportunities for storage in remote areas. This concentrated solar power (CSP) firm stores excess solar energy in tanks of molten salt, then releases it through a heat exchanger as needed. The technique allows SolarReserve to power mining operations around the clock. "Why that's unique and interesting to the mining sector is that we have the ability to run 24/7, so we have base load capability," Tom Georgis, Director of Development for SolarReserve, explains.

"Solar has this significant advantage of being capable of generating close to the load and has a predictable generating curve that correlates well to the loads," Renzo Gaggioli explains. Gaggioli is Project Manager for Canadian Solar's South East Asia and Australia Region. "Paired with modular energy storage units available in the market, the combination represents the 'silver-bullet' to reduce electricity costs."

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> **Ivor Frischknecht**
> CEO, **Australian Renewable Energy Agency (ARENA)**

Rising Energy Costs Driving Uptake of Renewables

Cost is the main driver for mining companies to explore renewables. "Operational costs continue to go up for the resource sector. As miners have to go deeper, the purity of the ore requires more processing, more energy," Georgis explains. "The percentage of operational expense that's attributed to energy continues to go up...they need to minimize costs as much as possible to maintain their competitiveness."

Every business that runs on vast amounts of energy will have to look into look solar, Gaggioli reiterates. The industry's reliance on expensive diesel generators and electricity from distant generation sites will force the issue, he says. The sooner miners start the transition, the better. "What mining companies need to consider is that, unlike with any other commodity or product, renewable energy projects require long-term planning and diligence from inception to fruition, hence, early movers will now benefit significantly in this sense."

For now, Gaggioli feels that there's a "wait and see" approach in the industry. Once proven technologies and projects are rolled out, widespread uptake of renewables will follow.

Operational projects are already spurring more miners to explore renewable energy, according to Frischknecht. "After receiving 30 applications involving the mining sector in 2013, we had a couple of quiet years, comparatively speaking," he reports. "In the second half of 2016, however, the Degrussa Solar Project (at Sandfire's copper mine) came online, and ARENA experienced another notable surge in interest from the mining sector. I believe that miners are encouraged by the big names involved in the Weipa Solar Project (Rio Tinto, First Solar), and the size and ambition of the Degrussa project."

Early adopters look for three things, according to Georgis. A technology "has to be proven, in most cases it needs to run 24/7, and then of course the economics needs to make sense." Technically, renewables don't even need to run 24/7 if they're part of a hybrid integration. For grid-connected sites, "it really depends on where they're currently getting their power from, and is there an alternative that's more attractive."

Hybrid integration is still viewed as risky, however. Understanding and managing the risk of the technical and commercial integration of renewables is a challenge for mining companies, Zimmermann says. Fortunately, "the commercial integration issue is addressed through new business models where new players enter the market and offer a fully integrated hybrid solution with a single point of responsibility for the power supply," he explains. "The issue of minimising integration risk with existing diesel plants is addressed through the incremental hybridization, where renewables are introduced in stages, in combination with stabilizing and storage technology."

Roadblocks to Renewables in Mining

One key barrier is the mining sector's perception that renewables are costly and unreliable, according to Frischknecht. "Near-commercial, low-penetration, renewable projects do not deliver the savings that typically get a miner excited. Medium to high penetration systems can, but are seen as riskier." Miners are hesitant to disrupt the status quo and risk production downtime, especially if existing arrangements are meeting their needs.

A fixed asset with a 25 + year lifetime or a long-term power purchase agreement can also be a hard sell where mines have short operational lives. "Redeployable, plug and play solar is an exciting technology ARENA is supporting through Laing

O'Rourke, and we expect SunSHIFT to be a disruptive newcomer to this part of the market," Frischknecht reports. "The issue of short mine life or short contracts for purchasing renewable energy is addressed through companies like SunSHIFT who have developed redeployable solar," Zimmermann agrees.

Companies ready to explore renewables may find themselves constrained by factors outside their control—namely commodity prices. "We're engaged right now with various mining entities that are looking at an uptick in commodity pricing, meaning that they're getting the go-aheads to move forward with either new mines or mine expansion," Georgis explains. As a result, SolarReserve is currently focusing on mines that are already operating, or fringe-of-grid, that are experiencing power issues. When commodity prices rise, Georgis believes Australia's remote, off-grid mining sites will present countless opportunities for renewables.

How Will the Market for Renewables Evolve?

All eyes will be on commodity prices as stakeholders try to predict the future of renewables in Australia's mining sector. That factor will determine whether new mines and expansions come online, Georgis and Gaggioli say.

The dip in commodity prices has imposed capital constraints on mining firms, Gaggioli says. "Not all have a long-term vision and a clear path towards long-term low cost energy supply," he explains. "So the initial barriers may have been around capital and vision.When the first, then the second project have been rolled out and the benefits are understood, then will be a sort of snowball effect, and [that] will happen very soon."

Once that occurs, SolarReserve will be focused on pure off-grid solutions, "but also looking at states where there are quite a few mines that are grid-connected," he explains. Those mines will need to "make sure that they have pricing security, and they have availability and security for their power needs."

In the meantime, some miners are testing the waters. "BHP Billiton's involvement in the ARENA-funded Lakeland Solar Project and Newmont's use of a shadow price of carbon are good examples of these companies getting some corporate exposure but doing so within a low-risk environment by getting knowledge sharing returns," Frischknecht explains.

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Australia's Renewable Energy Targets

Jurisdiction	Goal	Target Date
Federal	23.5% renewable generation	2020
Victoria	25% / 40% renewable generation	2020 / 2025
New South Wales	10,000MW total renewable capacity / net zero carbon emissions	2022 / 2050
Queensland	50%	2030
Northern Territory	50%	2030
South Australia	50% renewable generation	2025
Western Australia	no state target	n/a
Tasmania	no state target	n/a
Australian Capital Territory	100%	2020

ARENA is eager to share knowledge and work with the mining sector more closely. The agency is currently developing a handbook to assist miners with the technical and commercial decision-making process, which is slated for release in the latter half of 2017. One lesson ARENA learned early on is how reliability can be managed with a robust data set, Frischknecht reports. “The importance of data cannot be understated. The cost of monitoring load and the solar/wind resource is negligible in comparison to what it can cost in the long term without it.” Data monitoring can be a key risk mitigation strategy that prepares companies for sudden shifts in energy or environmental policy, he advises.

Even with the risk of policy shifts, one thing’s for sure—the cost of renewable energy is falling fast, and the economic case for it is stronger than ever. “ARENA’s large-scale solar round has seen the cost of utility-scale solar in Australia become competitive with wind, Frischknecht reports. “It’s also worth noting that both Weipa and Degrussa were delivered on budget, these are important milestones, given there were plenty who doubted it could be done.”

The message around economics and lower cost to operate mines will drive change and increase the uptake of renewables in mining over the next one to two years, Zimmermann and other experts believe. “Utility-scale solar is already cheaper than new coal or gas generation, and Australia is not in [a] position to rely on fossil fuels to deliver competitive electricity prices to homes and businesses in future years,” Gaggioli predicts. “Today, with the aging fleet of traditional generators, we can comfortably say that in the long term, the switch to renewables is inevitable.”