

MINING AND RENEWABLES – OPPORTUNITIES IN COLLABORATION

It is easy to see why interaction between the renewables and mining sectors is steadily increasing. At a time when mine operating costs are a key focus, renewable power can offer mining companies lower energy costs, protection against fuel price volatility and, alongside new battery storage solutions, mitigation of the risk of power interruptions from unreliable grid supplies.

The growth of the renewables sector more generally is also driving increased demand for relevant commodities: particularly in recent times the metals used in batteries and electric vehicles such as copper, nickel, manganese, cobalt and lithium. For renewables developers, mining companies can be the reliable long-term power offtakers under power purchase agreements (PPAs) that they need to underpin project economics and raise financing. Miners too can often provide renewable developers with ideal sites for new projects. In this article we discuss some of the opportunities for the mining and renewables industries to work together.

AN OPPORTUNITY FOR MINING COMPANIES

Renewable power for mines

Renewable energy can facilitate the development of new mining opportunities as many mines are isolated from the central power grid. As a result, obtaining reliable power supplies can be a major expense. Typically this involves investment in on-site generators fuelled by diesel or heavy fuel oil, which in turn requires substantial road infrastructure, fuel storage facilities and a regular fuel transportation operation. The alternative of investing in extending existing power transmission lines can be equally or more expensive and does not necessarily guarantee reliable power supply. Outside of hydro and geothermal power projects which can provide firm baseload power, the big drawback of renewable power projects has always been their characteristic intermittent generation – the sun shines only during the day for solar projects and the wind blows even less predictably for wind turbine projects. However, where in the past this meant that renewable power projects had only been

Key issues

- Install renewable energy at active mines to drive energy costs down
- Generate a new source of demand for commodities used in energy storage technology
- Execute corporate PPAs for renewables projects, mining companies are ideal offtakers
- Transform disused mines into pumped hydro electricity storage facilities
- Address "double project risk" by asset financing portable renewable energy assets
- Reallocate renewable project risk at mine sites in return for better power deals
- Electrify Africa with micro-grids and off-grid renewables

able to provide a partial power supply solution alongside existing grid or local generator supplies, the development of reliable and increasingly affordable battery storage has the potential to revolutionise the sector by eliminating the problem of intermittent generation.

Either alone or as part of hybrid power solutions, studies increasingly indicate that by investing in renewable energy on site, miners may be able drive down energy costs by up to 25 per cent in existing operations and 50 per cent in new mines.¹

By way of illustration, Sandfire Resources' DeGrussa copper and gold mine in Western Australia is supplied with electricity from Australia's largest integrated off-grid solar and battery storage facility, which generates around 7MW of solar power for the mine.² The project also includes a 6MW Samsung lithium-ion battery storage facility installed alongside the mine's existing 19MW diesel-fired power station. By supplying the majority of DeGrussa's daytime electricity requirements with solar and storage, Sandfire Resources can offset about 5 million litres of diesel fuel a year.

Publicly available results seem encouraging. For instance, it was planned that integration of the solar PV and battery system at DeGrussa would require at least six hours total mine downtime for construction and commissioning, however the actual total outage of the diesel network powering the mine was closer to 40 minutes.³

Australian miners have been at the forefront of developing renewable power solutions and another interesting example of this is Sun Metals' 116MW solar farm in Queensland. Unlike Sandfire Resources, Sun Metals will self-finance the AUD 182 million solar project. Once constructed, the solar farm will be the largest single consumer solar farm in Australia with over one million panels installed over approximately 130 hectares of land, supplying 29 per cent of Sun Metals' zinc refinery's current base load power needs. Sun Metals' CFO, Kathy Danaher, said "Sun Metals is helping to showcase that large scale solar is becoming more cost-effective for large commercial and industrial loads."⁴

Other potential benefits of installing renewable energy facilities at active mines include:

- long term power price predictability,
- reduced exposure to future fossil-fuel price volatility,
- lower operating and maintenance costs and reduced maintenance downtime,
- reduced carbon emissions and associated social and health and safety benefits.

There may even be benefits for grid-connected miners to tender for renewable energy solutions, even if they do not actually follow through with commissioning a renewable energy project at site (for instance, because management does not want to take the additional project risk or divert time from core operations). This is because conducting a tender may give a mining

¹ Deloitte, "Renewables in Mining" Thought Leadership Series, Vol. 2, p. 12.

² <https://onestepoffthegrid.com.au/wa-copper-mine-goes-green-as-it-powers-with-solar-and-storage/>

³ Juwi Renewable Energy Pty Ltd and ARENA, "DeGrussa Solar Project" Knowledge Sharing Reports, 9 March 2017, p. 25.

⁴ Tony Raggatt, "Sun Metals achieves financial close on \$182m solar farm at Townsville" Townsville Bulletin, 9 February 2017, p. 1.

company access to current pricing, which may be useful in re-negotiating pricing from traditional suppliers.

A final Australian example worthy of note here is the Lakeland Solar and Storage Project, Australia's first grid-connected solar and storage project of scale. Located in far north Queensland, the Conergy-sponsored project comprises a 13MW solar PV array with an integrated grid connected 1.4MW/5.3MWh lithium-ion battery. Clifford Chance advised Nord/LB, the sole debt financier to the project, which provided a 15-year non-recourse financing facility.⁵ Although the project is not intended to power a mine, there has been clear interest in the project from the mining community: BHP is part of the knowledge sharing steering committee formed by Conergy and the Australian Renewable Energy Agency (ARENA) for the project. The release of knowledge sharing reports (which will be available on the ARENA website) will be another useful resource for miners with an interest in the integration of energy storage and renewables.

New demand for commodities

The global shift to increased renewable energy generation is accelerating. This has been driven by the dramatic decrease in the cost of solar panels,⁶ as well as climate change regulation. Together with energy storage and electrification – in particular the burgeoning electric vehicle sector – this renewable power revolution is creating new sources of demand for the commodities that underpin the associated technologies, such as cobalt, lithium, copper, nickel and manganese. Metal miners have much to benefit from this potential surge in demand. Speaking at the Bank of America Merrill Lynch Global Metals, Mining & Steel Conference in Barcelona last year, Glencore CEO Ivan Glasenberg said that the impact of electrification per vehicle would be approximately 160kg of copper, covering the battery, charging point and the car itself. What this means is that if countries meet their 2025 targets of 52 million electric vehicles, this would equate to demand for an additional 1.65 million tonnes of copper and 210,000 tonnes of nickel.⁷

AN OPPORTUNITY FOR RENEWABLE ENERGY COMPANIES

Mining companies as offtakers

The growth of any new category of credit-worthy, long term power purchasers is a welcome development for renewables developers, whether for off-grid projects such as remote mines or, in markets where direct on-grid sales are permitted, on-grid projects. Indeed the rise of corporate PPAs (where corporates purchase power for their own use directly from power projects) for renewables projects in many jurisdictions will help foster new deals between renewables developers and mining companies. For many corporates, purchasing "green power" has always had a strong corporate social responsibility justification. However, as discussed above, increasingly renewable power solutions can make absolute economic sense as well.

⁵ <https://www.cliffordchance.com/news/news/2016/08/clifford-chance-advises-on-australia-s-first-utility-scale-integ.html>

⁶ Solar photovoltaic (PV) panel prices have fallen in excess of 80% since 2009 and SunPower Corporation's founder, Richard Swanson has famously predicted a further 20% drop for every doubling of shipped volume into the future.

⁷ <http://www.miningnews.net/energy-minerals-investor-hub/energy-minerals-investor-hub-events/ev-revolution-is-upon-us-glasenberg/>

Renewables and mine sites

Aside from being power offtakers for renewables projects, present and past mine sites are also potentially favourable locations for the development of renewable energy projects.

Potential advantages for renewable energy companies developing projects at disused mine sites include:

- proximity to existing electricity infrastructure such as sub stations and transmission and distribution systems
- minimal environmental impacts during construction due to the site's historic use
- access to related infrastructure such as roads, telecommunications and housing, as a result of historic mining activity.

One example from Australia is Collinsville, an old coal mining town in Queensland, which is now the site of two solar projects – one being developed by RATCH Australia Corporation and one by Edify Energy. The projects will be constructed in the vicinity of a decommissioned coal-fired power station, with both projects reportedly using some of this legacy infrastructure to supply energy into the grid.⁸

Further, the Rocky Mountain Institute (RMI) has developed a methodology for screening legacy mine sites for renewable resource availability and, when applicable, assessing the feasibility and value of their development.⁹ BHP has taken advantage of this service, commissioning RMI to look at their North America portfolio: RMI identified "significant potential for redevelopment" and "a clear subset of sites with a collective potential of over 0.5 GW".¹⁰

And it is not only solar PV projects that can benefit from old mine sites. On the site of the disused Kidston Gold Mine in Northern Queensland, Genex Power Limited, with support from ARENA, is developing the world's first integrated solar and pumped hydro project. The project will consist of a hybrid 250MW pumped hydro electricity storage facility (PHES) and a 270MW solar PV power plant. Essentially the PHES consists of transforming two very large holes in the ground left by the mining process into reservoirs by filling them with water. The PHES will provide support to the solar PV power plant during peak power periods by releasing water from the upper reservoir into the lower one, passing through turbines. During off-peak periods, when the sun is shining, the water will be pumped back from the lower to the upper reservoir, mainly using solar power.¹¹ Given there are around 60,000 abandoned mining sites across Australia,¹² it is very likely that there are other "pre-dug" holes for renewables developers to take advantage of.

Australia is not the only country that is looking to turn mine pits into giant batteries. In Germany, the state of North-Rhine Westphalia plans to transform

⁸ <http://www.abc.net.au/news/2017-03-05/collinsville-coal-mining-town-moves-to-solar-capital-north-qld/8023384>

⁹ Rocky Mountain Institute, "Sunshine for Mines: A Second Life for Legacy Mining Sites" Insight Brief, November 2017, p. 2.

¹⁰ <http://reneweconomy.com.au/bhp-sees-500mw-solar-storage-potential-disused-mines-20836/>

¹¹ <https://arena.gov.au/news/one-step-closer-giant-kidston-solar-pumped-hydro/>

¹² <http://www.abc.net.au/news/2017-02-15/australia-institute-report-raises-concerns-on-mine-rehab/8270558>

its Proper-Haniel hard coal mine into a 200MW PHES. This will have the capacity to power more than 40,000 homes.¹³

A LOOK TO THE FUTURE

It is clear that there are many potential advantages to collaboration between the mining and renewable energy sectors. However, whenever two projects (such as a new mine and a new renewable power project) are developed in combination, the interface and co-dependencies of "double project risk" present a real challenge for the developers and lenders to each project. In essence, solutions have to be found to mitigate compounding risks and to enable benefits to be realised without finding that neither project can get off the ground. The potential portability of renewable solutions provides one mitigant, as does the ability to spill power onto an electricity grid until a mine is ready to start buying power. Ultimately, project developers and their advisers have to find creative solutions to these risks and development and export credit finance providers also have an important role to play.

Unlike fixed renewable energy assets, portable renewable energy assets have their own intrinsic value – i.e. a financier can lend against the asset in isolation (at least in part) from the mining project itself. This can enable a renewables developer or mining company to obtain asset or equipment finance for its portable solar PV solution for example, rather than relying on traditional project finance. This could reduce the risk for financiers and significantly speed up the financing process for developers or miners.

One example of this approach is SunSHIFT, which is a "pre-engineered, pre-fabricated, modular, and moveable turnkey solar PV solution, specifically designed to overcome the limitations of traditional solar PV and enable the mining sector to adopt renewable electricity".¹⁴ It may also be that batteries can be developed to be transportable even if the PV array is fixed.

If the risk related to the mining project cannot be reduced, it may be worth exploring shifting some of the risks traditionally allocated to the renewables developer, in aid of greater collaboration. Typically, under renewable energy PPAs, developers take wind/solar radiation and site risks, albeit often with some pass-through to EPC contractors on site risks (which comes at a cost). The renewables developer will need to survey the site and will need time to collect wind or solar radiation data. This is a lengthy exercise, one that could be either conducted (or assumed) by a mining company who has already invested significant time in surveying the land for viable metals and minerals and/or collected weather data. Perhaps mining companies could entice renewable energy companies to offer better power deals by taking on some of these traditional project risks themselves.

In summary, both industries have much to gain from greater collaboration. Innovative financing arrangements and creative risk allocation are just two ways to help both industries work closer together.

RELEVANCE TO AFRICA

Much of the African continent faces major electricity challenges – a combination of growing power demand on the one hand and relatively poor

¹³ <https://www.bloomberg.com/news/articles/2017-03-17/german-coal-mine-to-be-reborn-as-giant-pumped-hydropower-battery>

¹⁴ ARENA, "Renewable energy in the Australian Mining Sector" White Paper, November 2017, p. 18.

power transmission infrastructure and insufficient power generation capacity on the other. Power supply deficits and unreliable power infrastructure have undoubtedly impacted the development of the resources sector across the continent. According to the Africa Progress Panel (APP), led by Kofi Annan, it would cost USD 63 billion a year until 2030 to expand electricity grids in Africa to reach almost everyone, compared with the current annual spend of circa USD 8 billion.¹⁵ In the absence of comprehensive transmission infrastructure any time soon, the development of micro-grids and off-grid renewable power would therefore seem a logical way to speed up electrification for both domestic and industrial uses.

It is possible to envision a future where, for some parts of Africa as well as for many countries elsewhere, 21st century answers, based on renewable generation technologies and battery storage, will provide a solution to electricity supply challenges without the need for as much of the capital intensive (and polluting) power infrastructure that underpinned much global development in the last century.

Already, funding from private investors is flowing into developing off-grid solar power in Africa, with many new companies making the most of the opportunity. For example, M-Kopa, an American start-up that launched in Kenya in 2011, has now brought solar power to half a million pay-as-you-go customers.¹⁶

Clifford Chance recently advised on the US\$55 million local currency debt funding to M-Kopa, the largest commercial debt facility to date in the pay-as-you-go off-grid energy sector.

This month we have seen new equity investments in Husk Power Systems and Off Grid Electric, providers of off-grid energy solutions in Africa. The increasing size of funding rounds which these companies are able to undertake, from both strategic and financial investors, demonstrates growing market confidence in the ability for these businesses to achieve scale.

Whilst individual roof-top solar PV panels only produce a small amount of electricity: by investing in micro-grids, communities can share the initial capital cost of construction and commissioning. Both the APP and RMI cite micro-grids as the solution to Africa's electricity issues.¹⁷ Recent changes to funding policies at the World Bank, which provides developing countries with about USD 60 billion a year in financial assistance,¹⁸ may help stimulate further investment. In particular, the World Bank announced at a climate summit in December last year that it will stop financing oil and gas exploration and extraction from 2019, so as to free up funds to help countries meet their 2015 Paris Agreement pledges to cut greenhouse gases.¹⁹

Despite the challenges, renewable energy has proved popular in Africa, owing largely to Africa's abundance of high quality wind, solar and hydro resources and the fall in costs of renewable technologies. Indeed, the International Renewable Energy Agency reports that Africa's solar energy capacity has

¹⁵ <https://www.economist.com/news/special-report/21731042-road-ubiquitous-electricity-africa-might-leapfrog-straight-cheap-renewable>

¹⁶ <https://www.newyorker.com/magazine/2017/06/26/the-race-to-solar-power-africa>

¹⁷ Rocky Mountain Institute "Energy Within Reach: Growing The Minigrid Market In Sub Saharan Africa" (2017) and Africa Progress Panel, "Lights, Power, Action: Electrifying Africa" (2015).

¹⁸ <https://theconversation.com/signaling-more-independence-from-the-us-the-world-bank-phases-out-its-support-for-fossil-fuels-89497>

¹⁹ <http://www.france24.com/en/20171212-world-bank-stop-funding-oil-gas-projects-2019-climate>

increased from 78MW in 2007 to 2,920MW in 2016.²⁰ In South Africa alone the solar energy capacity has risen from 17MW in 2007 to 1,744MW in 2016, and a study led by Anton Eberhard of the University of Cape Town found that grid-connected wind and solar energy in South Africa is now amongst the cheapest in the world.²¹

No doubt this year's Mining Indaba will give rise to new ideas for further collaboration between the mining and renewables industries in Africa.

²⁰ International Renewable Energy Agency, "Renewable Capacity Statistics 2017", March 2017, p. 21.

²¹ <https://www.economist.com/news/special-report/21731042-road-ubiquitous-electricity-africa-might-leapfrog-straight-cheap-renewable>

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