AGGREKO PERSPECTIVES

AN AGGREKO WHITEPAPER

OVERCOMING UNCERTAINTY IN THE MINING INDUSTRY

JANUARY 2019

Contents

Aggreko White Paper: Overcoming uncertainty in the mining industry

1. An industry marked by uncertainty

As we approached the end of 2018, it seemed that the only certain thing in the mining industry was uncertainty.

Following an encouraging upturn in 2017, the middle of 2018 saw a dip in pipeline activity due to uncertainty caused by trade disputes across the globe.

Opinion is divided about what 2019 holds, with some analysts identifying a "rested bull market" which is set for recovery, whilst others contend that we could see the market slow down further, as a broader global economic downturn takes hold. The outlook will depend on the commodity type but should highly rely on China's ability to support its economy and the metal demand.

By its very nature, mining is a cyclical industry, with the life of a mine depending closely on economic ups and downs; it is not uncommon for mines to open and close in line with the commodity prices. Importantly not all commodity price-cycles are pre-aligned and may occur at different times and by different global market drivers. For example Gold, Silver, Platinum (precious metals) will react differently to Coal and Base metals (Copper and Zinc). Supply and demand drive base metals stronger than precious metals at different times depending on global country demands.

This presents all mine operators – juniors, middle-tier and majors – with the significant challenge of managing both capital and operational risk in an uncertain price environment. Lead times on capital is a big risk mainly due to volatility. Operators often 'shelve' projects or put them on hold because of volatility influencing the capital investment, timing, risk as well as the process.

In the absence of a grid connection, which is often the case for remote mines, the major component of the initial CAPEX outlay is often around the project's power requirements. The operator has to decide whether to either build a captive power plant or buy/lease generators.

Captive power plants usually need to be financed off-balance sheet through limited recourse project finance. Due to lenders' due diligence processes, this option may take many months or years before the financing is ready to draw down. Often this process is further delayed because of the viability of the project in a volatile commodity price cycle.

Where there is uncertainty over the life duration of the mine, raising this type of financing can become even more complex, making buying or leasing generator sets the only other option to managing or eliminating this capital and project risk. The leasing option is obviously the better risk option for the mining operator.

Furthermore, deciding the optimal capacity of a captive plant has its challenges in an industry which is forced to cut back production and therefore its energy requirements in response to lower demand, but where it is equally important to be able to ramp up production when economic cycles are on an upward trend. The rental or leasing model is the best suited for this occurrence and obviously the lower risk option when it comes to flexible project power requirements as previously highlighted.

The management of energy costs in what is an inherently energy-intensive industry is crucial – Chile's mining industry consumes 15% of the country's power supply, and the Australian mining sector consumed 148TWh in 2014, which is almost as much as Malaysia's entire energy demand.[1]

With this in mind, it is easy to understand why getting the right fuel type or fuel mix to optimise fuel costs and maintain competitiveness is top of the industry's agenda. Any fuel savings or fuel saving initiatives over the life of the mine will influence the rate of return on the project and therefore influence the project rollout.

More recently, an additional challenge has entered the mix. The reduction of carbon intensity, just one of the pillars of sustainability and the overall environmental, social and governance standards (ESG) being demanded by investors. Renewable energy initiatives are becoming an important part of the project trigger decision making process and all of these renewal initiatives are aimed at supporting the 'Life of Mine' viability of the project and to lower the capital investment risk.

This report takes a look at where the mining industry is today, and, as energy markets transition, how it can maximise on challenges and opportunities ahead to support each project.

2. Exploration budgets: an upturn in the industry

2016 marked a low point in mining activity with specific reference to exploration, following a period of falling pipeline activity which was closely correlated with a drop in commodity prices, which began in 2011. Importantly, low exploration spend results in low replacement of ore reserves. Every year mining operators mine a significant amount of the ore reserves on the property and unless more are found, the mine or project heads towards a 'cliff' in terms of its Life of Mine and remaining ore reserves.

Mining is an inherently capital-intensive industry and therefore it is no surprise that falling prices led directly to falling investment. The state of the global economy also had a significant impact with a similar drop in activity following the 2008 crash (see graph 1).[2]

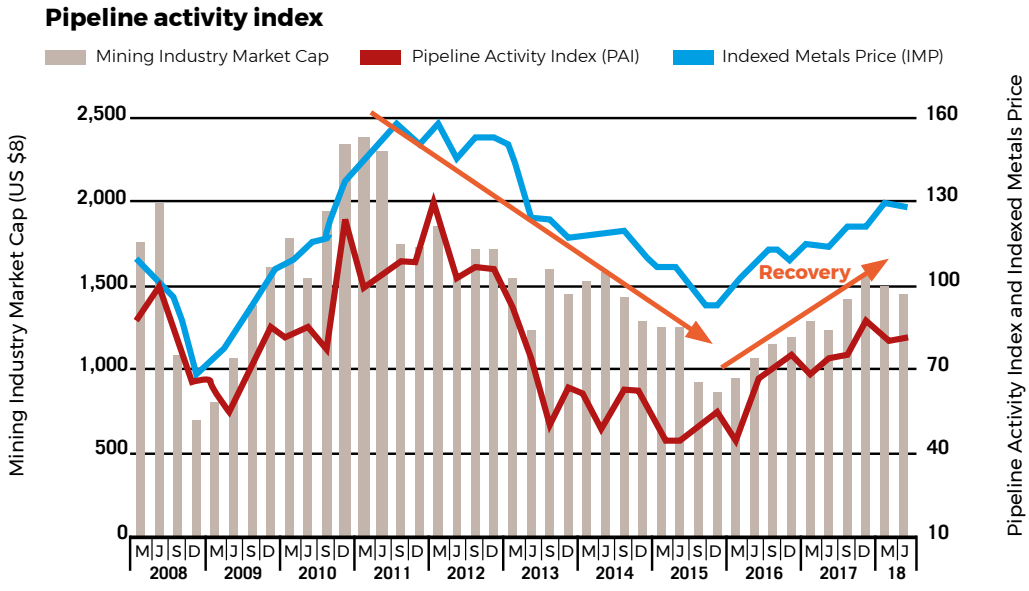
However, since then we have witnessed a period of modest recovery, with budgets increasing globally once more in line with a general increase in commodity prices. In particular, Australia has been a significant growth area, along with Canada, Africa, and South America. In spite of this, mining activity annually may exceed any new finds through the exploration process, often leading to early closure of projects due to limited ore reserves.

Many signs currently point to a recovery point in the mining cycle, with prospects looking brighter due to an increase in prices and growing demand for certain minerals and materials. Although it is not yet clear precisely how much further this recovery has to go, there are still opportunities for mining operators to bolster profits particularly where new metals are concerned. This experiment often accelerates merger and acquisition activity in the industry (a survival strategy by mid-tier and majors) where juniors are targeted to replace depleted ore reserves.

[1] Renewables in Mining', Bloomberg New Energy Finance, 2018

[2] Source: S&P Global Market Intelligence

GRAPH 1: MINING ACTIVITY INDEX



Data as of July 26, 2018.
The quarterly PAI is calibrated so that the June quarter 2008 = 100.
The quarterly IMP is the average of the monthly IMP, which is calibrated so that May 2008 = 100.

Source: S&P Global Market Intelligence

3. The mine of the future

The world around the mines of today is changing. We are witnessing an evolution in the kinds of materials which mining companies are turning their attention to, driven by emerging technologies in other sectors and changing consumer demands.

It may not be surprising that the greatest growth in drilling recently has been in precious and base metals such as gold and copper, but interest is also rapidly beginning to grow in the likes of cobalt, lithium and nickel.

One of the common factors linking these three base metals is the rise of electric vehicles (EVs), and the lithium-ion batteries which are an essential part of their structure. This is part of the broader energy transition which is driven by the '4Ds' of decarbonisation, decentralisation, digitisation, and demographic change – electrifying transport is vital for achieving a reduction in global carbon emissions.

This is potentially good news for the mining groups - a lucrative new set of metals is moving closer onto the horizon in terms of projects and project development.

However, the characteristic uncertainty which hovers over the industry also applies to this new group of metals. Although many would agree that EVs are an important part of a decarbonised future, there is less

consensus as to the best technology to use, with many companies still not moving into mass production whilst waiting for further evolvement in these areas.

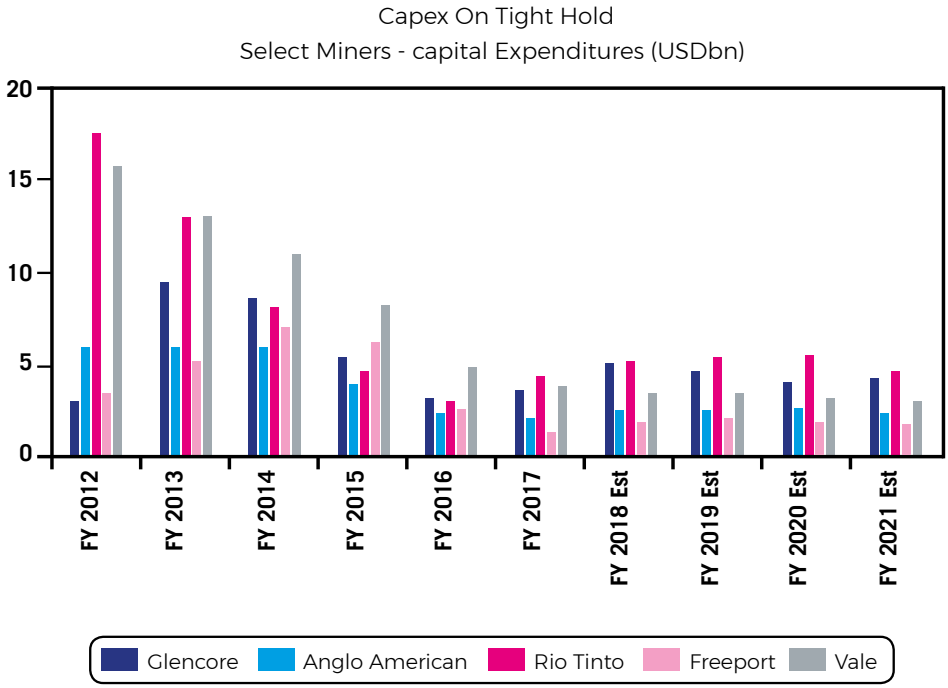
Lithium-ion may be the current flavour of the month, but we can't be sure that this will always be the case as many alternative battery technologies are under development with the aim to replace lithium-ion and overcome associated drawbacks.

This has serious implications for operators. With the technology still in its infancy, very few are willing to place a bet on future demand and allocate balance sheet capital accordingly. Prices of cobalt, lithium, and nickel are certainly rising, but operators are faced with a difficult decision as to when to commit, balancing the risk of capital allocation with the reward of returns. This is part of a broader trend of limiting capex amongst the mining majors (graph 2).[3] This however is strongly supportive of the 'power leasing' model which is flexible to the easy expansion (on future growth) in production from the project.

Opportunities certainly exist – for example, research shows that Western Australia is tipped to produce more than half of the world's lithium supply by 2019.[4]

However, many operators are approaching with caution for now.

GRAPH 2: CAPITAL EXPENDITURE OF SELECTED MINING COMPANIES PER YEAR



Estimate. Source: Bloomberg BMI

[3] Source: Bloomberg BMI

[4] Source: https://www.smh.com.au/business/companies/australia-tipped-to-soon-produce-more-than-half-of-the-world-s-lithium-20180427-p4zc5h.html

4. The energy question: powering new mining frontiers

As we move towards decarbonisation, there have been a number of significant changes to the energy landscape – this includes the rise in green technology which is driving demand for the new materials, as noted above.

In addition, companies are also being forced to consider their own carbon footprint, especially energy-intensive ones such as mining, with pressure increasing from shareholders and national governments, as well as broader public expectation. Today, transparency is high on the agenda as required by Company Boards and Shareholders. Most projects these days must include some renewable energy, environmentally friendly solutions or fuel saving technology in the power component of the project.

The challenges are complex and so too, unsurprisingly, are the solutions. However, interesting options are emerging, particularly around the use of renewables and microgrids.

As ever, there are capital challenges for mine operators to overcome. Structuring a renewable or a combination of renewable energies project, where returns are based on the projected life of the mine can be challenging. A mine can take up to 10 years to develop and then operates anywhere between 5-50 years, whereas the typical life of a solar plant is 20-25 years.[5]

Furthermore, while a solar plant can be developed within 12-18 months and its price is predictable, its energy output is highly variable.

One emerging solution is the introduction of microgrid systems, which integrate storage with renewable generation, helping to avoid the intermittency of supply which comes hand in hand with renewable energy. Fuel saving technologies are also being investigated and tested on a global scale, as fuel and power costs certainly affect the return on the project.

Aggreko is no stranger to the challenge and opportunities around microgrid solutions. For years, we have been supporting clients across the mining sector, and are investing in technology which can help operators not only reduce the amount of carbon they produce, but also provide solutions which suit the often-changing power requirements of mines in a capital-friendly way.

For example, we installed our first ever solar-diesel hybrid generator at the Bisha mine in Eritrea this year. This has allowed the mine operator to not only cut fuel costs but also cut around 10,000 tonnes of CO2 annually. Fuel saving technologies are also being investigated and tested on a global scale as mentioned earlier in this document.

Elsewhere, we are working with the Granny Smith mine in Australia to integrate renewables with the current gas-fired power stations. The proposed new hybrid power station, combined with a thermal station expansion to just over 24MW, will meet the increased daily power needs of the entire mine in response to the rising demand for gold.

These are by no means isolated examples.

Research by Bloomberg New Energy Finance (BNEF) estimates that around 219MW of renewable capacity

[5] Source: NortonRose Fulbright

was installed at mines in 2017 alone.[6] Total capacity installed at mines stands at 2.4GW globally – a drop in the ocean compared to the energy needs of the sector, but an important step in the right direction nonetheless to ensure the projects align with evolving environmental demands as well as the cost reduction (or savings) which will influence capital investment pressures and risks.

5. Maximising opportunities for a successful future

Uncertainty within the mining industry can be a big barrier to the adoption of new technologies needed to meet the demands being made by stakeholders as the energy transition continues apace. It has also become clear that this uncertainty can take many forms, both from a revenue perspective and also from a cost perspective.

When it comes to revenue, the impact of commodity prices are still keenly felt across the industry, and the varying lifespans of mines means that income can fluctuate just as much. And as far as costs are concerned, operators must strike a balance between allocating CAPEX and OPEX, particularly as decarbonisation is requiring the adoption of new technologies working together in novel configurations such as microgrids. With pressures mounting, and the future still unclear, some may argue that this is not a good time for mining. However, there are ways in which companies can future-proof their operations and protect capital expenditure, as well as reducing their energy usage and the carbon intensity of their operations. No doubt that commodity prices have been under pressure but when this downward pressure turns and the commodity prices experience an upturn, the longevity and robustness of mining projects will again be the flavour for long term sustainable investment capital.

Whilst uncertainty may be the only certain thing about mining, mining companies can still maximise the opportunities for growth and secure their businesses for the future by being smart in certain areas, starting with power.

In particular, over the next five years, the key success factors for miners will be around effective cost control, availability of resources and proximity to key suppliers.

A smart approach to energy management can be an important and effective way of mitigating several of these issues and preparing mine operators for future success. It is therefore no surprise that the rental power market has seen a resurgence recently, offering a much more flexible option for operators in a market which is touched by so much uncertainty. As mine operators continue to innovate to meet the challenges of the energy transition, power suppliers are seeking to match this innovation, offering solutions which are not only cost-effective, but also meet the needs of the mine of the future head-on. Most investors in recent times would request mine owners not to buy power plant but to rather lease or rent their power equipment. A similar trend is seen with mining fleet which is to rent or engage a mining contractor to do the mining with their own equipment. This strategy reduces the invested capital in the project in both applications.

[6] 'Renewables in Mining', Bloomberg New Energy Finance, 2018

REGIONAL INSIGHT: AFRICA

Allan Fairbairn, Area General Manager, West & Central Africa (Aggreko)

Risk Profile

"The decrease in long term mining projects across Africa generates a favourable environment for rental or leasing of equipment over the historical practice of purchase. Raising of capital from global institutions such as the World Bank and the IMF for mining projects also requires very specific timelines in the reduction of thermal power generation in favour of renewable energy. This is a long term process and during this time the effect of fuel saving technology will be a very effective bridge in the reduction of carbon emissions until renewable energy technology comes into its own."

Mechanizing Mines

"Higher labour demands, wage increases and safety practices in mines are the key factors driving changes in mining methods and practices to shift towards a complete mechanised process. This requires additional reliable power. This evolution in mining and the elimination of manual mining methods are fast becoming the current norm.

"Mechanised equipment also radiates more heat and noxious fumes than manual labour which increases the demand for clean and cool air. Aggreko's temperature control solutions offer cost effective solutions to the mining industry to better manage these requirements in underground mines."

REGIONAL INSIGHT: AUSPAC

Rod Saffy, Head of Sales and Marketing (AusPac), Aggreko

The implications of decentralisation

"Almost all mines in AusPac are off the grid, making microgrids a highly attractive option for operators in this region. As fuel is one of the biggest operating costs for any mine, integrating renewable options like solar and battery hybrids are vital for keeping costs down and reducing the impact on the environment."

The importance of innovation

"Although mining technologies are well-established, there is an emphasis on developing and using new techniques in an effort to improve efficiency and cut costs. Digitisation is an important part of this, as miners look at operational technology for operations which can not only improve efficiency but also reduce risk."

REGIONAL INSIGHT: LATIN AMERICA

Pablo Varela, Head of Sales and Marketing (Latin America), Aggreko

The outlook for the sector

"Latin America will continue to face social and environmental issues in the years to come; the success of the sector will depend on how politicians/authorities are able to handle this aspect. In addition to that, mining companies across Latin America are investing again with some big projects getting out of paper and transitioning to investment mode. Most of the mines are grid-connected, but still there are some isolated operations (in very remote locations) where they need local generation, these operations are desperate for reducing costs and the hybrid or gas solutions (when possible) are a great solution to them. They are also interested in reducing emissions which can be supported with solar/batteries and gas generation."

Responding to the energy transition

"Latin America has approximately 60% of the world's lithium reserves, most of it concentrated between Chile, Argentina and Bolivia. There are several mining groups investing into the 'white petroleum' as the demand and price for it is increasing due to the increase of storage applications. With the more stable institutions and countries' policies, it is expected that the investment in mines will increase on the following years, with lithium, copper and gold being the main ones. Cost-cutting and efficiency is a must for all these miners to continue investing, mainly on the isolated ones where electricity is a big part of their cost. Gas applications and solar/thermal hybrids will be fundamental to reduce costs and improve emissions."

REGIONAL INSIGHT: NORTH AMERICA

Mike Kalinowski, Mining Sector Manager (North America), Aggreko

Looking ahead to the next decade

"In North America, it's clear that the next decade will see us advancing towards affordable, reliable and low carbon power for mines as the energy transition continues. In order to effectively respond to this shift, it is essential for companies to future-proof their operations. An important part of this will be finding new ways to ensure the security of the energy supply, which is paramount to mines for safety, production and profit. All of this this requires sector collaboration both from the juniors and majors to project a greener message, as well as for the gap between school and industry to close while we collectively work towards a positive culture shift."

The importance of balance sheet management

"As the future yield, load growth and life of a mine are not certain, the energy transition has also had an effect on balance sheet management and the allocation of capital. Conventional mine power solutions are Capex light and Opex heavy whereas greener Hybrid solutions are Capex heavy and Opex light. Therefore, finding the right balance between ownership of assets and contract life is key."

REGIONAL INSIGHT: ASIA

Joscha Schmitz, Area General Manager- Asia Local Business

Regulatory challenges to shape the Asian mining landscape

"Indonesia and the Philippines present the biggest mining opportunities for us in Asia. However, government regulations will have a significant impact on the development of the sector. In the Philippines, for example, an ongoing suspension of large scale, new mining operations has put pressure on investment activities within the sector. Meanwhile, in Indonesia, the ever-evolving regulatory requirements, such as a ban on unprocessed ore exports to encourage the development of local smelting facilities, leads mining companies to be hesitant and adopt a wait-and-see stance. Alternatively, we often see companies transferring control to local investors. However, we expect to see an increase in smelting production activities where power demands are sure to surge."

Striking the right balance

Governments and environmentalists are increasingly scrutinising mining operations and their environmental and societal impacts. As a result, we, as power suppliers, have to adapt and provide solutions to help miners comply in a challenging operating climate. Balancing operating efficiency while reducing carbon emissions and optimising energy costs and ensuring profitability will be key. With the high photovoltaic potential for South East Asian countries, tapping the abundant solar power at disposal and merging it with conventional fuel sources presents a unique and viable proposition for miners to adopt.