Building a better working world

Will electrification spark the next wave of mining innovation?

The better the question. The better the answer.
The better the world works.

Electrification in mining survey

Electrification of mines is climbing the agenda of mining companies as a driver of cost reduction, energy efficiency and license to operate stewardship. But, reaping the full benefits of an electrified mining future will require reskilling, reaching out across sectors and rethinking the fundamentals of mine design.

Executive summary

To uncover both the opportunities and challenges of electrification, we commissioned a survey of miners and original equipment manufacturers (OEMs) with the Sustainable Minerals Institute at The University of Queensland (Australia) and The Norman B. Keevil Institute of Mining Engineering at The University of British Columbia (Canada). Four key themes emerged:

1

Electrified mines improve economics and strengthen license to operate.

The cost of energy represents up to one-third of a mining company's total cost base, making it a keenly managed component of operations. In addition, demand for carbon reduction in the sector is inevitable, and electrification is one way to achieve it. Diesel engines cannot be replaced with carbon-generating electricity and, therefore, electrification needs to be accompanied with a move to renewable power.

2

Electrification needs different skills.

Mine electrification requires different worker skills as it enables other advanced technologies. In developing economies, this challenges the assumption that a mine provides employment for laboring workers.

3

Collaboration will unlock better electrification solutions.

Partnerships and co-creation of solutions with OEMs, other mining companies and governments are needed to successfully integrate electrification in mines.

4

Mine design needs a rethink to build in optionality for future innovation.

Decoupling mines from diesel is not an easy task, mainly due to the diverse range of technical and financial challenges in mining various deposits, which make a "one-size-fits-all" solution hard to find. Getting full value out of electrification means developing a technology road map in parallel with the mine plan. It is important to start thinking about building agility into mine design to leverage the potential benefits in asset flexibility, lower ventilation requirements and the human footprint.

The future of electrification in mines requires a paradigm shift to embrace new emerging technologies.

Our survey sample

The Sustainable Minerals Institute at The University of Queensland and the Norman B. Keevil Institute of Mining Engineering at The University of British Columbia undertook extensive interviews of mining companies and OEMs located in Australia, Canada, Colombia, New Guinea, Peru, Russia, South Africa, Sweden, the UK and the US. These companies have operating mines in all continents except Antarctica.

The job roles of the interviewees included CEO, CFO, COO, global head of underground mining, vice president (VP) – product line, senior project manager – technology, executive head of technology operations, head of technology, chief innovation officer, VP – sustainability and director of digital technology.

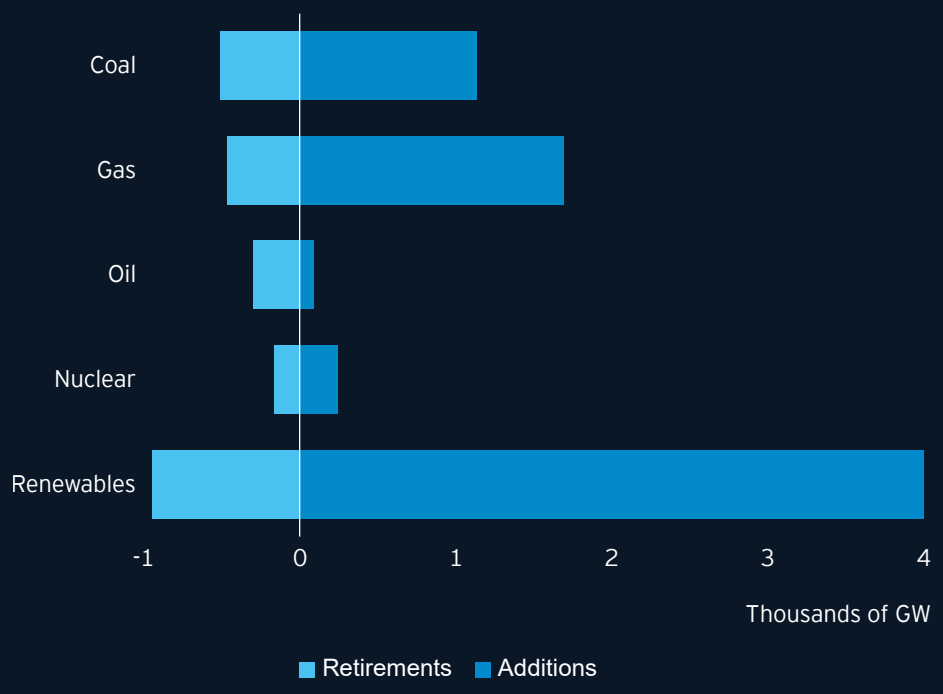
The EY organization has anonymously quoted these participants throughout the report. EY teams would like to thank all the interviewees for their participation and their candid insights.

Electrified mines improve economics and strengthen license to operate

The cost of energy represents up to one-third of a mining company's total cost base, making it a keenly managed component of operations. Average grades have halved and overburden has doubled over the last 30 years, and, as mines are beginning to extend to depths beyond current norms, their energy demand is growing even larger. Going electric reduces not only ventilation and maintenance costs but also up-front capital costs. For example, automation efforts at Resolute Mining's Syama mine in collaboration with Sandvik have resulted in lower up-front capex and also have the potential to reduce life-of-mine all-in sustaining costs by **approximately 16%.**[1]

But, to date, we've seen little innovation in providing energy to mines, with operations largely relying on fossil fuels to run equipment and electricity for processing. Mines in remote areas are most likely to use diesel power generation. For example, by the time a Canadian remote diamond mine is decommissioned, it has consumed more than 800 million liters of diesel fuel (accounting for over 20% of its operating costs). In addition, renewable energy has simply not been cost effective until recently. But as technology costs have fallen, the uptake of distributed energy resource has accelerated. By 2040, renewables will outpace all other sources of energy and account for 60% of all capacity additions.

5,285GW of net capacity to be added in the period 2018–40



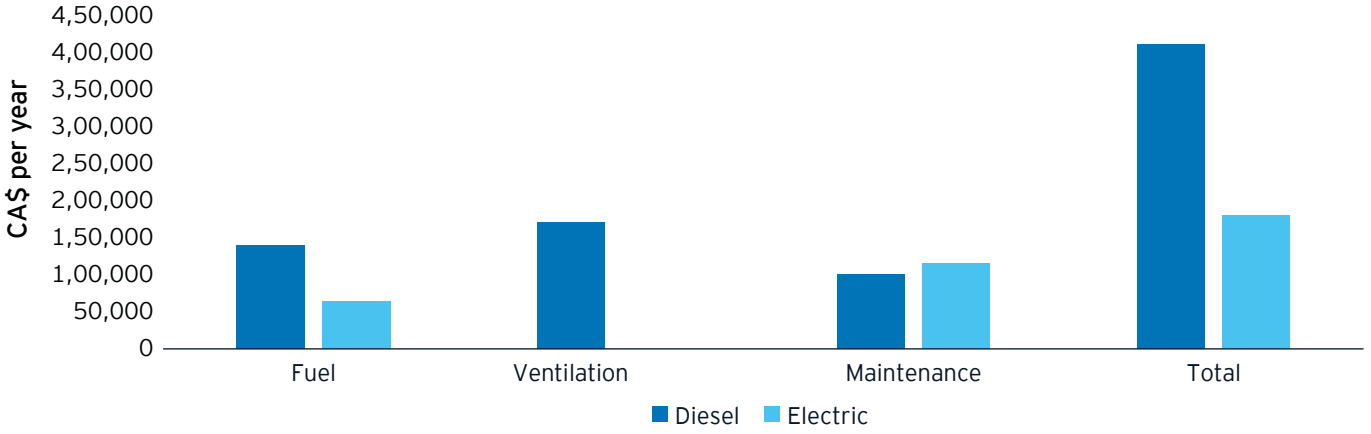
Sources: IEA World Energy Outlook and EY analysis, March 2019.

[1] "Resolute Mining's updated study cuts underground gold mine costs by US$135 per ounce" Mining Capital, https://www.miningcapital.com/companies/news/199989/resolute-minings-updated-study-cuts-underground-gold-mine-costs-by-us135-per-ounce-199989.html, accessed 22 May 2019.

The World Health Organization has declared that diesel engine exhaust emissions cause cancer in humans, outlining that diesel particulate matter belongs in the same potentially deadly category as asbestos, arsenic and mustard gas.[2] This has relevance to underground mining, where diesel equipment is operating in confined areas and workers are subject to potentially hazardous exhaust fumes in their day-to-day operations. As much as 40% of an underground mine's energy outlay is spent on powering gigantic ventilation systems to remove pollutants from tunnels.[3] And, diesel engines generate twice as much energy as battery-powered vehicles, making it even more necessary to have proper ventilation systems in place. The switch from diesel to electric therefore makes good economic sense, but critically, it also enables a greater level of on-site health and safety.

> "The biggest issue I see driving underground is human health. Over time, that's going to push us toward electrification. You don't want any accidents at your mine sites, but you also don't want any long-term implications for the safety of your workers. So, we've got to be investing more in terms of the technology to provide that safer working environment for them. The issues with asbestos are already here. I think that the secondary effects of diesel particulates are coming.

Comparison of operating costs for similar diesel and electric load haul dump trucks



Source: http://minewiki.engineering.queensu.ca/mediawiki/index.php/Electric_equipment.

[2] "Cancer risk from diesel fumes in underground mines prompts fears of industrial health disaster," *ABC News*, https://www.abc.net.au/news/2018-09-15/mining-industry-confronted-over-cancer-risk-from-diesel-fumes/10209762, accessed 4 April 2019; "Diesel cancer risk in WA mines 'worse than asbestos,'" Perthnow, https://www.perthnow.com.au/news/diesel-cancer-risk-in-wa-mines-worse-than-asbestos-ng-f4d6ebea31d42746f1a67053c0e3429b, accessed 4 April 2019.

[3] Electric vehicle revolution goes underground with mining trucks," Mining Weekly, https://www.miningweekly.com/article/electric-vehicle-revolution-goes-underground-with-mining-trucks-2018-11-14/, accessed 2 July 2019

Improving economics and the benefits of license to operate are driving more companies to consider electrification, and some have already begun this journey. Remote mines without access to the grid are mostly continuing with conventional sources of energy, but, for those connected to electricity, electrification increasingly makes economic sense. Most new mines are considering including battery-based equipment in their mine plans. Tony Makuch, CEO of Kirkland Lake Gold, said, "Ten years from now, I'd think we'll go from 90% to 100% reliance on diesel at some mines to less than 20%, the rest will be using batteries. If all the equipment was developed now, I'd want to pretty much convert all our mines at once."[4]

Case Study

Canada's first all-electric operation and the world's first diesel-free hard rock mine: Newmont Goldcorp's Borden mine[5]

Newmont Goldcorp's Borden mine uses a full range of electrified equipment, including load haul dump trucks, drills, bolters and personnel carriers. According to Newmont Goldcorp, electrification at Borden has resulted in benefits that include:

- Improved safety performance
- Reduction in annual greenhouse gas (GHG) emissions of 70%
- Reduction in ventilation costs of 50%
- Improved staff well-being
- Reduced megawatt hours of 33,000 per year because of the huge decrease in ventilation requirements

"We've already surveyed the first group of workers that started at our Borden mine," says John Mullally, Newmont Goldcorp Group Executive for Sustainability, North America. "Something like 90% said that they would not want to go back and work in a traditional underground mine alongside diesel engines. Even though they had to adapt to some of the new equipment and technology at this mine site, they said that the noise level and the air quality inside meant this is where they want to stay. They would encourage people to go and work underground at these types of mining operations, because they feel that it's a safer and better working environment for them.

[4] "Even the World's Biggest Miners Are Switching to Electric Vehicles," Bloomberg Quint, https://www.bloombergquint.com/business/bhp-biggest-miners-are-starting-to-drive-evs-deep-underground, accessed 4 April 2019.

[5] "Borden: the 'goldmine of the future,'" World Gold Council, https://www.gold.org/about-gold/gold-supply/gold-development/positive-impacts-mining-case-studi es/borden-gold-mine-of-the-future, accessed April 2019.

Electrification needs different skills

"We are generating opportunities for our current and future workforce to gain skills and competencies for smart mining. The new curriculum will enhance the capability of those in the mining sector and form part of the learning pathways for those seeking to enter a range of industries, applying automation and technology. By working with South Metropolitan Technical and Further Education and the Western Australian State Government, we will deliver the courses that will prepare young West Australians for the jobs of the future.

Chris Salisbury
Chief Executive, Iron Ore, Rio Tinto.

Electrification will accelerate automation and the internet of things (IoT), as more reliable electric motors require less maintenance and human intervention. With electrification, automation through drones, autonomous vehicles and remote-controlled operational systems will be rolled out more widely across mining operations. There will be increasing demand for data and digital literacy skills across all phases of the mining value chain that will redesign most occupations as the human-to-machine interface evolves and becomes more prevalent. By better understanding the future skills required, industry stakeholders will be able to strategically plan their workforce and sustain their competitive advantage in global markets. However, to achieve this, a significant investment and an adaptive workforce will be required.

Skills such as change management, managing innovation, systems engineering and digital technology are required to break employees out of silos. At the same time, mining companies and universities need to communicate changes in required skillsets and collaborate to develop future courses. In 2018, the number of mining engineers continued to decline, with only 34 first-year enrollments across the four Mining Education Australia universities, which supply 80% of Australian mining engineering graduates.[6] This shows a declining supply of workers and also indicates that universities need to develop and deliver education and training options with new and existing partners to increase the future pipeline, as well as provide opportunities for the existing workforce.

For example, as the skills gap grows, Rio Tinto's US$2m vocational education and training initiative, Resource Industry Collaboration group, has delivered the first nationally recognized course in automation. This will ensure the next generation of workers is ready for mining's brave new digital world.[7]

Technological advancement and innovation in the industry do not necessarily correlate to an immediate reduction in the workforce, but it will change the skills required. For example, "driverless trucks" will result in shifting skill profiles from heavy-license drivers, to employees with data processing, digital literacy and technical planning skills. A recent EY report, commissioned by the Minerals Council of Australia[8], found that:

- **Employment projections are set to increase over the next five years** and approximately 77% of occupations in the sector will be enhanced or redesigned due to technology.
- **Skills with growing demand** include system evaluation and analysis, mathematics, active listening, instructing, data analysis, data and digital literacy, and judgment and decision-making.
- **Skills with decreasing demand** include vehicle operations, materials extraction, operations and control, equipment maintenance and blast-hole drilling.

For employees, the ability to transition, upskill, cross-skill and reskill will be essential, while companies will need to provide employees with the platform to do this. Innovation has changed the modality of work – from mine site to remote and integrated operating centers.

[6] "The Future of Work: The Changing Skills Landscape for Miners – A report for the Minerals Council of Australia," https://minerals.org.au/news/powering-future-australian-mining-people-innovation-and-modern-education, accessed 4 April 2019.

[7] "Machine learning: Australia's first automation course launched at WA TAFE," *Sydney Morning Herald*, https://www.smh.com.au/business/workplace/machine-learning-australia-s-first-automation-course-launched-at-wa-tafe-20190612-p51ww4.html, accessed 24 June 2019

[8] The Future of Work: The Changing Skills Landscape for Miners – A report for the Minerals Council of Australia," https://minerals.org.au/news/powering-future-australian-mining-people-innovation-and-modern-education, accessed 4 April 2019.

This brings benefits that include increased employee safety, improved recruitment and retention, and more efficient operations. Moving workers to a safer environment closer to communities can also attract different types of employees, allowing for greater diversity. In these new digitally powered workplaces, employees will move from routine tasks to roles requiring a higher level of thinking to anticipate and plan activity and manage the human-to-machine interface. For example, automation efforts at Resolute Mining's Syama mine in Mali have not led to any job losses but have created more training opportunities for local workers to operate at higher levels.[9]

Case Study

"Helping communities thrive well after the mine is gone" Anik Michaud, Group Director of Corporate Relations, Anglo American.[10]

At the Investing in African Mining Indaba 2019 conference, Mark Cutifani, Anglo American's CEO, described a future scenario where five off-site, non-mining jobs are being targeted for every one on-site mining job. The plan is to advance local communities from subsistence farming to commercial agriculture, which will also involve helping them to access water. Achieving this will involve greater collaboration with government on their country vision and with academia on the creation of the right skills. The company is focused on:

- Moving from a social license to operate to a social license to innovate
- Creating a sustainable jobs program in collaboration with academia
- Upskilling or reskilling employees
- Identifying transferrable skills to work in any company, industry or country

> "There's a lot of work to be done to get people up to the level needed to maintain and service new high-voltage electric equipment in an environment where it can be hot, humid and corrosive. That is going to be a challenge for everybody.

[9] "Sizing up Syama: the world's first fully automated mine," *Mining Technology*, https://www.mining-technology.com/features/sizing-syama-worlds-first-fully-automated-mine, accessed 14 June 2019

[10] "Innovation mining's biggest challenge – Anglo," *Engineering News*, http://www.engineeringnews.co.za/article/innovation-minings-biggest-challenge-anglo-2019-02-04/rep_id:4136, accessed 4 April 2019.

Collaboration will unlock better electrification solutions

> It's got to be done in partnership. The mining houses can't do it by themselves, and the OEMs can't do it by themselves.

> I don't believe that mining companies or OEMs need to develop the technology independently. I believe a lot of these technologies will be commodity technology at the end of the day, so none of this should be proprietary or be seen as a competitive advantage.

> When there's an accident at a mine site, we share the findings across the sector so that we all learn from it. If we're going to embark on an innovation strategy that will improve the overall reputation and viability of our industry, we have to start sharing some of the knowledge that's going to be out there.

Mining organizations tend to be risk-averse and conservative, contributing to a conventional and typically fixed perception of the value chain and how it should be managed. Miners tend to view supplier relationships as zero sum, rather than exploring mutually beneficial opportunities with the potential to maximize value for both parties. A more open perspective around the role of suppliers as strategic partners expands the possibilities for miners to benefit through innovation, cost reduction and competitive advantage. In the case of electrification, miners are clear that they can't go it alone.

Interestingly, many of the participants felt that not only was it time to work more collaboratively with OEMs, but it was also time to collaborate across the sector and, potentially, in a noncompetitive way.

Collaboration can create value for both parties. The partnership among Newmont Goldcorp, Sandvik and MacLean at the Borden mine is an example of this. Future mines will be carbon-free, electrified and autonomous, which will require new technologies to be developed and tested to ensure that the mining industry will remain competitive. This not only requires new control systems and equipment but also efficient management systems that meet future demands for a sustainable industry. This will need a new type of collaboration, a digital ecosystem, where the miners' and OEMs' digital systems and operations are in sync.

For example, LKAB, Epiroc, ABB, Combitech and AB Volvo have joined forces in a partnership and are starting a unique test-bed in the ore fields of northern Sweden. The implementation of this project will require significant investment, and the partners are therefore seeking collaboration with more suppliers, the Swedish state, research institutes and universities. According to Johan Söderström, Managing Director of ABB Sweden, "LKAB is taking a whole new approach to the development of future mines with unique digital and sustainable solutions. We look forward to partnering with LKAB, Epiroc, Combitech and AB Volvo, and contributing our knowledge of automation and electrification of underground mines and services. Digitalization presents tremendous opportunities and, together with our partners, we are creating the safe and efficient mines of tomorrow."[11]

Data collaboration will be a critical element to mine electrification. But, although the benefits of data sharing are widely publicized, concerns, such as loss of intellectual property, competitive advantage or perceived loss of data monetization-related opportunities, have created a protectionist attitude toward data from mining organizations, suppliers and OEMs. This has limited the ability to unlock the full potential of data-driven decision-making:

- **Mining organizations:** Mining's end-to-end systems rely on a common integrated data model to support related business processes. For example, optimizing maintenance planning, scheduling and execution requires an integrated view of equipment performance, asset health, maintenance costs and the economic impact to production. The inability to access, or only partially access, this data compels organizations to explore alternatives, including moving away from tier 1 OEM providers.
- **Suppliers:** Suppliers need to understand how their equipment is used to ensure consistency and quality of service and achieve greater levels of customer satisfaction. Suppliers also require a real-time understanding of equipment performance, operating behaviors and conditions, and key operational KPIs, such as mean time to recovery and mean time between failures.

[11] "New world standard for sustainable mining," Epiroc, https://www.epiroc.com/en-in/newsroom/2018/new-world-standard-for-sustainable-mining, accessed 4 April 2019.

What does good look like?

European Sustainable Intelligent Mining Systems for the global mining industry is a three-year-old Horizon 2020-funded, European-wide project to create the digital mine. The project has a total budget of €16.2m (about US$18.3m), and Atlas Copco is leading the consortium of 12 partners, including miners, METs and universities. The aim is to make a connected, efficient, safe and attractive workforce. Existing test sites for successful demonstration of technologies are in Germany, Poland, Sweden and Finland. Technologies include using battery rigs to reduce diesel emissions and improve underground air quality and the use of semi-autonomous battery vehicles plus 5G technology to link people, machines and data.[12]

Battery Electric Vehicles Underground Project

The Global Mining Guidelines Group and Canada Mining Innovation Council outline the recommended practice for the use of battery electric vehicles (BEVs) in an underground mining environment. It can be used by both mining companies and OEMs in designing and accommodating BEVs. It aims to strike an appropriate balance between standardization and innovation, providing a global scope while acknowledging that regional differences exist in standards and regulatory frameworks.[13]

Source: Sustainable Intelligent Mining Systems.

[12] "Sustainable Intelligent Mining Systems," *Bergforsk*, http://www.bergforsk.se/wp-content/uploads/2018/05/morgan-rody.pdf, accessed 12 April 2019.

[13] "Recommended practices for battery electric vehicles in underground mining v2.0" *Canada Mining Innovation Council*, https://gmggroup.org/wp-content/uploads/2019/01/BEVs-Poster.pdf, accessed 12 April 2019.

Mine design needs a rethink to build in optionality for future innovation

> You can change open pit very quickly at a small capital cost. But for underground mining, what you do today will be there forever. You're making a decision you're going to have to live with for a long time. You can't mine through it.
>
> But … if you're developing a new mine, then we've got all sorts of other degrees of freedom, such as intelligent ventilation, much less ventilation and other things now that you have this new equipment. So, you can actually start changing your capital quite dramatically.

Reaping the full value of electrification requires a rethink of mine design that considers a technology road map in parallel with the mine plan.

The long-term view is almost like a prequalification for near-term work. An electric mine looks different, and that differentiation will grow optionality in mine design, which is critical now. At the same time though, the mine plan needs a technology road map, so that technology options can be incorporated as they come onto the market. It may not be possible to predict the operational tactics and assets for the duration of mine plans, but it's important to start thinking about building agility into mine design to leverage the potential benefits in asset flexibility, lower ventilation requirements and the human footprint. This requires a fundamental change in mindset: alternate asset life cycle strategies, ownership models and duty cycles.

Companies also need to understand the risk-reward profile of investing in technology and automation, as well as whether they will be able to generate returns or reduce costs and not just change the risk profile of their operations. This move toward electrification is happening in phases. A phased approach enables mines to immediately lower costs and carbon footprints, while advancing progressively as technology becomes more scalable and cost effective. A phased approach also helps limit up-front capital investment for the miner.

The future of electrification requires a paradigm shift to embrace new, higher-risk technologies.

Many of the technologies enabling the shift are still at the prototype stage, and getting them from lab to mine will require patience — and a new mindset. While safety must remain the priority, the traditionally risk-averse culture of mining must embrace a new commitment to support and shape the development of emerging technologies.

For example, electric fleets present sector-specific challenges that go beyond the relative newness of the technology. The range of electric haulage vehicles is limited compared with traditional diesel equipment and, as a result, charging the vehicles without overloading the system adds a layer of complexity. Miners need to follow a staggered approach to charge vehicles in order to manage the charging time and minimize downtime.

> You've got to make a call on technology, but don't get yourself stuck with that technology for 20 years. Acknowledge that in five years' time the technology will be different … It's a big leap of faith.

There are challenges for both capital and technology

Making the right capital investment decisions

The fundamentals are different in conventional mining projects compared with those that use renewables. A renewables-based energy system has high capital expenditure (capex) and low operating expenditure (opex), whereas conventional projects have comparatively low capex and high opex. While it is comparatively easier (and cheaper) to change open-pit operations, it takes a lot of investment to make changes to underground operations. Decisions around making changes will also depend on the stage of the mine cycle – toward the end of mine life, it may not make economic sense to invest.

Ensuring technology remains agile

Miners must recognize the fact that technology will evolve over the years and whatever makes economic sense today might not have similar results five years down the line.

Mining and metals continue to lag behind other sectors in the realm of technological effectiveness. The value from technology will only be realized when companies change how they work, rather than succumbing to the lure of individual technology programs and pursuing local optimization, which is not necessarily transformational.

“

You need to look at it from a feasibility level scope and look at the entire operation … Look at the mine plan and consider … Is that the best way to plan this mine, or should we attack it from a different direction with this different thought process altogether? You’ve got to get a task team together of the whole operation, maintenance and miners, and geologists, even metallurgists, the whole gamut to come in and look at it from a real holistic point of view; otherwise, you’re going to miss those opportunities.

“

Through my career, I’ve seen many organizations where, when you push technologies from the top down, you’ve got people in the field who probably know better than the people pushing it to begin with. Then there’s resistance, and they’re not buying in. It has to be their idea for it to really come together.

Change the hearts and minds of the people, challenge them to think differently and then the rest will flow. If you go and employ the right people to be able to do this, then we can change down to the business.

Case Study

Local energy policy: competitive edge or disadvantage?

Countries implementing policy and regulatory changes in a move toward carbon pricing and the reduction of GHG emissions will have first-mover advantage in accelerating the electrification or greater use of renewables in the sector. Both Chile and Canada have announced carbon-pricing schemes in a bid to incentivize miners to opt for electrification or renewable sources of energy. As a result, companies such as Barrick, Newmont Goldcorp and Rio Tinto have invested, or have plans to invest, in mine electrification.

Chile has outperformed other countries in terms of miners adopting renewables, following a law in 2013 mandating that 20% of its energy should be from renewable sources. This law has been so successful that it recently reset the target to 70%, which is anticipated to be accomplished by 2050.[14] Leading practices include:

- The Zaldivar copper mine in Chile, a joint venture between Barrick and Antofagasta, has become the first mine to operate with 100% renewable energy.
- A floating island of solar panels is being tested in Chile as a way to generate clean energy and reduce water loss at mine operations. The experimental “Las Tortolas” power-generating island is being run by Anglo American at its Los Bronces mine.

India and China are also pushing forward with measures to reduce GHG emissions, and South Africa implemented a carbon tax effective from 1 June 2019.

Countries with competitive energy policies will increasingly become more attractive for miners, unless we see breakthroughs that change the energy consumption of heavy processes, such as electrowinning and comminution. Comminution, in particular, will grow as a proportion of mining energy costs for certain commodities.

[14] “These Massive Renewable Energy Projects Are Powering Chilean Mines,” *Bloomberg Businessweek*, https://www.bloomberg.com/news/features/2018-08-07/these-massive-renewable-energy-projects-are-powering-chilean-mines, accessed 4 April 2019.

Prepare now to mine tomorrow's deposits

Consider a world where:

- The supply of energy to mining sites goes far further than fuel mix.
- The IoT forms part of site design, sending data on energy usage and production schedules to central or area processors.
- AI identifies patterns in usage, intensity, frequency, or mixture of staff or assets.
- Power supply is based on renewables and battery storage. Conventional power is directed only to the parts of the site that require it, leaving batteries to charge in other areas or excess power to be sent back to the grid

Integrated, linked, thinking and responsive systems will bring the new technologies that are transforming the power grids of today into the mining sites of tomorrow – thereby converging real estate, mining, automotive, technology and utilities through the lens of the employee, the operator and the shareholder. Precision mining with small-scale automated equipment could make small narrow-vein orebodies economically viable. The minimum-efficient mine scale could fall dramatically.

Electrification represents a viable channel for the mining sector to increasingly adopt or develop new technologies, and processes to explore mineral resources, while meeting environmental and social expectations. The integration of conventional and renewable energy is critical to ensure reliable and safe power for the mine. The mining sector is not only calling for technical integration but also for commercial integration between conventional and renewable energy, with an eagerness to retain a single point of accountability for power. In the event of power outage, the manager will want one point of contact, rather than separate points of contact for conventional and renewable energy.

With the costs of wind and solar generation and energy storage falling so rapidly, managers may be tempted to hold off for a further tender cycle before adopting renewable energy. A balance may be achieved by proceeding with a level of renewable capacity now and having the flexibility in power contracts to incrementally increase the renewable portion during the contract term.

Above all, miners need to remain competitive in terms of productivity, reduced operational risks and improved mineral recovery rates and recover metals and minerals of higher quality. As deposits are increasingly becoming deep, remote and difficult to access, new innovative processes are required — yesterday's expertise may not be able to mine tomorrow's deposits.

How EY's Global Mining & Metals Network can help your business

The sector is returning to growth, but mining and metals (M&M) companies face a transformed competitive and operating landscape. The need to improve shareholder returns will drive bold strategies to accelerate productivity, improve margins and better allocate capital to achieve long-term growth. Digital innovation will be a key enabler but the industry must overcome a poor track record of technology implementations. If M&M companies are to survive and thrive in a new energy world, they must embrace digital to optimize productivity from market to mine.

EY takes a whole-of-value-chain approach to support each client to help seize the potential of digital to fast-track productivity, balance portfolios and set a clear road map for their new energy future.

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