

MARKET REPORT

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By Catherine Skrzypinski, **Energy and Mines**

Alongside power security and cutting energy costs, reducing the emissions intensity of mining operations has been elevated to a top strategic concern for the global mining sector. The combination of carbon pricing in key mining markets and increased shareholder pressure to address climate risk has pushed carbon to the top of mining's agenda.

"Externally, carbon is a key strategic concern globally and therefore it translates into a key driver for Fortescue to ensure that we play an appropriate role in efforts to reduce emissions," observes Bethwyn Cowcher, Legal Manager for Energy and Power at Fortescue Metals Group, the world's fourth largest iron ore producer. "Carbon is a cost to our business that can be mitigated in a number of ways, be that via different technology choices for electricity generation, which are growing rapidly, or through alternative fuels such as hydrogen or innovative mining methods."

COP21 emissions targets combined with carbon pricing developments in Canada, China, Chile, and South Africa are pushing miners to integrate carbon exposure into their energy choices. "Without considering the cost of carbon, we default to the traditional sources of power," Newmont Mining's Technical Specialist Frank Roberto told Energy and Mines. "But, with the cost of carbon factored in, that gives us the opportunity to consider a wider range of power options, including renewables."

Indeed, carbon reduction is one of the key drivers behind recent renewable energy and electrification investments by major mining houses and junior operators including Tata Steel, IAMGOLD, TMAC Resources, Gold Fields, AurCrest Gold, Barrick Gold, Vedanta Resources, Vale, Glencore, Kirkland Lake Gold, GMA Garnet, and Goldcorp. And a new research project by diamond mining company De Beers Group aims to achieve the first carbon-neutral mine over the next 5 to 10 years by storing large amounts of carbon at its diamond mines.

Carbon Driving Mining's Energy Transformation

Industry leaders agree that renewables and storage integration, electrification, and digitization will become more prevalent for miners as they focus on the challenge of reducing global emissions while meeting growing energy demands.

"Renewables [for mines] makes good business sense and the falling prices of renewables in the next 7-10 years will continue to drive this," comments Marc Allen, Technical Director at Singapore-based Consultancy Engeco and former Greenhouse Gas Technical Advisor for Japanese oil giant Inpex.

Carbon War Room's Alastair Dick agrees that renewables and storage will play a greater role as mines continue to focus on carbon reduction. "Top-level mines are taking this seriously," says Dick. "Mining companies are integrating renewable energy across their operations. There remains an urgency to better understand and appreciate the value of renewables and energy storage."

For an industry facing greater emissions regulation, reducing diesel use through electrification is another core focus. Goldcorp, the world's fourth largest gold producer by output, is leading

innovation in this area by developing its first fully-electric operation with the Borden mine. The mine will use an electricity and battery-powered underground fleet, which is expected to eliminate all greenhouse gases (GHGs) associated with the movement of ore and waste rock, equal to roughly 50% of the total GHGs on site, or 5,000 tons of CO2 per year.

Digitization is another key area of mining innovation that will have significant carbon reduction benefits. "Digital technologies allow companies to rethink the way they generate and process information," notes Adriaan Davidse, Mining Innovation Leader at Deloitte. An integrated digital mine will improve planning, control and decision support across the mining value chain to optimize volume, cost and capital expenditure, improve safety and reduce carbon exposure.

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Bethwyn Cowcher

Legal Manager for Energy and Power
Fortescue Metals Group

Looking Down the Supply Chain

As carbon prices become more ubiquitous, mines that fail to act risk being left with assets that will simply be unaffordable to extract or sell. A recent report by the UK-headquartered Carbon Disclosure Project (CDP) shows that the mining sector is showing signs of progress in operational emissions management but, as a supplier to emissions-intensive industries, is facing significant risks from downstream regulation and changing consumption patterns.

The current low-carbon transition is impacting many industries – such as transport, construction and telecommunications – that demand commodities like iron ore, copper and nickel, notes Tarek Soliman, Senior analyst, Investor Research at CDP.

As the report shows, mining depends on continuing demand for the commodities it supplies and the countries consuming the most commodities are making significant changes in addressing climate change. Specifically, China's carbon price could disrupt the commodities market and demand for miners' output as well as be a catalyst for more widespread carbon pricing in commodity-consuming countries.

However, "miners play a role in the low-carbon future, as operations can't change overnight," adds Soliman. "Companies can cut costs by getting carbon under control. Miners in general have cut operational emissions and costs in recent years, as well as scaling down thermal coal exposure."

Teck: Reducing GHG and Committing to Renewables

Still, mining leaders including Teck Resources, Fortescue Metals Group and Avalon Advanced Materials are positioning themselves today for a low-carbon economy and considering carbon risk in energy decisions at the strategic and operational levels.

“As a result of our work to date, Teck is one of the lowest GHG emission-intensity miners in the world for the steelmaking coal and copper we produce,” reports Chris Adachi, Manager of Sustainability Implementation & Carbon Strategy at Teck Resources. “We remain focused on improving our energy efficiency and reducing emissions through new technologies and process innovations as we work to responsibly produce the materials essential for society today and for years to come.”

To date, Teck has cut its GHG emissions by over 200,000 tonnes, while its 2030 target is to reduce GHGs by 450,000 tonnes. Canada’s largest diversified resource company has also committed to 100 megawatts of new alternative energy generation

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Chris Adachi

Manager of Sustainability Implementation & Carbon Strategy
Teck Resources

by 2030. “We are sourcing 30% of our total energy needs for our Quebrada Blanca Operations in Chile from solar power,” reports Adachi. “And we are also assessing renewable energy opportunities at the former Sullivan Mine in Kimberley, British Columbia, where we are partners in a community solar farm.”

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“We believe our company and our industry have an important role to play in helping tackle the global challenge of climate change,” Adachi says. “This includes working to reduce our own emissions, as well as advocating for policies that support the world’s transition to a low-carbon economy.”

Teck actively advocates for policies that reduce emissions, including broad implementation of carbon pricing, Adachi states. “We believe that broad-based pricing of carbon is one of the most effective ways to incentivize real reductions in GHG emissions by ensuring that all emitters contribute to the solution,” he says. “But until carbon pricing is effectively established in the global economy, we believe that jurisdictions with carbon-pricing systems today must have policies in place to ensure the global competitiveness of energy-intensive, trade-exposed industries.”

“A significant investment in low carbon and renewable energy projects at many of our mines will ensure that we reduce the future cost of electricity and facilitate long-term security of supply.”



Tsakani Mthombeni
Group Head of Energy and Carbon
Gold Fields

Gold Fields’ Energy and Carbon Management Journey

Similar to Teck, South African gold mining leader Gold Fields has elevated carbon and energy management to top strategic priorities at the board and management levels. One of the company’s key priorities is a greater use of renewables, with the added benefit of reducing its carbon footprint, notes Tsakani Mthombeni, Group Head of Energy and Carbon for Gold Fields. Currently, Gold Fields has a target for 20% renewable energy for all new mines - where feasible, and is in the process of implementing a 40 MW solar project for its South Deep operation in South Africa.

“A significant investment in low carbon and renewable energy projects at many of our mines will ensure that we reduce the future cost of electricity and facilitate long-term security of supply,” notes Mthombeni. Among its sustainability accolades, Gold Field’s CEO Nick Holland was awarded Renewables in Mining Visionary of the Year at the Energy and Mines Award last November.

Exploring Alternatives to Drive GHG Reductions: Fortescue Metals Group

Australia-based Fortescue Metals Group is similarly committed to reducing its emissions intensity and investing in low-emission technology to reduce the company’s impact on the environment, notes FMG’s Cowcher. “We have reduced emissions intensity by 8% on 2015 levels,” she reports.

Fortescue’s primary focus to meet GHG targets is to reduce its diesel consumption, Cowcher continues. “Fleet is our largest consumer of diesel, and we are constantly looking for ways to reduce this consumption – either via shorter haul distances, enhanced fuel efficiency or alternative fuels.” The company is exploring traditional renewables like solar and wind to meet carbon reduction targets, Cowcher adds, as well as pumped hydro, use of hydrogen, compressed natural gas, liquefied natural gas, solar thermal and waste heat.

“Energy will be a significant component of the operating costs at Avalon’s future operations. We are making every effort to minimize planned energy use to reduce future operating costs and improve return on investment for the company’s shareholders.”



Mark Wiseman
Vice President of Sustainability
Avalon Advanced Materials

MINING AND CARBON READINESS

Note: Here are some of the key findings from the Carbon Disclosure Project’s recent report on “Which miners are facing up to the low-carbon challenge?”

- The mining sector shows signs of progress in its operational emissions management, reduced exposure to thermal coal and capital allocation in the context of a low-carbon transition.
- However, significant risks remain for the sector, as a supplier to emissions-intensive industries, from downstream regulation and changing consumption patterns.
- The mining industry has significant potential exposure to carbon emissions regulation in its value chain where Scope 3 emissions from downstream customers is estimated at an average of 10x and up to 30x higher than operational emissions.
- Carbon pricing regulation is on the rise with China’s emissions trading scheme (ETS) likely to be most disruptive to demand patterns of commodities – Chile introduced carbon pricing this year with Canada and South Africa coming on stream in 2018.
- China could play a pivotal role in the demand for “low-carbon” commodities and disrupt demand in the seaborne bulks as it adopts a leadership role in climate change regulation.

Source: Carbon Disclosure Project

“Digital technologies allow companies to rethink the way they generate and process information.”



Adriaan Davidse
Mining Innovation Leader
Deloitte

Other key initiatives driving GHG and energy intensity reduction at Fortescue include improved strip ratios across all mine sites, improved ore recovery from wet plant operations, automation of haul trucks and consolidation of large dewatering bore generators with more efficient units and control systems.

Avalon Advanced Materials Pursues Green Projects

Canadian mineral development company Avalon Advanced Materials is analyzing alternative energy sources, including wind, solar, biomass and run-of-river hydro to reduce power costs and continuously improve its GHG footprint.

Avalon's Separation Rapids project near Kenora, Ontario hopes to fill the growing need for lithium chemicals for energy storage. "The project is, by its very nature, a 'green' project, focused primarily on the production of lithium hydroxide, required for rechargeable batteries that will support the development of electric vehicles,

equipment and solar/wind power generation," reports Mark Wiseman, Vice President of Sustainability, Avalon Advanced Materials. "These are critical to the global reduction of greenhouse gases."

For the Separation Rapids project plan, the company will implement a number of initiatives, including improving the company's energy and water use efficiencies/tonne of product by 40% and 61%. "These initiatives have the potential to make our projects more cost effective and easier to permit, contributing to shareholder value," notes Wiseman.

"Mining, by its nature, is an energy intensive industry," Wiseman concludes. "Energy will be a significant component of the operating costs at Avalon's future operations. We are making every effort to minimize planned energy use to reduce future operating costs and improve return on investment for the company's shareholders."

Shareholders Pushing for Climate Action

One of the key drivers for carbon becoming a top priority for mines is pressure from shareholders to take action on climate change and reduce carbon exposure. Indeed, shareholders are now pushing emissions-intensive industries to be clear on their carbon-related risks through the Michael Bloomberg-led Task Force on Climate-Related Financial Disclosure.

As a result of shareholder interest, mining management now views carbon as a core strategic issue rather than an environmental concern. "[Management] is no longer reacting to what's happening with the environment – it's showing genuine leadership," comments Marc Allen, Technical Director at Singapore-based Consultancy Engeco and former Greenhouse Gas Technical Advisor for Japanese oil giant Inpex. "[Carbon] has evolved from an environmental response to a strategic one."

Shareholder interest in climate risk can benefit mining companies taking an active role on carbon and energy management. "The more the shareholders take interest, mining companies can respond," observes Tsakani Mthombeni, Group Head of Energy and Carbon for Gold Fields.

MINING'S READINESS FOR A LOW-CARBON ECONOMY

Note: The summary League Table below is from the Carbon Disclosure Project's recent report entitled "Digging Deep: Which miners are facing up to the low-carbon challenge?" and presents headline company performance and ranking. It is based on detailed analysis across a range of carbon and water-related indicators which could have a material impact on company performance. The League Table is designed to serve as a proxy for business readiness in an industry which will undergo significant change as governments increase efforts to implement the Paris Agreement. Companies placed towards the bottom are deemed less prepared for a low-carbon transition.

League Table rank	2D15 League Table rank	Company	Country	Average market cap: a 02 2017 (US\$bn) ⁽ⁱ⁾	2016 Emissions (\$1+2 CO ₂ , million tonnes)	League Table score	Managing transition risk	Managing physical risks	Transition opportunities	Climate governance & strategy
1	1	Vale	Brazil	31.8	14.7	4.90	A	A	C	D
2	n/a	Boliden	Sweden	6.4	1.0	4.96	A	B	B	C
3	2	BHP	Australia/JK	6.4	18.0	5.28	B	A	C	B
4	4	Rio Tinto	Australia/JK	63.4	32.4	5.82	B	C	A	C
5	11	Glencore	Switzerland	40.6	35.6	5.88	C	B	B	C
6	n/a	South32	Australia	9.3	23.5	6.15	D	B	D	A
7	6	Antofagasta	UK	7.1	2.8	6.29	C	C	B	C
8	5	Teck	Canada	10.8	2.9	6.60	D	B	E	B
9	7	Anglo American	UK	16.0	17.8	7.07	E	B	D	D
10	8	Freeport-McMoRan	USA	16.1	10.3	7.17	C	D	D	D
11	10	First Quantum Minerals	Canada	6.3	1.4	7.79	B	E	C	E
12	9	Vedanta Resources	UK	2.2	53.3	8.02	E	E	D	C
Weighting							30%	30%	20%	20%

(i) Average market cap for last 12 months up to 02 2017

Source: Carbon Disclosure Project