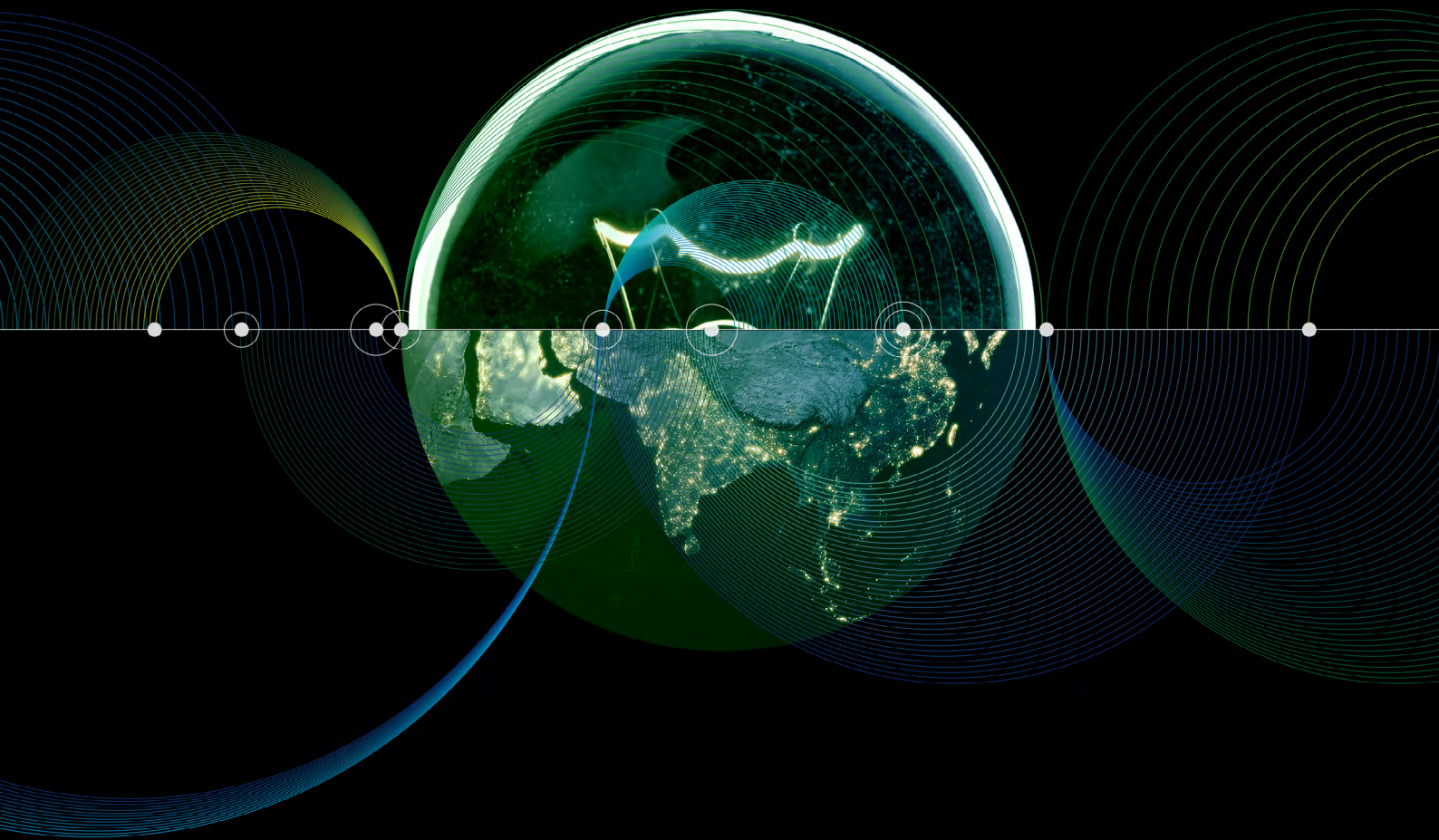


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The 2030 decarbonization challenge
The path to the future of energy



Mining and metals



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Forward

The global energy mix is shifting from fossil fuels to renewables. There are abundant examples of both public and private organizations working hard to decarbonize the economy. As this energy transformation or “Green Deal” gains momentum, new ecosystems are forming and new technologies are emerging. These developments are helping to grow renewables, develop new energy carriers, improve energy efficiency, reduce emissions and create new markets for carbon and other by-products as part of an increasingly circular economy. At the same time many of these commonly pursued steps to decarbonization, such as increased electrification, wide-scale use of renewable energy and intensifying energy efficiency measures pose unique challenges.

Many participants in the Energy & Resources (E&R) industry have publicly declared their intention to become carbon neutral by 2050. While their long-term vision is clear, the more perplexing challenge for E&R companies lies in the immediate future. Many companies are struggling to understand the material impacts that their stated goals are going to have on their valuations, operations, employees and markets over the next few years.

This report explores how companies in certain sectors of the E&R industry—chemicals, oil and gas, mining and metals, and power, utilities and renewables—can accelerate decarbonization over the next decade and achieve meaningful interim targets by 2030.

Introduction

The transition toward a clean energy future is underway and it will change almost every aspect of E&R companies' assets and operations. Taking a global view across sectors, the top drivers of decarbonization include:

- Customer, employee and community demands.
- Investor pressure.
- Policy and government targets.
- Technology and operational cost reduction—a more efficient frontier.

A closer examination of each driver suggests that the energy transition is anchored in long-term trends, which is likely to make it capable of withstanding the current economic downturn.

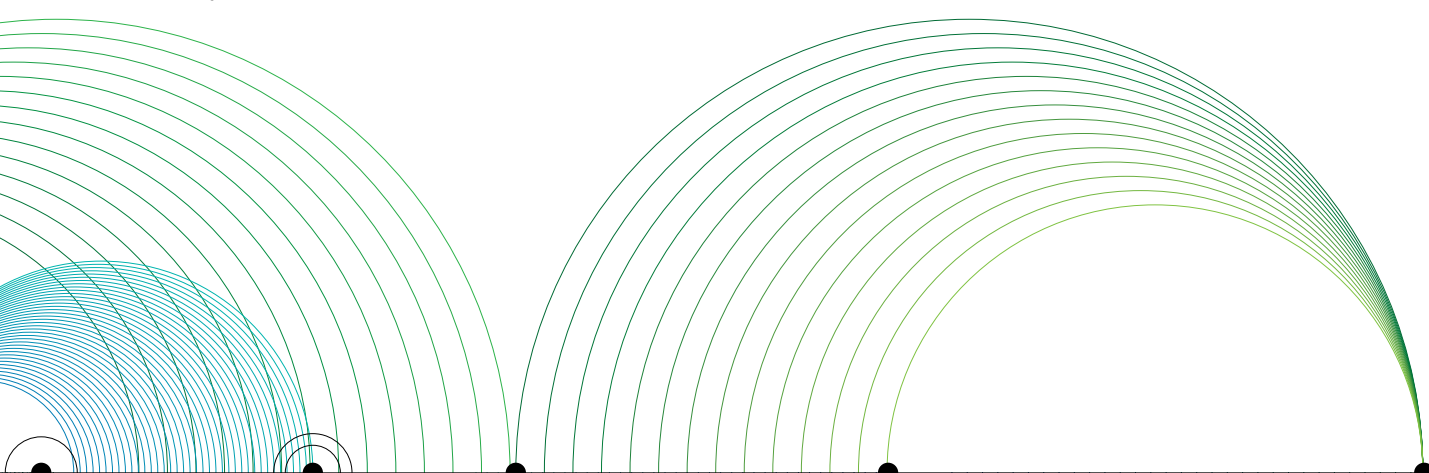
Customer, employee and community demands

A groundswell of support for climate action has arisen across the globe. 2019 saw the biggest climate protests ever as millions took to the streets to demand immediate action to tackle climate change and reduce pollution.¹ In the estimated 185 countries where demonstrations took place, protesters put pressure on governments and businesses to address urgent sustainability issues, such as rising sea levels in the Solomon Islands, toxic waste in South Africa, air pollution and plastic waste in India, and expansion of coal extraction in Australia.² The economic shutdowns in 2020 in response to the coronavirus pandemic have further highlighted the environmental damage and pollution that have become the norm for much of the world's population. In China and India, for example, the skies cleared over industrial centers for the first time in years.^{3,4}

The change in consumer attitudes, activism and the positive impact of reduced mobility and industry on the environment is apparently getting through to companies and industries. More and more are acknowledging that they need to embrace a low-carbon future not only for the sake of the planet, but to improve customer loyalty and assure their long-term viability. A growing body of evidence reflects this shift in sentiment. For instance, nearly three-quarters of United States business respondents in the [2020 Deloitte Resources Study](#) said their customers are demanding that they procure a certain percentage of electricity from renewable resources, and a rising portion (77%) actively publicize sourcing of renewables.⁵ From sustainable building materials to green minerals, demand is also increasing for other carbon-neutral products beyond energy. Meanwhile, a shift in generational values has occurred. Younger employees increasingly want to work for companies that benefit society in addition to producing a profit.⁶ The recent rise in employee activism suggests that employees are increasingly monitoring company responses to issues, ranging from gun control to climate change to the coronavirus pandemic.

Policy and government targets

Where the public leads, policymakers eventually follow. Climate strikes and marches around the globe have illustrated that both employees and customers mean business when it comes to emission reductions. With large swathes of the public demanding action on climate change, many governments now have a mandate to set carbon-reduction targets and enact green legislation.



The European Union (EU), for instance, aims to be climate-neutral by 2050. Pursuing an economy with net-zero greenhouse gas (GHG) emissions is at the heart of the [European Green Deal](#) and aligned with the EU's commitment to global climate action under the [Paris Agreement](#).⁷

China has also announced ambitious carbon-reduction goals, having set 2030 as a target for peak emissions as part of the Paris Agreement.⁸ China's near-term goal is to reduce emissions intensity: energy use and carbon emissions for every unit of gross domestic product.⁹ It is currently on track to reach its goals after reducing emissions per GDP by 5.1% and 4% in 2017 and 2018, respectively.¹⁰ More recently, China's decarbonization progress received an unexpected boost: an analysis by Carbon Brief, a UK-based website specializing in climate change, estimated that the coronavirus shutdown from December 2019 through February 2020 had temporarily cut China's carbon emissions by 25%.¹¹

Beyond setting reduction targets, some governments are using carbon pricing schemes to accelerate progress toward their goals. More than 40 governments worldwide have now adopted a price on carbon, either through direct taxes on fossil fuels or through cap-and-trade programs.¹² These programs have so far produced mixed results. Some are perceived to be wildly successful while others are viewed as ineffective and expensive at a time when energy customers cannot bear the added costs. That may be why some governments are choosing to tax carbon indirectly through subtler methods such as renewable portfolio standards, energy efficiency mandates, emissions regulations, and carbon-offset pricing.

Investor pressure

In response to policy shifts and customer needs, investors too are taking decarbonization seriously. BlackRock, the world's largest fund manager, with about US\$7 trillion of

assets under management, is an example¹³. In 2020 Larry Fink, BlackRock's chief executive, declared that "climate risk is investment risk," and published two letters, one to clients and one to CEOs, stating that the group would begin to "place sustainability at the center of its investment approach."¹⁴ He also predicted that "in the near future—and sooner than most anticipate—there will be a significant reallocation of capital to address the climate threat."¹⁵

Key aspects of BlackRock's sustainability strategy include:

- Selling direct investment in companies that derive more than 25% of their revenues from thermal coal.
- Pledging to vote against management teams that do not publish reports in line with the recommendations of the Task Force on Climate-Related Financial Disclosures and the Sustainability Accounting Standards Board.
- Using economic, social and governance (ESG) criteria more rigorously in active investment strategies.
- Offering more sustainable investment funds.¹⁶

While BlackRock's strategy made headlines due to the fund's size and influence, other investors have also been pressuring companies to take more action on climate change. For instance, Climate Action 100+, which BlackRock has joined, targets high-emission companies and has grown into one of the largest investor-led engagement initiatives, with over 450 investor signatories and representing over US\$40 trillion in assets under management across dozens of markets.¹⁷ Although short-term financial returns generally remain at the forefront, investor efforts such as these could have profound long-term implications for global business and finance, particularly for the E&R industry.

Technology cost reduction

Steep reductions in technology costs are helping E&R companies enable their decarbonization strategies.

Energy storage, which is key to large-scale adoption of renewable energy, is a case in point. Average market prices for battery packs have plunged from US\$1,100/kilowatt hour (kWh) in 2010 to US\$156/kWh in 2019, an 86% fall in real terms, according to a report released by Bloomberg New Energy Finance (BNEF).¹⁸ Battery-pack prices are projected to fall even further to around US\$100/kWh by 2023, driving electrification across the global economy, according to BNEF's forecast.¹⁹

In addition, advancements in digital technology, such as the Internet of Things (IoT), blockchain, digital twins, and AI-enabled energy-management and trading platforms, also promise to boost efficiency and drive costs down across both conventional and renewable energy value chains.

An opportunity to transform

As these drivers intensify and converge, many leading E&R companies are publicly announcing goals related to reducing emissions, utilizing renewable energy, and addressing climate-related risks. In Deloitte's recent energy transitions survey entitled Navigating the energy transition from disruption to growth, 89% of E&R executives reported that they either already had a plan in place or were developing a strategy to reduce reliance on fossil fuels.²⁰ 30% of those executives already had a fully developed plan in place. While some E&R companies are mainly responding to government mandates, others see the energy transition as an opportunity to transform themselves via long-term scenario planning over the next 10 to 30 years.

The future of energy

Scenario modeling traditionally arrives at a potential future by examining trends and considering the effects of variables that could be encountered along the way. But what if researchers took a fundamentally different approach based on the idea that the future is not determined by trends but by what will shape their trajectory? To find out, the Deloitte Energy, Resources & Industrials industry team identified 19 uncertainties that will likely influence the speed and scope of the macro trends that are underway today. Working backward along their trajectories, the team arrived at four plausible and divergent scenarios for what the future of energy might look like in 2035 from a global perspective. For more information on Deloitte's Future of Energy Scenarios visit our [website](#)



Thus far, the transition to a low-carbon economy has largely been led by the power and utilities (including renewables) sector. Emissions from leading power and utilities companies around the globe have fallen dramatically since 2015, according to an analysis commissioned by the World Economic Forum.²² Point380, a specialist data analytics firm, performed the analysis using company data reported to the CDP, a not-for-profit organization that monitors global emissions.²³ The reductions are likely due to a combination of factors, including:

- Green policies, such as carbon pricing schemes and renewable portfolio standards, which are driving power generators away from coal-fired thermal generation.
- An abundance of low-cost, cleaner-burning natural gas, which is being used as a bridge fuel in transitioning away from coal.
- Supportive incentives to invest in renewables and bring down the price of technology.
- Commitments from large commercial and industrial customers such as those in the RE100 initiative to source 100% of their power from renewable sources²⁴.

Building on the progress made, some power and utilities companies are raising the bar on their own, without further prompting from regulators. For instance, the Italian multinational energy corporation, Enel, set a carbon-neutral ambition for 2030, well before the 2050 goal of many companies.²⁵ To attain this goal, the company is pursuing an ambitious global investment plan to expand its renewables generation portfolio.²⁶

Mining and metals organizations came under public pressure early to reduce GHG emissions as part of preserving a social license to operate. Consequently, some are already working toward electrifying their operations and are collaborating with industry associations and other groups to develop innovative solutions for decarbonizing energy-intensive

processes, such as smelting and calcining. For instance, in July 2019 BHP announced their intention to invest US\$400 million over five years on low emissions technologies and natural climate solutions and support partnerships to address Scope 3 emissions.²⁷ Since then, they have identified approximately US\$350 million of investment opportunities and are now beginning to allocate funding. The initial investments will focus on reducing operational emissions initially through the purchase of renewable energy and on Scope 3 emissions in the steelmaking sector, with a particular focus on emerging technologies that have the potential to be scaled for widespread use²⁸. Similarly, Rio Tinto plans to spend US\$1 billion over the next five years on climate-related projects.²⁹ It has also exited coal production, agreed to an asset-by-asset review of its emission reduction targets, and joined the Energy Transitions Commission to accelerate progress on hard-to-abate sectors.³⁰ Meanwhile, CEMEX has announced an ambitious strategy to reduce its carbon dioxide (CO₂) emissions by 35% by 2030.³¹

Companies in the oil, gas and chemicals sectors, whose core business models are based on producing and processing hydrocarbons, have generally been slower to change. Nonetheless, several companies are now seizing upon the transition to a low-carbon economy as a means to transform not only how they operate, but also what they offer. Shell, Repsol, Equinor, Total, and bp have developed initial investment plans to diversify their businesses and have set long term energy intensity targets to reduce emissions.³² Their plans include investing in renewable energy sources, such as solar, wind, hydrogen and biofuels, as well as expanding into ancillary low-carbon businesses such as battery packs and grid-balancing technologies.³³

With cross-sector intentions, the scale of Oil Majors' commitments could be a game-changer for the E&R industry. For instance, within 10 years bp anticipates having increased its annual low-carbon investment 10-fold to

around US\$5 billion per year.³⁴ This investment is expected to encompass a variety of low-carbon technologies, including renewables, bioenergy and early positions in hydrogen and carbon capture, usage and sequestration (CCUS).³⁵ Likewise, Total has announced its intention to become a leading international player in renewable energies and has allocated significant funds toward achieving this goal.³⁶ The company currently allocates more than 10% of its capex to low-carbon electricity, and it plans to increase this allocation to 20% by 2030 or sooner.³⁷

Similarly, several multinational chemical companies have launched transformational initiatives centered upon sustainability. DuPont, for instance, has committed to: integrating circular economy principles into its business models; designing 100% of its products and processes using sustainability criteria including the principles of green chemistry; and reducing GHG emissions by 30% by 2030, including sourcing 60% of its electricity from renewable energy.³⁸

The desire to refashion themselves is not limited to the world's largest companies. For example, Occidental, an integrated energy company with oil, gas, and chemicals operations and low-carbon ventures, recently announced its bold aspiration to become completely carbon-neutral by using CCUS and by developing other economic applications for CO₂.³⁹

Navigating the future of energy

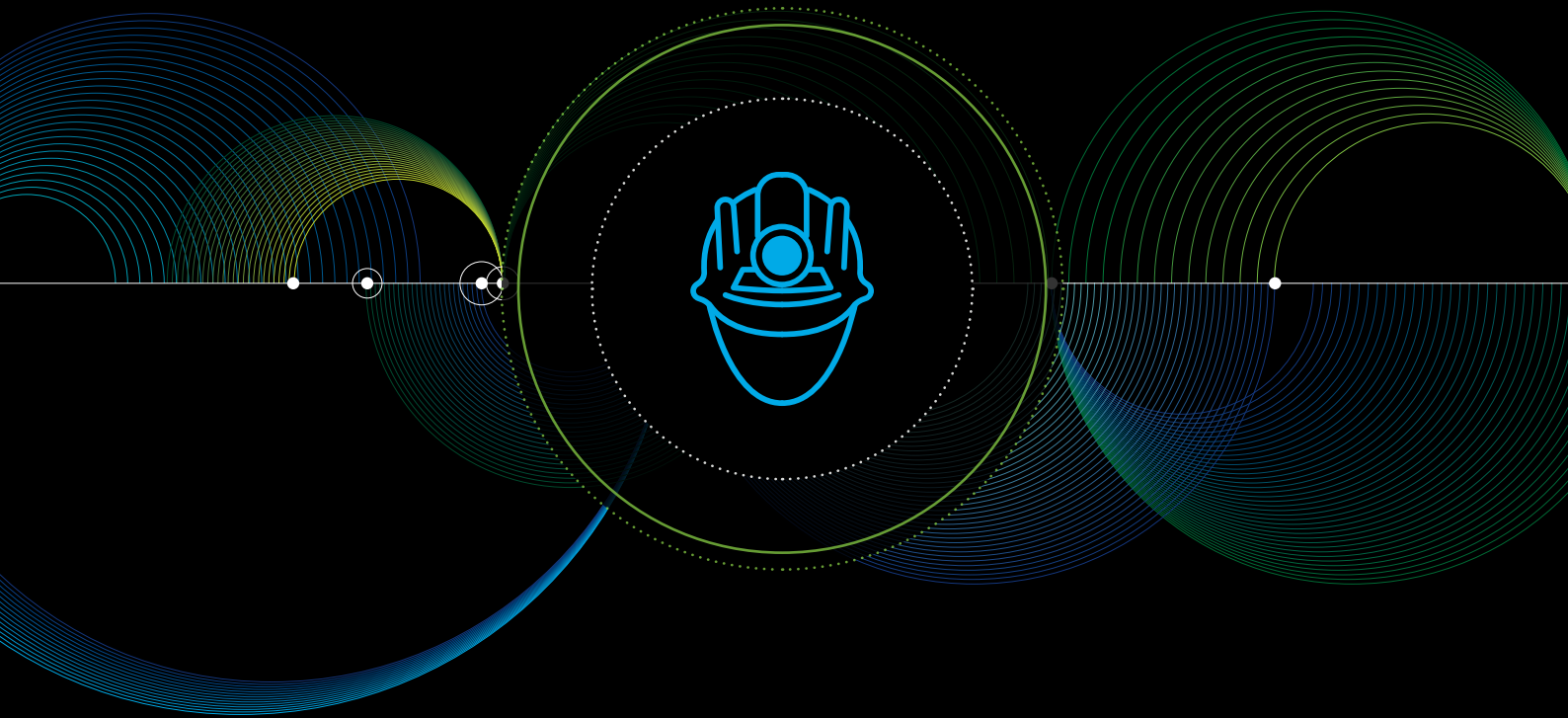
Although the transition to a low-carbon economy is gaining momentum, there is still much work to be done. In a 2019, Monitor Deloitte Australia conducted a market study of 112 companies around the world, 69% of them in the Energy, Resources & Industrials industry. Data came from publicly available disclosures and sustainability reporting from

2017 to mid-2019. During this period, these 112 companies collectively emitted 4.53 billion tonnes of carbon dioxide, of which 96% was attributable to E&R—oil and gas, chemicals, mining and metals, and power and utilities. Though these figures can only be approximate given variations in reporting standards, they still illustrate the magnitude of the challenge that lies ahead.

Decarbonization involves heavy lifting. For companies pursuing these goals, it requires a transformational shift in the way they operate: how they source, use, consume and think about energy and feedstocks and how they engage with multiple stakeholders. It also requires a significant financial commitment from investors and governments. The energy transition also has sector-wide implications for how E&R companies interact with each other as well as for how the sectors themselves may combine and converge.

To help companies navigate their way to the future of energy, the following sections examine the current state of decarbonization across four E&R sectors: chemicals; oil and gas; mining and metals; and power, utilities, and renewables.

Each analysis examines the current state of decarbonization in the sector; distinct or outsized macro drivers; which emissions are within a company's control; and potential decarbonization pathways and practical considerations that may influence a company's decarbonization strategies and tactics. For the purposes of this paper we will use the emissions taxonomy put forth by the Greenhouse Gas Protocol: Scope 1 emissions are direct emissions from owned or controlled sources; Scope 2 emissions are indirect emissions from the generation of purchased energy; and Scope 3 emissions are all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.⁴⁰



Mining and metals

Decarbonization in mining largely relies upon electrification and renewables. In some ways, it is easier to envision how mining could become carbon-free than other sectors. That does not mean it will be easy.

Distinct or outsized drivers

Investors are applying intense pressure on large multinational players in the mining sector, particularly regarding operational emissions. The rapidly declining cost of renewables has made it easier for them to respond. For example, BHP has signed a deal to develop new solar and wind farms in Australia's Queensland state which will enable them to run their coal operation in the region on solar. They expect this will help them cut their indirect emissions in the country by 20% over five years⁴¹. BHP is also moving toward green copper by signing renewable energy contracts that will allow its Escondida and Spence copper mines in Chile to shift to 100% renewables, replacing imported LNG.⁴² It has also committed itself to eliminating ground water usage in Chile by 2030 by investing in desalination plants.⁴³

With a patchwork of different national and local policies to navigate, many mining companies are designing their decarbonization strategies based on the most stringent common denominator and then applying those tactics globally across their organizations. Although mining and metals companies expect carbon pricing and increasing regulation, these are not the primary drivers at present. Instead, investors and the markets are ahead of where governments stand, as evidenced by the increasing number of companies that are signaling their decarbonization ambitions.

Supply chain pull is also generally stronger in mining than in other sectors. For instance, battery manufacturers are starting to look for carbon-neutral lithium and nickel, while automakers are starting to ask for green steel and aluminum. Market demands such as these may become the biggest driver of all. If customers start demanding green products, mining companies must offer them in order to stay in the game.

Which emissions are in a mining company's control?

Operational emissions (i.e., Scope 1 and 2) are largely within a mining company's control. Although execution is always tricky, it is generally easy to see how it can be done. One exception is fugitive emissions from coal mining, where there are still no widely available economically viable solutions for controlling methane leakage. Another exception is emissions from construction base materials, especially cement, where CO₂ is produced as a byproduct of the calcination process.

Value chain emissions (i.e., Scope 3) are where it becomes harder. This includes upstream suppliers, which provide copper, steel, and vast amounts of concrete to construct the mine site as well as downstream customers who use base materials and metals to construct virtually every heavy-duty product in modern society, ranging from ships to bridges, cars to buildings, and much in between. In mining, value chain emissions can be several times greater than operational emissions. With few easy answers available, many believe a more complex solution may be necessary to manage Scope 3 emissions in mining and beyond: principally the creation of a circular economy, whereby carbon-neutral ore is used to make carbon-neutral materials.

Practical considerations

The thorny part of decarbonization in mining, which involves tackling value chain emissions, requires partnerships and an ecosystem mindset. Forcing customers to use raw materials in ways that reduce emissions is counterproductive. Partnerships of customers and suppliers who have the same goal is generally more effective. However, forging such alliances would oblige mining companies to collaborate with each other and with other players in the supply chain.

Instead of imposing carbon-reduction targets upon the downstream value chain, companies will increasingly need to function as an ecosystem, setting goals in terms of the

partnerships they have, the trials they are conducting and the solutions they are developing. They will also need visibility on who buys and sells their ores, including traders and end customers, and how the minerals they mine are ultimately being used. New blockchain-enabled tracing methods are already being deployed to track ethical sourcing of materials and they should readily be extendable into low-emissions mining. An effort overseen by the multinational responsible sourcing group, RCS Global, offers an example. Led by Ford, a cross-industry, collaborative effort is underway to help ensure that cobalt supplies in high demand for use in lithium ion batteries are not linked to human rights abuses.⁴⁴ For the pilot project, Ford has teamed up with IBM, South Korean battery maker LG Chem, and China's largest cobalt producer Huayou Cobalt to test the first blockchain solution for tracing supplies of the metal from the Democratic Republic of Congo.⁴⁵

From an ecosystem perspective, mining companies will also need to make sure their positions on carbon-reduction align with industry association standards. This is important to avoid "green-washing," where companies profess to be committed to carbon reduction for branding purposes but do not back up their claims with measurable action. This alignment is also important in order to arrive at standardized ways of reporting.

Maintaining a social license to operate is a significant practical consideration for many mining companies. Rightly or wrongly mining is often perceived as a low-tech, heavily polluting industry. This affects the attraction and retention of employees, particularly younger ones. Accordingly, large multinationals increasingly want to be out in front on sustainability issues in order to attract the best talent. Being a leader in carbon abatement also delivers practical social benefits, such as improving air quality by reducing particulate emissions from diesel-powered trucks and heavy equipment, and creating sustainable power sources, which can be transferred to the community after the closure of the mine.

Cross-sector solutions

Understanding the financial impact of climate-related risks and opportunities on their businesses is imperative for companies across all sectors. In time, greater scrutiny will be placed on organizations to not just disclose but respond to the transition and physical risks that lie on the path to the future of energy.

Transition risks include depressed asset values, stranded assets and changing market demand. For example, midstream companies that own gas pipelines may someday encounter decreased utilization or disuse, the odds of which increase with time. An unintended consequence of the transition could be that the big companies will exit the space. This has happened with coal mining and coal-fired power plants in the United States and Europe to some extent, raising the question of who ends up owning high-emissions assets as they wind down. It might be a race to the bottom, with the least socially responsible companies the only ones willing to take these assets on, potentially creating new risks. Another question is at what stage do asset valuations start to take into account the eventual phase out of fossil fuels.

Physical risks include direct and indirect impacts of severe weather on infrastructure, worker safety and productivity. The industry has already seen far too many real-life examples. The E&R industry in Australia offers a case in point; stronger typhoons in Northern Australia have repeatedly caused shutdowns because some mine sites

and all LNG facilities are close to the coast. There have also been many days of extreme heat, above 40°C (104°F), where workers need more breaks, reducing productivity⁴⁶. Fires, too, have come close to critical infrastructure, triggering shutdowns and pre-emptive power outages.

In this environment, markets are beginning to scrutinize the methodologies companies use to prepare for the energy transition to ensure they are adhering to science-based targets and developing effective strategies for risk mitigation and carbon abatement. Robust, science-based analytical tools and frameworks are likely to become essential. Such tools can help companies to identify decarbonization pathways and prioritize abatement projects by analyzing their costs and linking them directly to science-based targets.

As executives figure out how to manage the decarbonization challenges within their company and sector, they should not forget that vertical integration and cross-sector consolidation may be part of the solution. This could begin with bilateral partnerships but evolve into partnerships or acquisitions throughout the value chain. For instance, a mining company could merge with a cement-maker, or an oil and gas company could acquire a battery manufacturer or enter into a joint venture with an EV automaker. In a world where the traditional lines between sectors are blurring, these types of non-traditional amalgamations may become routine.

Conclusion

Towards the new circular economy

For companies that emit and/or produce hydrocarbons, the pressure to change is building on all sides. But as the problems become more urgent, they are also becoming more feasible to solve. The emergence of a low-carbon, circular economy is now possible and many governments and regulators are starting to show their support. They now stand to gain, rather than lose, political capital by enacting policies that spur climate action and establish a circular economy.

While the economic shock of the coronavirus pandemic may slow progress in the short term, it is also shining a spotlight on the human impacts of pollution and climate change, thus advancing the decarbonization agenda in the long run. What emissions or waste products are attractive to acquire is an interesting question that arises.

New technologies make it possible to use CO₂ as a feedstock for chemicals and plastics. Waste-to-hydrogen plants are being built. Renewable electricity is rapidly descending the cost curve. This suggests the E&R industry is on the cusp of a paradigm shift that could transform waste from a problem to a solution.

Instead of pondering how to dispose of CO₂ and other waste, many companies may by 2030 view everything they produce, including emissions, by-products and end-products, as a resource that can be traded to create economic value. New partnerships and markets are likely to form. Substances long emitted or discarded as costly nuisances can become products that companies want to buy. And a new, cleaner, more circular economy can emerge.

About Deloitte's Decarbonization Solutions

The [Decarbonization Solutions](#) package provided by Deloitte member firms, includes modules relating to abatement portfolio management, decarbonization scenarios, abatement pathways, and impact analysis as well as modules to help consider physical climate risk. The modules leverage scientific information from leading bodies and methodologies including Represented Concentration Pathways from the Intergovernmental

Panel on Climate Change, shared socio-economic scenarios from the International Institute for Applied Systems Analysis, and methodologies from the Science-based Targets Initiative, among others. The modules compare forecast emissions reductions from selected abatement projects with short, medium and longer-term aspirations and pathways as well as identify physical climate risks.

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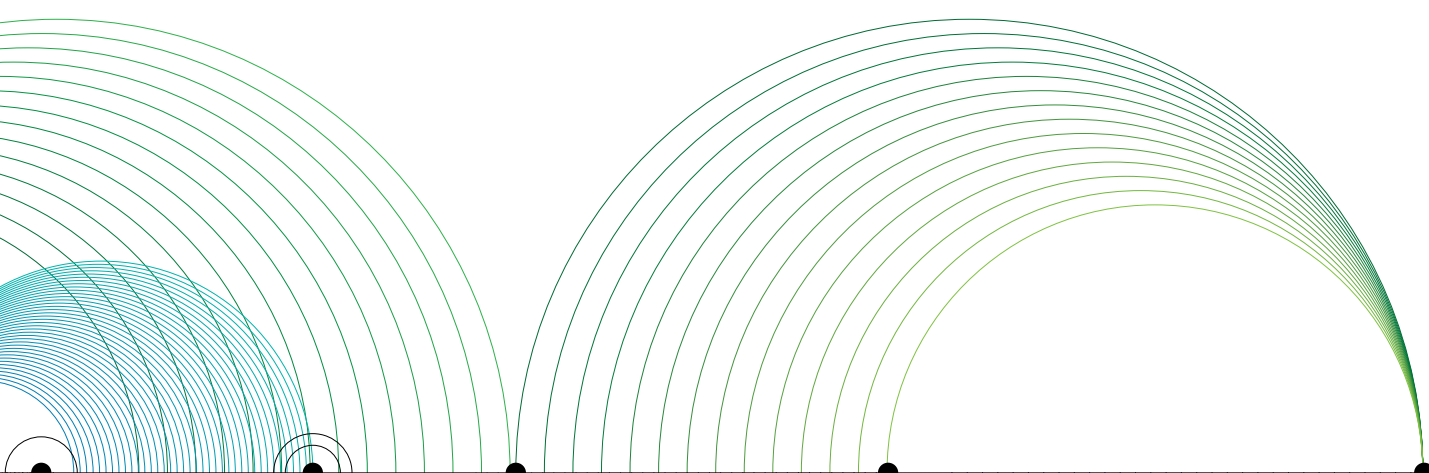
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