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Volume: 115. Issue.11 November 2026

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Mining Review Magazine

Who Checks?

The Experts Behind Mining's Biggest Deals



The Fire Rules Battery-Electric Mines Still Need

The Report That Moves the Money

The New Lithium Investment Test: Beyond Demand and Resources

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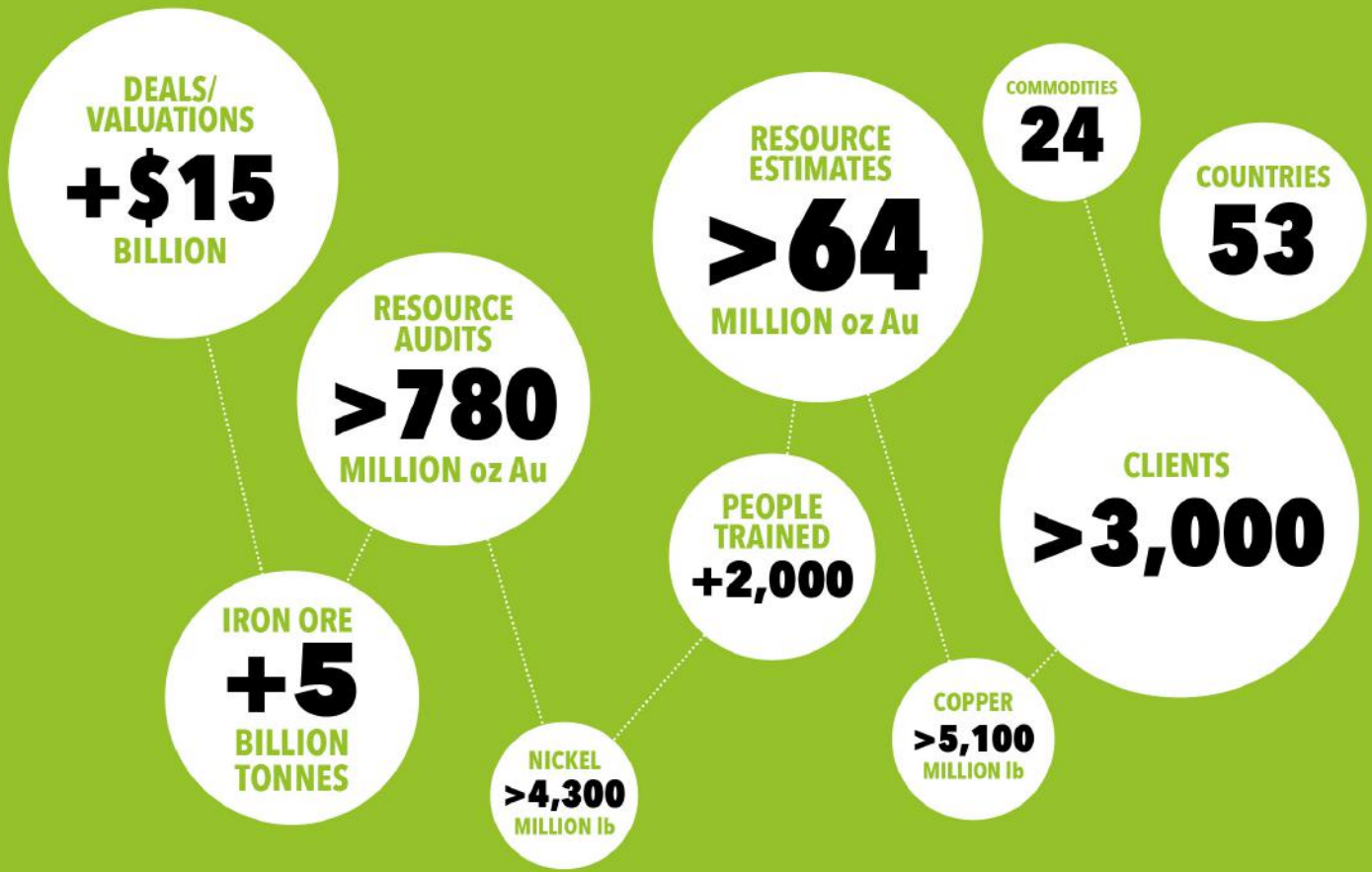
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IN THIS ISSUE

Where Mining's Biggest Decisions Begin

This issue of ***Skillings Mining Review*** examines the decisions shaping mining's next phase: technical expertise, emerging regulations and investor confidence. From independent assessments to battery-electric mine safety, the stories explore the standards and accountability driving an industry under pressure to evolve.

Our cover stories address three critical questions. Who Checks the Experts Behind Mining's Biggest Deals? examines the scrutiny of specialists influencing major transactions. The Fire Rules Battery-Electric Mines Still Need explores safety standards and regulatory challenges in underground electrification. The Report That Moves the Money looks at how independent technical opinions build project confidence and unlock investment.

Beyond the cover, we track developments across the mining value chain, including Pilgangoora's P2000 expansion, Syrah Resources' Balama funding, direct lithium extraction, Arafura's Nolans rare earths project, Caldeira's rare-earth development and AI in geological core logging.

As projects grow more complex and investment decisions more demanding, reliable information and sound technical judgement remain essential. This issue explores the people, processes and technologies shaping mining's future.

Editor
Skillings Review

SINCE 1912 Skillings Mining Review Magazine

Skillings Mining Review (ISSN 0037-6329) is published monthly, 12 issues per year by CFX Network, 350 W. Venice Ave. #1184 Venice, Florida 34284.
Phone: (888) 444 7854 x 4.
Printed in the USA.



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350 W. Venice Ave. #1184, Venice, FL 34284.
Periodicals Postage Paid at:
Venice, Florida and additional mail offices.
Postmaster: Send address changes to:
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Phone: (888) 444 7854 x 4. **Fax:** (888) 261-6014.
Email: advertising@skillings.net.

Skillings Mining Review, a publication of CFX Network LLC, publishes comprehensive information on global mining, iron ore markets and critical industry issues via the monthly Skillings Mining Review magazine and the weekly SMR Americas, Global Skillings, and Skillings Equipment Gear newsletters.

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Protecting Production in the Critical-Minerals Era:

Regional manufacturing. Proven engineering. Reliable support for the operations that keep essential minerals moving.



About ME Elecmetal

The minerals powering modern infrastructure, advanced manufacturing, energy systems and emerging technologies depend on one thing first: reliable production.

As demand for critical minerals grows, mining companies are looking beyond equipment performance alone. Supply availability, manufacturing capacity, regional support, and the ability to respond quickly when operating conditions change have become increasingly important to maintaining production.

ME Elecmetal helps customers address these challenges through a combination of global manufacturing strength, regional supply capabilities, engineering expertise and technical support.

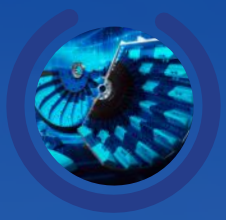
With 10 metallurgical plants strategically located across Chile, the United States, Peru, China, South Africa, Indonesia and Zambia, ME Elecmetal has a manufacturing capacity exceeding 134,000 tons of foundry products and 600,000 tons of grinding media. A commercial presence spanning more than 40 countries further connects that manufacturing network with mining operations around the world.

For customers in the Americas, regional manufacturing and nearshoring strategies can help shorten supply chains, improve responsiveness and reduce exposure to disruptions associated with long-distance sourcing.

The result is more than a supplier relationship. It is a stronger connection between manufacturing, engineering and the mine site—helping protect the production of the minerals industries depend on.

Essential Products

Mill Liners:



ME Elecmetal provides high performance liner solutions for SAG, AG, ball, tower and rod mills. Designs are engineered around operating conditions to support durability, efficiency, reliability and optimized grinding performance.

Grinding Media:



ME Elecmetal is renowned for its expertise in designing, manufacturing, and supplying the highest quality forged steel grinding media for SAG, ball, and rod mills.

Crusher Wear Parts:



ME Elecmetal offers wear components designed to optimize crusher performance and service life across primary, secondary, tertiary and pebble crushing applications.

ME Digital Lab



Advanced monitoring, wear analysis and digital technologies help customers better understand equipment performance, identify improvement opportunities and make more informed operating decisions.

Integral Solutions

A resilient supply chain is only valuable if it contributes to reliable production.

That is why ME Elecmetal combines manufacturing and product supply with engineering, digital technologies, technical services and optimization expertise through ME FIT® Programs.

ME FIT® takes a data-driven, holistic approach to mineral processing. Multidisciplinary teams evaluate operating conditions across crushing and grinding processes, using field data and technical analysis to identify opportunities to improve throughput, reliability, safety, efficiency and wear performance.

This partnership model also creates a stronger connection between what is manufactured, what is supplied and how it performs in the field.

By combining regional manufacturing capabilities with global expertise, ME Elecmetal can help customers build more resilient sourcing strategies while continuously improving operational performance.

For mining companies responsible for producing critical minerals, that combination matters. Reliable products, responsive technical support and stronger regional supply networks can help reduce risk and keep essential operations moving.

Partner with ME Elecmetal to strengthen operational resilience, protect critical production and support secure mineral supply chains.

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For more than two decades, ME Elecmetal has manufactured precision-cast track shoes for NASA's crawler-transporters.

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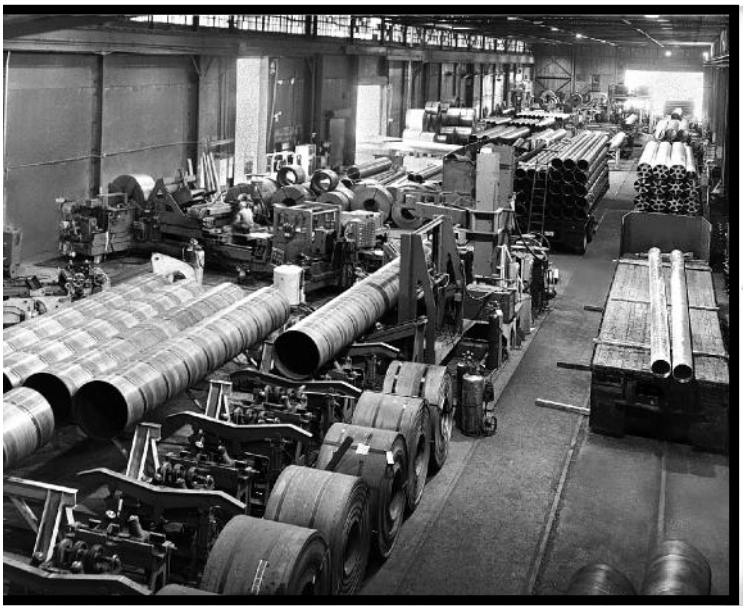
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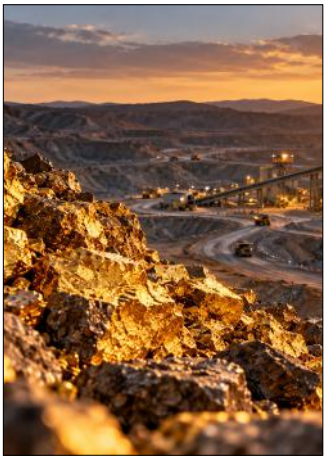
RIO TINTO RESTARTS OYU TOLGOI AFTER SEISMIC EVENT

Rio Tinto has begun progressively restarting underground operations at Mongolia's Oyu Tolgoi copper mine following a seismic event on 29 October. The incident caused a localised rockfall in a temporary storage area near the production zone, injuring three employees. The company reported no structural damage to the underground cave or operating infrastructure. Two workers remained under treatment for non-life-threatening injuries.



FREEPORT BEATS THIRD-QUARTER EARNINGS EXPECTATIONS

Freeport-McMoRan reported third-quarter revenue of US7.55billion,exceedinganalystexpectationsofUS7.4 billion. Revenue rose 8.2% from the previous year, supported by stronger metal prices. The performance came despite rising operating costs and a sharp decline in gold sales. The results provide an update on one of the world's largest copper producers as the industry navigates higher costs and changing market conditions.



VEDANTA OPENS R10 BILLION GAMSBERG ZINC EXPANSION

Vedanta Zinc International has inaugurated its R10-billion Gamsberg Phase II concentrator in South Africa's Northern Cape. The expansion doubles the mine's annual ore-processing capacity from four million to eight million tonnes, with zinc-in-concentrate capacity expected to reach approximately 500,000 tonnes annually. The company is also considering a local zinc smelter and refinery, although that investment remains subject to further development.

AGNICO EAGLE'S THIRD-QUARTER EARNINGS RISE ON HIGHER GOLD PRICES

Agnico Eagle Mines reported Q3 2026 adjusted net income of US$1.324 billion, with earnings per share rising 21.3% year on year. Higher gold prices offset rising mining costs and lower production, supporting profitability.

SOUTH32 SHAREHOLDERS APPROVE $5.6 BILLION ALUMINIUM ASSET SALE

South32 shareholders have approved the proposed sale of its aluminium assets to US-based Alcoa in a transaction valued at up to US$5.6 billion. The deal includes the Hillside Aluminium operation in South Africa, Worsley Alumina in Australia and Brazilian assets. Completion is expected in the first half of 2027, subject to regulatory approvals and other conditions. The transaction represents a major restructuring of South32's portfolio.

RIO TINTO BACKS FIVE STARTUPS DEVELOPING MINING TECHNOLOGIES

Rio Tinto and Founders Factory have selected five startups for their Mining Tech Accelerator, focusing on geohazard monitoring, metal analysis, mine planning, copper exploration and critical-mineral processing. Chosen from over 500 applications, the startups will receive investment, technical support and access to Rio Tinto's facilities in Western Australia to advance their technologies towards commercial use.

NEW LOCATOR TECHNOLOGY TARGETS UNDERGROUND MINE EMERGENCIES

South African mining technology company Booyco Electronics has introduced a Missing Person Locator designed to help mines locate workers during underground emergencies. The system uses radio-frequency devices integrated into miners' cap lamps to record their last known positions and support communication with surface control rooms. It is intended to help rescue teams narrow search areas during incidents such as fires and rockfalls, complementing existing emergency procedures.

DRC DETAINS CHINESE NATIONALS IN ILLEGAL MINING CRACKDOWN

Authorities in the Democratic Republic of Congo have detained around 300 Chinese nationals over suspected illegal mining in the copper belt, particularly near Kolwezi. The operation targets alleged mining on concessions licensed to other operators, highlighting ongoing disputes over mining rights and unauthorised mineral extraction.

GHANA MOVES TO STANDARDISE MINING CONTRACTOR PAY

Ghana has directed its Minerals Commission to develop common wage and employment standards as mining companies prepare to transfer more operations to local contractors. The regulator must submit implementation proposals and establish a contractor classification system by 30 November. The directive seeks to protect workers' wages, allowances and benefits during the transition, while addressing concerns that aggressive contractor bidding could undermine labour conditions and mine safety.



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The copper segment of ElvalHalcor S.A. is composed of six subsidiaries and seven associates/joint ventures, based in Greece, Belgium, Bulgaria, Romania and Turkey, while it operates a total of five production plants in Greece, Bulgaria and Turkey.

The copper segment of ElvalHalcor S.A. develops and distributes a wide range of products, including copper and copper-alloy rolled and extruded products with Halcor being the sole producer of copper tubes in Greece. High quality in production is achieved through strict controls applied throughout the production process. With a consistent quality focus, the company implements an ISO 9001:2015 Certified Quality Management System and leverages high technologies and expert staff.

As a result of the Group's strategic investments in research & development, Halcor is recognized as one of the leading copper producers globally, setting new standards in copper processing. The company maintains a consistent focus on quality and environmental protection and a strong commitment to the principles of sustainable development. In this context, all production facilities in the Group's plants leverage advanced technologies to bring in the market innovative products that are energy efficient and environmentally friendly.

For more information, please visit our website www.halcor.com



DE BEERS RAISES 2026 DIAMOND PRODUCTION TARGET

De Beers has increased its 2026 diamond production target to 25–28 million carats, compared with its earlier forecast of 21–26 million carats. The revised outlook follows a third-quarter production decline of 11% year on year to 6.8 million carats. The higher target reflects a planned increase in attributable production from Canada's Gahcho Kué mine following an agreed acquisition of its partner's 49% stake.

CHAMBISHI MINE RECORDS TUNNELLING MILESTONE

Zambia's Chambishi copper mine has recorded 422.4 metres of tunnel excavation in one month using a new hard-rock tunnel-boring machine during trials on its Southeast Orebody Project. The machine reached a reported maximum of 42.2 metres in a single day. The 9.7-kilometre tunnel is intended to provide access to the orebody. The trial highlights the growing use of mechanised underground mine development.

UGANDA EXTENDS SUSPENSION OF NEW MINING LICENCES

Uganda has extended its suspension on new mineral licences by three months while developing a revised framework focused on technical capability, financing, local content and transparency in mining approvals.

GLENCORE REPORTS HIGHER COPPER OUTPUT, BUT ZINC PRODUCTION FALLS

Glencore reported year-to-date copper production of 598,600 tonnes through September, up 3% from the same period in 2025. However, zinc output declined 23% to 547,200 tonnes, while cobalt production fell 52% to 13,700 tonnes. The company maintained its full-year 2026 production guidance, with zinc expected towards the upper end of its forecast range and copper towards the lower end.

VALE'S IRON ORE OUTPUT FALLS 6% AS COSTS RISE

Brazilian mining giant Vale reported third-quarter iron ore production of 88.4 million tonnes, down 6% year on year and below market expectations. Lower run-of-mine availability at its Serra Norte complex contributed to the decline. Adjusted EBITDA fell 20% to US$3.51 billion, affected by weaker iron ore prices and higher fuel and freight costs. Vale nevertheless maintained its 2026 iron ore production guidance of 335–345 million tonnes.



TECK FACES STRIKE THREAT AT HIGHLAND VALLEY COPPER

Teck Resources received a strike notice from the United Steelworkers union representing employees at its Highland Valley Copper operations in British Columbia. The notice allowed strike action to begin from 24 October, following the expiry of the collective agreement on 30 September. Teck said operations were continuing and contingency plans were in place to maintain safety and environmental management during any labour disruption.

SAMARCO POSTS HIGHEST QUARTERLY PRODUCTION SINCE RESTART

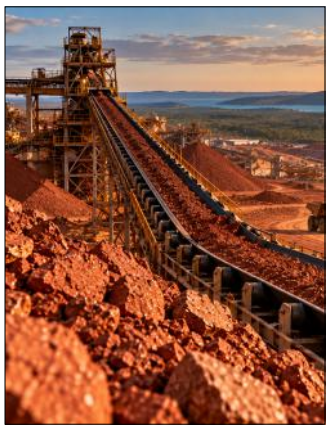
Brazilian iron ore producer Samarco reported third-quarter production of 4.3 million tonnes, its highest quarterly output since operations resumed in 2020. Production increased 10% from the previous quarter and 4% year on year. Combined iron ore and pellet sales reached 3.9 million tonnes. The Vale–BHP joint venture is continuing its recovery following the 2015 Fundão tailings dam disaster and expects to return to full capacity in 2028.

POLAND'S JSW OPENS TWO NEW COKING COAL MINING WALLS

Polish coal producer JSW has opened two new mining walls at its Pniówek and Knurów mines, adding 688,000 tonnes of coal reserves, with production expected to continue until mid-2027.

RIO TINTO COMMITS $1.9 BILLION TO QUEENSLAND BAUXITE PROJECT

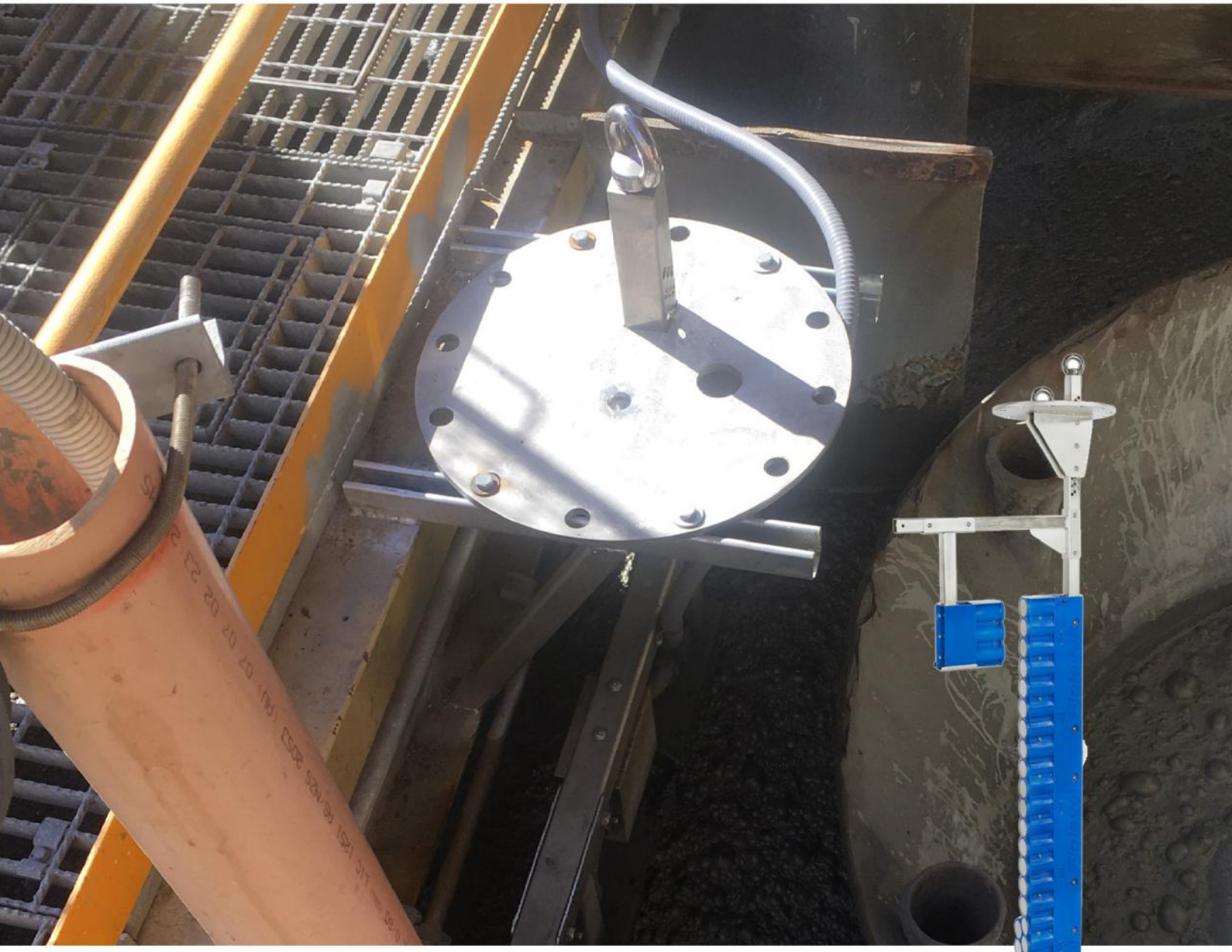
Rio Tinto will invest US$1.9 billion in the Kangwinan bauxite project on Western Cape York Peninsula in Queensland. The brownfield development is expected to add 20 million tonnes of annual production capacity to its Weipa operations. First output is targeted for 2029, with full production expected by 2032. The project is intended to replace production from the ageing Andoom mine and support long-term bauxite supply to customers and Australian alumina refineries.



FORTESCUE REPORTS LOWER IRON ORE SHIPMENTS AMID SALES NEGOTIATIONS

Fortescue reported iron ore shipments of 46.8 million tonnes in the first quarter of its 2026–27 financial year, down 11% quarter on quarter. Production reached 62.7 million tonnes, up 4% year on year. Sales were below shipments amid ongoing negotiations with China Mineral Resources Group. The company also reported its first hot-metal production.

A Level & Density Measurement Revolution for **Flotation Cells** is here!



FloLevel Technologies offers a range of Level & Density products designed to provide continuous process feedback on mineral recovery efficiency to allow for automatic control of the Flotation Cell. The FloLevel Array is the first dedicated “self-cleaning” instrument designed for the Flotation process to remove clay and scale buildup automatically.

Process feedback from the FloLevel Array allows the DCS to control aeration flow rate, adjustment of dart valve, optimisation of solids concentration, and adjustment of frother flow rate for the flotation circuit.

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THE EXPERTS BEHIND MINING'S BIGGEST DEALS?

A technical report can help secure millions for a mining project. But when the numbers fail, investors may discover that the expert's legal obligations are narrower than they thought.

WORDS BY *CHARLES PITTS* // **DATA BY SKILLINGS RESEARCH**

In January 2006, Standard Bank asked engineering firm Pincock, Allen & Holt, operating under Runge, Inc., to change the wording of a report on an Indiana coal mine. The report said the mine owner had hired the engineer. Standard wanted that reference removed before syndicating its $35 million loan. The firm agreed.

By May, the mine owner was bankrupt. Standard sued, saying the engineering assessment had missed serious problems. It lost. The dispute raises a question for anyone financing a mine: who checks the experts, and what happens when their work is challenged?

What the Signature Proves

A technical report can influence whether a mine attracts loans, shareholders or a buyer. Advisers check drilling information, mineral estimates, processing tests, costs and development plans. But a public technical report and a lender's independent engineering review do different jobs. Neither is a guarantee that a mine will succeed.

Reporting rules also differ. Canada's NI 43-101 requires qualified professionals and independence in certain situations. Australia's JORC Code permits a Competent Person to work for the mining company, with the relationship disclosed. Under U.S. SEC Regulation S-K 1300, qualified persons may also be employees. Their qualifications matter; independence cannot be assumed from the title. A professional may have genuine expertise





and still face pressure from the company paying the bill. Investors need to understand both before trusting the conclusion.

Who Is Watching?

Regulators review mining disclosures and can demand corrections. They do not routinely drill fresh holes, re-assay every sample or rebuild a company's geological model before financing closes. Professional bodies set membership and disciplinary standards, but those are not substitutes for examining each transaction.

A revealing example comes from Ontario. In 2013, the Ontario Securities Commission reviewed 50 technical reports. Eighty percent had some form of disclosure non-compliance; roughly 40 percent had at least one major concern. Those figures are historical, not today's failure rate. The commission could seek corrections, additional disclosure or action affecting a prospectus. It was reviewing compliance, not certifying that every model or mine plan was accurate. Filing a report should never be mistaken for having its underlying assumptions independently retested.

Follow the Contract

In the Standard Bank case, the engineer's contract capped liability at the greater of its fees or $50,000. It also excluded third-party beneficiaries. Standard had not negotiated its own protections. In 2011, the U.S. appeals court upheld dismissal of its negligence claims under Colorado's economic loss rule. The judges did not rule that the report's technical conclusions were correct.

This is where reliance letters matter. A lender can negotiate permission to rely on a consultant's report, including the scope of that reliance and any agreed limits on

claims. Without clear rights, a useful document may offer less legal protection than its reader expects.

Payment creates another question. A consultant may be paid by the developer, hired again for later studies or asked to meet a financing deadline. None of that proves bad advice. Boards should nevertheless know who pays, who sets the review's scope and whether future work could influence judgment.

The Limits of the Review

Under SEC Regulation S-K 1300, a qualified person may rely on company information for specified matters outside their expertise, including certain legal, environmental, government and marketing issues. That reliance must be identified and explained in a dedicated section. Readers should check it rather than assume every statement was independently verified.

Mine plans also depend on prices, recovery rates, construction schedules and costs. A credible review tests what happens if those assumptions worsen. It identifies who checked the geological model, who reviewed the processing plant and where evidence remains thin.

Reform is on the table. Canada's proposed NI 43-101 changes would remove the seasonal-weather deferral for site inspections and revise technical disclosure about community and Indigenous agreements. The proposal would also remove mandatory technical-report filings for royalty-only issuers, who often lack access to operators' data. Australia's JORC Code review also addresses reporting and professional competence. These are proposals and reviews, not proof that today's reports are sound.

The final responsibility sits with the company and its directors. Before signing off on a deal, they should ask for the unresolved risks, the adviser relationships, the work excluded from the review and the assumptions most likely to fail.

A signature should begin that conversation, not end it.



WHEN THE NUMBERS WERE WRONG—AND THE EXPERTS WERE SUED

In January 2022, Gatos Silver warned that a technical report for its Cerro Los Gatos mine in Mexico contained errors. The company estimated that remaining reserve metal content could be 30% to 50% below earlier estimates, after allowing for material already mined. It told investors not to rely on the previous figures.

The stock fell sharply. By October, fresh work showed contained-metal reductions of 32% for silver, 37% for zinc, 36% for lead and 35% for gold, after accounting for depletion.

The dispute reached the courts. Shareholders in Canada alleged that disclosures based on the report had misled investors. Engineering consultancy Tetra Tech and two employees, who had worked on the report, were among those sued. The allegations were contested.

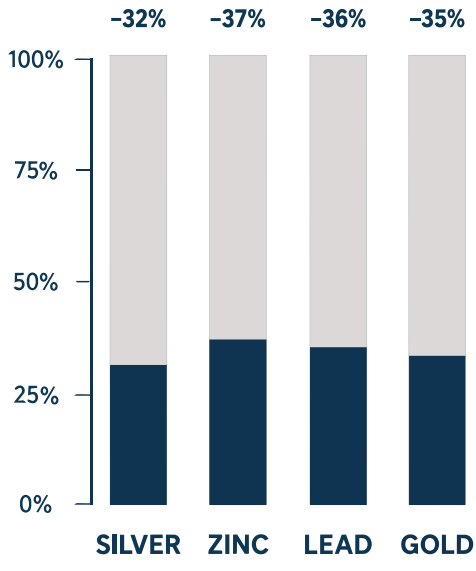
Ontario judges approved a C$1 million settlement involving Gatos and others in 2024. Neither settlement was an admission of wrongdoing. Lawyers in the Canadian case estimated that the combined settlements represented just 20% to 33% of the class's total estimated losses.

A parallel U.S. shareholder case was also settled in October 2024. The episode illustrates the gap between correcting a resource estimate and recovering money after investors have acted on it.

CERRO LOS GATOS | THE RESERVE RESET

How far did the reserve estimates fall?

Contained-metal reductions versus 2020 estimates, adjusted for mining depletion.



SOURCE: Gatos Silver, October 3, 2022 | Bars show percentage DECREASE, not metal remaining.

PLS Approves A$1.9 Billion Pilgangoora Expansion

The P2000 project will double Pilgangoora's annual spodumene concentrate capacity, with first production targeted for 2029.



PLS Group has approved its A$1.9 billion P2000 expansion at the Pilgangoora lithium operation in Western Australia, marking the largest investment decision in the company's history. The project will increase annual spodumene concentrate capacity from up to one million tonnes to approximately two million tonnes, with first production targeted for the September quarter of 2029.

Recovering More of the Orebody

The expansion centres on Jimmagunya, a new processing plant to be built alongside the existing Pilgan facility. Improved mining and processing methods are expected to make approximately 67 million tonnes of mineralised material previously classified as waste economically recoverable as ore.

PLS has also reported a 31% increase in contained lithium within Pilgangoora's Ore Reserve, bringing it to approximately 3.1 million tonnes of lithium oxide. The updated reserve totals 249.2 million tonnes grading 1.24% lithium oxide, providing a larger resource base for the expansion.

Scale and Cost Competitiveness

The project is expected to create more than 1,000 construction jobs and around 500 ongoing operational roles. PLS also plans up to A$650 million in supporting infrastructure investment, including road upgrades, permanent accommodation and a new mine services facility.

P2000 is designed to improve operating efficiency and strengthen Pilgangoora's position through lithium-market cycles. However, the A$1.9 billion capital commitment exposes the company to construction, commissioning and commodity-price risks. First production is expected to be followed by an approximately six-month ramp-up.

The expansion's long-term value will depend on delivering the plant on schedule, achieving planned recovery rates and converting greater production capacity into competitive supply. For PLS, P2000 represents a major step towards greater scale and a stronger position in the global lithium market.



LITHIUM FINANCING

PLS Raises US$700 Million

to Strengthen Funding for Lithium Growth

The new bond extends PLS's long-term funding capacity ahead of major lithium investments, while adding to the company's interest obligations.



PLS Group completed a US$700 million senior unsecured notes offering on October 26, 2026, expanding its access to long-term funding ahead of major investments at its Pilgangoora operation in Western Australia. The notes carry an annual coupon of 8% and mature in 2032, further diversifying the company's debt funding and extending its maturity profile.

The offering follows PLS's approval of the A1.9billionP2000expansion,whichisdesignedtoapproximatelydoublePilgangoora'sannualspodumeneconcentratecapacitytotwomilliontonnes.

ThecompanyalsoplanstoinvestA600-650 million in supporting infrastructure.

A Second Bond, a Higher Coupon

The new notes follow PLS's US$600 million bond issued in April 2026, which carries a 6.875% coupon and matures in 2031. The two issues have different principal amounts and terms, so their coupon rates alone do not establish why the borrowing costs differ.

At an 8% coupon, the new notes carry annual interest payments of US56million.Theearliernotesaddapproximately US41.25 million annually. Together, the two issues represent US$97.25 million in annual coupon payments, assuming both remain outstanding at their full principal amounts.

Flexibility Comes with Obligations

PLS intends to use the new proceeds for general corporate purposes, including capital expenditure and future growth opportunities. The funds are not earmarked exclusively for P2000, giving management flexibility to allocate capital across its priorities.

The offering provides liquidity through a major investment period, but also adds fixed interest obligations. Construction delays, higher project costs or weaker lithium prices could make it harder to generate the expected returns from expansion.

For PLS, the financing strengthens its capacity to pursue growth. Its long-term value will depend on disciplined capital allocation, reliable project delivery and sufficient cash generation to support both investment and debt servicing.



Syrah Advances US$15 Million Funding for Balama Graphite Mine

The additional US funding will support operations at Mozambique's Balama mine as Syrah works to resolve loan defaults and secure a longer-term financial solution.



Syrah Resources expects a further US$15 million loan disbursement from the US International Development Finance Corporation (DFC) to support working and sustaining capital at its Balama graphite operation in Mozambique. The advance was scheduled before October 31, 2026, following a temporary waiver of existing loan defaults.

The funding carries interest at 6% annually plus DFC's cost of funds, alongside a 1% advance fee. DFC has reserved its rights over future disbursements, which are not guaranteed.

Balama is strategically important to efforts to diversify natural graphite supply beyond China, including feedstock for Syrah's US battery-materials facility. However, the broader restructuring remains subject to binding agreements and regulatory approvals, with financial close expected in the first half of 2027.



LITHIUM TECHNOLOGY

Direct Lithium Extraction
The Test of Commercial Viability

New technology milestones are advancing direct lithium extraction, but reliable production and competitive costs remain the decisive tests for commercial success.

WORDS BY *SALINI KRISHNAN* // **DATA BY SKILLINGS RESEARCH**

Direct lithium extraction (DLE) is attracting investment as lithium producers seek alternatives to conventional evaporation ponds. Technologies such as adsorption and ion exchange selectively separate lithium from brine. DLE can reduce land requirements and shorten processing times, but performance depends on brine chemistry, energy consumption and the treatment needed to produce battery-grade material.

Progress Towards Commercial Deployment

Vulcan Energy began commercial-scale production of its proprietary VULSORB lithium-extraction adsorbent in Germany on October 8, 2026. The material is intended for the company's Lionheart project, where commissioning is planned for the second half of 2028. Vulcan reports lithium recovery rates of up to 95% during testing across thousands of operating cycles at industrial demonstration scale.



Separately, CleanTech Lithium reported producing lithium carbonate with purity of up to 99.75% during pilot-process validation for its Laguna Verde project in Chile. The trial processed 24 cubic metres of brine. The project's planned annual production capacity is 15,000 tonnes. These milestones demonstrate technical progress, not sustained commercial lithium production from either project.

Economics Will Decide the Winners

DLE's advantages must be weighed against capital costs, reagents, energy, water management and equipment durability. Price volatility, technical uncertainty and financing conditions remain important risks to project profitability. No single cost benchmark applies to every DLE project.

The commercial test is broader than extraction efficiency. Projects must demonstrate repeatable recovery, consistent product quality and competitive operating costs at scale. For investors, DLE's long-term potential will depend on whether technical advances translate into dependable production and viable returns.

Brazil's Bluebush Project Advances Heavy Rare Earth Exploration

Alvo Minerals has mapped thick clay profiles at its Bluebush project in Brazil, refining exploration targets for dysprosium and terbium, key elements in high-performance permanent magnets.

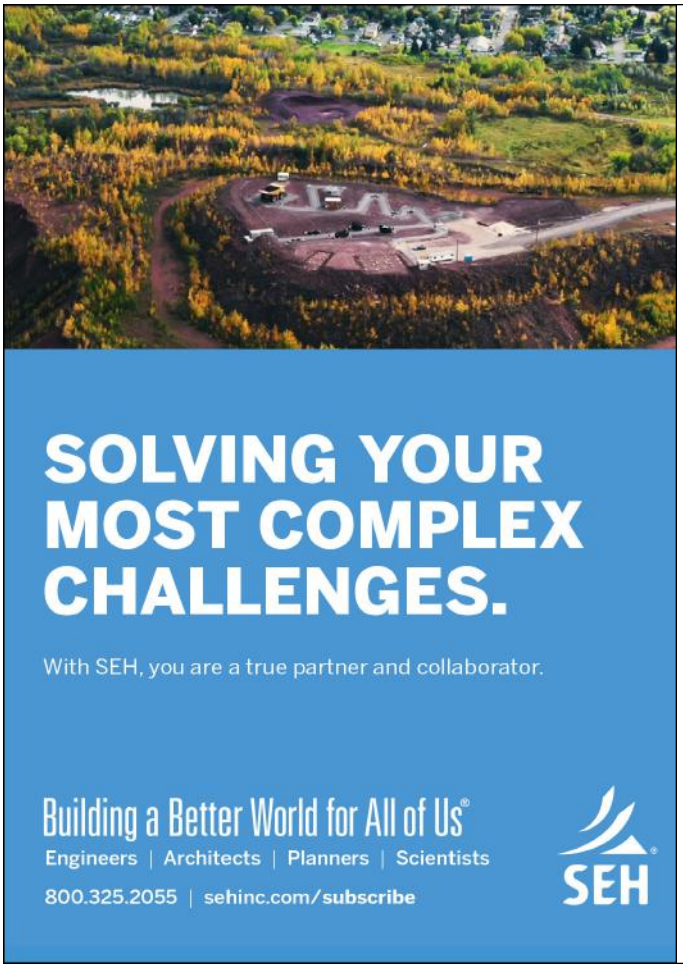
An electromagnetic survey at the Boa Vista prospect identified thick, continuous clay zones in eastern Bluebush, with stronger responses corresponding to deeper drill holes. The results will help guide further drilling, but the survey does not establish rare-earth grades or economic viability.

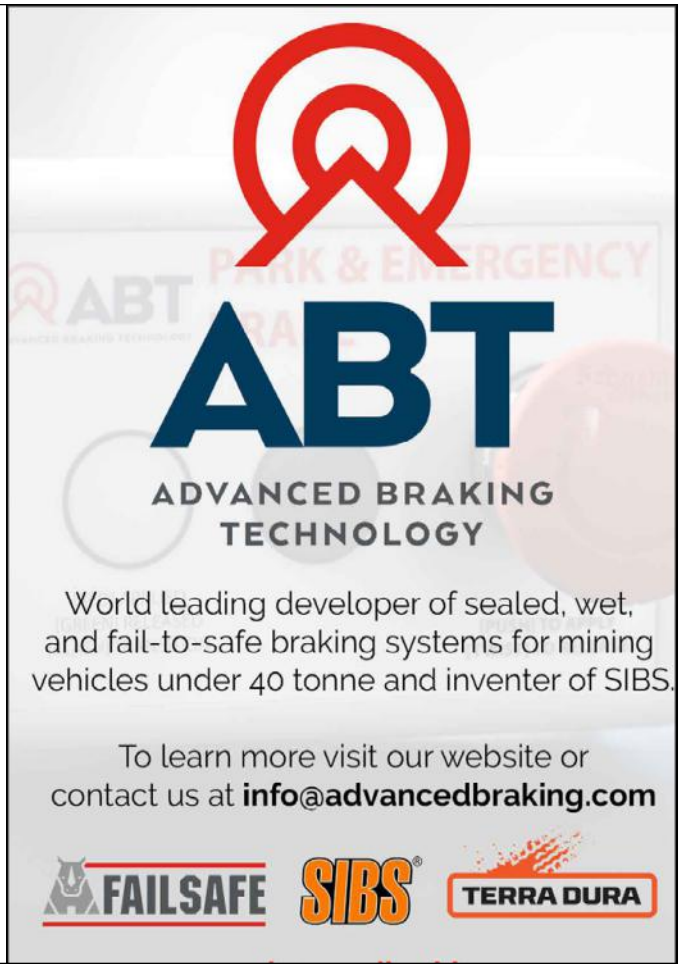
Previously reported drilling at Boa Vista returned 19.5 metres grading 1,324 parts per million total rare earth oxides, including 3.5 metres at 2,691 ppm. These results pre-date the latest survey.

Dysprosium and terbium are used in permanent magnets for electric vehicles and wind turbines. However, Bluebush remains an exploration-stage project. Further



assay results, metallurgical testing and permeability studies are needed before its resource potential and commercial prospects can be assessed. A maiden mineral resource estimate is targeted for early 2027.





RARE EARTHS

Arafura's Nolans Project Begins Construction, *Targeting Rare Earth Supply Chains*

With more than US$1.6 billion in financing commitments and binding customer agreements, Australia's Nolans project aims to establish a new source of magnet rare earths outside China's dominant supply chain.

WORDS BY *SONNY JIMERSON* // **DATA BY SKILLINGS RESEARCH**



Arafura Rare Earths has begun construction of its Nolans project, 135 kilometres north of Alice Springs in Australia's Northern Territory. The project reached a final investment decision in May 2026, with construction starting in September. First production is expected in 2029.

Nolans is designed to produce 4,440 tonnes of neodymium-praseodymium (NdPr) oxide annually, alongside a separate mixed middle and heavy rare-earth oxide product. NdPr is essential for high-performance permanent magnets used in electric vehicles, wind turbines, robotics and defence technologies.

Financing and Customers

Arafura has secured more than US$1.6 billion in debt and equity commitments from financing institutions and partners across five countries. Its funding structure includes senior debt facilities, equity investments and additional facilities intended to provide financial support through construction and ramp-up.

The company has binding offtake arrangements with customers in Europe, South Korea and the United States, including Hyundai, Kia, Siemens Gamesa and Traxys. These agreements provide a commercial foundation for future production.

The Australian Government has backed Nolans with A$1.2 billion in support through several financing mechanisms. It has also issued a non-binding letter of support for potential purchases of up to 500 tonnes of rare earth products annually under its Critical Minerals Strategic Reserve. This is not a guaranteed purchase contract.

The Challenge of Integrated Processing

Nolans is designed as an integrated operation, taking ore through beneficiation, extraction and rare-earth separation at one site. This could allow Australia to capture more value domestically rather than relying on overseas processing.

However, integrating multiple processing stages creates technical and operational challenges. Arafura must commission the facilities, maintain consistent product quality and control costs as production ramps up. Its remote location also adds infrastructure and workforce demands.

Nolans could become an important alternative source of magnet rare earths. Its long-term significance will depend on delivering the project successfully and supplying customers with reliable, competitively priced products.

Beyond Lithium: Nickel and Cobalt Face Diverging Market Risks

Nickel oversupply and tightening cobalt supply show why critical-mineral investment must be guided by market fundamentals, not demand forecasts alone.

Lithium may dominate battery headlines, but the energy transition depends on a much wider range of metals. Nickel is used in stainless steel and some electric-vehicle batteries, while cobalt serves battery, aerospace and industrial applications. Despite their strategic importance, the two metals face sharply different market conditions.

Nickel: Supply Outpaces Demand

Indonesia's rapid expansion of nickel mining and processing has reshaped the global market. The International Nickel Study Group forecasts a surplus of 19,000 tonnes in 2026, widening to 70,000 tonnes in 2027 as production continues to exceed demand. Nickel's role in electric-vehicle batteries has also grown more slowly than expected, partly because lithium iron phosphate batteries compete with nickel-bearing chemistries.

The pressure is influencing investment decisions. In October, India's state-owned NMDC paused plans to enter the nickel sector amid concerns about global oversupply, particularly from Indonesia. For producers, maintaining competitive costs is becoming increasingly important.

Cobalt: Policy Reshapes Supply

Cobalt faces a different risk. The Democratic Republic of the Congo, the world's leading producer, introduced export quotas that have tightened supply and increased uncertainty for buyers. The International Energy Agency projects a potential cobalt supply gap exceeding 25% by 2035 in its base case, reflecting the effect of these quotas and the limited pipeline of alternative supply. This is a forecast, not a guaranteed outcome.

Investment Beyond the Headlines

The contrast offers a clear lesson: being classified as a critical mineral does not protect a project from weak economics. Nickel producers must contend with oversupply and price pressure, while cobalt buyers and developers must manage concentrated supply and policy risk.For investors, the priority is to assess each metal on its own fundamentals–production costs, market balance, customer demand and exposure to trade restrictions. Strategic importance may attract attention, but commercially resilient projects must withstand both price cycles and policy changes.



THE REPORT THAT MOVES THE MONEY

An independent technical opinion can help unlock millions in mining investment. But when the numbers unravel, who is responsible for the assessment on which lenders and investors relied?

WORDS BY *MO SHINE* // **DATA BY SKILLINGS RESEARCH**





In January 2006, Standard Bank asked the engineer reviewing an Indiana coal mine to change the wording of its report. The existing version identified the mine buyer as the party that had retained the engineer. Standard wanted that reference removed before approaching other banks, concerned it might raise doubts about independence. Pincock, Allen & Holt complied, according to federal court records.

Standard had provided $35 million to finance the purchase. Within months, the mine was in trouble, and its owner filed for bankruptcy in May. The lender sued the engineering firm, alleging that the viability assessment had missed serious problems. Standard also alleged that thin rock layers made parts of the coal seam unworkable, undermining production forecasts. The bank also disputed reserves of Clean Air Act-compliant coal.

The Tenth Circuit upheld dismissal of the claims in 2011 under Colorado's economic loss rule. It did not rule that the underlying technical estimates were sound.What makes the episode revealing is the distance between a report's commercial influence and the responsibilities established in the engagement behind it.

A $2.9 billion financing decision

The stakes are visible at Perpetua Resources' Stibnite gold-antimony project in Idaho. In May 2026, the Export-Import Bank of the United States approved a proposed $2.9 billion loan through its Make More in America Initiative. Perpetua describes Stibnite as holding the only identified domestic U.S. antimony reserve, giving its financing a strategic-minerals dimension beyond gold economics.

The EXIM decision followed extensive due diligence, according to Perpetua. Yet board approval was not an immediate release of funds: the company's August filing still described loan documentation and closing conditions as outstanding. Capital assumptions could also change during detailed engineering and procurement. Perpetua's filing acknowledged that design changes and market conditions could materially alter the project's capital cost estimates.

The reserve that had to be rewritten

At Cerro Los Gatos in Mexico, a different problem reached investors. In January 2022, Gatos Silver disclosed errors in a technical report effective July 1, 2020, and warned of overestimation in its resource model.

Its initial assessment indicated that the remaining mineral reserve could contain 30% to 50% less metal than previously estimated, after depletion. The company advised investors not to

WHAT DOES INDEPENDENT MEAN?

In mining, independent is used across work that serves different audiences. Canada's NI 43-101 requires a Qualified Person for specified mineral disclosure, with independence mandatory in particular circumstances. Under Australia's JORC Code, a Competent Person may work for the reporting company, provided relevant relationships are disclosed. SEC Regulation S-K 1300 likewise permits an employee to act as a qualified person, subject to disclosure requirements.

A lender's technical advisor occupies another position. The mandate may concentrate on repayment risk, a proposed construction schedule or whether a borrower has met conditions for another loan drawdown. That advisor does not automatically assume the responsibilities of a qualified person signing a public resource statement. The lender's mandate may cover construction risk while leaving public reserve disclosure outside its scope.

rely on the earlier resource and reserve figures.

The disclosure led to securities litigation in Ontario. Investors alleged that overstated reserve information appeared in offering documents, including a July 2021 prospectus, with Tetra Tech named among the defendants.

An Ontario court approved a C$1 million settlement involving Tetra Tech and two employees in 2024. The settlement resolved their claims without a court finding of negligence.

By October 2022, after new drilling and model revisions, Gatos reported 32% less contained silver in reserves than the earlier estimate, after accounting for depletion.

The contract beneath the report

In the Standard Bank case, the engineer had originally been retained by the borrower. Its contract contained a liability limit and excluded intended third-party beneficiaries.

The lender nevertheless used the assessment in its financing process. Those terms became central when the dispute reached court.

A similar review of today's reports must go beyond credentials. Boards need to understand whether specialists checked recovery assumptions against test work, how much mine planning relies on company data, and whether the advisor had time to inspect the site. Critical exclusions should be evident before the report moves into a financing presentation.

The question before approval

Directors preparing for a financing vote need not rebuild the block model, but they must understand the engagement's limits and the assumptions capable of changing their decision.An expert signature should begin scrutiny, not end it.



BEFORE THE BOARD SIGNS: FIVE QUESTIONS

A valid Qualified Person signature doesn't mean the board's due diligence is finished. Before relying on an assessment in a financing decision, directors should establish what the expert was asked to do and what remains unverified.

Who retained the advisor? Identify the contracting party, who paid the fees and whether there are repeat mandates. A lender may use a report commissioned by the borrower without acquiring the same contractual rights.

Which assumptions were checked? Ask whether sampling results were verified independently. For metallurgy, determine whether the recovery forecast comes from representative test work or a management target carried into the cash-flow model. What relationships were disclosed? Review employment, ownership interests and commercial work for the issuer. Any contingent fee deserves particular attention because it may affect incentives.

How vulnerable is the schedule? Insist on scenarios for slower permitting, delayed equipment delivery and commissioning problems. A valuation based solely on the planned start date gives little guidance if construction slips.

Who can rely on the findings? Read the engagement letter for permitted users, exclusions and liability provisions. Ask how unresolved technical disagreements are recorded and escalated.

These questions belong in the board materials before the financing vote, alongside the report itself.



The Strategic Minerals Race
Turning Supply Security into Investment

Governments are backing alternative critical-mineral supply chains, but higher processing costs and uncertain returns remain major hurdles for mining investors.

Critical minerals have become strategic assets. Lithium, graphite, gallium, antimony and rare earths are essential to batteries, electronics, renewable energy and defence technologies. Yet concentrated refining capacity and export restrictions have exposed vulnerabilities in global supply chains. The challenge is no longer simply to discover deposits, but to deliver reliable supplies at commercially competitive prices.

Governments Shift Focus to Processing

Australia refreshed its Critical Minerals Strategy on October 27, 2026, placing greater emphasis on processing, refining and international partnerships. Its accompanying investment prospectus identifies 94 projects, including 36 midstream projects focused on activities such as processing.

The European Union is also seeking closer critical-minerals cooperation with Australia. On October 27, the EU was reported to be considering up to €10 billion for critical raw materials within a proposed €409 billion competitiveness fund for 2028–2034. The allocation remains a proposal, not a confirmed investment in individual projects.

The Economics of Diversification

Government backing may improve access to finance and long-term customers, but it cannot eliminate the cost disadvantage faced by new processing facilities. The International Energy Agency's Global Critical Minerals Outlook 2026 estimates that refining projects outside dominant supplier countries can face capital costs 20% to more than 150% higher, with operating costs averaging around 50% higher.

These differences make project economics decisive. Infrastructure, energy prices, processing technology and secure feedstock can determine whether a project attracts sustained investment. Offtake agreements and carefully designed public support may reduce risk, but commitments must translate into actual funding and operating capacity.

From Strategy to Commercial Supply

For investors, the strongest opportunities will be projects that combine strategic relevance with competitive costs, credible customers and reliable execution. Mineral security may justify public support, but lasting diversification depends on building supply chains that can remain viable beyond the funding cycle.



Sigma Lithium Extends US$100 Million Debt as Production Restarts

The six-month extension gives Sigma Lithium more time to rebuild production in Brazil, but the company must still repay US$100 million by June 2027.

Sigma Lithium has secured a six-month extension on its US$100 million senior secured debt with Synergy Capital, moving the repayment deadline from December 2026 to June 2027. Announced on October 23, the agreement keeps the interest rate unchanged at the Secured Overnight Financing Rate (SOFR) plus 6.95 percentage points.

The extension comes as the company works to restore operations at its Grota do Cirilo lithium project in Brazil. Production restarted on October 5 after a federal court reinstated its environmental licences. Between October 5 and October 21, Sigma produced 7,090 tonnes of lithium oxide concentrate.

Production Is Only the First Step

Sigma aims to reach an annualised production rate of 330,000 tonnes of lithium oxide concentrate by the end of 2027.

But restarting a plant is only part of the challenge. The company must sustain output, sell its product at viable prices and control costs to generate the cash needed to support its debt obligations.Sigma says it has repaid more than US90millionindebtsincethesecondquarterof2024.

Itstotaldebtstoodatapproximately-US125 million as of October 21, 2026, a reduction of around 40%.

The June Deadline

The extension provides additional time, but it does not reduce the US$100 million principal owed under the facility. Interest costs also remain linked to SOFR, meaning changes in benchmark rates can affect the amount payable.Sigma's immediate challenge is to turn the production restart into steady sales and cash generation before the revised deadline. Its next results, scheduled for release by November 13, should provide a clearer picture of production, realised prices, operating costs and cash flow.



BEYOND CHINA:

The Race to Build a Rare Earth Supply Chain

New investments are expanding rare earth production outside China. But building competitive refining, metal-making and magnet manufacturing capacity remains the industry's biggest challenge.



China's dominance of rare earth supply extends beyond mining. In 2024, it accounted for around 60% of global mined production of magnet rare earths, 91% of refining and 94% of sintered permanent magnet manufacturing, according to the International Energy Agency (IEA).

USA Rare Earth is seeking to help change that balance. The company completed its combination with Brazil's Serra Verde Group on September 3, 2026, linking its downstream ambitions with Serra Verde's Pela Ema mine and processing operation in Goiás, Brazil.

Pela Ema began production in January 2024 and produces rare earth materials containing neodymium, praseodymium, dysprosium and terbium. Serra Verde is still progressing through optimisation and commissioning, with a target of approximately 4,000 tonnes of total rare earth oxides annually by the end of 2026.

Days after completing the combination, USA Rare Earth broke ground on a planned US$1.2 billion metal and magnet manufacturing facility in South Carolina. Designed for annual capacity of 6,400 tonnes of neodymium-iron-boron magnets and 5,000 tonnes of metals, alloys and strip-cast material, the facility is targeting commissioning in 2028. These are planned capacities, not current production.

Processing Is the Missing Link

Mining rare earths is only the first step. Mixed concentrates must be separated into individual oxides, converted into metals, formed into alloys and manufactured into magnets that meet precise performance requirements. Each stage demands specialised equipment, technical expertise and substantial investment.



The IEA identifies metal-making and magnet production as particularly difficult stages to expand outside established supply chains.

Higher construction and operating costs, limited equipment suppliers and a shortage of experienced specialists can delay new projects and weaken their competitiveness.

From Capacity to Commercial Supply

USA Rare Earth's strategy illustrates the push to connect mining with downstream manufacturing. Yet combining assets does not guarantee reliable output or competitive prices. Projects must secure consistent feedstock, qualify products with customers and manage the economics of producing different rare earth elements.

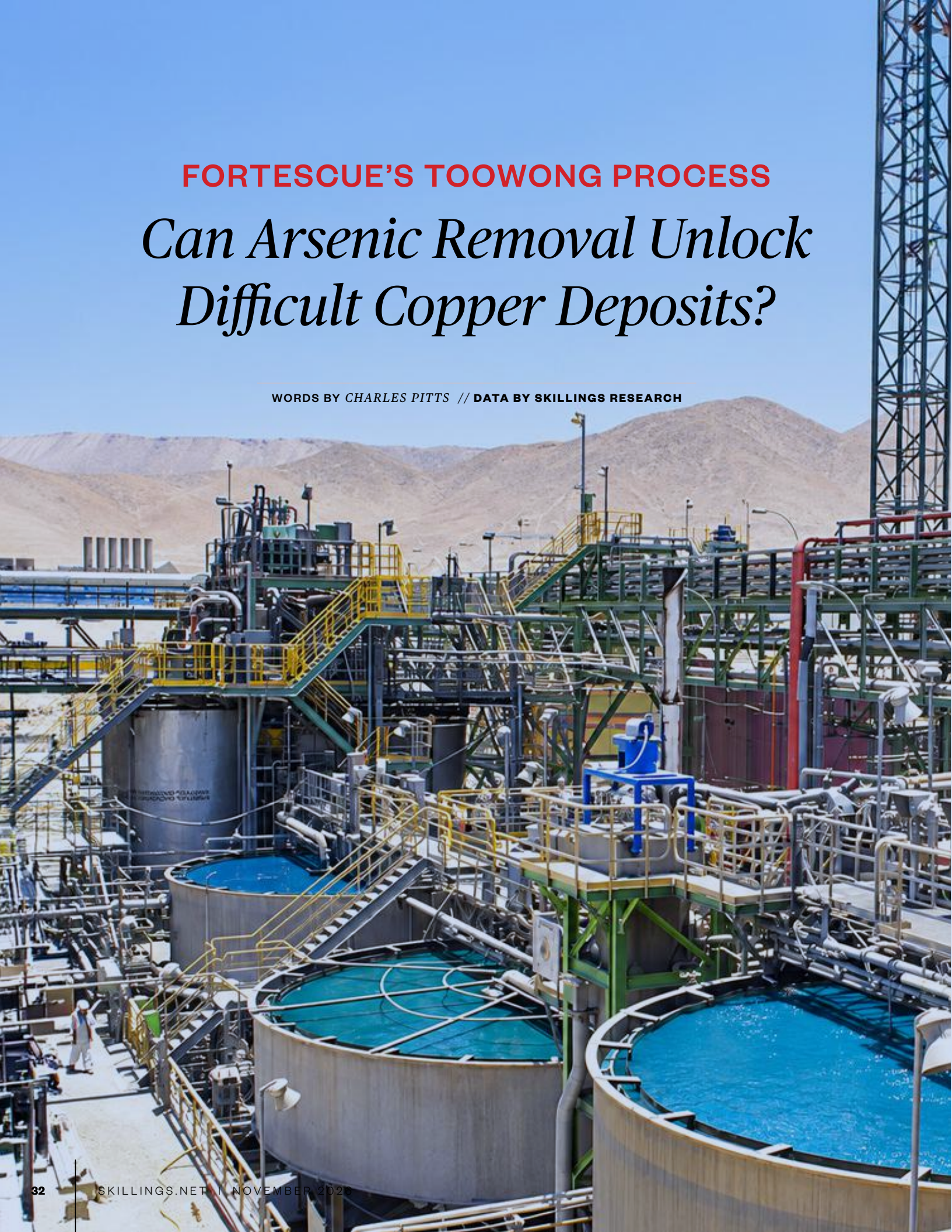
The strategic goal is clear: reduce dependence on a supply chain concentrated in China. But success will depend on more than new mines and factory announcements. It will require sustained production, competitive processing costs and dependable deliveries of finished materials.

Until those links operate at scale, expanding rare earth mining outside China will only partly address the industry's supply-chain vulnerability.

FORTESCUE'S TOOWONG PROCESS

Can Arsenic Removal Unlock Difficult Copper Deposits?

WORDS BY *CHARLES PITTS* // **DATA BY SKILLINGS RESEARCH**



Fortescue has sold more than 40 tonnes of arsenic-treated copper concentrate. The milestone is promising, but the technology's wider value will depend on its cost, environmental performance and ability to operate at commercial scale.

A copper deposit can contain valuable metal and still be difficult to develop. Arsenic is one reason. When it enters copper concentrate at high levels, smelters may impose penalties, require blending with cleaner material or reject the shipment. The result can be higher costs and copper resources that are harder to bring into production.

Fortescue is testing whether its Toowong Process can help overcome that barrier. On October 19, 2026, the company announced that it had sold more than 40 tonnes of copper concentrate treated at its Brisbane demonstration plant. The feedstock contained up to 7% arsenic, while the treated product contained less than 0.25%, according to Fortescue.

The sale confirms that a buyer accepted the material, although the company has not disclosed the buyer or the sale price. It does not, by itself, prove that the technology is commercially viable at full scale.

Removing Arsenic, Retaining Copper

Fortescue acquired the Toowong Process in 2022. The patented technology uses hydrometallurgy, treating concentrate with chemical solutions at relatively low temperatures and pressures rather than relying on conventional high-temperature roasting.

Across seven campaigns and more than 3,000 operating hours, Fortescue reports that the process reduced arsenic levels to below 0.3% while retaining more than 99.9% of the copper. These results are encouraging, but they are company-reported demonstration data, not independent guarantees of performance under commercial operating conditions.

If the process can consistently remove arsenic while preserving copper, it could improve the marketability of concentrates that would otherwise attract heavy penalties or face limited smelter options. For mine developers, that may create greater flexibility in deciding which resources can be developed.

The Environmental Challenge Remains

Removing arsenic from concentrate does not make it disappear. The process transfers it into another material stream that must be managed safely.

Fortescue has indicated that a future processing plant would require wastewater treatment, while recovered arsenic would need to undergo stabilisation. The design and cost of this waste-management system will be important to the technology's environmental performance and overall economics.

The process is intended as an alternative to roasting, which uses high temperatures and creates arsenic-bearing emissions that require control. Fortescue says its method can reduce energy use and emissions, but independent, quantified evidence of those benefits has not been publicly established in the reporting reviewed.

The Commercial Test

The next question is whether the technology can deliver its benefits at a cost that makes sense for a mine. Reagent use, energy consumption, plant reliability, maintenance and waste treatment will all affect the final economics. Fortescue has not disclosed commercial plant capacity, capital costs or a deployment timetable, and says it is continuing to refine the process and its engineering.

The company is also testing concentrate from its Cañariaco Copper Project in Peru. Successful treatment could improve the marketability of its concentrate, but it would not by itself establish the project's overall economic viability.

The sale of more than 40 tonnes is a meaningful step beyond laboratory testing. The decisive evidence will come from reliable operation at larger scale, transparent cost data and a safe, permitted solution for arsenic-bearing residues. Until then, the Toowong Process remains a promising technology with its commercial case still to prove.









The Fire Rules
Battery-Electric Mines
Still Need

Battery-electric machines are moving from trial fleets into the underground production plan. New research and an unfinished safety standard expose the harder question: are mines prepared for the battery fire their diesel procedures were never designed to contain?

WORDS BY *MO SHINE* // **DATA BY SKILLINGS RESEARCH**



At Hudbay Minerals' Lalor mine in Manitoba, battery-electric equipment has scaled. Hudbay reported ten battery-electric vehicles in February 2026, with two more planned. Hudbay linked cooler deeper workings to ventilation gains. In South Africa, Epiroc says Assmang's Black Rock underground fleet delivered 11% higher throughput while cutting ventilation and energy costs by 18% against diesel equipment. The commercial case is clear; the fire response is not.

Electrification changes what mines must fight. A damaged lithium-ion pack can enter thermal runaway, in which internal reactions generate heat faster than it escapes. Failures can spread between cells. Sandvik uses more thermally stable lithium iron phosphate (LFP), while Epiroc specifies higher-energy-density nickel manganese cobalt (NMC); even LFP cells can still vent flammable gases and toxic hydrogen fluoride. Unlike a conventional fuel fire, visible flame extinction may not establish that the battery is stable.

Australia's interim standard for underground battery-powered machines, published in September 2025, offers a revealing measure of how regulation is catching up. AS 5487 sets performance requirements, including for fire hazards, charging and verification. Yet its section for prescriptive requirements was deliberately left blank because the technology and accepted solutions



were not sufficiently mature. It is a significant standard, but not a ready-made emergency plan.

What the tests actually show

Research has exposed the difference between extinguishing flames and stopping the reaction inside a pack. In 2024, Liming Yuan and colleagues at the US National Institute for Occupational Safety and Health (NIOSH) tested suppression agents on LFP battery packs. Dry chemical initially knocked down flames, but the packs reignited. Water mist provided sustained cooling and prevented reignition under the tested conditions. Crucially, the researchers tested exposed cells, not complete sealed vehicle battery systems; their results cannot be transferred wholesale to a mine fleet.

A 2025 NIOSH paper by Thomas Dubaniewicz tested a battery inside a modified MSHA-approved explosion-proof enclosure. Thermal runaway forced jet flames through joints and deformed the housing beyond permitted limits. That finding, based on a specific test configuration, challenges assumptions about protection systems designed to contain methane-air explosions. It does not establish that every enclosure will fail.

These are engineering distinctions with procurement consequences. A suppression certificate cannot establish whether the installed design detects failure, limits propagation, cools the pack and protects responders within the mine's layout. Battery management telemetry can provide warning, but it does not replace independent detection or a response plan for lost communications and inaccessible equipment.

The ventilation paradox

Diesel displacement can reduce routine ventilation demand. A battery incident, however, may create a very different airflow problem. Smoke and gases can travel along headings, compromise escape routes and complicate rescue even where flames remain localized.

An October 2026 study by Universidad de Chile researchers Benavides Salinas and Kracht modeled battery-electric mining and fire scenarios. It found lower ordinary airflow requirements for much of the electric equipment assessed, but potentially dangerous carbon monoxide and hydrogen fluoride concentrations in simulated fires. The authors identified gaps in Chilean rules covering charging, gas monitoring and emergency response. Those are modeled hazards, not measurements from an actual mine disaster.

The practical question is whether ventilation-on-demand systems have been evaluated for charging incidents, loss of normal airflow and altered escape conditions, rather than solely for routine operations. Gas detection, alarm thresholds and evacuation routes must work as a co-ordinated system.

The investment test

Every fleet expansion needs a battery-specific safety case: tested pack protection; monitored and segregated charging; verified emergency airflow; electrical isolation; rescue withdrawal criteria; and post-incident temperature and gas surveillance. Suppliers must substantiate performance claims under conditions relevant to the vehicle and mine, while management must establish who owns each control. The case must be revisited when battery chemistry, pack supplier, charging equipment or deployment geometry changes.

These requirements have financial consequences. Charging infrastructure, water access, sensors, ventilation modeling and training belong in the electrification budget, not in an

unspecified future safety upgrade. Boards should demand independent evidence before approving expansion. If assumptions fail after deployment, the exposure extends beyond a damaged machine to lost production and interrupted access to workings.

Lalor and Black Rock offer a business case for electrification. The unanswered test is whether a mine's fire plan has been demonstrated through realistic site trials, rescue exercises and operating records, rather than asserted in a supplier's brochure.

THE SAFETY CODE BLIND SPOT



The regulatory problem is not an absence of mining fire rules. It is the distance between established duties and a validated response to lithium-ion battery failure.

In Australia, AS 5487 (Int):2025 sets performance-based requirements for battery-powered machines underground. Its prescriptive Section 3 is intentionally empty pending greater technical certainty. It does not remove operators' existing safety responsibilities. Western Australian guidance also requires a current, operation-specific underground fire risk assessment, but a generic fire assessment cannot establish how an individual battery pack behaves.

In the United States, 30 CFR 57.4502 requires ventilation at battery-charging stations to prevent hydrogen accumulation and prohibits ignition sources. Separately, 30 CFR 75.340 addresses underground electrical installations in coal mines, including charging stations and specified fire protection arrangements. Neither provision, by itself, certifies a complete lithium-ion vehicle response.

The necessary bridge is site-specific evidence: what triggers pack isolation; which gases detectors can identify; whether suppression reaches the cells; how airflow affects occupied workings; when rescuers withdraw; and what proves safe re-entry.

Legislation establishes duties; standards specify performance expectations. Mine operators still have to show, using suitable tests, scenario exercises and documented drills, that the entire protective system works reliably together when a battery fails during underground operations.



Ethiopia Opens $50 Million Precious Metals Refinery

Ethiopia has inaugurated its first National Precious Metals Refinery at the Bole Lemi Special Economic Zone in Addis Ababa, marking a step towards expanding domestic mineral processing.

The $50 million facility is a joint venture between state-owned Ethiopian Investment Holdings, with a 51% stake, and Sam Precious Metals, which holds 49%. It is designed to process more than 600 tonnes of precious metals annually, offering gold testing, refining, casting and bullion production.

The refinery aims to serve Ethiopian producers as well as mining companies from neighbouring countries, potentially reducing their dependence on overseas refining centres.

However, its commercial success will depend on securing sufficient feedstock, meeting international quality standards and competing with established refiners.

The project reflects Ethiopia's wider ambition to capture more value from mineral resources through domestic processing, technical expertise and downstream industrial development.



THE NEW LITHIUM INVESTMENT TEST

Beyond Demand and Resources

WORDS BY *PENNY LANEFORD* // **DATA BY SKILLINGS RESEARCH**

Lithium prices have recovered, but investors remain cautious. Projects must now demonstrate realistic costs, secure financing and reliable production–not simply promise to meet future battery demand.

Lithium's long-term outlook remains strong, driven by electric vehicles and energy storage. Yet the investment environment is changing. According to the International Energy Agency (IEA), lithium prices more than doubled during 2025 and early 2026 as demand strengthened and supply tightened. Even so, lithium investment fell by around 40% in 2025, reflecting caution after the previous downturn.

This contrast captures the challenge facing developers: future demand may be attractive, but investors must determine whether individual projects can survive volatile prices and deliver returns.

The Price Assumption Problem

Lithium projects can take years to develop, making commodity-price assumptions critical. A feasibility study built around optimistic prices may overstate a project's financial resilience.

An August 2026 analysis by S&P Global Market Intelligence found that lithium projects' average price assumptions in 2025 were more than double the prevailing spot price.

The gap creates significant risk if prices remain weak during construction or early production. A project that looks profitable on paper may struggle to generate sufficient cash flow once operating.

Investors therefore need to test project economics against lower-price scenarios, higher capital costs and slower production ramp-ups—not rely solely on a developer's base case.

Thacker Pass: Financing Meets Execution

Lithium Americas' Thacker Pass project in Nevada illustrates how financing and execution risks intersect. Phase 1 is designed to produce 40,000 tonnes of battery-quality lithium carbonate annually. Its financing includes a US$2.23 billion US Department of Energy loan and strategic investment from General Motors and Orion Resource Partners.

Mechanical completion is targeted for late 2027, followed by a production ramp-up through 2028. The project also has a long-term offtake agreement with General Motors. These commitments strengthen its financing position, but construction completion, commissioning, operating costs and consistent product quality remain critical tests.

The distinction matters: funding a project and securing a buyer do not guarantee that it will reach planned output on schedule or within budget.

What Investors Must Test

A stronger investment case requires more than a large resource.

Investors need credible capital and operating costs, permits and infrastructure, proven processing technology, dependable feedstock and customers with workable contract terms.

Offtake agreements deserve particular scrutiny. A Financial Times analysis of battery-metal deals found that more than half of the agreements it examined between 2020 and 2024 had been delayed, renegotiated or cancelled. Such changes can weaken the revenue certainty developers need to secure financing.

The strongest lithium projects will be those that can withstand lower prices, manage construction risk and deliver consistent battery-grade material at competitive cost. Demand growth creates opportunity, but it does not guarantee profitability.For investors, the decisive question is no longer how much lithium lies underground. It is whether a project can turn that resource into reliable cash flow across market cycles.



RARE EARTHS

Brazil's Caldeira Project
From Resource to Commercial Reality

A completed feasibility study, encouraging pilot results and a proposed Lynas Rare Earths acquisition have advanced Caldeira's development. The challenge now is proving its commercial viability.



Brazil's Caldeira rare earth project, developed by Meteoric Resources in Minas Gerais, is progressing towards a potential construction decision as manufacturers seek alternative sources of critical minerals.

Its updated Ore Reserve stands at approximately 151.1 million tonnes grading 3,524 parts per million total rare earth oxides (TREO), supporting a mine life exceeding 20 years.

The feasibility study forecasts average annual production of 12,500 tonnes of TREO, including neodymium, praseodymium, dysprosium and terbium, essential elements for high-performance permanent magnets.

Testing the Processing Route

Caldeira's rare earths occur in weathered clay rather than conventional hard-rock deposits. This offers a different mining and processing approach, potentially reducing the need for drilling and blasting. However, recovery rates, reagent consumption, water recycling and residue management will determine its practical advantages.

Meteoric's pilot plant reported average magnet rare earth oxide (MREO) recovery of 71%, reaching 80% during optimisation in May 2026. Average total rare earth oxide (TREO) recovery was 61%, rising to 74% in May.

These company-reported pilot results are encouraging, but commercial-scale performance remains unproven.

The feasibility study estimates development capital expenditure of approximately US498million.Forecastlife-of-mineC-1cashcostsareUS11.68 per kilogram of TREO. These remain study estimates, not operating results.

Lynas Deal Changes the Picture

On October 1, 2026, Lynas Rare Earths agreed to acquire Meteoric through a proposed all-share transaction.

The agreement includes an interim funding facility of up to A$110 million to support development. The acquisition remains subject to shareholder, court and Brazilian regulatory approvals.

Construction is not yet authorised. Meteoric expects its Installation Licence to be considered in early 2027, while a final investment decision remains outstanding.

Caldeira has a defined reserve, a completed feasibility study and promising pilot results. Its next challenge is securing approvals and financing, then proving that the plant can deliver reliable production at the projected cost.

Until then, it remains a development opportunity rather than a commercial source of rare earth supply.

AI-Powered Core Logging

From Faster Images to Better Exploration Decisions

AI can turn drill-core photographs into structured geological data in minutes. But the real test is whether that speed produces reliable information that helps geologists make better exploration decisions.



Drill core provides direct evidence of the geology beneath the surface. Examining and documenting thousands of metres of core, however, takes time and can produce inconsistent results across teams. Artificial intelligence is beginning to automate parts of this workflow, helping exploration companies extract more information from both new and historical core images.

In October 2026, Seequent introduced AI-powered image analysis in its Imago platform. The company reported that the system processed 600 metres of drill-core imagery in two minutes, generating structured, depth-referenced data for further interpretation. This demonstrates image-processing speed, not the time required to complete and validate a full geological assessment.

Turning Images into Geological Data

Machine-learning systems can identify visible features such as fractures, core breaks and changes in core condition. These measurements can support Rock Quality Designation (RQD), an indicator used to assess rock-mass quality.

Automated analysis can help teams standardise routine measurements, review historical core images and update geological models more efficiently. However, photographs cannot establish mineral grades on their own or replace laboratory assays and appropriate mineralogical testing.

Even visible features can be difficult to classify. A break may have occurred naturally or during drilling and handling, while lighting, image quality and core orientation can affect automated measurements.

Accuracy Matters More Than Speed

Research published in 2025 on machine learning for drill-core image analysis identified a key challenge: models that perform well on one dataset may not transfer reliably to different deposits, rock types or imaging conditions. Research results are also difficult to compare when studies use different datasets and evaluation methods.

Validation is therefore essential. Geologists must check automated outputs against the original core imagery and, where appropriate, physical samples and reference measurements. AI can accelerate routine analysis, but geological interpretation remains a human responsibility.

Better Decisions, Not Just Faster Logging

The commercial value of AI-powered core logging will depend on whether it improves data consistency and helps exploration teams refine targets, review drill intervals and update geological models. Companies must also assess implementation costs, data quality and the amount of expert review still required.





Simandou

Enters the Iron Ore Market Can New Supply Reshape Global Trade?

Simandou could diversify iron ore supply and challenge established exporters. But its market impact will depend on sustained production, reliable infrastructure and whether steelmakers can absorb additional volumes.

WORDS BY *SALINI KRISHNAN* // **DATA BY SKILLINGS RESEARCH**

fter years of delays and infrastructure challenges, Guinea's Simandou iron ore project is beginning to establish its place in the global market. Its high-grade resources and planned production capacity make it one of the most significant additions to the seaborne iron ore supply chain.

The timing is challenging. China, the world's largest iron ore buyer, continues to import substantial volumes despite weakness in its steel sector. As Simandou ramps up, the central question is whether new supply will meet future demand or intensify competition in an already pressured market.

Production Ramps Up, but Scale Takes Time

Rio Tinto reported on 14 October 2026 that Simandou achieved an annualised production run-rate of approximately 10 million tonnes per annum (Mtpa) during the third quarter, measured across the project on a 100% basis.

Quarterly figures reveal the early stage of the ramp-up. Simandou produced 2.5 million wet tonnes of iron ore fines, shipped 2.2 million wet tonnes to China and recorded sales of 1.3 million wet tonnes during the quarter.

These measures represent different stages of the supply chain. Production refers to ore ready for train loading at the SimFer mine gate. Sales are recognised later, after transport through the export system and

further processing in China. Rio Tinto estimates that the mine-to-sale cycle will take approximately 75-90 days at full production, with up to another 30 days for customer collection.

At the end of September, stockpiles across the wider system totalled 11.1 million tonnes, including material at the mine, port, on vessels and in China. The figures underline a central challenge: increasing mine output is only one part of the task; moving ore efficiently to customers is equally important.

Rio Tinto remains on track for a production run-rate of 60 Mtpa at the SimFer mine in the second half of 2028. This target applies to the SimFer operation, which covers blocks 3 and 4, rather than the entire Simandou development. Together, SimFer and the separate Winning Consortium Simandou operation are planned to support up to 120 Mtpa of exports. Actual deliveries will depend on the ramp-up of both mining operations and shared infrastructure.

A Challenge to Established Exporters

Australia and Brazil dominate seaborne iron ore supply. Simandou could give steelmakers another major source, gradually diversifying supply and increasing competition among exporters.

Its high-grade ore may offer advantages in suitable steelmaking processes, potentially reducing certain processing requirements. However, quality alone will not determine commercial success. Mining costs, transport expenses, product specifications and delivery reliability all influence the final cost to a steelmaker.

If Simandou expands output faster than demand grows, competing producers could face pressure on prices and margins. The effect will vary across the industry. Lower-cost producers with reliable logistics and products suited to customer requirements are generally better positioned to withstand market weakness.

China's Demand Will Shape the Outcome

China's market illustrates the uncertainty facing new supply. Reuters reported on 25 October that Chinese iron ore imports rose 4.1% during the first nine months of 2026. Port inventories reached 152.23 million tonnes in the week to 23 October, up 14% year-on-year. Benchmark iron ore prices had fallen about 19% from their May peak.

Higher imports do not necessarily indicate stronger steel consumption. Inventory accumulation can sustain purchasing even when steel production and end-user demand remain weak. If stockpiles stay elevated while steel demand softens, Simandou's expanding output could add to downward pressure on prices.

China is also seeking greater influence over purchasing terms through state buyer China Mineral Resources Group. Simandou offers a potential additional source, but building dependable supply at scale will take time. Australian producers are likely to remain important to China's supply chain for years to come.

Infrastructure Is the Critical Test

Simandou is as much a logistics undertaking as a mining operation. Its performance depends on coordinating mine output, rail transport, port handling and shipping. Bottlenecks at any stage could constrain exports, even as production increases.

The wider development relies on a shared railway and export infrastructure connecting inland deposits to Guinea's coast. The ability of the project partners to coordinate capacity, commissioning and operations will be crucial as volumes grow.

Supply Growth Meets Market Reality

Simandou is emerging as a significant new participant in the iron ore trade, but its long-term influence will depend on execution and market conditions. Sustained production, dependable logistics and competitive delivered costs will determine how quickly it challenges established exporters.

For producers and investors, the central question is whether steel demand can absorb the additional supply. If production grows faster than consumption, pricing pressure could intensify. If demand holds and customers value Simandou's ore quality, the project could reshape competition without necessarily triggering a prolonged market downturn.



How Risk-Sharing Is Making Strategic Mining Projects Bankable

Strategic minerals may be essential, but projects still need competitive costs, reliable customers and financing that can withstand market volatility.



The Bankability Challenge

Developing a mine or processing plant can require years of construction and substantial capital before revenue begins. Prices can fall, costs can overrun and new facilities must compete with established producers. Strategic importance alone does not make a project financially viable.

Investors need confidence in construction schedules, processing performance, future sales and debt repayment.Uncertainty can raise financing costs or prevent a project from reaching a final investment decision.

THREE WAYS TO REDUCE RISK

Debt must be repaid, usually with interest. Lenders therefore look for predictable cash flow and manageable construction risk. Projects using unproven technology or exposed to volatile prices may struggle to secure affordable loans.

Equity investors own a stake and share future gains or losses. Equity strengthens a project's capital base, but can dilute existing shareholders and requires returns that reflect the risk.

Buyer-backed financing can improve revenue visibility. Long-term offtake agreements, prepayments or direct customer investment can help developers secure funding. However, an offtake agreement does not guarantee a profitable price. Its value depends on pricing terms, product qualification, volumes and the buyer's creditworthiness.

CASE STUDY | Korea Zinc's Project Crucible

Korea Zinc's planned Project Crucible in Clarksville, Tennessee, illustrates how government support and private finance can help develop strategic processing capacity.The proposed facility is designed to produce 13 critical and strategic minerals for industries including semiconductors, aerospace, defence and manufacturing.

The project's estimated total investment is US7.4billion,includingworkingcapitalandfinancingcosts,whileexpectedcapitalexpenditureisUS6.6 billion. The announced structure includes a US210millionUSDepartmentofCommercegrantandmorethanUS3.7 billion in Department of War equity and loan funding.

A commercial-bank syndicate led by JPMorgan is expected to provide an initial US$2.349 billion senior secured loan. This facility is linked to the wider financing arrangements and must not be added to the government-backed loan figure as though it were entirely separate funding.Part of the bank loan is planned to be refinanced through an export-credit agency facility.The project is expected to become operational by 2029. These are announced plans, not a guarantee of completion; construction, commissioning and market risks remain.

Price Support Has Limits

Governments are also considering price floors, contracts for difference and purchase commitments to protect selected projects against severe price declines. These mechanisms can help address volatile prices and competition from established producers, but their availability and design vary by market.

Poorly designed support can shift excessive costs to taxpayers or sustain uncompetitive projects. The right approach depends on the mineral, market structure and strategic objective.

Capital Must Deliver Capacity

JPMorganChase's US1.5trillionSecurityandResiliencyInitiativespansmultipleindustries.Initsfirstyear,thebankreportedmorethanUS230 billion in financing and facilitated transactions across its focus sectors. These figures cover the broader initiative, not critical minerals alone.

Market Intelligence:

October Critical Minerals Tracker – Funding, Projects and Strategic Deals

October 2026 saw new financing commitments for critical-minerals projects in Australia and strategic raw-material initiatives across Europe. Australia conditionally approved up to A$70 million for Astron Corporation's Donald mineral sands project, alongside up to A$110 million in senior debt from the National Reconstruction Fund. The project is expected to produce light and heavy rare earths. Australia also conditionally approved a US$41.4 million loan to Global Advanced Metals to support tantalum production.



Meanwhile, the European Commission selected 46 additional strategic raw-material projects across 16 member states, covering extraction, processing and recycling.

The key challenge remains converting financing commitments and strategic approvals into operating capacity. Permitting, construction, processing capabilities and long-term offtake agreements will determine whether these initiatives strengthen critical-mineral supply chains.

2025 GLOBAL CRUDE STEEL PRODUCTION TOTALS

Total world crude steel production was 1,849.4 Mt in 2025.

Rank	Country	2025	2024	%2025/2024
1	China	960.8	1005.1	-4.4
2	India	164.9	149.4	10.4
3	United States	82.0	79.5	3.1
4	Japan	80.7	84.0	-4.0
5	Russia (e)	67.8	71.0	-4.5
6	South Korea	61.9	63.6	-2.8
7	Türkiye	38.1	36.9	3.3
8	Germany	34.1	37.3	-8.6
9	Brazil	33.3	33.9	-1.6
10	Iran (e)	31.8	31.4	1.4
11	Viet Nam	24.7	22.0	12.2
12	Italy	20.7	20.0	3.6
13	Indonesia (e)	19.0	18.6	1.9
14	Taiwan, China (e)	17.1	19.2	-10.8
15	Mexico (e)	13.5	14.3	-5.9
16	Spain (e)	12.0	11.9	0.7
17	Canada (e)	11.5	12.3	-7.2
18	Saudi Arabia	10.8	9.6	12.3
19	Egypt	10.6	10.7	-0.8
20	France (e)	9.8	10.8	-8.7
21	Malaysia (e)	9.0	9.0	-0.2
22	Austria	7.6	7.1	5.9
23	Ukraine	7.4	7.6	-2.2
24	Poland (e)	7.2	7.1	0.8
25	Belgium (e)	7.2	7.1	0.5
26	Netherlands	6.5	6.4	1.4
27	Algeria (e)	5.3	4.5	17.9
28	Australia	5.2	4.7	12.1
29	Thailand (e)	5.0	4.9	2.6
30	Bangladesh (e)	4.5	4.5	0.0
31	South Africa	4.5	4.7	-4.7
32	Kazakhstan	4.3	4.2	2.2
33	Argentina	4.0	3.9	4.2
34	Sweden	4.0	4.0	-0.7
35	United Arab Emirates	3.8	3.7	3.3
36	Finland	3.7	3.7	2.1
37	Slovakia (e)	3.7	3.9	-5.6
38	Pakistan (e)	3.6	4.1	-12.2
39	Iraq (e)	3.0	3.0	0.3
40	Oman (e)	3.0	3.0	0.0
	Others	41.8	44.1	-5.3
	World	**1849.4**	**1886.8**	**-2.0**

Source – World Steel Association. 2025 Steel Statistical Yearbook published

e – annual figure estimated using partial data or non-worldsteel resources. * The world total production figure in this table includes estimates of other countries that only report annually.

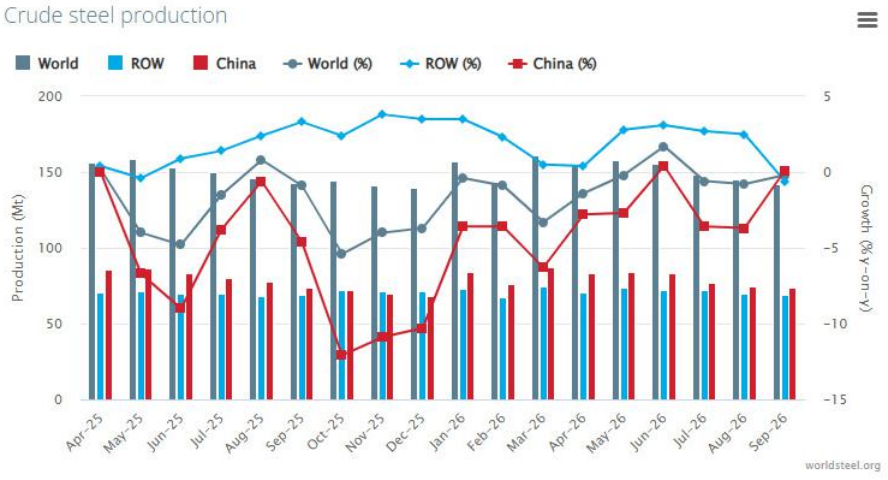
STATISTICS

SEPTEMBER 2026 CRUDE STEEL PRODUCTION

World crude steel production for the 70 countries reporting to the World Steel Association (world steel) was 142.4 million tonnes (Mt) in September 2026, a 0.2% decrease compared to September 2025.

Africa produced 2.2 Mt in September 2026, up 10.6% on September 2025. Asia and Oceania produced 104.0 Mt, up 0.7%. The EU (27) produced 10.1 Mt, down 5.0%. Europe, Other produced 3.6 Mt, down 1.4%. The Middle East produced 3.6 Mt, down 20.4%. North America produced 9.3 Mt, up 3.4%. Russia & other CIS + Ukraine produced 6.1 Mt, down 1.9%. South America produced 3.5 Mt, up 0.2%.

The 70 countries included in this table accounted for approximately 98% of total world crude steel production in 2025. Regions and countries covered by the table: Africa, Asia and Oceania, European Union (27), Europe, Other, Middle East, North America, Russia & other CIS + Ukraine, South America.



TOP 10 STEEL-PRODUCING COUNTRIES

China produced 73.6 Mt in September 2026, up 0.1% on September 2025. India produced 13.9 Mt, up 1.9%. The United States is estimated to have produced 7.2 Mt, up 4.3%. Japan produced 6.3 Mt, down 0.6%. Russia is estimated to have produced 5.5 Mt, up 6.2%. South Korea produced 5.2 Mt, up 3.6%. Türkiye produced 3.2 Mt, up 0.8%. Germany produced 2.6 Mt, down 13.0%. Brazil produced 2.8 Mt, down 0.8%. Viet Nam produced 2.6 Mt, up 29.1%.

TABLE 1. CRUDE STEEL PRODUCTION BY REGION

	SEP 2026 (MT)	% CHANGE SEP 26/25	JAN-SEP 26 (MT)	% CHANGE JAN-SEP 26/25
Africa	2.2	10.6	19.0	9.7
Asia and Oceania	104.0	0.7	1,009.8	-0.9
EU (27)	10.1	-5.0	94.5	-0.8
Europe, Other	3.6	-1.4	33.0	4.1
Middle East	3.6	-20.4	36.9	-9.2
North America	9.3	3.4	84.7	4.7
Russia & other CIS + Ukraine	6.1	-1.9	58.2	-5.0
South America	3.5	0.2	31.2	-0.2
Total 70 countries	**142.4**	**-0.2**	**1,367.5**	**-0.7**

TABLE 2. TOP 10 STEEL-PRODUCING COUNTRIES

	SEP 2026 (MT)	% CHANGE SEP 26/25	JAN-SEP 2026 (MT)	% CHANGE JAN-SEP 26/25
China	73.6	0.1	724.8	-2.9
India	13.9	1.9	130.0	5.6
United States (e)	7.2	4.3	64.9	5.8
Japan	6.3	-0.6	60.3	-0.3
Russia (e)	5.5	6.2	49.4	-3.6
South Korea	5.2	3.6	48.0	2.9
Türkiye	3.2	0.8	29.8	6.1
Germany	2.6	-13.0	26.5	4.0
Brazil	2.8	-0.8	24.6	-1.7
Viet Nam	2.6	29.1	23.2	29.1

The 70 countries included in this table accounted for approximately 98% of total world crude steel production in 2025. Africa: Algeria, Egypt, Libya, Morocco, South Africa, Tunisia, Asia and Oceania: Australia, China, India, Japan, Mongolia, New Zealand, Pakistan, South Korea, Taiwan (China), Thailand, Viet Nam, European Union (27): Austria, Belgium, Bulgaria, Czechia, Finland, France, Germany, Greece, Italy, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Europe, Other: Macedonia, Norway, Serbia, Türkiye, United Kingdom, Middle East: Bahrain, Iran, Iraq, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, Yemen North America: Canada, Cuba, El Salvador, Guatemala, Mexico, United States

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