



Energy Mining

# Striking heat and metal: why mining and geothermal should forge a new alliance

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**By Dr Marit Brommer, CEO and Dr Helen Robinson, Global R&D Manager,  
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The global mining industry consumes around 11 per cent of the world's total power – a staggering figure that underscores the sector's critical role in the clean energy transition. As the world demands more metals for batteries, wind turbines, and electric vehicles, mining is seeking new ways to become more sustainable. Enter geothermal energy: an abundant, baseload, and local solution with transformative potential.

But this is more than just one sector borrowing from another. Geothermal and mining are natural allies, with deep technological overlaps, mutual decarbonisation goals, and even co-located opportunities. What's more, even after a mine closes, it can offer new geothermal life through mine water heating – an emerging approach to district-scale, clean heat systems. It's time to connect the dots – and co-develop a shared future.





*International Geothermal Association Chief Executive, Dr. Marit Brommer, at the 2024 NZ Geothermal Workshop in Auckland.*

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### **Africa: A legacy and a frontier**

This alliance is not new on African soil. Few know that the continent's first geothermal power plant was built not in Kenya's Rift Valley, but in the copper- and tin-rich Katanga Province of the [Democratic Republic of Congo](#). In 1952, a 250 kW binary geothermal plant at [Kiabukwa](#) was developed to power tin mining operations – marking one of the earliest examples of mining-geothermal integration anywhere in the world. Engineers leveraged a nearby 91 °C hot spring, delivering clean energy long before Wairakei came online in New Zealand.

Today, Africa is rediscovering its geothermal potential, with mining players exploring heat beneath their feet to power the next wave of critical mineral extraction:

- In South Africa, Gold Fields is assessing geothermal use in the deep Witwatersrand gold mines, where rock temperatures are high and ventilation costs are significant. Cooling and refrigeration – critical for safety – could be supported by geothermal systems that extract and repurpose subsurface heat.

- In Eritrea, Australian mining company Danakali is exploring the utilisation of geothermal at its Colluli mine to meet operational demands in this remote, off-grid region.
- In Namibia, lithium developer Lapedico is exploring geothermal energy to reduce fossil reliance.
- In Tanzania, Helium One's drilling in the Rukwa Basin has uncovered geothermal brines rich in helium, suggesting a new frontier of rare gas and heat co-production.
- In Kenya, geothermal powerhouse KenGen is now testing mineral recovery from its geothermal brines – exploring how to extract silica, lithium, and other critical elements as part of its diversification strategy.

These examples show that Africa is not just a passive receiver of imported energy models – it is an incubator of geothermal-mining innovation that could lead global thinking.



*Dr. Marit Brommer and Seequent's Energy Segment Director, Jeremy O'Brien, announce their strategic partnership to boost geothermal's role as a renewable energy source.*

### **Geothermal: powering the mines of tomorrow**

Mining operations, often remote and energy-intensive, are under pressure to reduce emissions. Geothermal offers a solution: reliable, on-site, low-emission power. A

standout case is the Lihir gold mine in Papua New Guinea, which tapped into geothermal reservoirs of 240–300°C to generate 6 MW of clean power in 2003. Today, that has grown significantly, supplying about 75% of the mine's electricity, avoiding millions in fuel costs, and dramatically improving its environmental footprint.

Across Indonesia, Chile, and the western United States, overlaps between geothermal reservoirs and mineral-rich formations are increasingly identified. These are not coincidences – hydrothermal alteration, the geological process that forms copper, silver, and gold deposits, also creates the high-temperature environments that enable geothermal power. Where you see hot fluids and alteration zones, you often see both metals and megawatts.

### **Tools, data, and talent – shared from the start**

Beyond geology, mining and geothermal share core exploration methods: surface mapping, geophysical surveys, geochemical sampling, and 3D modelling. These synergies lower costs, speed up discovery, and enable data-sharing ecosystems. For example, the EarthMRI initiative by the U.S. Geological Survey generates national-scale subsurface datasets that can support both mining and geothermal development.

[The partnership](#) between Seequent and the International Geothermal Association (IGA) is an example of working smarter, not harder – Seequent's geological modelling software was originally designed with mining in mind, but its subsurface software portfolio has application cross industry, including helping shape the future of geothermal projects globally as well. We don't need to build parallel systems. We need to build shared ones.

### **From active mines to thermal legacy: The mine water revolution**

Geothermal doesn't end when a mine shuts down. Flooded underground mines – once seen as costly liabilities – are now being reimagined as subsurface thermal batteries. This concept, known as mine water geothermal, is already powering heating networks across Europe:

In Heerlen, the Netherlands, a disused coal mine now provides geothermal heating and cooling to over 350 buildings.

The UK Mining Remediation Authority supports more than 70 mine water heating projects, seeing them as key to the country's transition.

Here's how it works: flooded mine galleries typically stabilise at 12–25°C. By circulating this water through heat exchangers and pumps, it's possible to deliver low-carbon district heating to homes, schools, and businesses – especially in former coal regions.

This isn't only a European story. Countries with mining legacies – Canada, South Africa, China, Australia, the United States – can use mine water geothermal to revitalise post-mining communities, extend asset value, and reduce environmental risks. Designing energy reuse as part of mine closure should be the norm within mining companies to ensure what begins as extraction ends as regeneration.

### **Enhanced geothermal, strategic investments, and rare earth recovery**

Geothermal's evolution continues. Enhanced Geothermal Systems (EGS) – engineered reservoirs in hot dry rock – allow geothermal to flourish even outside traditional hydrothermal zones. This is particularly promising for mining sites that already have deep wells or suitable geology. In Nevada, Fervo Energy is using EGS to power Google's remote data centres. Similar models could easily be applied to mining operations looking to go off-grid.

Meanwhile, the U.S. Department of Energy's GEODE initiative is investigating how geothermal fluids can become sources of rare earth elements and critical minerals, turning geothermal power plants into dual-purpose energy and mining facilities.

And large mining firms are investing. Freeport McMoRan is working with the U.S. DOE on geothermal solutions to decarbonise its copper production, signalling an important trend: strategic mining players see geothermal not as a side story, but as a pillar of ESG transformation.

11%

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1952

New Zealand's  
Kiabukwa plant  
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6 MW

of clean power  
generated by Lihir  
gold mine, Papua  
New Guinea, in 2003

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Of course, challenges remain. Geothermal infrastructure requires steel and specialty metals – commodities deeply tied to mining. There's a circularity here that must be addressed with transparency and sustainable procurement. Moreover, geothermal's high upfront costs – particularly for drilling – can deter companies unfamiliar with long-term infrastructure investments. This calls for blended finance models, government guarantees, and regulatory frameworks that allow for co-development and co-permitting.

### **The jobs to be done: a cross-sector call to action**

To truly capitalise on this convergence, we need:

Integrated licensing for overlapping geothermal and mining tenures

Open data platforms for subsurface exploration and resource characterization

Co-investment strategies for joint geothermal-mining projects

Incentives for mine water geothermal planning in closure and reclamation stages

Shared curricula and training programs that build dual-sector expertise

Let's not leave this up to chance. At the 2024 Resources Tomorrow event, the IGA challenged both sectors to act – together. Let mining no longer be seen only as an extractive industry, and geothermal not only as a niche renewable. Their union has the potential to redefine how we use the Earth's subsurface: for heat, for metals, and for a sustainable low-carbon future.