

Canada faces net-zero acid test

Metallurgists in Montreal for a conference this week say challenges they face in sourcing skilled chemical engineers and greener reagents could complicate their role in Canada's net-zero carbon strategy.



Future Of Mining > Sustainability The Canadian Net-Zero Emissions Accountability Act, which became law on June 29, 2021, aims to mobilise the country's society and industries to achieve a 40-45% reduction in greenhouse gas emissions by 2030, and to reach net zero

Comments

emissions by 2050.

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Andrew Ghattas, a director at Natural Resources Canada, said at the Annual Conference of Metallurgists that the law was designed with specific focuses to help sectors, such as mining, reach their decarbonisation goals.

He also said, however, that Canada aims to solidify its leading position in aluminium, potash, and uranium, as well as ramping up production of processing of scandium and vanadium.

"We want our international partners to know that we have the resources, and a plan to develop them."

Canada is the world's second-largest producer of the rare earth metal niobium, critical for turbines and superconducting magnets, and is the fourth-largest producer of zinc and aluminium. It is the sixth-largest producer of nickel worldwide, eighth in iron ore, and 11th in copper.

The government plans to step up production of these critical minerals while also achieving other objectives, such as developing critical infrastructure, deepening engagement with indigenous populations, Ghattas said. It also wants to strengthen the economies of rural and remote regions by connecting them with operations in the country's south.

Regulatory roadblocks

He admitted, however, that bottlenecks in areas such as permitting could put pressure on meeting these production goals.

The Canadian government is aware that it needs to improve the regulatory process and reduce wait times for mines to receive clearance. The federal government is discussing different ways to address this, Ghattas said, including developing strategies to extract better data to determine a project's geology, finances, and environmental impact at its outset.

He said that issues are identified midway through the permitting process, which inevitably leads to delays.

Deeper engagement with indigenous groups at the outset is also being explored, as many new projects are located on indigenous land. The government has written a draft paper on increasing consultation with

indigenous groups, which is open for comment until September 15, Ghattas said.

He added that Canada is also working on ways to de-risk investment in mining and increasing funding to develop the required workforce to meet these net-zero goals. De-risking may take the form of encouraging the formation of JVs to share the risk and advance innovation.

While fully supportive of Canada's aim to embrace decarbonisation, some practitioners in the mining space pointed to areas where immediate improvements are required to meet these aims.

One metallurgist took issue with how the push to net-zero seems to be glossing over carbon emissions created in the supply chain for mined products.

"This 'cradle-to-grave' approach [in calculating emissions] should be applied to every reagent material in processing," BBA Consultants' Kevan Ford told *Mining Magazine*.

He cited cyanide, which has a very high carbon footprint. "We need to go back and do a Life Cycle Assessment to establish carbon emissions," he said.

He criticised the current approach to net zero in the mining sector, saying the industry is "taking snapshots" and limited audits, but not taking in carbon emissions for entire processes.

"The fundamentals of chemistry need to be better understood to solve these challenges, a lot of processes are restrained by a lack of understanding of chemistry."

Another consultant at BBA, National Director for Mines and Metals Colin Hardie, earlier told *Mining Magazine* that the mining industry will need to recruit many more chemical engineers to fine-tune processes and ensure that products meet the very tight specifications required by customers for battery-grade metals.

Brain drain

Ford is concerned that Canada may not have the human capital to meet these net-zero targets.

"There's a critical shortage of good skills," which has led to the industry being populated by "grey-haired guys and whiz kids," he said. Workers in the 40- 50 age bracket are few, he said. "We've got to get good people."

Several participants said that Canada no longer has the research and development labs it used to, impacting talent development.

People can earn MAs and find work, Dr Hani Henein, an engineering professor at the University of Alberta said. However, PhD students are moving abroad because corporate R&D labs have largely left Canada. Henein would like to see more government action on retaining and attracting R&D labs to build capacity.

"Nothing has been done to entice them to stay," he said. "This is a critical piece in the innovation pathway."

Acceleration of carbon-cutting technologies will take talent, funding, and the right pilot plan, metallurgist Phillip Mackey said.

"It needs increased research and development funding, not only from the government, but also from large mining companies operating in Canada," he said.

Hot for hydrogen

Two questions dominated the conference: where mining projects will source energy, and how projects would increase production to meet future demand, particularly in the case of electric vehicles.

On the energy front, many panellists and participants have an eye on hydrogen.

Many conference attendees remained sceptical about renewable energy's capacity to meet industrial electricity demand, given the many high-energy processes required to produce metal products. Panellists seemed more hopeful that hydrogen power could fill this need, and pointed to the increased production of hydrogen globally, with plants being built in Saudi Arabia, Nevada, and California, while Europe is building a pipeline for hydrogen production.

Hydrogen is also being touted as a way to reduce the carbon cost of refining processes.

Mackey said that new technology in refining nickel sulphides using H₂ is being tested, while H₂-based fuels are also being tested in rotary kiln-electric furnace smelting.

The industry will need to accelerate its innovation, Marty Tyrawskyj of National Resource Canada said.

"We need to accelerate on discovering metals and processes," he said. "We can't wait 15 years to develop them. We need to get out of our standard way of doing things and push the discovery of metals exponentially to meet these [climate] goals."

As for the increased production of rare earth metals, metallurgist John R Goode said it is not likely that Canada will meet its 2030 aims.

Goode calculated the amount of praeisidium and neodymium projected to be produced by existing projects in Canada by 2030, and determined that Canada will have a 10% shortfall of these materials, compared to its projected demand.

"New separation, reduction, and magnet-making plants are required," Goode said.

Magnet demand is primarily driven by projected demand for electric vehicles, he said. There may be an adjustment to this demand, depending on a variety of factors such as attitudes towards commuting for work, improvements in public transit, or the lack of sufficient charging stations.

If Canada were to adjust its targets and move back deadlines by a few years, there will likely be no shortages, he said. This is unlikely as the targets are now law.

A shortage in rare earths materials will also lead to greater substitution, which will increase recycling of these materials, Goode said.



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