

# Northern Miner

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## Scandium International hits feasibility study milestone



Drillers at Scandium International Mining's Nyngan scandium project in New South Wales, Australia. Credit: Scandium International Mining.

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With a management team loaded with former executives from **BHP Billiton** (NYSE: BHP) and a definitive feasibility study under its belt for a specialty metal project with a 20-year mine life, based on just 10% of the resource, **Scandium International Mining** (TSX: SCY) stands out in the crowded landscape of junior mining companies.

Its large, high-grade scandium project in the Australian state of New South Wales, 500 km northwest of Sydney, is a shallow, flat-surface mineable resource that could enter

production as soon as January 2018, at a cost of US\$87 million. The company has already submitted its environmental impact statement and signed the first of what it hopes will be many off-take agreements.

“There are no primary scandium mines anywhere,” the junior’s president and CEO George Putnam says in an interview. “We wouldn’t know of another place to go to find another highly weathered, lateritic environment that would deliver the same level of scandium grades.”

The specialty metal scandium enhances the performance of aluminum alloys by refining its grain structure, and making aluminum stronger. Aluminum-scandium alloys are also known for their corrosion resistance, weldability and heat tolerance. Scandium is a superior heat stabilizer in solid oxide fuel cells, for example, and can work in metal-halide lighting to resemble natural sunlight.

The most obvious uses of scandium-enhanced aluminum alloys are in the transportation business, where light-weighting carries a premium.



Scandium International Mining's Nyngan scandium property in Australia. Credit: Scandium International Mining.

"The Russians in the Soviet era figured out how dramatic scandium's impact was as a grain refiner, and used it in their military programs," Putnam says. "While we knew something about it and understood what it did to aluminum, there was no decent source to build on, so military aircraft designers in the West focused on titanium and its alloys."

When the Berlin Wall fell in 1989, Russian technology on aluminum scandium alloys was picked up by Airbus technical groups in West Germany, he says, giving a clearer picture of scandium's impact on aluminum alloy performance. Boeing has also known about scandium aluminum alloys for just as long and has done its own research, while Alcoa patented scandium aluminum alloys long enough ago that the recipes are now off-patent, so anyone can make them.

"There is no secret sauce, we all know what to do with it in the aluminum alloy business," Putnam says. "The only people left to clearly understand this opportunity are investors."

"We see an explosive forward market in scandium and we saw the opportunity to be first and different from everybody else, and we liked that. We believe investors who like specialty metals should really like scandium because of this significant market potential."

The Nyngan project sits in the clay belt of New South Wales, where past exploration found economic values of nickel, platinum and cobalt — metals commonly associated with scandium. But in each case, exploration generated only limited success, with interesting but marginal values of these metals found (less than 1% nickel and less than 1 gram per tonne platinum).

"Whatever mother nature did to displace the nickel and cobalt primary mineralization and concentrate it with scandium hasn't happened elsewhere, and that's really the game-changer here — that's what allows us to build a scandium-only project, get good economics and bring a substantial amount of scandium to the market," Putnam says.

According to the feasibility study completed in April, the Nyngan mine could produce an average 37,690 kilograms of scandium oxide a year at grades of 98% to 99.9%, and generate an after-tax, cumulative cash flow over the project's 20-year mine life of US\$629 million. The initial capex of US\$87.1 million can be paid back in 3.3 years, and the project produces an after-tax net present value at a 10% discount rate of US\$177.5 million, and a 33.1% after-tax internal rate of return.

The feasibility study is based on a 16.9-million-tonne, revised estimate of measured and indicated resources averaging 235 parts per million (ppm) scandium — up 40% from a 2010 estimate. (Proven and probable reserves stand at 1.4 million tonnes grading 409 ppm scandium.)

The mine plan envisions a plant feed of 240 tonnes per day, or 75,000 tonnes a year, based on a conventional, open-pit operation, with a strip ratio of overburden to resource of 2.1 to 1. Processing will involve the initial application of high-pressure acid leaching, using a continuous autoclave that is pressure fed with pre-heated ore and dosed with sulphuric acid. Subsequent circuits will recover the liberated scandium using solvent extraction, oxalate precipitation and calcination to generate a scandium oxide product.

Once at nameplate capacity, the plant could make between 36,600 and 42,000 kilograms of scandium oxide ( $\text{Sc}_2\text{O}_3$ ) product annually, and average 37,690 kilograms a year over the mine life. Oxide product would be produced on-site at grades of between 98% and 99.9% as  $\text{Sc}_2\text{O}_3$ , and be offered at grades that meet customer requirements and are packaged for direct sale to end users.

The largest operating cost will be reagents — sulphuric acid in particular. Total mining costs are an estimated US\$18.45 per tonne, or US\$35.15 per oxide kilogram, with total annual cash-operating costs of US\$292.10 per processed tonne and US\$556.57 per oxide kilogram. Based on available price estimates for scandium oxide, the feasibility study used US\$2,000 per kilogram as its price assumption.

Putnam says commissioning could start as early as October 2017 and start up in the first quarter of 2018, with first production in March 2018.

“We’ve turned a corner with the final feasibility study and the economics are good, dare I say robust,” Putnam says, adding that the company has spent US\$1.5 million to complete the flow sheet over the last four years. “I don’t see the financing as problematic. I know raising US\$100 million is not something that can just be assumed will be automatic, but we’ve prepared well ... [and] we think the project is unique and robust enough to get funded.”

The company already has an off-take agreement for 7,500 kilograms a year over three years with **Alcereco**, a private Canadian company in Kingston, Ont., that was founded by former scientists at Alcan who researched and developed advanced alloys.

Putnam doesn’t believe it will be that hard to find other off-takers to sign on.

“It won’t all be absorbed by the aircraft business, some will be in the automotive business, particularly automotive parts,” he says. “You could make a great high-speed train out of this, a good subway or a light-rail system — the faster the train goes the more light-weighting is important, and the more important it is to pay a premium for the scandium application ... we believe scandium aluminum is also going to be particularly adept in the extrusion area, and that’s a huge specialty market. Extruders get strong premiums.”

Putnam, whose career includes decades as assistant treasurer at BHP, says Scandium Mining’s management team is perfectly geared towards the next leg of Nyngan’s development.

“Almost all the management is ex-BHP — we’ve all run operations before, and we’re miners,” he says. “We’re just moving towards our sweet spot in terms of our collective management experience.”

Scandium International owns 80% of Nyngan and the remaining 20% is held by **Scandium Investments LLC**, a Nevada corporation owned by private interests.

Shares of Scandium International traded at 19¢ at press time, within a 52-week range of 7.5¢ to 23¢.

Christopher Ecclestone of Hallgarten & Co., a boutique investment firm based in London, has a 12-month, 60¢ target price on the stock.

“Scandium is one of the lesser-talked-of technology metals, but one that is getting increasing focus and mention,” he said in a research note. “It is the only definitive feasibility study on a primary scandium property that we know of.

“One might call the Nyngan project the ‘Bayan Obo of scandium,’” he adds, referring to China’s massive iron ore deposit and the world’s largest rare earth mine.

The Chinese are a major producer of scandium oxide, which is in limited supply.