

Scandium International – DFS sets the CAPEX Bar Low

In 2014 when we first brought Scandium to the attention of investors, one of “first movers” was Scandium International Mining (TSX: SCY) then called EMC Metals that was advancing its project which has now reached the Definitive Feasibility stage while gaining a potential offtaker. The very affordable capex number has set the bar low and Scandium wannabes will find it very hard to come in with numbers lower than those for the Nyngan project.

Its operational focus is on scandium project holdings, specifically the Nyngan Scandium project (and the neighbouring Honeybugle property) in Australia. The NSW laterite clay belt offers a unique production advantage. The Nyngan deposit is large and the grades are rather stunning. Nyngan might be described as the “Bayan Obo of Scandium”. The company also holds the Tørdal Scandium project in Norway. It is on the Nyngan Project that the Latest DFS has been published.

The Rationale

Scandium is one of the lesser talked of technology metals but one that is getting increasing focus and mention. This is despite the fact that the supply situation is dire with literally only a few tons of product hitting the market per annum and even that is as a by-product of the refining and processing of other metals. The applications for the element are known, particularly in aluminium alloys, solid oxide fuel cells and lighting but it’s just that manufacturers will not tool up for the metal if they cannot be guaranteed greater (reliable) supply.

Nyngan

The Nyngan scandium resource is located approximately 500

kilometers northwest of Sydney, Australia. It has in its time been trawled over by such substantial (now disappeared) players as Selection Trust, North Broken Hill and Anaconda. The property consists of three exploration licenses encompassing over 9,000 hectares, and is accessible via a 25 km sealed road from the local town of Nyngan.



Resource & Reserves

The original resource was established on the Nyngan property in 2010.

The revised NI 43-101 Measured and Indicated scandium resource now totals 16.9 million tonnes at an average grade of 235ppm scandium, from all scandium-bearing sources including hematite, limonite, saprolite and some bedrock resource material. The updated resource retains the same economic cut-off value of 100ppm as was used in the earlier resource estimate.



Another result of the DFS was the publication of the first Reserve on a portion of the resource, associated specifically with that portion of the limonite resource. The DFS utilizes 1.4334 million tonnes of limonite resource over 20 years, almost all in the Measured Resource category, and that portion of the overall resource has generated the Reserve figure.



PEA/PFS


In October 2014, the company published its Technical Report on the Feasibility on Nyngan prepared by the engineering firm of Larpro Pty Ltd, of Brisbane. The main mining assumptions were that a portion of limonite-only resource, in one particular

area of the overall resource, would provide a 20-year mining pit sufficient to supply the processing facility at a rate of 75,000 tpa, at an average grade of 371ppm Scandium. The results of that PEA are shown in a comparative table below. It is important to note that the estimates utilized an AUD/USD foreign exchange rate of US\$0.90 even though the rate subsequently dived to nearly US0.70.

The PEA premised a conventional flow sheet, employing high pressure acid leach (HPAL) and solvent extraction (SX) techniques, which were modeled and validated from METSIM modeling and bench scale/pilot scale metallurgical test work.



The Definitive Feasibility Study

In April of 2016, the company published its long awaited  DFS. This document was important not only in that it updated the previous PEA but in that it is the only DFS on a primary Scandium property that we know of and thus gave the market an in-depth view of how such a project might evolve and its implications in costings and potential addition of supply to Scandium Oxide to the global marketplace.

The well-known Australian consulting firm, Lycopodium Limited, (ASX:LYL) led the feasibility study.

The DFS outlines that the likely capex is US\$87.14mn, most of which is related to processing costs and infrastructure, as detailed at the right.

Mining & Processing

The Nyngan deposit is surface-mineable, with an overall strip ratio approximating 3.4:1. The mine plan is limited to a 20-year duration, with the plan utilising less than 12% of the total measured and indicated resource contained in the resource model. There will be two pits with the depths being

50 m and 45 m for the western and eastern pit respectively.

The mine plan targets delivery of only limonite resource to the processing facility, the processing route designed in this Feasibility Study is tailored for limonite-only production, at a 75,000 tpa ore feed rate.

At a daily process plant feed rate of 240 tpd, the strategy is to campaign mine and stockpile the mined material several times during the year, rather than attempt to maintain and operate an even smaller mining fleet throughout the year. It is envisaged that 25,000 to 30,000 tonnes of scandium-bearing material will be mined during each campaign. The mining strategy will minimise stockpile quantities by only mining the required ore quantities during each mining campaign. On this basis, the required ROM capacity is relatively small, at 50,000 t maximum.

The High Pressure Acid Leach (HPAL) test work, solvent extraction and precipitation programs conducted in 2015 have resulted in an evolution of the flowsheet compared to that developed by other researchers in the following areas:

- The extraction phase could be conducted successfully on HPAL discharge liquor
- Stripping was easily conducted with a low acid strip solution
- High purity scandium oxalate could be precipitated from the solvent extraction loaded strip liquor
- Calcined scandium oxide, approaching 99.9% purity can be produced using the process flowsheet that has been developed with 83.7% scandium recovery of scandium in feed to final product



The scandium oxalate precipitate is filtered in a plate and frame filter press. The scandium oxalate is added to rotating kiln furnace and calcined to scandium oxide at 900°C, before

being washed with deionised water and filtered. The scandium oxide is then dried and dispatched in small security drums.



Once at nameplate capacity, the processing plant is forecast to produce between 36,600 and 42,000 kilograms of scandium oxide product per year, averaging 37,690 kilograms/year over the 20 year feasibility study production period. Oxide product will be produced on-site at grades between 98% and 99.9%, as Sc₂O₃, and will be offered at grades that meet various customer requirements, suitably packaged for direct sales to end users.

So in summary the main features of the current study are:

- A Reserve totaling 1.43 million tonnes, grading 409ppm Sc was established on the limonite part of the resource
- Recently published Definitive Feasibility Study estimates CapEx at a low US\$87mn
- DFS projects NPV (at 10%) of US\$177 million and IRR is 33.1%, (NPV at 8% is US\$225 million)
- Cash costs of US\$557 per kg of Scandium Oxide, with DFS utilizing US\$2,000 per kg pricing while current price is somewhere around US\$5,000 per kg
- Oxide product volume averages 37,690 kg per year, over 20 years, giving revenues of over US\$75mn per annum and operating revenues (EBITDA) of around US\$50mn per annum
- Strong potential for expansion of demand based upon increased availability at current or lower prices – applications follow supply

Pricing

There is a certain element of licking your finger and sticking it in the air to see which way the breeze is blowing in Scandium pricing. It seems to be conducted mainly by nods and winks. The USGS has some numbers available but their accuracy remains undecided. At least they give us a guide.



It is key to note the SCY is using a price of \$2,000, so a good 60% below supposed current market prices. Scandium International will not only be a first mover it will be a game changer in the Scandium space.

Conclusion

Now the DFS has come off the presses, the investment community can see that the capex is on the right side of achievable helped by the infrastructure and jurisdictional advantages of being located in central New South Wales.

While the project's rated production is higher than the perceived global consumption, that global consumption number is suspect and more likely to be upwardly revised than to be an over-estimation. The dynamic of "build it and they will come" also seems to have promise here with Scandium having a potential for expanded demand if only end-users could be sure they can get all they need if they tool up for greater production of lamps, bicycles, auto parts, wheels, aircraft, high speed trains--whatever wants a lightweight high performing metal alloy, ideally already being made from aluminum.

Certainly Nyngan moving into operation might also drive down prices making the metal more accessible to potential users with the potential to create a virtuous cycle of affordability and enhanced supply driving widened applications. Beyond all this it creates a market for a specialty metal, in a safe Western jurisdiction, over which the Chinese do not have a stranglehold.

In the absence of other comps in this metal another way to look at the Nyngan scandium project is as an equivalent to a one ounce/tonne gold project. One tonne of 400 ppm (g/t) elemental Sc = US\$1,200 revenue, assuming a US\$2,000/kg sales

price for oxide, equates to an ounce of gold at US\$1,200/oz.

The challenge now will be financing, with the most likely scenario being an offtaker stepping up to ensure that they get first dibs on the product flow from the mine upon completion.