

With plans to become a significant producer of the magnet rare earths, Defense Metals deserves a deeper dive

written by Tracy Weslosky | October 13, 2022

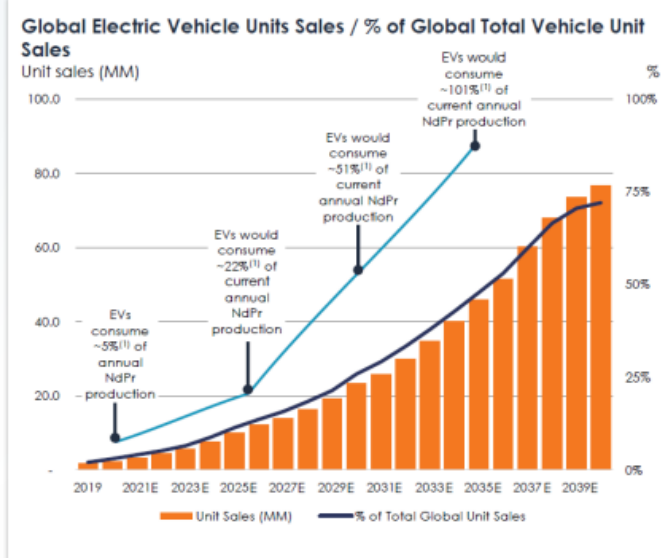
The Wicheeda Project plans to produce 25,000tpa of REO which represents ~10% of the current global production

Magnet rare earths demand is forecast to surge this decade. This is because an electric vehicle (“EV”) uses 1kg to 3kg of neodymium–iron–boron (“NdFeB”) magnets in standard drivetrain electric motors. NdFeB magnets are in [93%](#) of all EVs. Global demand for EVs is expected to grow from 6.75 million in 2021 to over 70 million by (or before) 2040. This will require huge amounts of neodymium.

Every ten million new EVs require ~10,000 tonnes of additional neodymium or ~20% of the current annual global supply

ELECTRIC VEHICLES – A DRIVER FOR RARE-EARTH DEMAND

- An electric vehicle (EV) uses 1kg to 3kg of neodymium-iron-boron (NdFeB) magnets in standard drivetrain motors
- NdFeB magnets are in 93% of all electric vehicles. Tesla, GM, Ford, VW, Hyundai, Toyota and others build vehicles using these magnets
- Every ten million new EVs require ~10,000 tonnes of additional neodymium or ~20% of current annual global supply. Over 70 million electric vehicles are expected to be sold when internal-combustion-engine vehicles are phased out



DEFENSE METALS CORP. TSXV:DEFN OTCQB:DFMTF FSE:35D

6

Source: [Company presentation](#)

The key problem for the EV industry is where will the new magnet rare earths supply come from and can the West become independent from Chinese supply. Today's company is working towards a solution.

[Defense Metals Corp.](#) (TSXV: DEFN | OTCQB: DFMTF | Frankfurt: 35D) ('Defense Metals') plans to become a significant producer of the magnet rare earths neodymium and praseodymium from their 100% owned Wicheeda Rare Earth Element Project spread over 4,244 hectares and located 80 km northeast of Prince George, British Columbia, Canada.

Brought to my attention a few dozen times over the last 2-years, I am fond of Dr William Bird, Director – who is deemed a leader in understanding rare earths in our sector; and likewise, President & Director Luisa Moreno who has at least 10,000 professional hours in this sector by now I suspect. With a PhD in Materials Science and Mechanics, this is the theme we are stressing at the [Critical Minerals Summit](#) on Wednesday, November

9th and that is the scarcity of talented professionals with both the experience and education to tackle the formidable task of creating a decarbonized economy.

The Project has an Indicated Mineral Resource of [5 million tonnes averaging 2.95% LREO](#) (“Light Rare Earth Oxide”), and an Inferred Mineral Resource of 29.5 million tonnes averaging 1.83% LREO. Key rare earths contained include neodymium (Nd) and praseodymium (Pd), as well as cerium (Ce) and lanthanum (La). The Resource is amenable to an open pit project and contains a mix of monazite and bastnaesite ore.

Some of the best drill results to date at the Wicheeda Rare Earth Element Project include:

- WI21-49 – [3.79% Total Rare Earth Oxide \(“TREO”\) over 150 Metres](#)
- WI21-54 – [3.81% TREO over 117 metres](#).
- I21-58 – [3.09% TREO over 251 metres](#).
- WI21-59 – 2.76% TREO over 212 metres.

Strong PEA result with a NPV8% of C\$517 million

The Wicheeda Project [PEA](#) (Jan. 2022) resulted in a post-tax NPV8% of [C\\$517 million](#) and a post-tax IRR of 18%, using a price assumption of US\$100/kg NdPr. Initial CapEx is estimated at [C\\$440 million](#).

Once in production Defense Metals targets to produce 25,423tpa of REO over a 16 year mine life, which would make the company a globally significant rare earths producer with ~10% of the current global production.

The Wicheeda Project plans to produce ~25,000tpa of REO which represents ~10% of the current global production

CHINA CONTROLS THE RARE-EARTH SUPPLY CHAIN

Projected Wicheeda annual
production 25,000 tonnes REO

~10% of the Global Current Production

(tonnes REO)		SUPPLY CHAIN		
		Mining & Mineral Upgrade	Cracking	Separation
	Country	Ore Conc	Mixed Chemical Conc	Separate Oxides
140,000	China	China	China	China
38,000	United States	United States	China	China
30,000	Myanmar	Myanmar	Myanmar, China	China
25,000	WICHEEDA	(projected)		
17,000	Australia	Australia	Malaysia	Malaysia, China
3,000	India	India	India	India
2,700	Russia	Russia	Estonia	Estonia
4,000	Madagascar	Madagascar	China	China
2,000	Thailand	Thailand	Thailand	Thailand
1,000	Brazil	Brazil	Brazil	Brazil
1,000	Vietnam	Vietnam	Vietnam	Vietnam
500	Burundi	Burundi	China	China

Source: [Company presentation](#)

The Wicheeda Project is accessible by a major forestry road that connects to a highway, with the town of Prince George 80kms away. Power lines and a gas pipeline are <40kms away and a major rail line is nearby.

Next steps for Defense Metals include a PFS to be completed in H1 2023, a pilot plant in 2024, and a FS completed in 2025.

The Wicheeda Project location map and key points showing adequate road access and reasonable local infrastructure including access to power and gas <40kms away

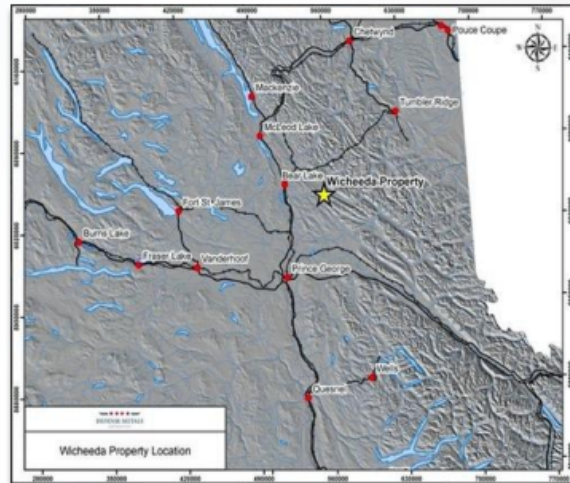
WICHEEDA DEPOSIT IN STRATEGIC LOCATION

Strategically positioned 80 km from Prince George and accessible from a major forestry service road, which connects to **Highway 97**

The 100% owned 4,244-hectare Wicheeda deposit, has power transmission lines, a gas pipeline and a major rail line nearby

Prince George, British Columbia, is a mining centre, with a skilled workforce

Port of Prince Rupert is 500km to the west and accessible by rail and road



DEFENSE METALS CORP. TSXV:DEFN OTCQB:DFMTF FSE:35D

11

Source: [Company presentation](#)

Given the size and quality of the resource, safe location in Canada (with forestry road access, power & gas not too far away) and strong fundamentals supporting key magnet rare earths demand this decade; most investors would agree Defense Metals is worthy of a deeper look. Defense Metals current market cap is [C\\$44 million](#).

MP Materials is riding the rare earths tonnes per year train

written by | October 13, 2022

[MP Materials Corp.](#) (NYSE: MP) emerged from the Chapter 11 of

MolyCorp and is the only producing rare earths mine in the USA. At one time the in the 1990s it was producing upwards of 40% of the world's rare earths. MP has a current market cap of US\$5.6 billion, which puts it slightly ahead of [Lynas Rare Earths Ltd.](#) (ASX: LYC), which is the biggest producer of separated rare earths outside of China. Combined their market caps exceed the annual revenue of separated rare earths globally.

MP has made some interesting news this year. Q1 revenues of US\$166.3 million which is 50% of their revenues from all of 2021. This is due to the high pricing of Neodymium (Nd) and Praseodymium (Pr) in Q1 of this year. Based on Roskill's report of 2015, MP's content of NdPr is 16.3% of the total volume. This may vary a little but it is likely to be the two elements that set the pricing for their concentrate as the balance of the materials are of little value. Looking at a basket price, NdPr will account for 93-94% of the total value, assuming all elements were sold which is doubtful as the Chinese have lots of the remaining elements, especially Cerium and Lanthanum. Gross margins in Q1 2022 were 88%, up from 81% in 2021, but I expect this will fall for the balance of the year as NdPr prices are now 20-25% lower than Q1 peaks. Either way, MP is poised to improve its Net Income to US\$168.4 million. MP has done a good job in their sales price to China for their concentrate. I calculate they are getting somewhere in the range of 40-50% of market value, which is high versus traditional pricing for concentrate which I have seen at 25-30%.

In April a definitive [supply agreement](#) was announced between MP Materials and GM to supply rare earth alloy and magnets for GM's EV program. This is significant as it would restore NdPr rare earth metal, alloy and magnet production. The USA does produce Samarium Cobalt magnets but these are typically used in military applications. There is no indication on what technology will be used to produce the metal, which in China is a messy process.

Planned capacity is 1,000 metric tonnes of NdFeB magnets. This will require 280-300 tonnes of NdPr. The previous Molycorp plant was designed to produce 20,000 tonnes of REO of which NdPr would account for over 3,000 tonnes.

This does leave the question as to where MP will sell the remaining NdPr. Europe has one metal/alloy producer and one magnet producer, and Japan is the other logical market, but Lynas owns 80% of the Japanese market and has a shorter supply line. What is left is China. Also to supply other US car producers MP would have to expand capacity, and it is not clear what limits or exclusivity GM has with MP Materials.

The challenge is that the original plant was designed as a single train of 20,000 tonnes per year. Nowhere in China is there a single train much larger than 5,000 tonnes per year (TPY). Lynas built four 5,500 TPY trains. This allows flexibility should there be issues like reduced demand during COVID where one or two trains can be shutdown to allow matching with demand, or if one train has operational issues. I would expect that MP, with the input from [Shenghe Resources](#) (a related party of MP whose ultimate parent is Shenghe Resources Holding Co., Ltd., a rare earth company listed on the Shanghai Stock Exchange, and as of its [March 31, 2022 quarterly report](#), a buyer of MP's rare earth concentrate that accounted for more than 90% of MP's product sales), will reconfigure the plant to be more flexible. Also MP, like anyone else, will not go from zero to 20,000 TPY overnight. There will be a qualification process and time to acquire accounts so multiple trains makes sense as one penetrates a market as they can be brought on as the business grows.

The other news was that the US Department of Defense (DOD) granted MP \$35 million to build a heavy rare earths at Mountain Pass. I find this interesting as Mt. Pass has 98.6% of its

content in light rare earths. This would mean at a run rate of 20,000 TPY the total output of the heavy rare earths would be 280 TPY. The only real valuable heavy rare earths are Terbium (Tb) and Dysprosium (Dy) which would total about 10 TPY combined. At today's pricing, which for Tb is high, in my opinion, this plant would generate revenues of \$10-11 million per year.

Overall MP has been doing well – selling concentrate to China. What will happen to profits as they move downstream only time will tell.

Rare earths giant MP Materials invests heavily to rebuild a U.S. magnetics supply chain

written by InvestorNews | October 13, 2022

Taking private companies public through alternative investment vehicles, such as special-purpose acquisition companies (SPAC), was a popular trend in 2020 and 2021. SPAC and other deals, such as Fortress Value Acquisition Corp (FVAC), have come under scrutiny by some parties as a cash grab. However, there are multiple success stories that have been able to secure investor trust.

One company who did not fall victim to this hype is [MP Materials Corp.](#) (NYSE: MP). In fact, MP Materials has continued to impress investors since the company went public through a FVAC in December 2020. Operating the only rare earth mining and

processing facility in the United States, MP Materials is poised to continue to deliver rare earths (RE) to US customers whose appetite for these materials is nearly endless.

MP Materials primarily provides lanthanum, cerium, and neodymium-praseodymium oxide. Interestingly, MP Materials has both support from the commercial and military sectors. We reported back in [December](#) that General Motors (GM) struck a deal with MP Materials to supply U.S.-sourced and manufactured rare earth materials, alloy, and finished magnets for GM's electric vehicle programs. MP Materials plans to ramp up production to support this effort in 2023, but it remains to be seen if they can meet that aggressive timeline.

The Department of Defense will help contribute to the continued operation of the Mountain Pass facility. MP Materials was awarded a [\\$35 million contract](#) through the Industrial Base Analysis and Sustainment Program to support heavy rare earth elements (HREE) mining. These materials are critical to the development of permanent magnets that are key components in various products, from wind turbines to missile systems.

The Mountain Pass facility already has the capability to mine and process light rare earth elements (LREEs). The added capability to mine HREE will enable MP Materials to mine all rare earths for high-performance magnet production. The company will also be able to recycle all recoverable rare earths from end-of-life magnets and magnet production scrap.

The company is currently [building](#) a 200,000 sq. ft. greenfield metal, alloy, and neodymium-iron-boron (NdFeB) magnet manufacturing facility in Fort Worth, Texas. This facility will also serve as the business and engineering headquarters for MP Magnetics. Materials mined at Mountain Pass will be processed and transformed into products at the Texas-based facility.

Construction of this facility began in April 2022.

These exciting new developments and other macroeconomic forces have led to a positive outlook for MP Materials. The company had a promising [first quarter](#) of 2022 and beat market expectations. MP Materials posted revenues of \$166 million—surpassing the \$132 million expected—and boasted earnings per share of \$0.50 (as opposed to the \$0.38 expected).

Revenue increased 177% year-over-year from increases in the realized price of rare earth oxide from higher demand for rare earths. The increase in revenue was also in part due to the amount of rare earth oxide sold, which occurred due to higher production volumes and shipment timings.

MP Materials also had a significant amount of free cash flow in quarter one, but that will likely change throughout the rest of 2022. The company plans to continue to heavily invest in its assets this year. These investments could result in a negative free cash flow in 2022.

It remains to be seen whether MP Materials can meet the bold promises that management is aiming for. Improving rare-earth supply chains in the United States is a massive challenge, but currently, MP Materials has a chance to get there.

Peak Resources CEO on the economics of its rare earths

project in Tanzania

written by InvestorNews | October 13, 2022

March 23, 2018 – “But Tanzania is getting ready to start working the backlog of mining licenses and we get that from the mining minister, the deputy mining minister and the commissioner of mining” – said Rocky Smith, CEO of [Peak Resources Ltd.](#) (ASX: PEK), in an interview with InvestorIntel’s Peter Clausi.

Peter Clausi: The rare earths are an interesting market right now given the electric vehicle movement. Which rare earths does Peak Resources mine?

Rocky Smith: We mine all of the rare earths, but the primary rare earths in our operation are going to be NdPr – neodymium-praseodymium. They represent about 23% of our total rare earth composition.

Peter Clausi: What are the other ones?

Rocky Smith: Like most rare earth operations, you get about everything, everything comes. There is 15 rare earth elements. The primaries are always cerium and lanthanum, but you always get all of them. In our case the mids and heavies only represent about 1% of the total so they are really not worth that much to talk about.

Peter Clausi: Cerium is not really a rare earth. It is a rare earth, but it is not that rare. It is about as plentiful as copper.

Rocky Smith: Yes. Well, rare earths are really not that rare in the crust of the earth, but harder to find them in concentrations that you can actually recover them from.

Peter Clausi: The economics of mining. You have two projects

underway right now.

Rocky Smith: We have an operation in Tanzania where the resource is. We are looking at starting that up and putting in a concentrator in Tanzania. Then taking the concentrate and moving it to Teesside in the U.K. and putting a refinery in there. We will basically crack the concentrate and then separate the impurities and then separate the rare earths from each other.

Peter Clausi: To my ear it sounds expensive to ship concentrate that far away. Why would you not just build on site?

Rocky Smith: The cost of shipping the reagents to the site would be about five times the cost to ship the concentrate to the reagents. So in this case the availability of a (inaudible) production and we actually do it as a by-product acid source. That is not available in Tanzania. If you were to try to process everything in Tanzania then you would have to ship five tons of reagents to Tanzania for every ton of concentrate that you would have shipped to the U.K. if you would have done it in the other direction.

Peter Clausi: Yeah, that is not very economic. Speaking of economic, you put out a project update in October of 2017 with some very impressive numbers. I saw pre-tax NPV of \$914 million U.S. dollars.

Rocky Smith: Yes. When we got done with the bankable we started really taking a hard look at the numbers and we noticed that we had some high reagent costs, particularly in the floatation areas in Tanzania. We went back and screened that particular area more diligently. We found that there were some opportunities there. We looked at different reagents that were less expensive, which was good, but we also found that the reagents that we were using actually performed so much better than the one that we had in our BFS that we were able to bring

more material through the same size plant. The effect of which was we had about a 15% increase in capacity through the plant, which of course affected the economics.

Peter Clausi: When do you think that plant will be constructed and operational?

Rocky Smith: All the construction is really pending, the permits coming through in Tanzania and the required financial raise, so whenever those happen we will start. That will take us about 15 to 18 months to build both these plants. It's a little bit difficult for me to say exactly when these other two things are going to happen. We're making some progress in Tanzania. It's been since July last year when they changed the mining law. Everyone kind of stopped their process. But Tanzania is getting ready to start working the backlog of mining licenses and we get that from the mining minister, the deputy mining minister and the commissioner of mining. Everyone is pretty much saying the same thing that they've got to set this commission, once that happens they will start working through this long list of mine projects that are there...to access the complete interview, [click here](#)

Disclaimer: Peak Resources Ltd. is an advertorial member of InvestorIntel Corp.