

# Constantine Karayannopoulos on the State of the Critical Minerals Market

written by InvestorNews | December 7, 2022

At the [Critical Minerals Institute](#)'s recent Critical Minerals Summit "**The Race to Achieve a Critical Minerals Supply Chain ROW**", Tracy Weslosky talked to keynote speaker Constantine Karayannopoulos on the state of the critical minerals market.

Held at the National Club on November 9th in Toronto, Constantine, who is CEO, and Director of Neo Performance Materials Inc. (TSX: NEO), offers compelling commentary on market evolution and why the demand for critical minerals will continue to escalate. Sharing breaking news about receiving a multi-million dollar grant from the Government of Estonia for the construction of Neo Performance Materials' Sintered Rare Earth Magnet Manufacturing Plant in Estonia, Constantine explains how this will offer "a very meaningful addition to the Western world's magnet capacity."

From supply chain challenges to addressing what the market really needs today, Constantine offers relevant examples of where we are in this process today. From billionaire investment dollars to controversial headlines in the sector, the conversation does not shy away from the impact of geopolitical issues facing the market.

Providing an update on Neo Performance Materials' rapidly advancing "Magnets-to-Mine" vertical integration strategy, Constantine discusses how Neo is progressing towards being a fully integrated magnet producer outside of China. With trillions of dollars in investment required for the world to

achieve the decarbonization targets, Constantine says that we “need an extraordinary level of capacity expansion for all the critical minerals.”

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Neo manufactures the building blocks of many modern technologies that enhance efficiency and sustainability. Neo's advanced industrial materials – magnetic powders and magnets, specialty chemicals, metals, and alloys – are critical to the performance of many everyday products and emerging technologies. Neo's products help to deliver the technologies of tomorrow to consumers today. The business of Neo is organized along three segments: Magnequench, Chemicals & Oxides and Rare Metals. Neo is headquartered in Toronto, Ontario, Canada; with corporate offices in Greenwood Village, Colorado, US; Singapore; and Beijing, China. Neo operates globally with sales, research and development, and production across 10 countries, being Japan, China, Thailand, Estonia, Singapore, Germany, United Kingdom, Canada, United States, and South Korea.

To learn more about Neo Performance Materials Inc., [click here](#)

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If you have any questions surrounding the content of this interview, please contact us at +1 416 792 8228 and/or email us direct at [info@investorintel.com](mailto:info@investorintel.com).

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# MP Materials is riding the rare earths tonnes per year train

written by | December 7, 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.

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## **Jack Lifton on the real challenge of China Incorporated on the global supply of rare earths**

written by Jack Lifton | December 7, 2022

China's recent re-enactment of its export "[prohibition](#)" list

illustrates the differences between the impact of the West's "financial globalization" and of China's approach to globalization under "Socialism with Chinese Characteristics" on the individual nations' security of supply of [critical materials](#) (rare earths) as enabled by what are the two principal competing economic systems in today's world, "free market" capitalism and state-controlled capitalism (also known as Socialism with Chinese characteristics).

It's easy to say that China's recent revisions to and the republication of the law that makes the export of named technologies from China either subject to governmental approval or simply illegal, is retaliation for the American (Trump[?]) (and now also the Japanese and EU) administrations' technology import and use bans applied recently to Chinese cybertechnology, but for the Rare Earths these restrictions have been in place for more than a decade, and their updating and reaffirmation in Chinese law tells a much more nuanced and worrisome story.

Looking carefully at those of China's export restrictions that are focused on rare earth "processing" technology, they show that China does not want any of its companies, state-owned or "private", to give any assistance to foreign entities to develop any aspect, at all, of a total rare earth supply chain.

I have been told that China originally acquired rare earth separation (by solvent extraction) technology from the first Molycorp in the early 1980s when that company was seeking to lower its costs by exporting the rare earth separation technology it had developed in the 1960s and 70s to China where bastnaesite, the same mineral as was being mined at Mountain Pass by Molycorp, was being recovered in large quantity as a byproduct of iron ore mining in Baotou, Inner Mongolia. I believe that Molycorp also then began sending some ore or ore concentrates from California to China at that time for

separation in China. I have been told that the “blueprint” for a rare earth separation plant supplied by Molycorp was stolen and illegally “sold” into alleged operatives from China in the first Chinese “rare earth processing rush” in the 1980s during which dozens of dedicated solvent extraction systems for rare earths were built outside of Molycorp’s control.

Deng Xiaoping, the real founder of modern China’s economic system famously said during this period of rapid growth for China’s rare earth “processing” industry that **rare earths were to China what oil was to the middle east**. Besides encouraging the development of a rare earth industry and to support it, this pronouncement also encouraged the creation in Chinese universities of departments of “separation science” in departments of chemistry and chemical engineering. Today, in 2020, thousands of Chinese chemists and chemical engineers specialize in rare earth “processing.” The State Key Laboratory for Separation Science at Peking U., alone, has four locations with more than 400 researchers, more than 150 of whom hold PhDs! It is estimated that several thousand Chinese researchers are dedicated today to the field of rare earth studies in China.

All of the raging commentary about Chinese intellectual property theft from the West, America in particular, has masked the fact that regarding rare earth processing downstream of ore concentration China has an existing and growing advantage technologically over all of the West. While it is certainly true that we do not know the true costs of mining and refining rare earths in China, because China doesn’t seem to capitalize health and safety concerns that are both significant and also highly regulated in the USA and almost all other Western countries, we must also concede the advantage of extensive experience to China in the effective production of rare earth metals, alloys, and magnets. The current method of choice, for example, for the production of rare earth metals, the electrolytic reduction of



molten salts, has never even been practiced commercially in the USA.

The [unfortunate truth](#) is that the US and the West needs technological help. Particularly in scale-up, from China's large reservoir of downstream (of mining) rare earth processing knowledge and experience if, and only if, the goal is global competition with China for the 150,000 mta rare earth permanent magnet markets. If the goal is regional or national self sufficiency and security of supply then governments will have to either subsidize or get much smarter, with regard to economics and the selection of companies that have the necessary skill sets, about (re) establishing total domestic supply chains for critical materials and, especially, the components manufactured from them.

The American federal bureaucracy is an assembly of the industrially inexperienced but well credentialed (not necessarily well educated!) who first and foremost speak with each other, and, when and if they must reach outside of their group, go only to academics for advice on policy.

Implementation of policy is simply not considered, and the excuse for that is it would look like overstepping their authority, favoritism, or worst of all, a mistake might be made that would reflect badly on the bureaucrat.

China's mandarin bureaucrats are chosen primarily for their experience and skills as well as their education and (Chinese Communist) Party connections. The China "State Council" sets the nation's industrial policies. The bureaucrats implement those policies. Those bureaucrats, speaking with the authority of the State Council and President, have a great influence on the lending policies of the People's Bank of China.

The current Chinese "President" has decreed (not recommended)

that by 2025 China will be independent of the rest of the world in 10 key high technologies. Several of these technologies are critically dependent upon rare earth enabled components, especially rare earth permanent magnets.

China is today cleaning up its rare earths industry to meet global standards of health and safety. This has necessitated a sharp restriction on rare earth mining within China. China is today, in 2020, on a track to import nearly 40% of its needs for rare earth bearing ores for ALL of the rare earths.

In fact, heavy rare earth production from so-called ionic clays has essentially halted within China. Yet, notwithstanding the rare earth mining pollution “problem” the implementation of China 2025 is advancing rapidly.

**What does this mean for Western rare earths mining, refining, metal and alloy making, and rare earths enabled products' manufacturing? It means that China, Incorporated, is your competitor at every stage of the total supply chain. It means more importantly that as China's consumer economy grows and as long as China requires outside raw materials the rest of the world will be completely subjugated to Chinese pricing and export policy.**

Neither the US (or any other allied) defense establishment can take the risk of having its rare earth permanent magnet and alloy supply cut off or curtailed by the Chinese government. Even more dependent upon China today, in permanent magnet volume alone, are the global OEM automotive and consumer appliance industries.

Investment outside of China in a total rare earths supply chain is a necessity for US defense and the continuation of an independent American manufacturing base for high technology consumer products. It is certainly not wise to put all of your

eggs in one basket, but it is also very unwise to plan on just one company or one technology to solve America's (and the West's) dependency on the Chinese rare earth industry. The solution is to choose only those participating companies that understand the need to manage or have a total rare earth supply chain in view. The poor economics of some of the component operations of the total rare earths supply chain can be solved by legislation (e.g., the Cruz rare earth components tax relief bill) or by the distribution of costs among the supply chain components so that the whole is profitable.

It's time for a serious discussion of the rare earths supply problem. China is not planning to assist the development of competitors in this field.

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## **Jack Lifton talks with Neo Performance's Constantine Karayannopoulos on China's rare earths recovery**

written by InvestorNews | December 7, 2022

The Technology Metals Show host Jack Lifton talks with Constantine Karayannopoulos, President, CEO & Director of [Neo Performance Materials Inc.](#) (TSX: NEO) about the recovery of the Chinese rare earths industry. "The Chinese rare earths industry is recovering but so is the rare earths industry everywhere," Constantine said in an interview. "It looks like the worst is over in China and the rest of the world is showing spurts of

demand in specific markets, even in automotive.”

Jack and Constantine went on to discuss neodymium and praseodymium (NdPr) prices, the separated praseodymium market, and how the current market situation is affecting the prices for neodymium and praseodymium. In the interview Constantine also provided an update on Neo’s magnetic materials business.

To access the complete interview [subscribe](#) to the [Technology Metals Show](#) and get exclusive access to member-only content through this exclusive site. Or [Log-In Here](#) for the latest conversations, debates, updates and interviews with the leaders, thought leaders and investors focused on issues relating to sustainability in the critical materials sector.

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## The U.S. Rare Earths Supply Chain Challenge – Part 4

written by InvestorNews | December 7, 2022

In an ongoing series on how to solve the U.S. rare earths supply chain challenge, 3 Sr Editors from InvestorIntel and well-known Rare Earths Consultants debate on what are the skills needed to create a rare earths supply chain in North America.

Participants include Tracy Weslosky, InvestorIntel’s Sr Editor, Publisher and Rare Earths Consultant; Jack Lifton, InvestorIntel’s Sr Editor, Host and Rare Earths Advisor; and

Alastair Neill, InvestorIntel's Sr Editor and Rare Earths Expert.

Alastair started by saying that there is no facility in the US to convert rare earth alloys to magnets. Jack continued by saying that "the US Department of Defence doesn't want any rare earth permanent magnet from China. The only thing they will accept from China is the raw material which the Chinese do not export. They want extraction, separation, metal making and alloy and magnet making done either in the US or in NATO or SEATO ally countries."

Alastair concluded the discussion by saying, "To achieve this goal it is going to take a couple of different skill sets. It is one set of skills to get something out of the ground and turn it into a separated oxide. That is completely different from metalization and alloy production and then getting into assembly. So you will need three special types of industries that need to be managed. That is where you have to have someone with a vision to be able to bring that type of team together to be able to manage such a diverse set of skills."

- To access the complete discussion, [click here](#)
- To access Part 1 of this rare earths series, [click here](#)
- To access Part 2 of this rare earths series, [click here](#)
- To access Part 3 of this rare earths series, [click here](#)

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## The U.S. Rare Earths Supply

# Chain Challenge – Part 3

written by InvestorNews | December 7, 2022

In an ongoing series on how to solve the U.S. rare earths supply chain challenge, 3 Sr Editors from InvestorIntel and well-known Rare Earths Consultants begin the debate on what are the challenges in creating a rare earths supply chain in North America.

Participants include Tracy Weslosky, InvestorIntel's Sr Editor, Publisher and Rare Earths Consultant; Jack Lifton, InvestorIntel's Sr Editor, Host and Rare Earths Advisor; and Alastair Neill, InvestorIntel's Sr Editor and Rare Earths Expert.

Jack starts the debate with: "When you extract rare earths from ore you get a mixture of rare earths and other things that were in the ore that came out in the extract which is usually an acid. The first thing that you have to do is make a pregnant leach solution. What that means is that you put the metal values in the minerals into the solution. Then you separate out those things that are not rare earths or rare earths that you don't really want for example cerium. Now that solution which is normally a hydrochloric acid extract goes into a separation system which in the US has only been a solvent extraction for light rare earths."

Alastair added "There are other companies looking at novel ways to separate rare earths in an environmentally friendly process to tackle this and compete with the Chinese. The benchmark is the Chinese separation cost which is about \$2.50 to \$3 a kilogram."

The experts panel also discussed some of the major problems in the North American rare earths supply chain. The panel discussed

that the problem in the North American rare earths space is the absence of rare earth separation facility and metallization capability in North America.

- To access the complete discussion, [click here](#)
  - To access Part 1 of this rare earths series, [click here](#)
  - To access Part 2 of this rare earths series, [click here](#)
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## The U.S. Rare Earths Supply Chain Challenge – Part 2

written by InvestorNews | December 7, 2022

In an ongoing series on how to solve the U.S. rare earths supply chain challenge, 3 Sr Editors from InvestorIntel and well-known Rare Earths Consultants begin the debate on what is the actual formula to create a supply chain in North America.

Participants include Tracy Weslosky, InvestorIntel's Sr Editor, Publisher and Rare Earths Consultant; Jack Lifton, InvestorIntel's Sr Editor, Host and Rare Earths Advisor; and Alastair Neill, InvestorIntel's Sr Editor and Rare Earths Expert.

Alastair starts the debate with: "First of all the key is to find a deposit that has a reasonable cost structure and also reasonable content particularly the magnetic four – neodymium, praseodymium, terbium, and dysprosium because those will drive 85-90% of the revenue of any deposit. Then you have to be sure that you can convert that deposit into a concentrate and after that you have to be able to separate it into the oxides. When

you talk about magnets you then have to go to the subsequent steps of conversion to metal and then into alloy before you can even get to the magnet manufacturing stage.”

Jack added, “The first thing you do is ask the customer what he wants to buy. Then you can go upstream in the supply chain and find out what you need to do.”

The experts panel also discussed the exploration and extraction plays in North America. Tracy said that some of the exploration plays in North America include [Avalon Advanced Materials Inc.](#) (TSX: AVL | OTCQB: AVLNF), [Search Minerals Inc.](#) (TSXV: SMY), Ucore Rare Metals, Imperial Mining Group, etc.

To access the complete discussion, [click here](#)

To access Part 1 of this rare earths series, [click here](#)

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## **Nic Earner on the US Defense Act and our dependence on Chinese rare earths**

written by InvestorNews | December 7, 2022

“We do have the heavy rare earths, terbium, dysprosium, which others do not apart from Northern Minerals now at their pilot plant. We have a very good mix of the magnet rare earths and the heavy magnet rare earths. Then, of course, we have 40% of revenue coming from zirconium, a lot of uses there, 10% of our revenue coming from hafnium, which is an emerging technology metal. We see people using it in the light generation phone



chips. Then we have 20% come from niobium. Certainly we would be one of the largest complexes and revenue generators. That is nearly US\$500 million of revenue a year.” states Nic Earner, Managing Director of [Alkane Resources Ltd.](#) (ASX: ALK | OTCQX: ANLKY), in an interview with InvestorIntel Corp. CEO Tracy Weslosky.

**Tracy Weslosky:** Nic we are so delighted to have you. We really want to talk to you and get right into this U.S. Defense Act and how this might affect shareholders for Alkane Resources, as you are clearly the frontrunner for supply for magnet materials worldwide.

**Nic Earner:** Thanks Tracy. We are really hoping that this provides a catalyst to get Western companies, particularly those that want to supply U.S. Defense contracts, moving and motivated to shore up their supply chain. If you look at this act what it is saying is the U.S. will only or wants its contractors to only buy magnets from allied countries so this excludes buying magnets out of China and Russia. It not must happen immediately today because we all know the capacity for that to actually happen does not exist. It is saying, put your best foot forward, best endeavors. This is where the U.S. government is moving. These companies have to act if they want to make that regulation now or into the future.

**Tracy Weslosky:** We have been talking and discussing sustainability for a number of years so we were delighted to see that the U.S. is putting a good foot forward. Of course, they do not have the supply. Let us talk about your timeline for getting to production. If I understand this correctly, and please do correct me, when you guys are in full production you will have the largest supply chain for magnet and battery materials in the world outside of China. Is that correct?

**Nic Earner:** I would like to think so, but no. Lynas will still be number one in that. If you look at Lynas' neodymium and praseodymium production, with their next program they are moving towards 6,000 tons per annum, which would put them at about 15% to 20% of the magnet market. That is as it stands today not in expanded demand. We in vanadium and praseodymium would be doing 1,200 tons. We do have the heavy rare earths, terbium, dysprosium, which others do not apart from Northern Minerals now at their pilot plant. We have a very good mix of the magnet rare earths and the heavy magnet rare earths. Then, of course, we have 40% of revenue coming from zirconium, a lot of uses there, 10% of our revenue coming from hafnium, which is an emerging technology metal. We see people using it in the light generation phone chips. Then we have 20% come from niobium. Certainly we would be one of the largest complexes and revenue generators. That is nearly US\$500 million of revenue a year. That is a substantial revenue base, but we would be definitely one of the frontrunners absolutely. More importantly we do not have offtake into China or a large Chinese shareholding either, which really means we can tick the U.S. Defense boxes.

**Tracy Weslosky:** I am still certain that most of the investors out there may not be clear on how unique this critical material market is. Now I was reading in your quarterly activities report that your project, your Dubbo Project that we are referencing, could generate \$4.7 billion free cash flow at the 20-year base case...to access the complete interview, [click here](#)

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