

# Catching the world with our rare earths contingency pants down

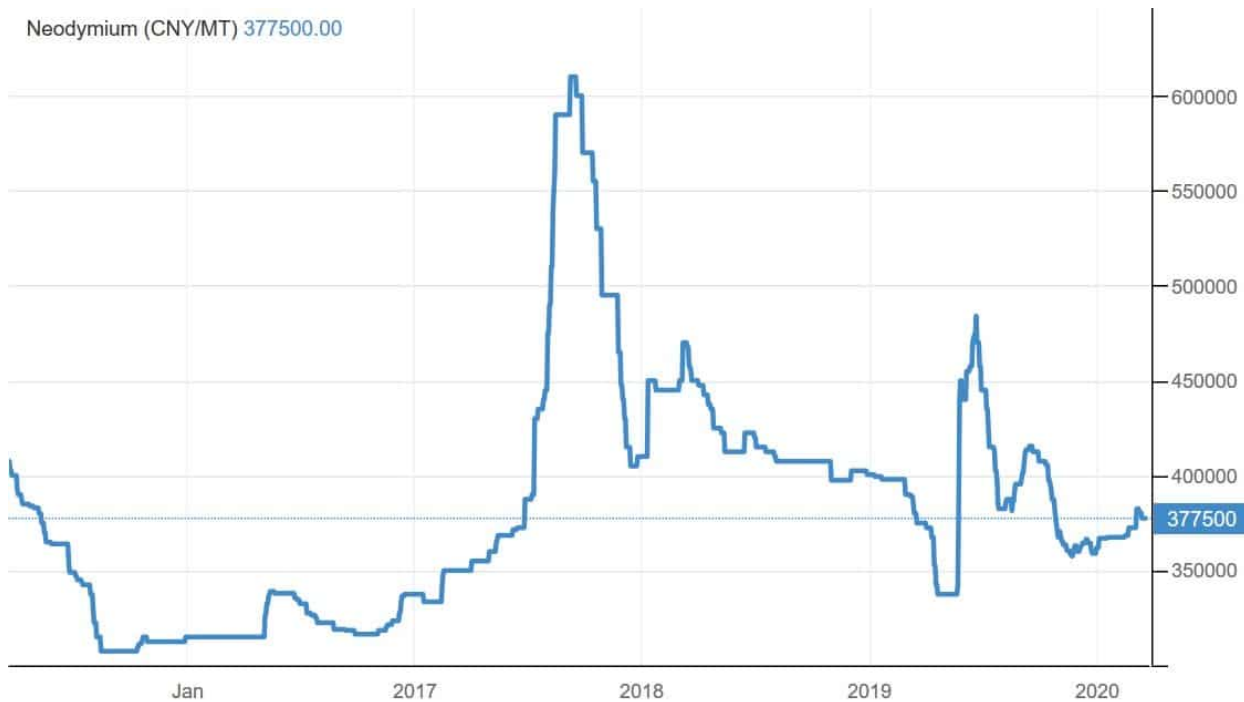
The rare earths market has had its ups and downs the past few years. In particular, the US-China trade war brought a new focus to the sector highlighting the world's dependency on China for rare earths supply.

Then in early 2020 with much of China closed down by the coronavirus the Chinese rare earths supply was put to test. While the Chinese market is often quite opaque, market pricing for key rare earths such as neodymium give an indication of the supply and demand dynamics.

## **Key rare earths price movements in 2020 as the China disruption was taking place**

Neodymium (Nd) prices are up 4.28% so far in 2020, despite the slowdown in industrial production of goods that contain neodymium. Asian Metal reports praseodymium (Pr) prices are slightly down in 2020, and dysprosium (Dy) prices are up ~5% over the past 2 months.

## **Neodymium 5 year price chart**



Source

All of this suggests that despite the coronavirus chaos in China the key rare earths market remained very stable. It would appear from this that China's inventory was adequate to cover any mining disruptions; however, demand was also lower due to the industrial slowdown.

### Experts view

In this exclusive February 18, 2020 InvestorIntel video, rare earths expert Jack Lifton discussed with Tracy Weslosky the impact the coronavirus is having on critical metals:

Jack Lifton states:

*"(China) Shipments could stop at anytime.....logistics are compromised....**The coronavirus has caught the West with its contingency pants down.....this is a warning bell for everyone in the world.**"*

Jack also revealed that we do not even know if the Chinese possess enough stockpiles of rare earths to handle their own demand, never mind the needs of Americans.

## Rare earths are vital ingredients for modern technology and the world relies largely on China



Source

### Lynas Corporation Limited

Outside of China, the rare earths supply chain is completely reliant on one company. That company is Lynas Corporation Limited (ASX: LYC). Lynas is the world's second largest supplier of rare earth materials, and the only significant rare earths producer outside of China. Most of Lynas' rare earths go to long term contracts mostly with Japan. This means if we get a rare earths supply disruption from China and higher NdPr prices, then Lynas Corporation will be the key global company to benefit. This is worth keeping in mind in case we get a second wave of the coronavirus outbreak in China.

### The latest news with Lynas Corporation

- February 3, 2020 – Australian government awards major project status to new Lynas WA plant. The Lynas Kalgoorlie plant will undertake cracking & leaching of rare earth concentrate from Lynas' Mt Weld mine, which is also located in Western Australia's Goldfields

region. Lynas will also explore opportunities for additional processing in Kalgoorlie.

- February 27, 2020 – Lynas Malaysia operating license renewed for three years.

The good news here for investors is that Lynas has achieved good progress towards their new cracking & leaching (C&L) facility planned for completion by 2023. This will tie in nicely with the 3-year Malaysian license renewal given the relocation of the C&L facility to Australia should be able to be done in the 3 year time frame. This clears the cloud over the stock from 2019 when they had uncertainties over their Malaysian license renewal due to environmental concerns. This is good for Lynas and good for security of rare earths supply ex-China.

**Lynas Corporation to diversify its rare earths operations under their 2025 plan**

# Diversifying our industrial footprint

## United States



MOU with a skilled US based partner, Blue Line Corporation, to produce separated Heavy Rare Earths and value added Specialty Materials.

## Malaysia



A dynamic operation in Gebeng with Cracking & Leaching, Solvent Extraction, Product Finishing and opportunities for further downstream processing.

## Western Australia

Tier 1 deposit at Mt Weld: Mining and Concentration. Cracking & Leaching to be relocated to WA by 2023



**A summary of Lynas' progress towards their 2025 plan**

**Making significant progress on Lynas 2025 initiatives**



Mt Weld, WA: Production ramp up to meet forecast demand growth



Kalgoorlie, WA: Building a new Cracking & Leaching in WA



Malaysia: Investing in increased downstream processing, product range, recycling



United States: Filling a market gap with new separation and product finishing capability

Source

## Closing remarks

Japan recently announced they plan to stockpile rare metals as part of an effort to reduce dependence on China. Let's hope

the US and others finally get their act together to financially support the critical materials miners. This includes not only rare earths, but also the key EV metals cobalt and lithium.

The 2020s will be a decade of enormous technological advancements with AI, IoTs, robotics, electrification of transportation, renewable energy, and energy storage. All of these need a secure supply of the 35 critical materials as identified by the U.S. Government, including rare earths.

For now, the West is lucky to have Lynas Corporation, but clearly we need many more great critical materials miners and processors to help build up our severely damaged local supply chains.

As Jack said: *"this is a warning bell for everyone in the world."* Western leaders please listen and let's not get caught with our pants down!

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## **Search Minerals may be Canada's first rare earths producer**

Preliminary comments from InvestorIntel's Publisher Tracy Weslosky: With the Coronavirus nipping at all our hard-earned portfolio heels, this is a good time to remind ourselves of the value of people, talent and knowledge. Bring these variables together and you get a competitive team. In meeting with dozens of CEOs from the resource sector during PDAC last week, I was reminded of why I have been such a fan of Search Minerals Inc. Search's CEO Greg Andrews was accompanied by Dr.

Randy Miller, and when speaking with Dr. Miller, I started thinking about how many people in the industry consider him to be an intellectual giant, a leader in understanding the complex extraction processes related to rare earth elements.

I asked Jack Lifton about Search and he confirmed both my understanding and professional conclusion on Search when he replied with: *“Search is an outstanding project technologically. It’s really state-of-the-art rare earth deposit development, and I think it may well be Canada’s first commercial rare earth producer.”*

Let me add, in addition to Dr. Miller, many of us in the industry are aware of another well-known and equally admired rare earths expert that is championing Search – Dr. David Dreisinger. We will be placing a request for Jack Lifton to do an interview with Dr Dreisinger shortly, we hope you enjoy this update on rare earth gem, Search Minerals Inc.

Search Minerals Inc. (TSXV: SMY) is focused on finding and developing critical rare earth element mineral assets in Labrador, Canada. The Company controls properties in three distinct areas of this region; the Port Hope Simpson (PHS) Critical Rare Earth Element District in SE Labrador; the Henley Harbour Area in Southern Labrador; and the Red Wine Complex located in Central Labrador.

Search Minerals President and CEO, Greg Andrews, told InvestorIntel: *“Search is well-positioned to be a stable, secure, significant supplier of critical materials to the electric vehicle market or other industries dependent on rare earth elements, in Canada, US or Europe.”*

### **The Port Hope Simpson District**

The Company’s Port Hope Simpson (PHS) District 100% owned property includes four promising discoveries known as Foxtrot, Deep Fox, Fox Meadow, and Silver Fox.

The Foxtrot resource, Deep Fox, Fox Meadow, and Silver Fox discoveries contain rare earths including dysprosium (Dy), neodymium (Nd), praseodymium (Pr), terbium (Tb) and yttrium (Y).

The flagship Foxtrot Resource covers a 70 km long and 8 km wide belt. At Foxtrot the Total Indicated Resource is 7.392 million tonnes with grades of neodymium oxide (1,732ppm), neodymium (1,485ppm), praseodymium (397ppm), and dysprosium (191ppm).

## **Search Minerals Port Hope Simpson District – Foxtrot, Deep Fox, Fox Meadow, Silver Fox and other prospects**

### **Preliminary Economic Assessment (Foxtrot only)**

The April 2016 updated Preliminary Economic Assessment (PEA) on the Foxtrot project resulted in a post-tax NPV10% of C\$48 million and a post-tax IRR of 16.7%, based on a 14-year mine life, and applying Search Minerals' proprietary Direct Extraction Process.

Initial capital cost was estimated at only C\$152 million (including a C\$33 million contingency), with an after-tax payback period of 4.4 years. Revenue estimates were dominated by Nd (39%), Dy (29%), Pr (14%) and Tb (8%).

### **The economics should improve significantly as the resource grows**

The initial PEA post-tax NPV10% of C\$48 million on the Foxtrot Project is a bit underwhelming. On the flip side, the initial CapEx of C\$152 million is low and should be easier to fund.

The current very low market cap for Search Minerals of just C\$8 million reflects the early stage of the project and the current low NPV10% of C\$48 million. With further drilling success Search should be able to significantly grow the resource and this should substantially improve the economics.



The Company's primary objective is to extend the mine life beyond the current 14 years, which usually improves the economics.

It is important to understand that the PEA was ONLY on Foxtrot and Search has other rare earths discoveries (Deep Fox, Fox Meadow, Silver Fox and others) nearby. As these are drilled the resource and economics will most likely improve significantly.

### **The US and Canadian Governments are now more eager to help fund rare earth projects**

Greg Andrews, President and CEO of Search Minerals, stated: *"We are very encouraged with the recent Canada and US collaboration announcements, the US Department of Defense request for funding proposals. Search has participated in the process outlined by Defense Protection Act (Title III), as Canadian projects are considered a Domestic Source, and are eligible to apply for these funding initiatives. Search continues to provide information under these US led funding programs."*

In recent news, Search Minerals announced receipt of funds from Atlantic Canada Opportunities Agency for cost and design studies. The funding was for up to \$50,000 towards the completion of two engineering studies to further advance the Company's Critical Rare Earth Element District in South East Labrador, Canada.

As a part of the above-mentioned studies, Search intends to update the 2016 Foxtrot PEA to incorporate the improved recoveries shown from the pilot plant work.

Search Minerals President and CEO Greg Andrews told InvestorIntel:

*"Search has benefited from the support of both Atlantic Canada Opportunities Agency ("ACOA") and InnovateNL as collectively,*

*they have provided over \$2.5 Million towards our processing technology.”*

### **Current and next steps for Search Minerals**

Search has completed 2 continuous pilot plants which each have produced a 99% high purity mixed rare earth concentrate thereby reducing metallurgical risk which will help in the off-take process.

The next steps for Search will be the design of a 1/100th scale demonstration plant to be built on-site in St. Lewis, Labrador, the completion of a 3,000m Phase III drill program at Deep Fox, further channel sampling at Fox Meadow to make the prospect drill ready, and further exploration on Silver Fox and Awesome Fox projects.

Search Minerals CEO stated to InvestorIntel: *“Search Minerals has two of the world experts on rare earth geology and processing on the executive team. Dr. Randy Miller and his team have staked, explored and interpreted the geology of our 70km X 8km rare earth district in SE Labrador. Search has two 43-101 resource estimates at the Foxtrot and Deep Fox deposits. Dr. David Dreisinger has developed our patented direct extraction technology and worked with our test work providers from bench scale to the operation of two successful pilot plants. We believe our low cost (C\$152 Million) rare earth project provides a key advantage to be the next REE producer, to support the upward trending permanent magnet market.”*

### **Closing remarks**

Investors in early-stage exploration and development projects such as Search Minerals ‘Fox’ projects in northern Canada need to be patient and give a company a 5-year time frame to build a considerable resource. In this case, the beginnings are already there, they just need to be further drilled and expanded. Should the drilling continue to find reasonable or

high-grade rare earths then the later stages of the project may be easier than other projects given the large US and Canadian demand to establish a reliable non-Chinese supply chain of rare earths. Recent Canadian government support confirms this.

One thing is for sure, the world will continue to love their electronic gadgets and the EV and green energy boom is not going away anytime soon. This means the demand for rare earths will only get stronger each year, and projects such as Search Minerals Port Hope Simpson Critical Rare Earths Project are likely to be the future winners.

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## **Jack Lifton ignites the ‘who has the highest grade rare earths debate’ with Appia’s Tom Drivas**

“The Alces Lake Project has the highest occurrence of rare earths in Canada, possibly in North America. In terms of monazite, possibly in the world. We have shown pictures of samples of monazite to SGS, and they haven’t seen anything like it – it is unique. We are getting up to 85% of monazite on the surface. In addition to that, we are getting up to 49% total rare earth over a few meters. We are not talking about grab samples. We have six-seven zones right on surface and then with some drilling that we did, we hit some blind zone subsurface. A few years ago the Saskatchewan government geologists went and looked at all the rare earths projects in Saskatchewan and Alces Lake Project came as number one.”

States Tom Drivas, CEO, President and Director of Appia Energy Corp. (CSE: API | OTCQB: APAAF), in an interview with InvestorIntel's Jack Lifton.

Tom went on to say that the Alces Lake Project is a 35,000-acre property and the company has looked at a very small area and there are many areas that have a lot of potentials. Tom also said that the project is located in Saskatchewan which is a top-rated mining jurisdiction in the world. All the rare earths in the Alces Lake Project is contained within coarse grain monazite and has the right mix of rare earths. About a quarter of the total rare earths are critical rare earths (neodymium, praseodymium, dysprosium, terbium).

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

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## **The U.S. Military faces the Rare Earths Supply Chain Gallows**

“The industry is not mining, but its being directed by the mining industry – and its just not the same” explains an anonymous source that I pistol-whipped with questions on rare earths earlier this morning. Undoubtedly never to answer my calls again in the future, I start with: “I have been in the industry for 10 years and if I don't understand, how can we expect anyone else too?”

10 years in the business and the reason I cannot quit the rare earths industry is that its like a high level business sudoku puzzle aching for a remedy. And no one can solve it because the rules change depending on what piece of propaganda you

want to quote. With media sources texting me daily, the result is a regular agitation mobilizer, a spin cycle of the wrong data rotating around regularly without any resolution thanks to the internet and social media plagued by misinformation. And respectfully, these journalists, who are on a fact-finding mission to sort their message have yet to find a holy grail of information, just endless disjointed content of disinformation to which they cannot sort because even the experts can't agree.

Determined to be a part of the supply chain remedy, having invested the hours, and well – I do believe that if we do not sort this out, our history books are going to have a lot of chapters that will start with: “we should have done...we could have done...but we didn't.”

Taking an industry leader to lunch last month, he explained to an esteemed colleague that the real supply chain issue in North America is simple: **we cannot produce with the same cost efficiency of the Chinese**. Talk to him and one would conclude that the game is over, in fact, it never started. That same week I spoke with an expert in Korea who was explaining how Chinese dealing with significant water issues. Hyper focus for a moment, and the theme of that conversation was that the real reason for the influx in the rare earths media attention is that the Chinese want the North Americans to get an opportunity to pollute their waters and air in the same way they have in taking over the global rare earths industry?

Make no err of understanding that this business is a dirty one, but the rumors of collusion and conspiracy make spy novels pale in comparison. Could this industry be that smart?

I would argue not, but it is indeed complex. And this debate does require a white board, a global map and toss in some basic history – and you too may radiate a false sense of intellectual superiority.

For the sake of this rare earths' discussion, we are dealing with 4 of the 17 rare earth elements known as the magnetic materials. The 4 magnetic materials heavily in debate in the news are usually about Neodymium (Nd), Praseodymium (Pr), Dysprosium (Dy) and Terbium (Tb). And the question we are discussing is **how the U.S. military will secure an independent source of rare earths and what will we need to do to create a supply chain to achieve this goal.**

*Sounds easy, right?*

Industry expert Alastair Neill agreed to go on record, he starts, **"The challenge is that the military wants to get independence from Chinese sourcing. The problem is that the military does not buy oxides, they buy components with the rare earths in them. What we need is the ability to convert oxides into metals and the metals into alloys and then turn these alloys into magnets."**

Let me add, Alastair also invested 20-minutes reminding me of the 4-stage process for securing rare earths: (1) Mining – Source must be mined, result is ore; (2) Extraction – the ore must be turned into concentrate; (3) Separation – the concentrate is turned into oxides; and finally, (4) Metallization – the oxides through chemical processing are then turned into metals. Now if you re-read Alastair's quote, he starts at how the U.S. supply chain cannot handle the oxides (reference #3), without the oxides being turned into metal (reference #4), and then the metals being turned into alloys (welcome #5) and then the alloys, then being turned into magnets (final stage? Level #6). How many steps? I count 6 – clearly, this is not the same as mining gold.

To be clear, in the next couple of pieces on InvestorIntel I will examine trying to find the sources to mine, or stage 1 in the supply chain as presently we have only one producing, and the ownership includes Chinese investment. Get ready Hoidas Lake...am going down this road next!

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# Lifton with Greg Andrews on Search Minerals' rare earths pilot plant

"We have completed the \$1.9 million pilot plant. We are just finishing off our optimization and what we are looking for is again to tweak those capital costs and get the operating cost down. Our next step then will be to build a demonstration plant and we are hoping to initiate that and we are looking at doing about a 1/100 scale of that. The key thing there again is to be able to deliver more products for the refineries to go further down and get into those offtake discussions that are quite needed now. Our quantities on a 1000 tons per day will be about 3200 tons of mixed rare earths (per year). It is mixed rare earths concentrate right now but we can change that to be the chlorides or whatever we need in our process to suit the market." States Greg Andrews, President, CEO and Director of Search Minerals Inc. (TSXV: SMY), in an interview with InvestorIntel's Jack Lifton.

Greg went on to say that Search Minerals has neodymium, praseodymium and a mix of dysprosium and terbium in its resource. The company will be able to produce 650 tons of neodymium-praseodymium, about 50 tons of dysprosium and 10 tons of terbium. Greg said that Search Minerals enjoys strong support from the provincial and federal government and has received funding from both for its pilot plant.

Search Minerals participated in the request for information to the US in July and the company qualifies to be considered a domestic rare earths supply source for the US. Greg also provided an update on Search Minerals' Direct Extraction

technology. The scalable technology eliminates the grinding and wet flotation stages which help to significantly reduce CAPEX and operational costs.

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

**Disclaimer:** Search Minerals Inc. is an advertorial member of InvestorIntel Corp.

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## **Hochschild chases rare earths in Chile – Is it worth the risk?**

On October 2, 2019, Hochschild Mining PLC (LSE: HOC) announced it had bought the BioLantanidos Ionic Rare Earth Clay Project in Chile for an additional \$56.3 million to achieve 100% ownership (previously \$2.5 million for a 6.2% project share). The question and challenge for Hochschild Mining is have they bitten off more than they can chew?

Hochschild Mining is a leading British-based silver and gold mining business operating in North, Central and South America. Hochschild is headquartered in Lima Peru with a corporate office in London. The main shareholder is Peruvian businessman Eduardo Hochschild.

### **The positives of the deal**

On the positive side, Hochschild has only spent what for them is a small percentage of their GBP 1 billion market cap, and they have mining experience in South America. The world is crying out for non-China sourced rare earths. Furthermore, the Ionic Rare Earth Clay Project has a high concentration of key



magnet rare earths such as neodymium (Nd) and praseodymium (Pr), as well as the important heavy rare earth elements terbium (Tb) and dysprosium (Dy). The mineralization occurs from the surface to about 20-30 meter deep, so it will be easy to mine. The concession has three main districts covering a total of 72,000 hectares.

BioLantanidos has constructed an on-site pilot plant that has demonstrated both technical and commercial viability, also has a Feasibility Study (FS) prepared.

Hochschild stated that “the process is environmentally friendly and as it does not require potentially harmful chemicals, whilst capital and operational expenditure is projected to be low with the result that **the project is expected to be one of the lowest cost rare earth producers.**” Hochschild plans a staged modular approach which is sensible and spreads out the CapEx, and increases the chance to make it to at least Stage 1 production.

### **Acquisition highlights according to Hochschild Mining**

- Ion Adsorption Clay deposits are currently the lowest cost sources of rare earths in the world
- Special concentration of high demand rare earths – Terbium, Dysprosium, Praseodymium and Neodymium
- Simple and low cost to extract with no use of explosives
- Environmentally friendly process to extract rare earths with no tailings dam
- Low capex, modular processing facility allowing for staged growth
- Geopolitically independent source with traceable and sustainable production
- Significant exploration upside potential
- Low risk and proven mining jurisdiction
- Substantially de-risked post initial 6.2% investment in 2018

### **BioLantanidos ionic rare earth clay pilot plant in Chile**



*Source*

### **The negatives of the deal**

- Rare earths are extremely difficult to process. Extracting from clay can be difficult and expensive. Current rare earth miners have billion dollar initial CapEx costs when including the rare earth processing. This suggests we may see cost blowouts for this project.
- Rare earths mining is a dirty and polluting industry, often leading to environmental concerns by the host country as Lynas Corporation has experienced in Malaysia.
- Hochschild Mining has no experience or expertise in rare earths mining, or more importantly rare earths processing. Biolantánidos has an agreement with Rare Earth Salts (RES), but RES has not yet proved it can do the separation at scale.
- Chile is currently under siege with millions of protestors wanting equality. Two large lithium miners SQM (SQM) and Albemarle (ALB) have had recent issues with the Chilean Government (CORFO) and have been hit

with very high tiered royalty payments. Protestors have recently blocked their Atacama mine site. All of this emphasizes geopolitical risk is high in Chile.

Based on current information Hochschild has invested 2.5 million initially for 6.2% in 2018, and another \$56.3 million to own 100%. Next, they plan to invest another \$10 million to de-risk the mine with an updated FS, then a further \$40-50 million for the first stage with an 18 month construction period. All up that is over \$100 million, which a sizeable investment on an unproven process at scale, in a relatively high geo-political risk country, and to achieve Stage 1 production only.

Only time will tell if Hochschild Mining's rare earths Chile bet will pay off, or would they have been better off partnering with other safer country projects in Australia, USA, or Canada. Some examples are Alkane Resources Ltd. (ASX: ALK | OTCQX: ANLKY), Avalon Advanced Materials Inc. (TSX: AVL | OTCQB: AVLNF) or Search Minerals Inc. (TSXV: SMY). All are in safe jurisdictions.

The jury is out on this one. I would have chosen a safer location like Australia, USA, or Canada and used a low interest rate Government loan as Lynas did with Japan, or gone with an Australian rare earth project where the Australian Government is considering to support.

What do you think?

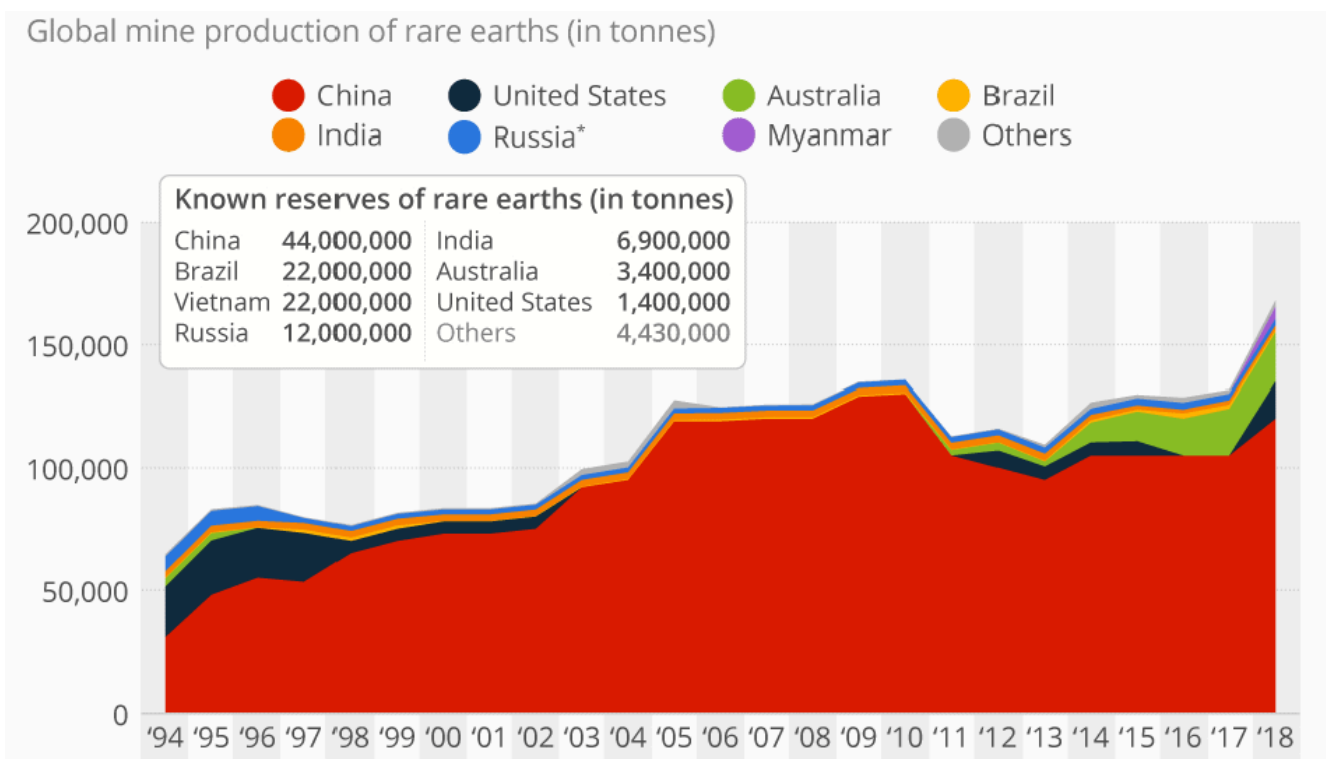
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## **The U.S. rare earths saga**

# continues...

Put simply, the US produces minimal rare earths, while China produces 70.59% (in 2018). This is important as rare earths are used as components in most electronic devices, electric vehicles, wind turbines, and the aerospace and defense industries. They are essential to our modern society, and the US depends on China's exports.

## Global rare earths production is dominated by China (in red)



Global rare earths production is dominated by China (in red)  
Source: Statista

The US' only domestic rare earths producing mine is California's Mountain Pass rare earths mine, owned by MP Materials. And for now, it sends its ore to China to be processed. MP Materials say they will kick-start their own processing operation by the end of 2020 and produce about 5,000 tonnes of two popular types of rare earths annually: Neodymium (Nd) and Praseodymium (Pr). In 2008 remaining reserves (using a 5% cut-off grade) were estimated to exceed

20 million tons of ore that averages 8.9% rare-earth oxides. Another two processing operations in the US are expected to open in mid 2022.

### **Before we can move forward we need to review the past**

Since 1985 China has steadily grown its rare earths production. While other countries shunned the dirty production of rare earths China embraced them, realizing the world's reliance on rare earths and hence their strategic importance. By the 1990s and 2000s China's rare earth production dominance grew to the point of today. China has ~ 40% of global rare earth deposits but produces over 70% of global production, or ~120,000 metric tons of rare earth a year. In comparison, the world's second largest supplier, Australia, produces ~ 20,000 metric tons.

### **Rare earths significant events timeline**

2006-10 – China imposed rare earths quota limits on production and exports, as China wanted to be sure that they had enough supply for their own technological and economic needs. The 40% reduction in quotas in 2010 caused a severe rare earths price spike to begin. It also motivated manufacturers to move to China in order to be sure to get supply.

2010 – China and Japan clashed over a territorial dispute in the East China Sea. As a result, China halted shipments of rare earths to Japan, disrupting the supply chain for major manufacturers like Toyota and Panasonic.

2010 – The U.S. Department of Energy reported a possible shortage of five rare earth elements (dysprosium, neodymium, terbium, europium and yttrium).

2010 – The Rare Earth Supply Technology and Resources Transformation Act of 2010 was passed in the USA. The legislation's goal was stated (p 133): "To provide for the re-establishment of a domestic rare earth materials production

and supply industry in the United States and for other purposes.”

2010-11 – Rare earths prices spike as Chinese export quotas take effect. Prices quadrupled in 2010, then doubled again over a 4 month period in H1, 2011.

2012/13 – China announced new rare earth export quotas for the start of 2013; however the export quota was still significantly higher than the actual amount of rare earth exports, therefore, there was no impact. High rare earth prices also encouraged illegal mining in China further oversupplying the market.

2011-13 – New illegal supply from China and new supply from Lynas Corporation’s Mount Weld mine and others helped the market to re-balance. Rare earth prices subside.

2014-15 – In 2014 the WTO ruled against China, which led China to drop the export quotas in 2015.

2015 – US company Molycorp Inc. (owned the Mountain Pass rare earth mine in California) filed for bankruptcy in June 2015. The bankruptcy was as a result of a 2014 restructuring (a large debt burden and heavy capital expenses) and lower prices in the China-dominated market. It was subsequently purchased by its largest creditor Oaktree Capital Management and was reorganized as Neo Performance Materials.

2019 – Chinese newspapers talk of a possible China retaliation to US tariffs on Chinese goods. On May 28 The Global Times, tweeted: “Based on what I know, China is seriously considering restricting rare earth exports to the US.

2019 – The United States has again decided not to impose tariffs on rare earths and other critical minerals from China.

May 2019 – Pentagon seeks funds to boost U.S. rare-earth production as fears over China supply mount.

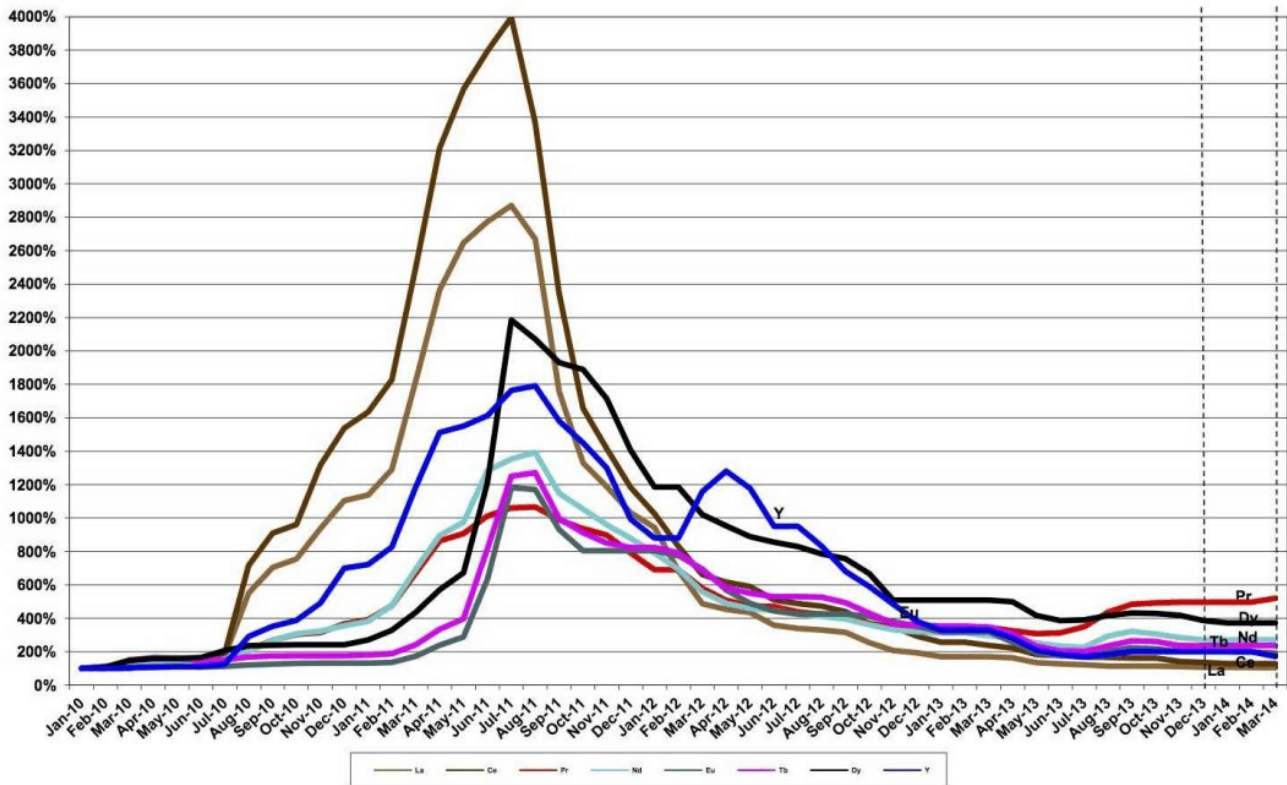
June 2019 – The Rare Earths Industry Association was launched in Brussels. The group has 12 founding members from nations such as the UK, Germany, France, the Netherlands, Japan and China. A key goal of the group is supporting transparency across the supply chain.

June 2019 – China rare earth prices soar on their potential role in the trade war.

### **Rare earth prices spiked in 2011 when China introduced export quotas**

As you can see in the rare earth index chart below the index rose spectacularly from July 2010 to June 2011; then fell equally as spectacularly from mid-2012 to 2014. The large price fall devastated the industry resulting in a huge contraction in the number of rare earth miners. In mid-2019 the US-China trade war and the concern of a 'possible' China rare earth US export ban caused prices to jump. Any further threats of a China export ban of rare earths will no doubt send prices much higher.

Rare Earth Index Prices: (% based on Jan. 2010 Prices)



(Source: Metal-Pages, FOB China min)

Rare earth prices spiked in 2011 when China introduced export quotas – Source

### The US rare earths market blows itself up

In the period between 2010 and 2019 there have been numerous calls for the US to develop its own rare earths industry. In 2010 the US Department of Energy released a report titled “Critical Materials Strategy”. Several of the rare earths were discussed. For example on page 122 of the report they state in regard to neodymium: “Limited near-term flexibility for increasing global supply, despite stockpiled supplies.... Demand for Nd-Fe-B magnets is likely to exceed producer’s ability in the short term.... Predominantly produced in China, which has instituted significant export quotas and tariffs on REEs for resource conservation and environmental regulatory reasons. New mines in Australia, Canada and the United States will provide additional supply, but are subject to strict permitting processes and environmental regulations.” The later has been a contributory factor to a lack of new supply from



these countries, and hence the problems of today where China dominates the industry.

Yet 10 years later nothing has changed. No new US rare earth mines.

### **The EV boom will cause a new demand surge for some rare earths**

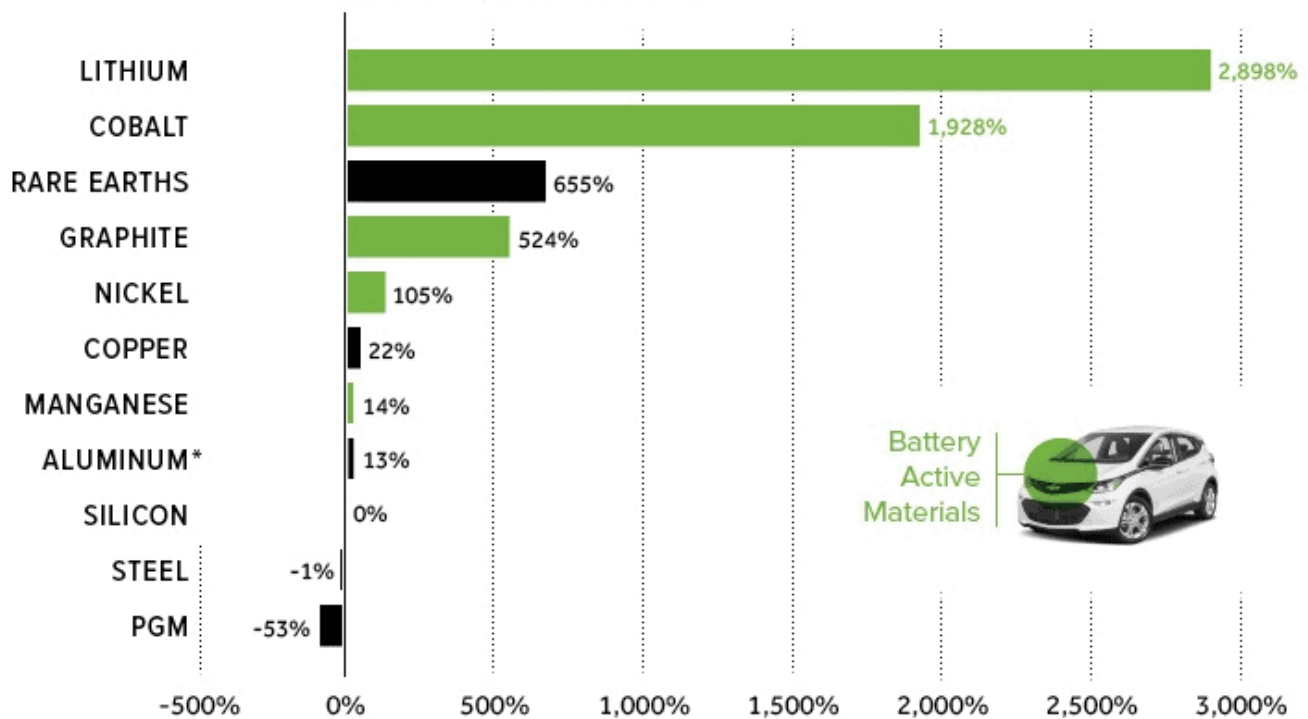
The electric vehicle (EV) boom will cause a new wave of rare earth demand especially for Neodymium (Nd) and Dysprosium (Dy), as they are commonly used components in electric vehicle motor magnets. As the EV boom takes off (especially post 2020) demand for these key rare earths will surge.

### **Rare earths demand set to surge 655% in a 100% EV world**

If electric vehicles continue to boom then the demand surge expected for the 'magnet rare earths' neodymium (Nd) and praseodymium (Pr) will be huge (see chart below). Dysprosium [Dy] is also sometimes used to make permanent magnets. As a result these magnet rare earths are forecast to go into deficit as the EV boom takes off.

## INCREMENTAL COMMODITY DEMAND IN A 100% EV WORLD

Percentage of today's global production



\*Small amounts of aluminum are used in NCA batteries, but this change in demand stems mostly from replacing steel in the body.

Rare earths demand set to surge 655% in a 100% EV world

Source: UBS

### Conclusion

The brutal rare earth price falls post 2011 has significantly contracted the number of rare earth juniors. This means any recovery in pricing will be favorable to the few rare earth juniors that survived the past decade's turmoil.

Fast forward to the current era of supply insecurity (exacerbated by the US-China trade war) and it no longer looks wise to rely on one country (China) to be your source of rare earths supply. The only other major source of supply is Australia's Lynas Resources who are already heavily contracted and send most of their material to Japan. In fact, the US has rare earths listed as critical materials, yet have done nothing to secure supply.

China still controls the vast majority of the global rare earth industry and hence controls the supply chain critical to

producing high tech electronics, especially those using magnets. Once again China's dominance of the sector makes the world very vulnerable to any China export ban or supply disruption.

It makes no sense for the US to be so reliant on rare earths from China. In fact, the US is very vulnerable to a China ban on rare earths as the US imports most of their rare earths from China, either directly or indirectly as end products such as magnets, electronics, or electric motors. As the era of electric vehicles takes off demand for rare earths will also explode. What will happen if China refuses to sell rare earths to the US? The US nuclear industry is currently asking the same question with regard to Russian sourced uranium.

Thanks to US Senator Lisa Murkowski and the Rare Earth Supply Technology and Resources Transformation Act of 2010, the US government did recognize the need to "provide for the re-establishment of a domestic rare earth materials production and supply industry in the United States". But what action was taken to make this happen. US environmental and permitting rules make it very difficult to start a new rare earths mine in the US today.

With renewed rare earth supply concerns during the US-China trade war, the question remains when will the US wake up and secure supply to critical materials such as the rare earths. The breaking news discussed above gives hope that the US may have finally started some action to secure supply of critical elements such as the rare earths. Perhaps the US has woken up at last!