

China Is Consolidating its Industrial Economy – The Case of the “Medium and Heavy Rare Earths’ Industry”

Perhaps the most significant announcement in the commodity space last week, one that was almost completely overlooked by the mainstream press, although it was picked up by some of the the “wire” services, and the New York Times, was the announcement that the Chinese “medium [samarium, europium, and gadolinium] and heavy {mainly terbium, dysprosium, and yttrium] rare earth producers and processors” were consolidating their operations. Those of you who follow the Chinese rare earth industry know that in the mid-teens [around 2015] China’s mandarins reformed the Chinese rare earth industry by consolidating all of its operations under the umbrella of just 6 companies, which each became responsible for the rare earth companies in their geographic areas meeting and not exceeding their government specified quotas for production and processing. The ostensible purpose of this initial consolidation was twofold. It was intended to corral illegal rare earth mining and to address the rampant pollution from all domestic Chinese rare earth mining.

Most of my “in-the-know” colleagues scoffed at both stated purposes. They said that no one could or wanted to control Chinese illegal mining and no one in China really cared about pollution. They were all wrong; they did not understand that these goals were set by China’s president, Xi Jinping, and that it would be very unhealthy for any Chinese businessman to scoff at these goals or to impede them.

For most of the last two years the production of heavy rare earths from China’s ionic clays has been completely curtailed

due to pollution, and China today is importing more than a third of its rare earth bearing ore concentrates including most of its needs for heavy rare earths. This is a result not only of the crackdown on pollution but to continue the ban on working Chinese ionic clays, both to reduce pollution and to conserve a scarce and diminishing resource.

Last week the Chinese government announced the implementation of a second phase of consolidation in its domestic rare earths' industry. Two or three of the six rare earths' production managing companies will merge their medium and heavy rare earths' operations to form just one Chinese manager of all of China's medium and heavy rare earth production centered on the city of Ganzhou, which is the center of the Chinese medium and heavy rare earth industry.

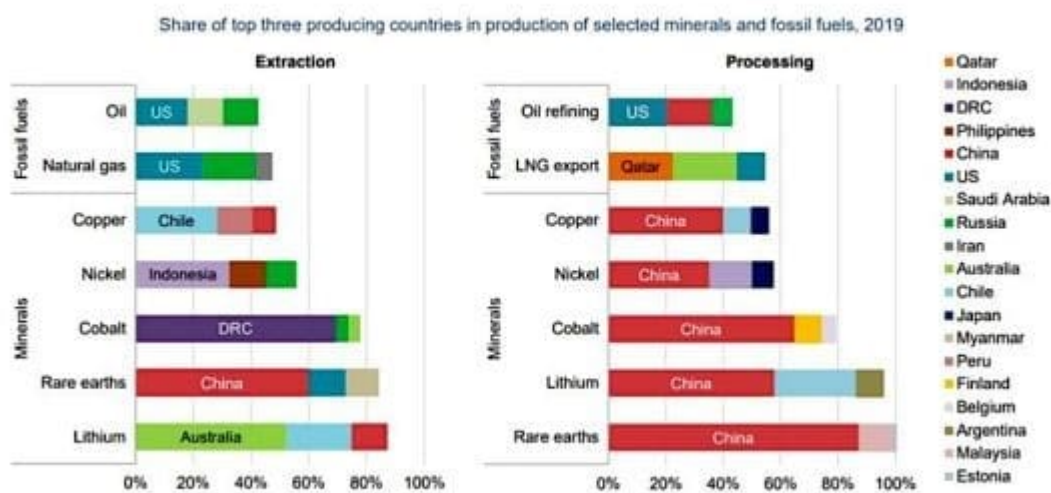
My guess is that before 2025 a third phase, the consolidation of all Chinese rare earths' production and processing, light, medium, and heavy, will be announced and implemented so that there will be then just one Chinese Rare Earths producer and processor. If that happens then there will be no possibility of any non-Chinese company controlling the prices, or supply, of rare earths.

I doubt that any nation or region that has not secured a sufficient supply of rare earths for its critical needs by 2025 will never after that be able to do so. China today has not only a near monopoly on all rare earths production and processing but also has a monopsony of demand for rare earth permanent magnets. The numerical size of the Chinese domestic market is twice that of the USA and Europe combined, and the Chinese Communist Party's plan, also known as Xi Jinping "thought," is for every Chinese to have the world's highest standard of living by 2049. That's going to require a billion EVs, billions of home appliances, and thousands of passenger aircraft, just to name a few large-scale users of rare earth permanent magnets.

It's becoming harder and harder for Western companies to pretend that their fiercest competitor is not China, Inc. It's also harder and harder to believe that Xi's "dual circulation" [in which domestic consumption grows to be greater than export volumes] reformation of the approach to China's economy is not already dominant.

To achieve its goal of being the world's richest nation by 2049, China has already implemented its plan to become the world center of critical metals processing. Its progress is apparent from the graph below.

Production of many energy transition minerals today is more geographically concentrated than that of oil or natural gas



Notes: LNG = liquefied natural gas; US = United States. The values for copper processing are for refining operations. Sources: IEA (2020a); USGS (2021); World Bureau of Metal Statistics (2020); Adamas Intelligence (2020).

IEA. All rights reserved.

In reality, all Chinese businesses are SOEs, state-owned-companies, because they all take their direction from Beijing.

The centralization of China's critical metals industries is well underway. Rare Earth production and processing is just the beginning.

Imperial Mining is set to announce a Resource Estimate that will Highlight Significant Grades of Scandium and Related Technology Metals

Imperial Mining Group Ltd. (TSXV: IPG | OTCQB: IMPNF) ("Imperial") is due to shortly release a 43-101 preliminary Resource Estimate for their 100% owned Crater Lake Scandium-Rare Earth Project in northeastern Quebec, Canada. What can investors expect?

The Crater Lake Project consists of 57 contiguous claims covering 27.8km². The Project has ~14 km of potential mineralized horizon (only 1/4 drill tested) spread over several zones, some of which have drill tested high-grade scandium and some rare earths deposits, including and yttrium. There is also potential for niobium and tantalum.

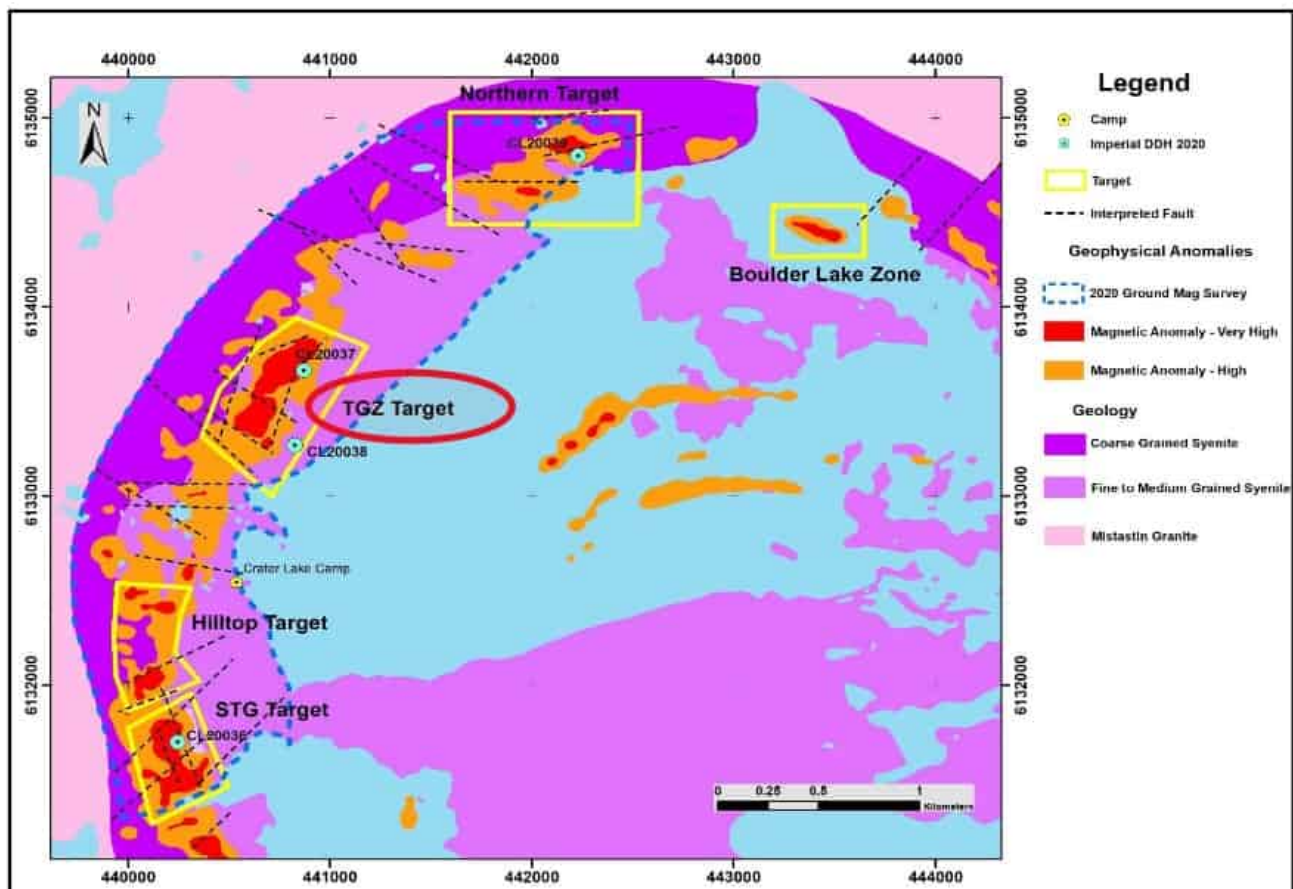
Imperial Mining's Crater Lake location showing excellent infrastructure nearby



- 👑 Large surface scandium resource inventory
- 👑 Near Quebec's aluminum metal production/value-add product
- 👑 Good road, rail, air and hydroelectric capacity
- 👑 Supported by Plan Nord infrastructure program
- 👑 New QC critical mineral development fund (\$90M)

Drilling has defined several mineralized zones of over 600m in total strike length and from surface to a vertical depth of up to 200m.

Crater Lake Exploration Targets



Source: Company presentation

Excellent drill results at Crater Lake continue in 2021

Past drilling has shown some excellent long length, high-grade, scandium oxide results ranging from 0.0235% to 0.056% (235-506 g/t).

For example, in April 2021 the Company announced excellent drill results at Crater Lake that included **92.5 m @ 291g/t scandium oxide (Sc_2O_3)**. Elevated levels of total rare earth oxides plus yttrium of up to 0.42% were also found. There is also a parallel niobium target showing grab assay results of between 0.20% and 1.42% Nb₂O₅ which sits 250m west of the scandium target.

Then in May 2021, Imperial announced:

- **“Assay results from the first four drill hole continue to return impressive intercepts of **111.9 m (367.0’)** grading **298 g/t scandium oxide (Sc₂O₃)**, including 40.5 m (132.8’) grading 336 g/t Sc₂O₃ and 34.77 m (114.0’) grading 321 g/t Sc₂O₃.**
- **Elevated levels of total rare earth oxides plus yttrium (TREO+Y) of up to 0.38 %.”**

More recent drill results announced in June 2021 included:

- **“99.8 m (327.3’) grading 299 g/t scandium oxide (Sc₂O₃)**, including 24.2 m (79.4’) grading 331 g/t Sc₂O₃ and 77.3 m (253.5’) grading 313 g/t Sc₂O₃.
- **Elevated levels of total rare earth oxides plus yttrium (TREO+Y) of up to 0.46%** characterize the scandium-bearing intercepts.”

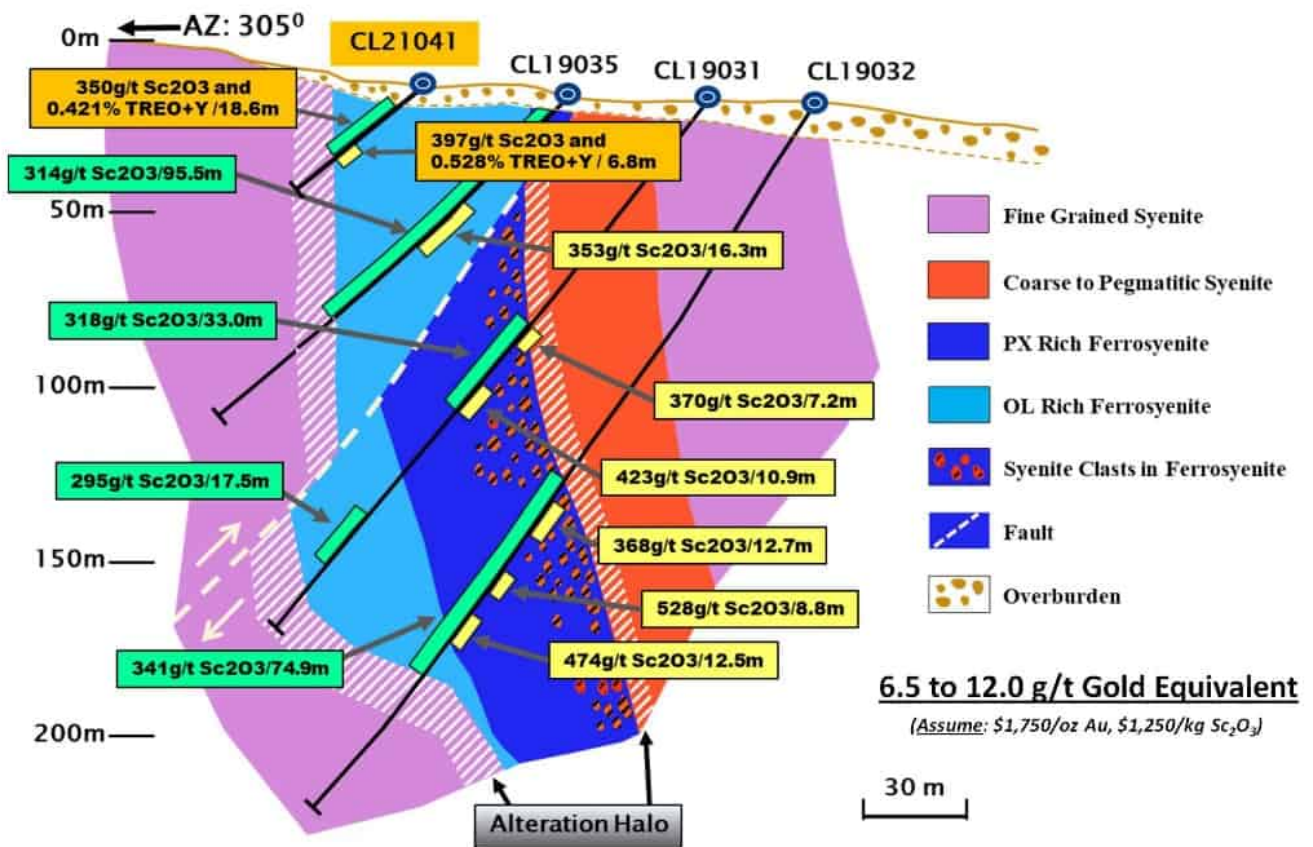
Crater Lakes’ critical minerals mean a 10MT resource can potentially be very valuable

Imperial’s ‘target’ at Crater Lake is to define a scandium-REE mineral resource of a minimum of 10 Mt, sufficient for a 25-year operating model. What some investors miss is that a small relatively shallow resource-rich in valuable metals such as scandium, niobium, and rare earths can be highly valuable. The chart below highlights this by expressing the results as 6.5 to 12.0 g/t ‘gold equivalent’. If Imperial Mining was able to achieve 10MT of ore at say 6.5 g/t Au equivalent (lower range) that would be equivalent to 65 million grams (2.1 million troy ounces) of gold in terms of value. If the grade was in the higher range then the gold equivalent would be almost double. Of course, the 10MT is a ‘target’ and not yet a reality, as we will have to wait to see what the upcoming resource estimate is.

The Crater Lake TG Zone drill results are equivalent to 6.5 to 12.0 g/t gold equivalent



Crater Lake Property - TG Zone Drilling – 500N



Source: Company presentation

Once a resource is grown the other important issue is the extraction method and recovery rates. In June 2021 news Imperial announced that they had developed a “high-recovery extraction process for scandium and rare earth elements for Crater Lake mineralization...as part of its current Phase 3 Hydrometallurgical Development Program.” Scandium extraction was at **84-87%**, and total rare earth elements, including yttrium (TREE+Y) was **84%**. This is excellent news.

Near term stock catalysts

Imperial President & CEO, Peter Cashin, stated in August: “We are now in the final stages of the surface evaluation of our Crater Lake property. In addition to delivering the inaugural 43-101 Sc2O3 resource estimation on our TG Zone later this month, we look forward to delivering on the results of the remainder of the targets present on the Crater Lake property. We clearly

believe that much additional critical metal potential remains to be evaluated on our property as we have only drill-tested one-quarter of the favourable 14-km-long mineralized horizon. We also intend to assess a high-grade niobium-tantalum mineralized area identified in 2010, north and northwest of the scandium-bearing Crater Lake Complex.”

Imperial will now embark on a Summer 2021 campaign that will include surface evaluation of additional high priority scandium rare earth exploration targets outside of the drilled TG Zone mineralized area. 50-tonne bulk samples at the STG mineralized Zone will be used in a pilot plant study to further test and optimize Imperial’s metallurgical process method. Next, a detailed assessment of historical high grade rare earth, niobium, tantalum occurrences at the Crater Lake Extension property area will be undertaken. Following this will be a pilot plant study and a Preliminary Economic Assessment.

Closing remarks

Imperial Mining trades on a market cap of a mere C\$20 million. Considering the outstanding drill results over the past year, outstanding hydromet recovery rates achieved to date, and the impending 43-101 preliminary Resource Estimate due out any day now the stock looks likely to be potentially re-rated higher soon. Don’t wait too long!

**MOU with the Saskatchewan
Research Council signals**

another milestone for Search Minerals on their quest to produce rare earths in NA

A likely Biden victory in the USA is positive for all the rare earths miners. This is because one of Biden's key policies is a massive \$2 trillion green infrastructure and jobs plan over his first term in office that aims to have a US carbon pollution-free power sector by 2035. This would be a huge tailwind for the US renewable energy sector (solar and wind) as well as supportive to the US electric vehicle (EV) industry. Any North American rare earths suppliers who can potentially supply the USA and/or Canada with rare earths would be likely to benefit as North America embraces the green revolution.

One rare earth miner worth considering is Search Minerals Inc. (TSXV: SMY) ("Search"). Search is focused on finding and developing critical rare earth element mineral assets in Labrador, Canada.

In some very exciting recent news Search has signed a Memorandum of Understanding (MOU) with the Saskatchewan Research Council (SRC). The MOU outlines a collaboration with SRC as they build their Rare Earth Processing Facility in Saskatchewan, Canada.

Search Minerals President and CEO, Greg Andrews, commented: "We anticipate using the (SRC) conventional solvent extraction process to enable Search to validate the ability to produce the individual rare earth oxides necessary to enter the rare earth supply chain.

Recent announcements regarding building electric cars in Canada and other government led initiatives for clean and green technology provides the framework for industry access to

a secure rare earth supply chain in Canada. We believe Search is well positioned to capitalize on these opportunities.”

Search controls properties in three areas of Labrador, Canada. These are:

- The Port Hope Simpson (PHS) Critical Rare Earth Element District in SE Labrador
- The Henley Harbour Area in Southern Labrador
- The Red Wine Complex located in Central Labrador

Search Minerals has nearby infrastructure in place at St. Lewis, Labrador, Canada

Community of St. Lewis

- Diesel power plant (expandable)
- Ice-free deep sea port: reagents & other supplies
- 12km from Foxtrot
- 2km from Deep Fox
- Small aircraft airstrip
- Fox Harbour House: housing, office, core shack, workshop

Trans-Labrador Highway

- All season paved highway – transport REE Concentrate



Source

Within the Port Hope Simpson District Search's main

discoveries are the **Foxtrot Resource, Deep Fox, Fox Meadow, Silver Fox, and Awesome Fox deposits** which contain rare earths including dysprosium (Dy), neodymium (Nd), praseodymium (Pr), terbium (Tb), yttrium (Y), zirconium (Zr), and hafnium (Hf).

The district covers a 63 km long and 2 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). The 14 year Life of Mine (LOM) Foxtrot Project offers an IRR of 16.7% on an after tax Net Present Value (NPV) 10% of \$48M, with a CapEx of only \$152M. The NPV quoted above is only for the Foxtrot Project, so once the other projects are combined into a bigger project the NPV should improve.

At Fox Meadow, 2020 channel assay results outlined two mineralized zones on the surface: The NW zone is up to 175m wide and the SE zone is up to 116m wide. Combined, the mineralization is at least 790m long and contains similar grades of the REE magnet materials (Nd, Pr, Tb and Dy) as Foxtrot and Deep Fox. This is a good result as it means Search is continuing to find more REE mineralization to potentially further grow their resource.

At Silver Fox, Search has recently successfully expanded the Silver Fox high grade zirconium-hafnium (REE) mineralized zone. In the news release Search commented: "This surface expression is significantly longer, but thinner, than the surface expressions of the nearby and related Foxtrot and Deep Fox Resources. The mineralization is similarly hosted by peralkaline volcanic rocks and contains lower grades of the REE magnet materials (Nd, Pr, Tb and Dy) but significantly higher grades of Zr and Hf."

At Awesome Fox, the 2020 channel program (7 new channels) along with previous channels has outlined a REE mineralized zone ranging from about 4-43m thick and 850m long.

Why Invest in Search Minerals?

SMY: TSX-V

-  Lowest CAPEX project in North America - \$ 152M (\$Cdn), 1000 tonnes per day scalable processing technology to align production rate with CAPEX
-  Patented Processing Technology – produced 99% high purity mixed REO concentrate during \$1.9M pilot plant operation
-  100% owned Foxtrot and Deep Fox Resources: Fox Meadow and Silver Fox Advanced Prospects; Multigenerational opportunity
-  Strong support from Federal/Provincial governments, NunatuKavut Community Council (Indigenous) and Local Communities
-  Macro Developments – US/China trade war, Defense Production Act Title III – Create North American rare earth supply chain, Possible future supply constraints
-  Led by a proven management and Board of Directors. Insider ownership greater than 38%

Source

Closing remarks

Earlier in 2020, rare earths expert Jack Lifton stated about Search Minerals: “I think it may well be Canada’s first commercial rare earth producer.” Given Search has completed a Resource estimate (Foxtrot, Deep Fox), a PEA (Foxtrot), has successfully produced 99% purity REO concentrate from their pilot plant and patented process, and now has a potential larger scale processing option with SRC; this all combines to suggest that Search Minerals is well on the way towards commercial production. Next steps would involve a BFS and potentially some trial production with SRC once their facility is built.

Search Mineral’s current market cap is only C\$10.5M suggesting there may be plenty of upside potential ahead, especially if they continue to successfully advance towards production.

Search Minerals expands their rare earths discovery with critical materials' zirconium and hafnium

As the West looks to establish a non-Chinese source of supply of critical rare earth elements, one Canadian company has been successfully expanding its rare earths project, as well as discovering some additional valuable metals like zirconium (Zr) and hafnium (Hf).

Zirconium dioxide (ZrO_2) is used in laboratory crucibles, metallurgical furnaces, as a refractory material, and in ceramics (including use in dental ceramics); because it is mechanically strong and flexible. Zircon ($ZrSiO_4$) and the cubic zirconia (ZrO_2) are cut into gemstones for use in jewelry. Ceria-zirconia is widely used as a component in current three-way catalytic converters.

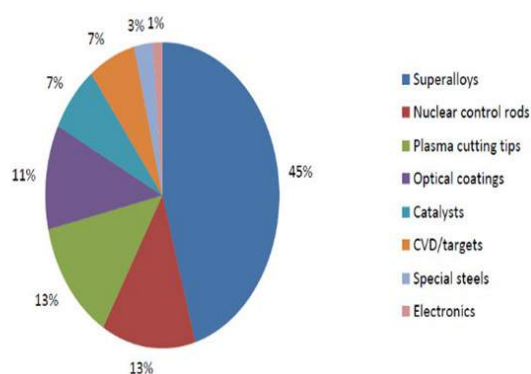
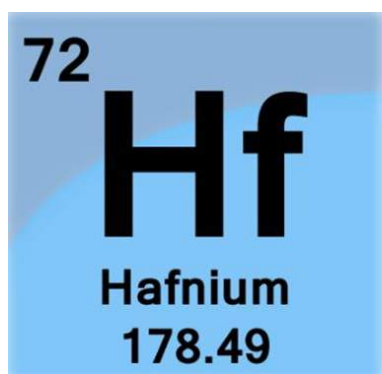
Zirconium is used in ceramics, jewelry, dentistry, and catalytic converters



Hafnium is a good absorber of neutrons and is used to make control rods, such as those found in nuclear power plants and submarines.

Hafnium is used in some superalloys for special applications such as jet engine turbines in combination with niobium, titanium, or tungsten. Hafnium oxide is used as an electrical insulator in microchips, filaments and electrodes.

Hafnium is used in superalloys, nuclear rods in nuclear submarines, microchips, and jet engine turbines



Search Minerals discovers zirconium and hafnium

Search Minerals Inc. (TSXV: SMY) recently announced that they have discovered zirconium and hafnium, in addition to their existing valuable rare earths dysprosium (Dy), neodymium (Nd), praseodymium (Pr), terbium (Tb) and yttrium (Y). The discovery was made at their Silver Fox Deposit.

With regards to the Silver Fox discovery Search Minerals stated: "This surface expression is significantly longer, but thinner, than the surface expressions of the nearby and related **FOXTROT** and **DEEP FOX** Resources. The mineralization is similarly hosted by peralkaline volcanic rocks and contains slightly lower grades of the REE magnet materials (Nd, Pr, Tb and Dy) but significantly higher grades of Zr and Hf."

Dr. David Dreisinger commented: "The objective of metallurgical testing of the **SILVER FOX** (and other deposits) will be to recover a high grade zirconium by-product for sale

with minimal processing cost and complexity. Search is engaged with our technology advisor, SGS Canada, to identify process flowsheet options.”

Search Minerals expands the mineralized zone at Fox Meadow

Search Minerals also recently announced that they have successfully expanded the critical rare earth element mineralized zone at Fox Meadow. The Company stated:”The trenching/channelling programs at **FOX MEADOW** have outlined a mineralized zone of up to 123.6 m wide and at least 500m in strike length; mapping and airborne magnetic anomalies suggest that the zone is up to 650m long. In contrast, both the **DEEP FOX** and **FOXTROT** mineralized resources are about 350-450m long and up to 40m thick.”

About Search Minerals

Search 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.

Within the Port Hope Simpson District, Search’s main discoveries are the Foxtrot Resource, Deep Fox, Fox Meadow, and Silver Fox deposits which 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).

The 14 year LOM Foxtrot Project offers an IRR of 16.7% on an

after tax NPV10% of \$48 million, with a CapEx of \$152 million.

Investors should note the NPV quoted above is only for the Foxtrot Project, so once the other projects are combined into a bigger project the NPV should improve materially.

Closing remarks

Search Minerals is both expanding their existing very promising rare earths project as well as finding other valuable metals zirconium and hafnium. Investors will need some patience, as more exploration work needs to be done to further grow the resource and improve on the economics.

Combined with an excellent management team, and strong Government and local support, the Company continues to advance their Port Hope Simpson District project at a steady pace. Rare earths expert Jack Lifton recently stated about Search Minerals: "I think it may well be Canada's first commercial rare earth producer."

With a market cap of just C\$9 million there is plenty of potential upside ahead for investors if Jack is right.

TMRC's Chairman Anthony Marchese on what the US-China Trade Agreement means to the US Rare Earths Market

"If you look at the specifics of the trade agreement (US-China Phase One Deal), the way they have listed is, all of the rare earths including scandium and yttrium because a lot of people

don't consider especially yttrium a rare earth. So it is all of the rare earths and scandium and yttrium and any of the alloys. It is true that the United States currently has zero manufacturing capacity...I look at it as another potential market for our products when we get into production. Remember this is phase 1. There is going to be phase 2 and hopefully phase 3. They are committed to buying it once we get into production. We will be able to sell 100% of our goods to the American market. China then becomes a secondary market for some of our products. It gives acknowledgment to the fact that we have a potential supply chain resurgence in the United States." States Anthony Marchese, Chairman of Texas Mineral Resources Corp. (OTCQB: TMRC), in an interview with InvestorIntel's Tracy Weslosky.

Anthony went on to say that Texas Mineral Resources is developing the Round Top Heavy Rare Earth and Critical Minerals Project in Texas with its funding and development partner, USA Rare Earth LLC. The Round Top Project has the optimal infrastructure to move materials to other parts of the country as it is very close to Interstate Highway 10 and a major railroad. The project is located on State property and not on Federal property which is a huge advantage for the company. Anthony also said that the Round Top project will provide a balanced and diversified revenue stream as a third of the output will be rare earths, another third will be critical materials like scandium and lithium and remaining will be industrial minerals.

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

Earner on new role at Alkane and Dubbo Project update

Nic Earner, Managing Director of Alkane Resources Ltd. (ASX: ALK | OTCQX: ANLKY) (“Alkane”) in an interview with InvestorIntel Senior Editor, Peter Clausi discuss one of the most substantial evolving rare earths project in the world – the Dubbo Project in North Western Australia. Virtually an entire supply chain source alone for battery materials, the Dubbo Project has zirconium, hafnium, niobium, yttrium and many of the prized rare earth metals such as neodymium. In this interview, Nic explains how Alkane has completed all required government permits for this project to proceed and Nic’s focus towards production as he transitions from COO to Managing Director...to access the complete interview, [click here](#)

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

Profiting from the Inevitable Price Increases of Rare Earths in 2018

The rare earth market will have a tremendous 2018. Position yourself now to profit from that.

There are three key takeaways from this article. The first is that while rare earth elements aren’t actually that rare (for example, cerium, #58 on the periodic table, is about as common as copper), REE’s are extremely difficult to extract and

process.

It is technically complicated to separate them from each other and from the host ore, increasing the cost and risk of mining REE's as compared to something more generic like gold or nickel. While they are easy to find, these metallurgic difficulties makes the REE supply response inelastic.

Second, something to compare it to, and for that we look at cobalt, the dominant element in the cathode of a lithium ion battery. For a primer on why cobalt spiked, please look here and here. In summary, Economics101 predicted the increased value in cobalt. It was clear that demand for cobalt was increasing as lithium ion batteries found their way into our toothbrushes, hedge trimmers, drones, cell phones and most importantly our electric vehicles. It was also clear that supply was at risk due to the concentration of cobalt production in the unfortunate Congo.

Risky supply + increased demand = price increases. When we called about cobalt about 20 months ago, it was trading on the LME at roughly USD\$10 per pound. Today, it's around \$27. We're calling for \$35 by year end.

We are calling for the same kind of reaction in the REE market, and for the same basic reasons.

Which brings us to the the third takeaway, namely, supply and demand. The REE market already had one major surge this century, coming in 2010, but that was in response to China's state-managed cuts in production. Since 95% of the world's REE's come from China, those production cuts caused prices to jump through 2011, when China changed its mind and prices plummeted (a simplistic summary of a complicated situation). In that case, the supply side dictated pricing.

As with cobalt, and the third major takeaway here, is that the next run in REE pricing will be driven by the leveraged push-pull of global product shortage and increased demand.

The U.S. Department of Energy is anticipating a critical shortage of neodymium, europium, terbium, dysprosium and yttrium necessary for green technology development and construction. (US Dept of Energy, Technology Metal Research). With virtually no production outside of China and with the supply response being inelastic, it will take a considerable amount of time for new mines to come online and begin production.

Part of that shortage will be driven by new demand, with possibly the greatest new demand for REE's in electric vehicles. For proof, consider the thought experiment from UBS in May, 2017. UBS's thought experiment was, let's tear apart a Chevy Volt to see what it's made of, and then draw inferences as to pricing of the vehicles and the pricing of the minerals that go into making a Volt. (As an aside, note that UBS' cobalt conclusion was the same as ours, that cobalt will have a great run should the sale of EV's continue.)

One of UBS' many interesting conclusions was that the market for rare earths, neodymium in particular, could face demand shocks in case of a rapidly evolving EV market. The material is used in the e-motor magnets (see page 8 in the report).

There is one more less empiric measurement to consider here, and we acknowledge it is less scientific and more anecdotal. However, it has been a reliable gauge for us in the past.

That gauge is this: there are more REE deals passing through my inbox than ever before. Investors are asking me to find them to good REE companies, and good REE companies are confidently seeking growth capital rather than coming apologetically hat-in-hand. Those two things happening at the same time is a leading indicator that the REE market will be play within 12 months or so.

So our three takeaways and the anecdotal evidence result in one question: do you as an investor think there will be more

appliances with lithium ion batteries sold next year, or fewer? If it's more, then load up on the REE companies. If it's fewer, then go long steel.

Our call is that 2018 will be a big year for REE's. Plan ahead to profit from that.