Appia Rare Earths & Uranium by the numbers

written by | July 25, 2022

Appia Rare Earths & Uranium Corp. (CSE: API | OTCQX: APAAF) recently reported results from its 2021 drilling program and work completed this year on its Alces Lake property in Northern Saskatchewan. While results are still pending from the 34 holes drilled at the recently renamed site Magnet Ridge (formerly Augier), other areas returned values as high as 14.95% TREO over 0.66 metres. This is high compared to most deposits. As of early July Appia has drilled over 14,000 metres in 2022 and plans to drill up to 20,000 metres this year, which should provide them with valuable information on the Alces Lake deposit. Magnet ridge is interesting as Appia has reported it outcrops at surface with a strike length of about 300 metres and a width of 175 metres, and has been penetrated to over 100 metres deep.

The mineral hosting the rare earths at Alces Lake is monazite. Monazite is regularly processed in China to produce rare earths, so making a concentrate and separating the rare earths is an established technology. In several jurisdictions, this could be a problem as monazite is typically associated with the radioactive elements Thorium (Th) and Uranium(U). However, it comes down to the old paradigm, location, location, location. Being situated in Saskatchewan, Appia is in a jurisdiction that understands radioactive materials and that they can be properly handled and stored, and in the case of uranium can be a valuable resource. The other advantage for Appia being in Saskatchewan is that the Saskatchewan Research Council is building a pilot plant for rare earth separation over the next 2 years. This will give Appia the ability to test their material locally, which is a significant advantage.

A 2020 Appia presentation indicates Neodymium (Nd) oxide levels of 17.4% and Praseodymium (Pr) oxide of 5.4% which gives a combined total of just under 23%. This is close to the Lynas levels from its Mt. Weld deposit, which Roskill's Market Outlook 2015 indicates to be 23.8%. The Mountain Pass Mine, the deposit in California owned by MP Materials, has Nd+Pr levels at 16.3%. so they would have to process up to 50% more material to get the same revenue levels as Appia or Lynas. In addition, Appia's report shows added value in Terbium (Tb) and Dysprosium (Dy). Looking at recent pricing in Shanghai Metal Markets (SMM), the Nd/Pr holds 87.8% of the total value. Terbium and Dysprosium add another 0.3%. This assumes that all the elements are sold, which typically is impossible, especially the Cerium, which is over 49% of the total volume. However, there may be markets in North America and possibly Europe for Cerium and Lanthanum. Their current price in China is $1.22 and $1.15 per kg respectively and freight can be a high proportion of the total cost of the product outside of Asia.

One way to look at the value of the deposit is to see what potential revenue can be generated from the four main magnetic elements (Neodymium, Praseodymium, Terbium and Dysprosium). Assuming the long range plans would be to build a 20,000 TPY plant, which is similar to the previous Molycorp output and just below the Lynas present output of around 22,000 TPY, their projected revenues would be around US$500 million per year. This assumes 90% recoveries and revenues only from Nd+Pr. Any sales of Cerium and Lanthanum would be minimal but an added bonus.

In addition, Appia has properties in the Elliot Lake area in Ontario. This is in the right area code as from the mid-late 1950s to 1990 there were 10 mines producing Uranium. Again location, location, location. Given the push for electric vehicles and the corresponding increase in electrical demand, countries are going to review their long term needs including

Germany and China, and possibly India, and given alternative producing options nuclear is a cleaner way than coal or gas to produce electricity. Also given the current Russian situation more focus will come on nuclear and correspondingly Uranium. Thorium may also come into demand as it can reduce the operating temperature and thereby improve safety.

All things considered, Appia has an interesting opportunity and with the grades shown so far, and is poised to take the next steps to becoming a potential domestic producer of rare earths.

Hunting the big North American rare earths elephant

written by Jack Lifton | July 25, 2022

"Amazing discovery… I keep making this point that there is a deficit of rare earths worldwide and Appia is the premier rare earths discovery in North America." – Jack Lifton, Global Critical Materials Expert

A mineral discovery is the natural occurrence of a specific chemical compound or a mix of chemical compounds, which may be processed mechanically and chemically to isolate one or more forms of individual chemical elements, and then be purified and converted into useful forms for industrial use. If the discovery is extensive enough and the contained chemical compounds are of a sufficiently high enough grade for efficient and economical separation of them from each other and then can be further processed into forms that can be utilized industrially, then the large-scale production and concentration of the initial mineral

concentrate is called mining.

How do you evaluate a rare earth discovery? The best way is to determine if it contains "valuable" rare earth elements, which can be economically and efficiently recovered in the jurisdiction in which it is located, in such quantities that the capital expended can be recovered at a profit.

The old-timers (aka, experienced exploration geologists and mining engineers) have just two simple metrics they use in first determining whether or not there is any point in answering this question: Grade and accessible tonnage.

Appia Rare Earths & Uranium Corp.'s (CSE: API | OTCQB: APAAF) rare earth discovery at Alces Lake, Saskatchewan, meets the first of the above requirements, and the company is now in the process of a comprehensive drill program to determine if the second one is met as well.

The Appia discovery is of the mixed rare earth mineral, monazite, the most desirable rare earth bearing mineral on the planet. Monazite was the original rare earth mineral mined commercially in the late nineteenth century, not for rare earths, but for its contained thorium, which was heated, as an oxide in the form of a mixed ceramic mantle, with natural gas, to produce a brilliant white light for illuminating the stage in theatrical performances. Monazite fell out of favor as a mineral resource after World War II because of thorium's natural radioactivity being highlighted as a danger in the early atomic age. Of course, electric lights, had by then long eclipsed the need for thorium.

In the 1950s though, thorium again became of interest when it was discovered that nuclear reactors for the commercial production of electricity could be fueled with thorium, which could not easily be used to make nuclear weapons. Anglo-American

Mining in that period discovered the highest-grade thorium and rare earths deposit then known in the world in South Africa and began producing thorium for the UK's civilian nuclear reactor program. Thorium reactors fell out of favor by the mid 1960s and thorium (monazite) mines were shut down, even though they were associated with high grade rare earths, because of the problems of disposing of the thorium and the then extremely expensive processes for separating the rare earths from each other, ion exchange, and fractional crystallization.

The discovery of a huge primary, accessible, mineable deposit of the rare earth mineral bastnaesite at Mountain Pass, California, in the late 1940s, and the development in the 1960s of the commercial application of solvent extraction to the separation of the rare earths, led to the eclipse of the use of high thorium monazites by bastnaesite as the primary mineral for rare earth mining.

The development of the rare earth permanent magnet in the late 1970s, at first using the rare earth element, samarium, and the rare earth elements neodymium and praseodymium, revived interest in monazite, because monazite contains 50% more, by weight, of neodymium and praseodymium, than bastnaesite.

However, the low thorium bastnaesite in California, because of its accessibility, became the world's largest source of the magnetic rare earths, samarium , neodymium and praseodymium by the early 1980s. It was eclipsed by the bastnaesite recovered, more economically, as a byproduct of iron mining in China's Inner Mongolia by the late 1980s. The Chinese iron deposits also contained some monazite, and this was processed there also to recover the rare earths. The thorium co-produced was stored, but its radioactivity ultimately led China to bring its control under the aegis of its China Nuclear Corporation (CNC), which stored it along with any other thorium produced as a byproduct

of rare earths or its own uranium minerals processing.

Today, as Chinese bastnaesite grades seem to have declined from high grading and as pollution (environmental) consciousness has come of age in China, monazite, as a source of magnetic rare earths has revived dramatically in China. And China has become the world's largest processor of monazite. Chinese mining and processing companies already import nearly 40% of their rare earth ore needs annually. They get bastnaesite from California and CNC is licensed to process up to 5o,ooo tons per year of monazites containing up to 30,000 tons of rare earths. All monazite imported into China must first go to CNC for thorium and uranium removal, before it goes to the Chinese purchaser, which will then recover the rare earths contained. China buys monazites as ore concentrates from the USA (until very recently), Brazil, Madagascar, Australia, and Myanmar, and Chinese companies are scouring the world seeking more.

The Chinese had the use of monazites as a source of magnetic rare earths to themselves until 2017, when Australia's Lynas Rare Earths (ASX: LYC) went into commercial production and separation of the individual rare earths from its massive monazite mine at Mt. Weld, Australia. Then. in 2020, the only privately owned licensed uranium ore processor and thorium storage facility in the USA, Energy Fuels Inc. (NYSE American: UUUU | TSX: EFR), began a project to process monazite for its rare earths and to stockpile and sell the uranium recovered and store the thorium. Energy Fuels is and remains the sole such facility in the Americas. Its business plan is to become vertically integrated by building, on-site, a separation facility, and a rare earth metals and alloys operation also.

Energy Fuels has acquired domestically produced American monazite from the heavy mineral sands operations of The Chemours Company, and is actively seeking additional materials both

domestically and internationally. Energy Fuels has already produced and sold commercial quantities of mixed rare earth carbonates cleaned of uranium and thorium.

Now, at last, we come to Appia and Canada's entry into the rare earths' mining and processing arena.

Australia's Vital Metals Limited (ASX: VML | OTCQB: VTMXF) is now mining bastnaesite just outside of Yellowknife in Canada's Northwest Territory from a high-grade deposit discovered by Avalon Advanced Materials Inc. (TSX: AVL | OTCQB: AVLNF) and licensed to Vital. The ore concentrate will be first sent to an operation being built by the Saskatchewan Resource Council (SRC), a Crown Corporation, where the uranium and thorium will be removed and a mixed rare earth carbonate produced for use in further downstream processing. The first such production has already been pre-sold to both American and European processing customers.

But the SRC has plans to construct not only a cracking, leaching, and radioactive recovery and storage system (Saskatchewan is Canada's largest uranium mining and processing province, so the business there is well established and understood), but also a rare earths separation system in the form of a dedicated solvent extraction facility, the first of its kind in Canada.

Now we come to Appia Rare Earths & Uranium Corp., a Canadian company, originally exploring for uranium in Saskatchewan's world-famous Athabasca Basin. About 5 years ago its then geologist discovered a dramatically high-grade sample of monazite on the company's Alces Lake Property in Saskatchewan. He soon found that the sample had come from an outcrop showing extensive monazite veining. He continued to explore the area and predicted that the monazite field was extensive. Analysis of

samples he took showed that it was also the highest grade neodymium rich monazite ever found in North America.

I was a speaker that year at a Metal Events' Rare Earth Conference in Henderson, Nevada, and the Appia geologist, James Sykes, was an attendee. I had never met him, but we shared a cab to the airport, and he excitedly told me the Alces lake, monazite, story. I was intrigued, but I had reservations about the thorium and uranium that would be present in such a high-grade material. I thought of the highest grade rare earths deposit ever worked, Steencompskraal, in South Africa, which was actually worked as a thorium mine with no interest (in the 196os) in the rare earths contained. I didn't then know of the monazite project in China or CNC's role in it. I listened politely to Mr Sykes and wondered what anyone would do with this discovery if it were confirmed to be extensive enough to qualify as a NI 43-101 resource.

Did I mention that James Sykes also said that he believed the extended discovery to be near surface, so that a quarrying operation would obviate the need for underground operations?

It is now the Spring of 2022, and Appia has raised approximately $15.5 million in the last year. This funding is for a drilling program which is underway to prove a resource.

Energy Fuels is processing monazite, the Saskatchewan Resource Council has approved $31 million to acquire monazite, and other rare earth ore concentrates, and build a first of its kind in Canada cracking and leaching and separation facility dedicated to rare earths, and Canada's Ucore Rare Metals Inc. (TSXV: UCU | OTCQX: UURAF) has begun construction of a Strategic Metals Center in Alaska for the central processing of critical metals, beginning with rare earth mixed carbonates from a variety of sources including Canadian and Australian monazites.

Appia's drilling results so far are very encouraging, and have been extensively reported.

I think we may see the highest grade neodymium-rich monazite in the America's flow from Alces lake before 2025. If so, It will certainly be in high demand.

Did I mention that the Appia monazite discovery contains 1% of xenotime, the hard rock mineral source of yttrium, dysprosium, and terbium? A one-stop-shop for magnet makers?

The stars and this planet are coming into alignment for this one. Monazite is back.

Disclosure: Jack Lifton is a member of Appia Rare Earths & Uranium Corp.'s Advisory Board and the Advisory Board for Energy Fuels Inc., and may hold securities or options in some of the companies mentioned in the above article.

Auxico Resources' Pierre Gauthier on being the first NA company to commercially produce and sell monazite into the world market

written by InvestorNews | July 25, 2022

Pierre Gauthier, Chairman and CEO of Auxico Resources Canada Inc. (CSE: AUAG) recently spoke with InvestorIntel's Byron W.

King about Auxico's just licensed patent for ultrasonic disintegration process technology. This technology allows a rapid decrease in the time, temperature, and pressure necessary to crack hard rock ores and extract valuable minerals by disintegrating the ores without the need for extensive crushing and grinding. The ultrasonic process allows a high level of extraction efficiency by greatly increasing the surface area to volume ratio of the minerals to allow rapid leaching out of the payable metals. Pierre emphasized the broad application by Auxico of this ultrasonic technology. In particular, it has allowed class-leading rapid high-level extraction of nickel and of rare earths from their ores. This saves water, energy, and most of all, time, which, of course, reduces costs.

Pierre went on to say that Auxico has also developed a new simplified chemical process for removing the radioactive elements from the very rich in magnetic rare earths mineral, monazite, after it has been treated ultrasonically. Auxico, he continued, has located monazite bearing mineral sands in Columbia and the Democratic Republic of Congo (DRC) as well as monazite rich residues from tin mining in Brazil, Bolivia, and the DRC. It will treat them ultrasonically, where necessary, to improve and facilitate the removal of radioactive thorium and uranium and their safe disposal in the countries of origin in order to be able to ship the monazite for extraction and separation into individual rare earths in a plant to be constructed in Quebec or the USA.

Auxico's monazite from the DRC is low enough in thorium and uranium so that the mineral can be shipped out of the country without processing. Pierre finally pointed out that Auxico has already sold and shipped 100 tons of monazite from its DRC operation to a customer in Asia. Auxico plans to ramp up the shipments from the DRC to 1000 tons per month by the end of 2022.

This makes Auxico the first Canadian company to commercially produce and sell monazite into the world market. As Byron W. King said, “This has been a fabulous interview.”

To access the complete interview, click here

About Auxico Resources Canada Inc.

Auxico Resources Canada Inc. is a Canadian company that was founded in 2014 and based in Montreal. Auxico is engaged in the acquisition, exploration and development of mineral properties in Colombia, Brazil, Mexico, Bolivia and the Democratic Republic of the Congo.

To learn more about Auxico Resources Canada 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.

Critical Minerals Corner experts debate one of the most important minerals for sourcing rare earths

written by InvestorNews | July 25, 2022

In this episode of **Critical Minerals Corner**, InvestorIntel Editor-in-Chief & Publisher Jack Lifton and Geologist and Newsletter Writer Byron King take on monazite – one of the most important and desirable mineral ores for sourcing rare earths. With guest Frederick Kozak, President of Appia Rare Earths &

Uranium Corp. (CSE: API | OTCQB: APAAF), Byron King explains that while it is very rare to find a monazite deposit, “it is extremely rare to find a really really good monazite deposit…”

“One of the hottest rare earth deposits you will ever see anywhere…” starts King, find out why Saskatchewan, Canada is critical to the production of rare earths in North America.

To access the complete episode of Critical Minerals Corner, click here

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Chalmers and Karayannopoulos on the production initiative designed to strengthen the US/EUR rare earths supply chain

written by InvestorNews | July 25, 2022

In a recent InvestorIntel interview, Tracy Weslosky speaks with Mark Chalmers, President and CEO of Energy Fuels Inc. (NYSE American: UUUU | TSX: EFR) and Constantine Karayannopoulos, President, CEO and Director of Neo Performance Materials Inc. (TSX: NEO), about their new rare earth production initiative to strengthen and diversify U.S. and European rare earths supply chains.

In this InvestorIntel interview, which may also be viewed on YouTube (click here to subscribe to the InvestorIntel Channel), Constantine went on to say that monazite is the perfect raw material for the industry because of its excellent distribution of magnetic rare earths – neodymium and praseodymium. "Energy Fuels is the missing link to solving the monazite problem," he added. Speaking on the joint venture with Energy Fuels, Constantine commented that it "is going to be a major contributor to the overall supply of rare earths globally." Mark adding, "We are confident that we can be cost-competitive with the world."

To watch the full interview, click here.

About Neo Performance Materials Inc.

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 and production across 10 countries, being Japan, China, Thailand, Estonia, Singapore, Germany, Unite d Kingdom, Canada, United States, and South Korea.

About Energy Fuels Inc.

Energy Fuels is a leading U.S.-based uranium mining company, supplying U_3O_8 to major nuclear utilities. Energy Fuels also produces vanadium from certain of its projects, as market

conditions warrant, and expects to commence commercial production of REE carbonate in 2021. Its corporate offices are in Lakewood, Colorado, near Denver, and all of its assets and employees are in the United States. Energy Fuels holds three of America's key uranium production centers: the White Mesa Mill in Utah, the Nichols Ranch in-situ recovery ("ISR") Project in Wyoming, and the Alta Mesa ISR Project in Texas. The White Mesa Mill is the only conventional uranium mill operating in the U.S. today, has a licensed capacity of over 8 million pounds of U_3O_8 per year, has the ability to produce vanadium when market conditions warrant, as well as REE carbonate from various uranium-bearing ores. The Nichols Ranch ISR Project is on standby and has a licensed capacity of 2 million pounds of U_3O_8 per year. The Alta Mesa ISR Project is also on standby and has a licensed capacity of 1.5 million pounds of U_3O_8per year. In addition to the above production facilities, Energy Fuels also has one of the largest NI 43-101 compliant uranium resource portfolios in the U.S. and several uranium and uranium/vanadium mining projects on standby and in various stages of permitting and development.

To learn more about Neo Performance Materials Inc., click here.

To learn more about Energy Fuels Inc., click here.

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