

# The EV sector sizzles, will rare earths be next? Spotlight on Appia Energy...

The electric vehicle (EV) sector has been one of the hottest sectors the past 3 months as investors chase everything 'electric'. For example, Tesla (NASDAQ: TSLA) is up over 7 fold the past 14 months and is now the world's most valuable car company. The past 3 months NIO is up 3 fold and Nikola is up 5 fold. The battery manufacturers have also surged.

So what's next? Following the EV thematic one would say the EV metal miners should be next, and that includes the rare earths miners, as rare earths are a key component in the most powerful magnets used in EV motors. Last year Roskill reported that "Tesla extends EV range using '*permanent magnets*' motors in Models S, X, and 3. This resulted in a 10% increase in the overall drivetrain efficiency of Tesla's EVs, and hence an improvement in range. Roskill then expressed the following view:

*"Permanent magnets that offer the best performance and optimisation potential in electric motors are rare earth neodymium-iron-boron (NdFeB) magnets. Over 90% of EV models currently use NdFeB-based permanent magnet motors as part of the EV drivetrain."*

Additionally, the US Senate will soon consider various Acts, including the ORE Act, that aim to secure US supply of critical elements such as rare earths. This has the potential to be another catalyst for the rare earths sector in the near future.

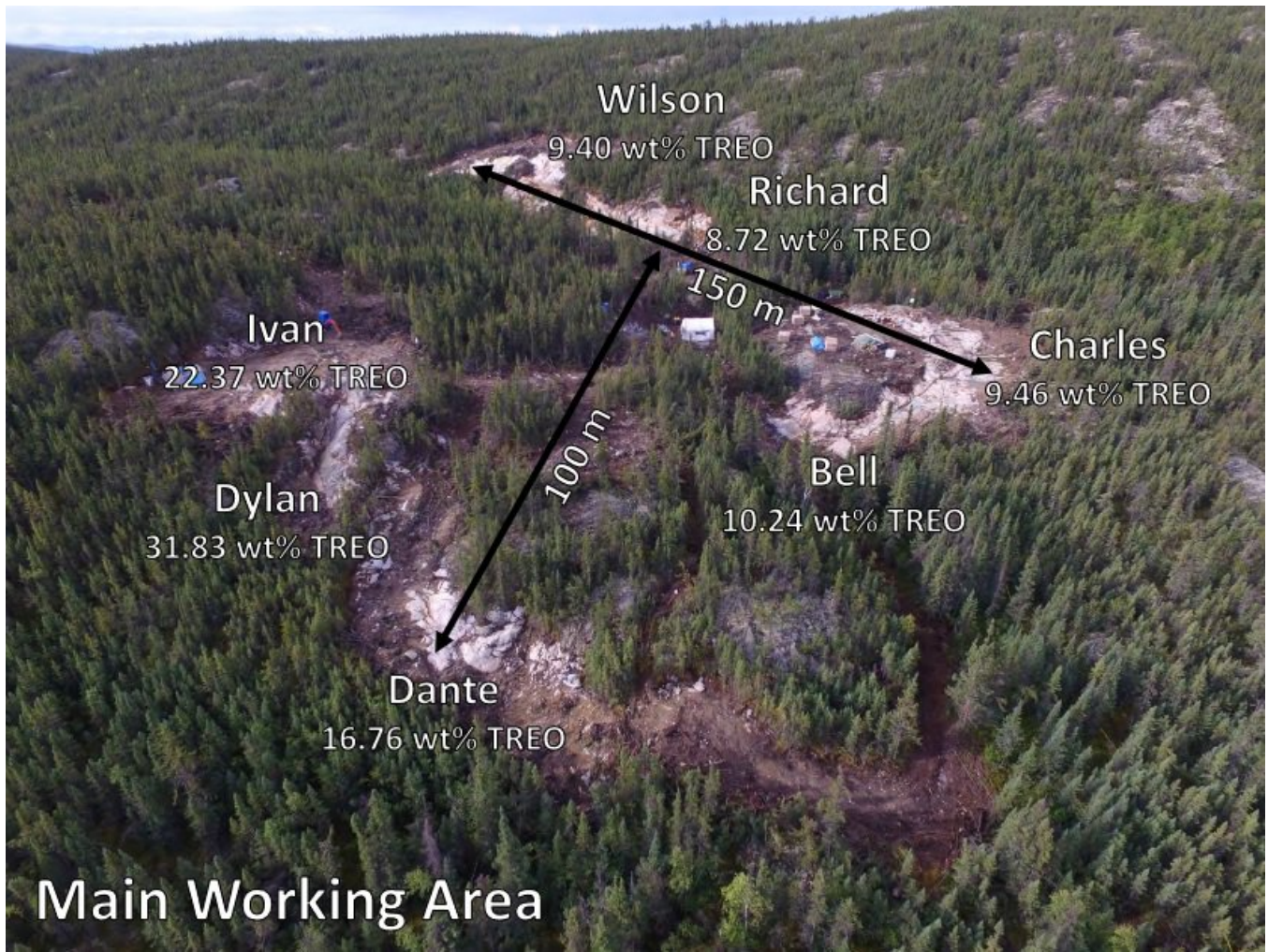
One of the most promising rare earths junior miners is Appia Energy Corp. (CSE: API | OTCQB: APAAF). Appia is currently exploring and developing uranium and rare earth deposits at

its Alces Lake Property, in the Athabasca Basin area of northern Saskatchewan, Canada. They also have a promising uranium-rare earths project in Ontario, Canada.

Appia 100% own the Alces Lake property spread over 14,334 hectares. The Alces Lake property has monazite ore that is enriched in valuable critical rare earth elements, particularly Neodymium (Nd), Praseodymium (Pr), Dysprosium (Dy), and Terbium (Tb). These 4 elements account for between 23-25% of the TREO, or ~85% of the potential value at Alces Lake. **Alces Lake hosts the 2nd highest average REE grade in the world.**

At a 4 wt% Total Rare Earth Oxides (TREO) cutoff, Alces Lake average grade is exceptionally high at 16.65 wt% TREO. By comparison rare earths producer Lynas Corporation's Mt Weld mine has an average grade ~10 wt% TREO, and is perhaps the most successful non-Chinese rare earth mine in the world today.

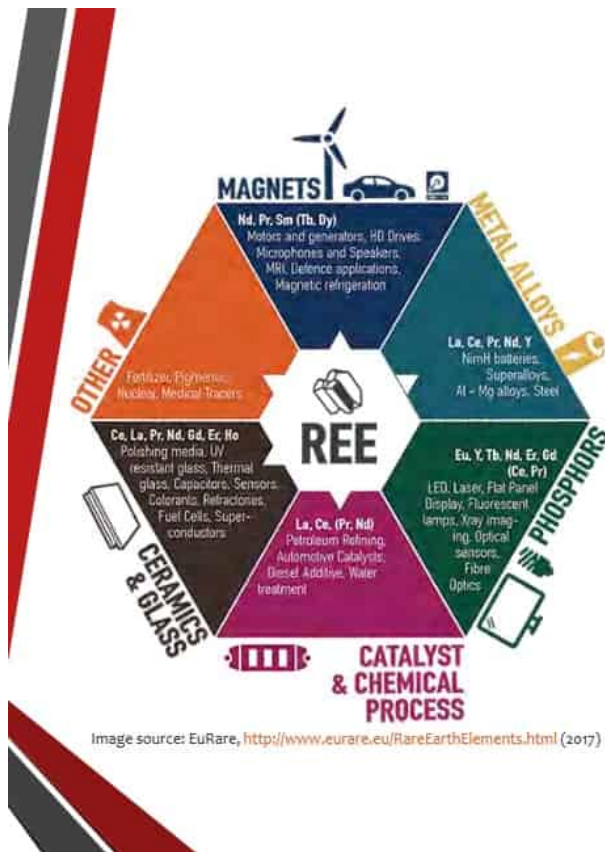
**Appia Energy's Alces Lake property has exceptionally high grade critical rare earths in Northern Saskatchewan, Canada**



Source: Appia Energy company presentation

The high grade TREO at the Alces Lake Project hosted in monazite is an ideal potential western located source of the most valuable key rare earths needed in future industries such as EV motors and catalysts etc.

**Rare earths key uses include powerful magnets (21% of demand and growing) used in EVs, electronics, and wind turbines etc**



## Rare Earth Elements Basics (2019)

- REE, a.k.a. the “Seeds of Technology”
- **Critical for high-tech applications, clean energy, transportation, communication, robotics, nanotechnology, medical equipment, antibiotics and medicines**
- Global demand is growing (>10% over last couple of years)
- Primary demand: 21% magnets which are used in the EV market where growth is accelerating
- Global Production: 210,000 tonnes of REO (oxides)
- 66% REO (oxides) global production sourced from China, China is now a net importer
- Over 90% magnet production from China
- Lack replacement, recycling or re-invention

The Alces Lake Project’s rare earths are near surface and hence suitable for an open pit mine. Permitting should be smooth being in northern Saskatchewan Canada and the CapEx and OpEx should be reasonably low given the good grades and near surface resource. There is also an existing pilot plant and extraction facility in Saskatchewan the Project can use to start up a small scale production of rare earth oxides.

**Appia Energy’s Alces Lake ticks all the right boxes**

# The Criteria for a Viable REE Project

- Grade
- Mineralogy
- Composition
- Pilot Plant
- Radiation and Environmental Management
- **Appia's Alces Lake project meets all of these criteria**



Appia Energy President and CEO, Tom Drivas, stated exclusively to InvestorIntel:

“Appia is currently exploring its Alces Lake project located in Saskatchewan Canada. Alces Lake has a number of surface zones with up to 85% monazite and can become one of the highest grade critical rare earth producer in the world. Appia could supply the critical rare earth needed to the developing industry in the US and Canada.”

Appia recently announced that they have begun further exploration at the Alces Lake property. It is expected that between late July and early August Appia will commence -2,000 to 3,000 m of a drilling program to potentially expand the resource.

**Closing remarks**

Appia Energy trades on a market cap of just C\$14 million, which is very low given their super high grades, valuable critical rare earths, and good location. The only possible explanation can be the relatively early stage of the project.

Rare earths expert Jack Lifton recently stated Appia Energy's Alces Lake "is probably the best choice for development into a producing rare earth magnet materials' mine in North America."

Finally, Appia also offer investors exposure to several other projects in Canada that are highly prospective for both rare earths and uranium. Early investors in junior miners such as Appia have the potential for tremendous returns, especially if the Alces Lake project achieves funding and production. The recent surge in EV related companies, the US Senate considering rare earths Acts, and Appia's potential for excellent near term news flow should all serve as strong catalysts for the stock in the year ahead.

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## **Unique cost structure and 'low environmental footprint' provides a real rising star for unconventional oil recovery**

☒ American Sands Energy Corp. ('AMSE', OTCBB: AMSE), an oil sands exploration and development company, based in Utah. recently presented a new Project Feasibility Study, featuring updated capital and operating costs as well as a new Mine Plan. The revised studies suggest that AMSE's costs are below

those of other tar sand or unconventional oil projects. Indeed, AMSE would need about USD\$ 75 million to lead it to production with 'per barrel' production costs expected in the range of USD\$ 15,000/barrel in CAPEX up front. This is half the price of the average Canadian oil sand extraction costs, which range from of a low of about USD\$ 30,000/barrel to a high of USD\$ 100,000/barrel. At such costs, AMSE's oil is 'bargain basement' priced. Moreover, AMSE will not have to re-invest in the resource, which is what a drilling operation has to do.

A conventional oil company has to continuously drill new wells to continue to use a deposit, running the risk of coming up with dry holes, which makes AMSE much more convenient and attractive. The costs are very competitive in relation to other unconventional projects while having the distinct advantage of a much lower environmental impact because there are no tailing ponds given the production focus being directed toward reclamation sand. AMSE's low costs and lower environmental risk profile should allow production to begin in 2016. The highlights from the feasibility reports include:

- CAPEX estimates of USD\$ 15,000 per flowing barrel at peak production.
- Operating costs averaging under USD\$40 per barrel of heavy oil (for the first four years of production).
- Up 9,000 barrels per day production capacity.

AMSE's oil sands are of the 'oil wet' variety as opposed to what is more common in Canada: the 'water wet sands', which makes AMSE's oil sands easier to process because the oil impregnated sandstone is free of any water content. This results in a mining process whereby the sandstone is impregnated placed in a solvent solution that washes the bitumen away from the sand. The bitumen, then, is cleaned up from remnants of the solvents in order to be delivered to the market. The sand that is left over in the process is clean and ready to go back into the ground. This explains why AMSE's

production timeline is so fast and why production is expected to reach a rate of 5,000 bpd by 2016.

AMSE features a unique cost structure and its low environmental footprint in the context of the oil sands industry. This means that, compared to others in the oil sands space, AMSE is “much cheaper on a per barrel basis, much cheaper on a CAPEX basis and far less risky on an environmental basis because its process does not produce any dirty water. The recent debate over the Keystone XL pipeline reflects the costs and risks faced by AMSE’s tar sands competitors in Alberta. The exploitation of new unconventional oil resources in Alberta has brought great wealth to Canada; however, the process is so expensive that the current USD\$ 80/barrel oil price is a threat to the long term viability of the very expensive production from the ‘oil sands’. The Canadian province of Alberta has been credited with having the world’s third largest oil reserves, 97% of which are trapped in the oil sands: as yet barely exploited but dirty and demanding huge investments for its production. Apart from toxic emissions (apart from CO<sub>2</sub>), their extraction destroys the landscape when its pasty liquid is extracted in open-pit mines.

Rising oil prices since the late 1990’s and especially since 2008 made their development viable; it also helped to develop new oil extraction technology such as steam injection into the soil to soften and fluidize the bitumen in situ (and not by mining), are in operation. Yet, this process alone accounts for USD\$ 50/barrel. This is a very expensive cost and one that AMSE avoids by virtue of the nature of its much different oil sands resource. Alberta may have the largest unconventional oil deposit in the world (certainly in North America) but the development costs also make it less profitable for companies to exploit. Utah’s oil sands are more profitable. The sands are saturated with oil rather than water – as in Alberta. This means that there is simply more oil per granule of sand with



far fewer environmental risks than in Alberta or as some might say more 'bang for the buck'.