Tesla’s Lithium Refinery in Texas Ushers in a New Era for Critical Minerals Refining in the US

written by Matt Bohlsen | May 17, 2023
As announced on May 8, 2023, Tesla Inc. (NASDAQ: TSLA) has recently broken ground on their new lithium refinery in the greater Corpus Christi area of Texas, USA. The new, more than US$1 billion Tesla refinery will produce battery-grade lithium hydroxide (“LiOH”) with targeted commissioning by the end of 2023. Given Elon Musk’s track record, it may be more likely to shift into 2024.

Avalon Advanced Materials advances forward towards becoming a lithium producer

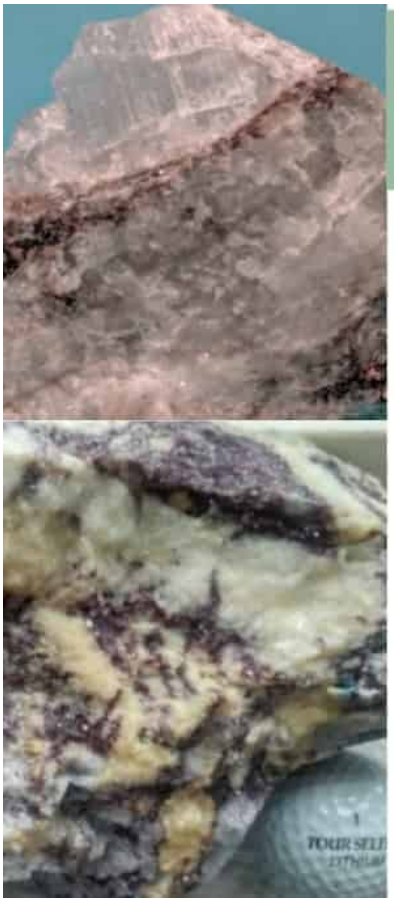
written by Tracy Weslosky | May 17, 2023
As I was having my morning coffee today I came across some quite incredible news. The world’s largest lithium miner Albemarle stated that they expect there will be a massive shortage of lithium this decade. The report stated that “global lithium demand should hit 3.7 million tonnes by 2030.” Given that the total lithium market was only at about 370,000 tonnes pa in 2020

that would mean a 10x increase in demand this decade. Albemarle expects an 800,000 tonne lithium deficit by 2030 with lithium prices staying high. Albemarle CEO Norris stated: “Incentivizing industry to fill this gap requires strong long-term pricing”.

This got me thinking about who will be the next lithium miners to help meet this huge demand for lithium. Perhaps it will be Avalon Advanced Materials Inc. (TSX: AVL | OTCQB: AVLNF) (“Avalon”).

Avalon 100% owns the advanced stage Separation Rapids Lithium Project in Ontario, Canada as well as the Lilypad Cesium-Tantalum-Lithium Project also in Ontario.

Separation Rapids predominant lithium ore is petalite which contains 4.5% Li2O and is extremely pure. Petalite ore is already successfully being mined in Zimbabwe to supply the lithium ceramics industry. Avalon state on their website that they have “developed a process flowsheet to make lithium hydroxide from its petalite. The potential for production of high-grade lithium hydroxide (99.9%) was demonstrated through laboratory test work performed in 2015 and defined in a Preliminary Economic Assessment filed in 2016.”



Lithium Minerals at Separation Rapids: a rare type of LCT pegmatite

- There are two main lithium ore minerals in the Separation Rapids LCT pegmatite: **petalite** & **lepidolite**
- Petalite is the predominant lithium mineral, with lepidolite occurring in distinct subzones comprising 20% of the resource
- **Petalite** ($Li\ Al\ Si_4O_{10}$) contains 4.5% Li_2O with no impurities
- **Lepidolite** ($K(Li,Al,Rb)_2(Al,Si)_4O_{10}(F,OH)_2$ is a lithium mica containing other elements including **cesium**
- They can each be concentrated to make saleable products:
  - Petalite can be used both as an industrial mineral for high strength glass and as a high purity feed to make battery grade lithium hydroxide or carbonate
  - Lepidolite concentrates are being used increasingly for production of battery grade lithium carbonate
- **Tantalum** minerals are also recoverable along with **Rubidium**-rich K-feldspars as an industrial mineral by-product

Source: Avalon company presentation

Avalon continues to be somewhat under the radar despite having an MOU to supply LG Energy Solution Inc. (“LGES”) and plans to build a lithium hydroxide refinery in Thunder Bay, Ontario, Canada.

LGES is one of the leading global manufacturers of lithium-ion batteries for electric vehicles, mobility, IT, and energy storage systems.

Avalon’s agreement with LGES is to supply battery-grade lithium hydroxide starting in 2025. That suggests that LGES has good confidence in Avalon’s potential to make it to production. The MOU would see Avalon commit, for five years initially, to provide LGES with at least 50% of its planned initial lithium hydroxide production from its Thunder Bay JV refinery (planned 20,000tpa capacity), with the potential to increase production

as demand grows.

The Thunder Bay lithium refinery would be designed to accept lithium concentrate material from both Avalon's Separation Rapids Project and other new projects in the region. In a January 10, 2023 regulatory filing Avalon stated:

"Essar failed to confirm their interest in finalizing an agreement with Avalon and the Company is now pursuing agreements with other potential investing partners including LG Energy Solution ("LGES")……..This agreement with LGES (when it gets finalized) will involve providing initial financial and development support for building a lithium refinery in Thunder Bay, Ontario that will be designed to accept lithium minerals concentrates, not only from Avalon's Separation Rapids Lithium Project north of Kenora, ON, but also from other aspiring new producers from the many lithium pegmatite resources that occur in northwestern Ontario. It will operate as a separate private business, called Avalon Lithium Inc., a newly established Avalon subsidiary in which LGES would potentially become a co- owner, when they finalize a formal agreement."

Avalon also has an off-take agreement with a major non-Chinese international glass ceramic manufacturer to supply petalite concentrate from Separation Rapids for the glass-ceramics market.

The next steps for Avalon include a winter drilling campaign (deeper drilling at Separation Rapids main lithium pegmatite resource known as the Big Whopper), completing Feasibility Study-level cost estimates, project engineering and pilot plant work to optimize lithium battery materials process flowsheet & costs for the refinery and confirm the location for the refinery on a vacant industrial site in Thunder Bay. Also to complete environmental assessments and project permitting. Beyond that

Avalon plan to begin small scale commercial operations with sales of petalite and mineral by-products while the new battery materials refinery is constructed ready for production in 2025/26, all going well.

Avalon Advanced Materials ticks many boxes for investors. Great lithium assets in Ontario Canada, supportive local, state and Federal governments, and a preliminary agreement to work with a multi-billion dollar company such LGES to establish a lithium supply chain in Canada. All at a time when it appears lithium will have a great decade. Execution risks to achieve lithium production remain high, but should de-risk with each successful step along the way. What's not to like with Avalon Advanced Materials on a market cap of C$68 million.

InvestorIntel plans to have some interviews in 2023 with CEO Don Bubar to get an update on how the Company's plans are progressing.

Lithium demand is poised to create a supercycle of supply deficits and lasting high prices

written by Matt Bohlsen | May 17, 2023

The past two years has seen lithium prices rise about ten times from US$7,000/t to US$70,000/t both for lithium hydroxide and carbonate. Meanwhile, the lithium spodumene price has enjoyed a

similar 10 fold increase from US$500/t to US$5,000/t. This has been caused by EV sales booming, resulting in a huge demand wave for lithium that literally swamped the small lithium industry.

The lithium carbonate price has risen as EV demand has taken off – Currently at CNY 510,500/t (~US$70,000/t)

Source: Trading Economics

What's next for the lithium sector?

Conventional commodity booms typically follow a rather fast boom and bust cycle as the cure for deficits is high prices, thereby encouraging new supply. However, every once in a while we get a commodity supercycle. That's where the demand wave is so big that it takes as long as a decade for supply to eventually catch up or for demand to subside. New mines can take 5-10 years to come online, yet a new EV and battery factory can be built in 1-2 years.

In the case of lithium, many EV metals experts agree we have only just entered a lithium supercycle. To better understand the size of the demand wave investors need to get a feel for how much lithium will be needed to feed the electric vehicle boom.

A typical 50kWh battery electric car (roughly the global average size in 2022) requires about 45kgs of lithium carbonate equivalent. In 2022 global plugin electric car sales look set to grow by at least 50%+ year over year. Given 2021 global plugin electric car sales were 6.75 million, 2022 will likely end up at about 10.125 million, or 3.375 million additional new electric cars. This means lithium demand, only from plugin electric cars, will increase by roughly 152,000 tonnes ("t") of lithium carbonate equivalent ("LCE") in 2022 ((45/1000) x 3,375,000)). If we add in other sources of lithium the global lithium market

will roughly increase by about 185,000t LCE in 2022, or about a 34% increase on 2021 levels of approximately 540,000t LCE.

Looking at lithium supply a typical new mine or mine expansion could possibly bring on 20,000t LCE in a year. This means the market needs about 9 new mines or expansion of existing mines, just to catch up with demand. This will be needed – and will grow larger – each year.

The scary part is that in a good year electric car demand can grow at 100%pa, as we saw with a 108% increase in 2021, which sent the lithium market into deficit. These days the demand is there but the supply is not, hence the global EV waiting list is now in the order of 3 million vehicles.

A lithium deficit can only mean lithium prices stay 'stronger for longer' this decade

Provided electric car sales growth remains at 30-50%+pa, all of this suggests we are likely to see constant lithium deficits this decade. Strong stationary energy storage sales are also pulling on lithium demand.

A lithium deficit can only mean lithium prices stay 'stronger for longer', meaning about US$50,000/t plus for lithium carbonate and lithium hydroxide and above US$5,000/t for spodumene.

Yet despite this, some analysts are forecasting lithium prices to fall over the next 5 years. This completely contradicts forecasts of continual lithium deficits this decade. In a deficit, prices do not fall.

A contradiction: Many analysts currently forecast lithium prices to fall as lithium deficits continue this decade

Source: Morningstar

What can go wrong with this forecast?

EV demand looks strong but in 2022 sales have been relying heavily on China, which has been responsible for 50-60% of global sales. This means any sales collapse in China will be heavily felt. European EV sales growth has weakened in 2022 due to events in Europe weakening their economy. USA EV sales have been growing quite well from a lower base, but the U.S economy is now slowing as interest rates are rapidly rising.

One plus for lithium demand is in the USA in 2023-24 we can expect to see new demand coming on from electric pickup trucks, which typically have a battery almost twice the size of an electric sedan, thereby requiring almost twice as much lithium.

Closing remarks

2022 has seen the West wake up to the need to source critical minerals and establish their own supply chain, or risk being left behind, as China grabs global electric car market share. The Inflation Reduction Act and the EU Critical Raw Materials Act are designed to address this problem and bring supply chains back home or at least with free trade agreement countries.

Again this is further evidence to suggest that the rest of this decade will see a fight to source critical minerals, none more important than lithium.

We may need to get used to lithium chemical prices at, or north of, US$50,000/t for the foreseeable future. This stronger for longer lithium pricing narrative should also flow through to the lithium miners many of which are currently priced at extremely low 2023 and 2024 earnings multiples, based on lithium prices falling back to US$20,000/t. If analysts become a little braver

and use US$40-50,000/t in their models expect some very significant price target increases over the next year or two. Stay tuned.

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Can Avalon Advanced Materials ride the lithium tidal wave?

written by InvestorNews | May 17, 2023

Lithium miners have been the best performing sector of almost every sector of the stock market over the past year. This has been due to a 'tidal wave' of new lithium demand as electric vehicle (EV) sales dramatically increased over the past year. For example global electric car market share more than doubled from 4.2% in calendar year 2020 to 8.7% in the month of June 2021. This has led to a surge in lithium demand and subsequently lithium prices in 2021.

Lithium prices (1 year chart) have risen rapidly due to a massive demand increase from booming EV sales

Source: Trading Economics

One under the radar lithium junior is Avalon Advanced Materials Inc. (TSX: AVL | OTCQB: AVLNF) ("Avalon"). Avalon has six projects, providing investors with exposure to lithium, tin and indium, as well as rare earth elements, tantalum, cesium and zirconium. Avalon is currently focusing on developing their Separation Rapids Lithium Project near Kenora, Ontario, while looking at several new project opportunities, one being a lithium hydroxide (and other materials) refinery in Thunder Bay, Ontario, Canada. They are also working to advance their Lilypad Cesium-Tantalum Project, in Ontario, Canada.

Separation Rapids Lithium Project (100% owned; Ontario, Canada) + possible lithium battery materials refinery (Thunder Bay, Canada)

Avalon completed a PEA of their 100% owned Separation Rapids Lithium Project in 2018, resulting in a pre-tax NPV8% of $156 million, post tax IRR of 22.7%, CapEx C$77.7 million with a 20 year mine life.

Then in March 2021, Avalon announced a Letter of Intent ("LOI") with Fort William First Nation ("FWFN") to collaborate on the development of a lithium battery materials refinery located on industrial lands owned by FWFN in Thunder Bay, Ontario. As stated in the announcement: "This facility would be designed to accept lithium mineral concentrates from Avalon's Separation Rapids Lithium Project (70 km north of Kenora) and Rock Tech's Georgia Lake Lithium Project (145 km northeast of Thunder Bay), as well as potentially other emerging, new lithium mining operations in northern Ontario, to produce lithium hydroxide and other lithium battery materials."

Then in May 2021, Avalon reported that their recent process testwork using dense media separation ("DMS") technology had proven to be successful at producing a high-quality petalite lithium mineral concentrate (4.0% – 4.2% Li_2O) from their Separation Rapids Lithium Project. The concentrate is suitable for the needs of specialty glass-ceramic end-users. As a result, Avalon is now looking at acquiring their own DMS equipment so they can more quickly meet the needs of the many end-users that have expressed interest over the years in their petalite product samples. Avalon will also resume exploration work this summer on the western part of the Separation Rapids property to further work towards growing their resource.

Avalon Advanced Materials Separation Rapids Lithium Project – PFS & PEA completed

Source: Company presentation

Announced in July 2021, Avalon is now in active discussion to potentially progress their lithium materials refinery in Thunder Bay. The release stated: "On the lithium battery materials market development work, Avalon continues to engage with potential customers looking for new supply sources and are in active conversation with one group in Europe. With a firm commitment on off-take, Avalon can then proceed with its plans for establishing a lithium refinery in Thunder Bay."

Lilypad Cesium-Tantalum Project (100% owned; Ontario, Canada)

Avalon's Lilypad Property, located 150 km northeast of Pickle Lake, Ontario, is an exploration stage project with cesium-tantalum-lithium mineralization. It has some potential to be a secondary lithium supply source for Avalon, however, cesium and tantalum are the key products for now.

In July 2021 news, Avalon stated: “Following the closing of the recent flow-through financing, an exploration work program was initiated in June on its 100% owned Lilypad Cesium-Tantalum Project involving re-establishing a field camp and new grid on the property **in preparation for detailed mapping and geochemical sampling to commence later this month.** Additional cesium mineralized rock was collected from the Pollucite Dyke for continued process research on techniques to efficiently concentrate the rare cesium mineral pollucite, which continues to be in high demand. **Drilling is planned for later this year**.”

Avalon Advanced Materials project pipeline

Source: Company presentation

Closing remarks

As evidenced by a recent record lithium spodumene spot market price achieved this past week of US$1,250/t (around 3x the contract prices from 12 months ago), there is now a new realization that lithium supply is critically low. This means it is a great time to be a lithium miner and it generally acts to boost the sentiment of the sector thereby helping lithium juniors raise capital and hopefully reach production.

Avalon Advanced Materials is not only a junior lithium miner, as they have a total of 6 projects across multiple critical metals and rare earths. Key critical metals Avalon has are lithium, tantalum, cesium and zirconium; all are on the list of U.S critical materials. The Company trades on a market cap of only C$52 million. One to watch.