

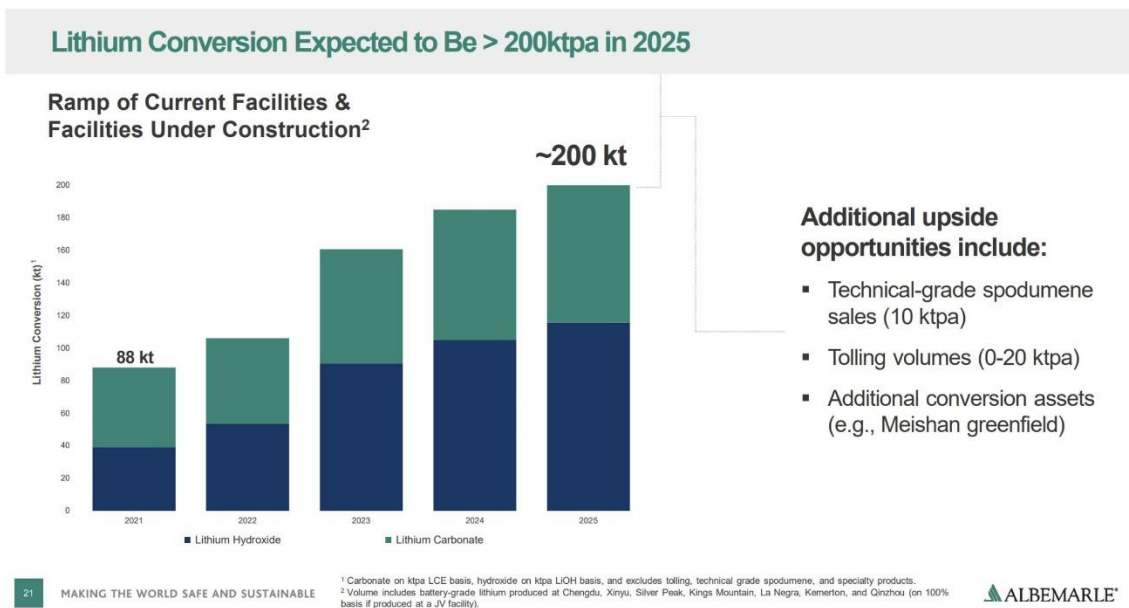
# Lithium: Virtual Reality

What follows is my opinion based on more than 30 years' experience in the industry. I understand that opinions differ. My thoughts are my own. DYOR.

The top four players, SQM, Albemarle, Ganfeng and Tianqi will continue to dominate lithium supply for a few more years. The number five & six players in vertically integrated lithium chemicals production, Livent and Allkem, together equal less than half of the chemical production of the smallest "Big 4" player. Hopefully that changes soon.

Now that annual demand is growing at > 200K MT of LCE per year, it is easy to see why the "Big 4" needs to morph into the "Big 8" or more very soon. Spoiler alert: a "Big 8" is highly unlikely before 2030. Developing lithium projects is much more time intensive than building battery capacity.

**It is doubtful ALB will reach their goals on time (they never have) but they have the best hard rock & brine assets & will remain a leader**



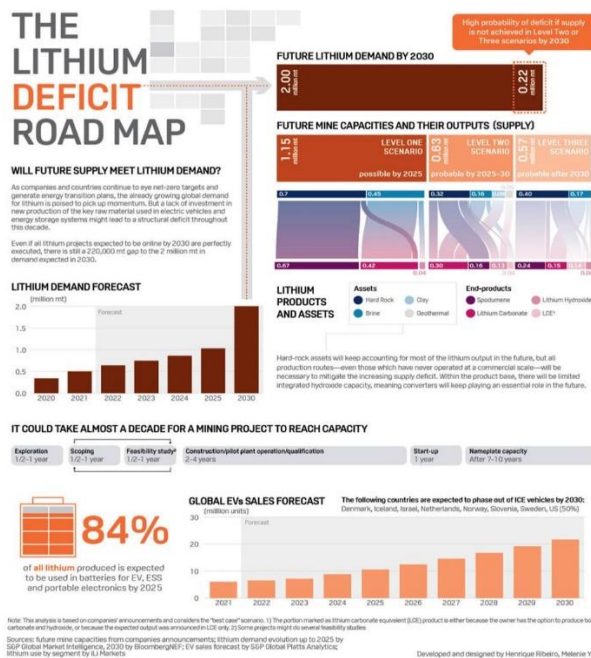
Lithium Americas with Minera Exar JV partner Ganfeng will soon start up the Cauchari project in Argentina. LAC's recently opened a Technical Development Center in Reno operates all the process steps they will employ at Thacker Pass from the ore processing to carbonate production and is a harbinger of large scale capacity coming online in the US. Hopefully, the legal system will make common sense decisions and enable construction work at Thacker Pass to commence soon. The DOE has a role to play at Thacker Pass by providing a low interest rate loan. I won't mention any names. Well maybe one: Jigar Shah.

Pilbara and Mineral Resources are the leading non-integrated hard rock players. I expect both to have significant lithium chemicals participation later in the decade. On an

LCE basis both companies will be majors soon with Pilbara’s addition of Altura and Min Res operating and co-owning both Mt. Marion and Wodgina.

In China, low quality Qinghai brine capacity continues to expand at a modest rate along with small high cost hard rock operations. China will remain the global high cost producer despite low capital costs.

Unfortunately, lack of investment in brine, hard rock, and sedimentary projects over the past five years by those at the downstream end of the supply chain (read OEMs and the larger battery companies) has caused the current lithium chemical supply shortage that will last into the next decade. The proverbial “hockey stick” in EV demand is upon us while viable lithium projects remain unfunded. Thanks to Platts and Global Lithium Podcast guest Henrique Ribeiro for this excellent graphic.



No, I haven’t forgotten Sigma, the Wesfarmers/SQM JV, Liantown, Core or the on again/off again Val d’Or operation. I consider all likely to be producers in the next few years but if you total up the existing and potential production, it doesn’t get you to Albemarle’s demand projection of more than 1.5 million tons of LCE by 2025. Projects like Rio Tinto’s Rincon and a few others, including a couple in Canada, are more likely to produce in the second half of the decade than by 2025. The shortage and high prices will continue despite the protestations of Goldman Sachs.

OEMs that just a couple of years ago believed lithium supply was “the battery supplier’s problem” are now in full-fledged panic as evidenced by the plethora of recently signed “virtual lithium supply agreements.” It seems the knee-jerk reaction to the shortage is signing and announcing agreements with anyone and everyone that claims they will be supplying in this decade.

Less real than the *virtual assistant* you have never met in person but who completes tasks for you via cyberspace or the *virtual office* where you can meet clients face to face in a conference room that isn't really yours, a *virtual supply agreement* attempts to convince the public that OEMs have secure lithium supply backing up all those kilowatt hours of battery capacity required for their promised EV models.

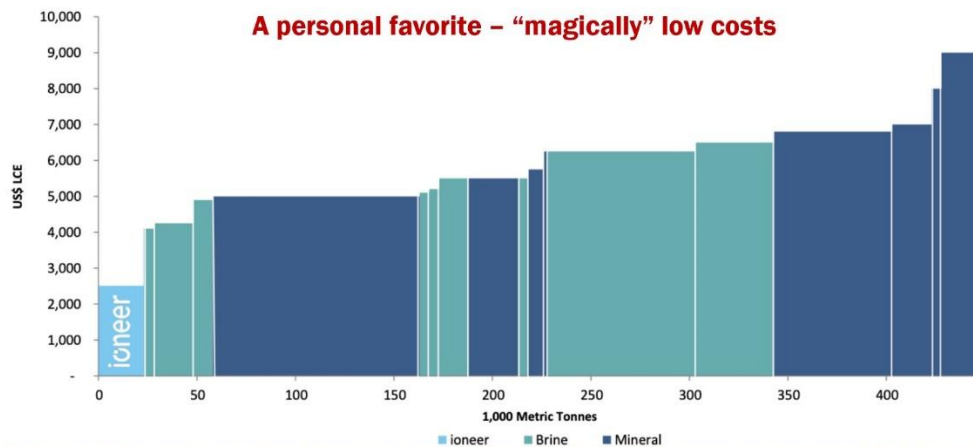
Recently we have seen a number of legacy automakers (Ford, GM, Stellantis, etc) that have ambitious EV plans compromised by nascent battery supply chains resort to signing agreements with aspirational (aka *virtual*) lithium suppliers whose ability to produce any quality of lithium chemicals exists only in the form of increasingly aggressive announcements about their future capacity plans, impressive presentations where they invariably land at the far left of the cost curve, and, of course, those few kgs of 99.9% lithium carbonate a 3<sup>rd</sup> party produced for them in a lab to prove they are "real".

The cost curve below is from Ioneer's latest AGM presentation. In my opinion, this slide is where *virtual supply* meets *virtual costs*.

### Expected lowest cost producer



All-in sustaining cash cost at the bottom of the cost curve



Source: Roskill for all producing lithium brine and mineral operations shown on this cost curve, except for Ioneer estimate sourced from the Rhyolite Ridge DFS. Costs as shown are all-in sustaining costs. The Rhyolite Ridge all-in sustaining costs were based on the same methodology as the Roskill cost estimates. (Cost includes Conversion Cost to Li2CO3, Royalties, Freight CFR China, Assumes spot FX for RMB, AUD, ARS, CLP)

I am not sure how many people “expect” Ioneer to be a low cost producer if, indeed, they ever produce. I believe the costs shown are less than half what will actually happen if the project moves forward. Ok, I know what the cynics are thinking – “it doesn’t matter what their costs are if they can produce. In this market cycle they will do well.” I can’t disagree with that line of logic but my rejoinder is: “if they are so far out of line on their costs, what makes anyone believe any of their other claims such as being the most advanced lithium project in the US or timing are valid?”

If Loneer gets a significant DOE loan, in my opinion it will be a victory of form (and fluff) over substance. I would be happy to be proven wrong but in my opinion this project is “America’s Nemaska.” I leave it to you to read their feasibility study. Only time will confirm whether I am correct but likely my critics will point out that Ford, a Panasonic – Toyota battery JV and EcoPro have all signed supply agreements with Loneer. Doesn’t that prove something? History would tell us that these agreements prove nothing other than extreme supply angst among those without solid or adequate relationships with established lithium producers – Albemarle, SQM, Ganfeng, Tianqi, Allkem and Livent.

Let’s not forget that in an earlier time, Tesla set the standard for meaningless virtual supply agreements. They signed at least two in 2015 when Elon mistakenly believed that would somehow change the behavior of the larger lithium companies.

**CALGARY, ALBERTA--(Marketwired - Aug. 27, 2015) - BACANORA MINERALS LTD.** ("Bacanora" or the "Company") (TSX VENTURE:BCN)(AIM:BCN) and Rare Earth Minerals plc ("REM") (AIM:REM), the owners of the Sonora Lithium Project(1) in Northern Mexico (Bacanora and REM are collectively referred to as the "Sonora Lithium Project Partners"), have finalised a conditional long-term lithium hydroxide supply agreement with **Tesla Motors**, Inc. ("Tesla"), the maker of electric vehicles and energy storage solutions (the "Supply Agreement").

In the past seven years despite Tesla developing the most solid portfolio of real supply agreements with the major lithium players, Elon has continued to express his angst about the adequacy of lithium supply. His “Battery Day” insistence that Tesla had figured out a way to wring lithium out of Nevada clay with table salt and his more recent urging of entrepreneurs to enter the lithium refining space because it is “like printing money” are cases in point.

Sometimes the attempt to join the ranks of “lithium money printers” goes awry. Such is the case of Lake Resources who boldly declared on the back of lab samples they could make the world’s highest purity lithium at scale with yet to be proven technology.

▶ Lake Resources - Clean Lithium Solution

- World’s highest purity lithium
- Technology-led direct extraction
- Major ESG benefits
- New independent clean producer – at scale, with de-risked finance

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**LAKE** RESOURCES

ASK: LKE OTC: LUKF SLIDE / 26

The recently departed CEO/Managing Director who said last year with a straight face that Lake was “on track” to become a top four global producer must have suddenly had a change of heart. Hard to explain a headline like this:

## **Outgoing CEO nets \$7.7m prior to company’s disastrous ASX 200 entry**

*Promnitz unloaded his 10.2 million shares five minutes before the company entered the Australian large-cap index*

There is no issue if a founder or C-Suite executive decides to leave a company for whatever reason as long as it is done professionally. The departure of Mr. Promnitz occurred with a complete lack of class. Dumping 100% of his shares demonstrated his disregard for Lake stakeholders and implies his lack of belief in the future of the company. On the second point, Steve and I agree.

From my perspective there are others in the class of *virtual* suppliers – at least two of the geothermal projects – one in the US and the other in Europe. More to come.