

Lithium: Boom or bubble?

Projected demand sends prices skyrocketing

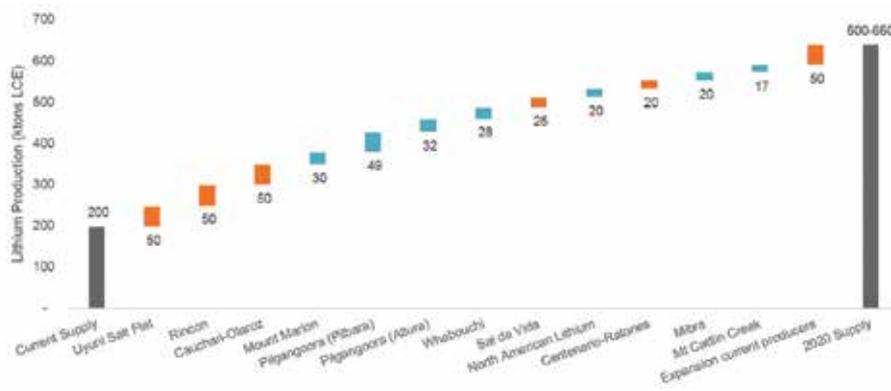
by Chee Theng, Technical Editor

Electric cars have been stirring up a storm for lithium. Prices of the mineral, which is an essential component of the lithium-ion batteries that power electric cars like Teslas, have been rising to stratospheric heights since October 2015 amid the prospect of widespread mass production of fully electric cars, each requiring some 21.4 kg (47 lb) of lithium carbonate equivalent in their batteries. Is the price boom

Cortegoso pointed out that the total number of lithium projects and operations worldwide was around 450 — and growing — on the morning of his talk on “Lithium supply and market: Past, present and future” at the American Exploration & Mining Association (AEMA) Annual Meeting in Sparks, NV, on Dec. 7, 2017. Only 3.5 percent of these are actually operating, he said, with 2.7 percent in construction, 8.6 percent in feasibility study, 35.8 percent in exploration stage (Fig. 2).

Figure 1

Lithium supply growth forecast, 2017-2020: Orange bars denote brines, blue bars denote hard-rock deposits. (Courtesy of SRK Consulting)



“There are many projects trying to make it happen, and only a few will become reality,” said Cortegoso. He sees a lithium rush with many project owners and developers focusing solely on demand while ignoring the supply side of the equation and the existence of an expanding supply side without substantial barriers to entry. A key determinant of who will make it and who will not would be how the lithium is extracted and how much is the operating cost. Technological innovations exist that could potentially halve costs and boost the reserve base. “It’s a matter of

sustainable, or is it a bubble? The answer may be a bit of both.

“Lithium is not rare — it is abundant, it’s out there,” said Pablo Cortegoso, consultant for lithium projects development at SRK Consulting. “There is a pricing bubble — hang tight. Oversupply may happen in the short term, but future demand will balance the lithium market. It will even out, just be patient.”

Cortegoso noted that supply, currently standing at around 200 kt/a (220,000 stpy) of lithium carbonate equivalent, mainly from brines and hard rock, is growing steadily, with many projects coming online, and SRK forecasts total production capacity could reach between 500 and 650 kt/a (551,000 and 716,500 stpy) in 2020 (Fig. 1). He assessed that there can be a small dip, but prices will continue to rise again as supply and demand adjust, with the market balancing out within the next five to 10 years.

Lithium rush

In response to the steep climb in prices, lithium projects have been proliferating,

who can get the right process and be out the door first,” he said. “Lithium demand is growing, and we’ll need it right now.”

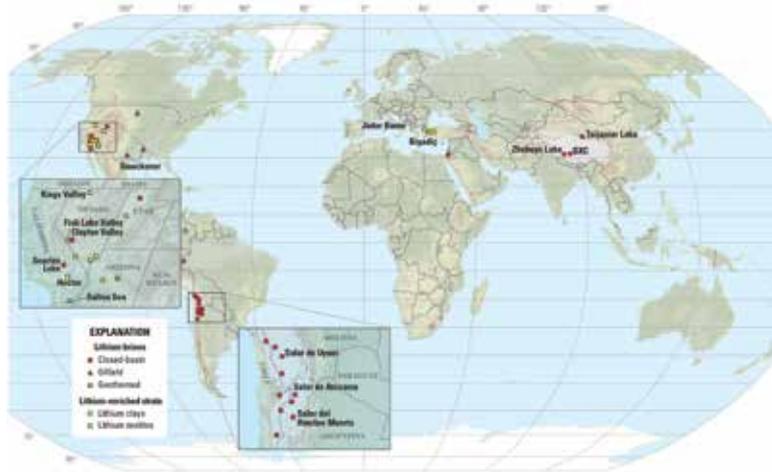
Executive order signed

The urgency is being stepped up a notch. As one of the 23 critical minerals covered by the U.S. Geological Survey (USGS) in its 2017 report on “Critical mineral resources of the United States — Economic and environmental geology and prospects for future supply,” lithium will fall under an executive order signed by President Donald Trump on Dec. 20, 2017, containing a directive for a report that includes (1) a strategy to reduce the country’s reliance on critical minerals, (2) a plan to improve the topographic, geologic and geophysical mapping of the United States and make the resulting data and metadata electronically accessible to support private-sector mineral exploration of critical minerals and (3) recommendations to streamline permitting and review processes related to developing leases, enhancing access to critical mineral resources and increasing the

Lithium

Figure 4

World map showing locations of selected closed-basin lithium-brine, lithium-enriched oilfield brine, geothermal brine, lithium-clay and lithium-zeolite deposits. (Source: U.S. Geological Survey)



Role of Nevada

Nevada is the only source of domestic lithium production, with value totaling to \$23 million in 2016, according to the Nevada Bureau of Mines and Geology. The bureau reported that placer claims for lithium accounted for 46 percent of the 19,039 new claims staked in 2016 in the state, mostly near Clayton Valley in the southwestern sector, and that several projects were drilled in the past two years by junior companies.

“Only one operating lithium brine mine exists in the United States, and it is in Nevada,” said Hickson. Developed in 1966 by Foote Mineral Co., the Rockwood Silver Peak lithium brine mine in Clayton Valley is now owned by Albemarle and has formed a nucleus for exploration efforts.

Hickson delved into the question “Do

geothermal systems play a role in lithium brine enrichment in Nevada playas?” at the AEMA meeting. She said that, in general, lithium brine deposits have the prerequisites of (1) a source of lithium, (2) an extraction mechanism, (3) a transport mechanism, (4) a trap such as a closed basin, (5) a suitable solar evaporation rate and (6) scale in terms of mass flux of lithium and limited dissolved salt competition. “The basins of western Nevada have many of these prerequisites but are dominated by clastic sediments and have relatively high subsidence and sedimentation rates. For these reasons, it is likely that lithium-enriched brines are deeper than in the mature basins of South America,” she said.

Lithium clay deposits

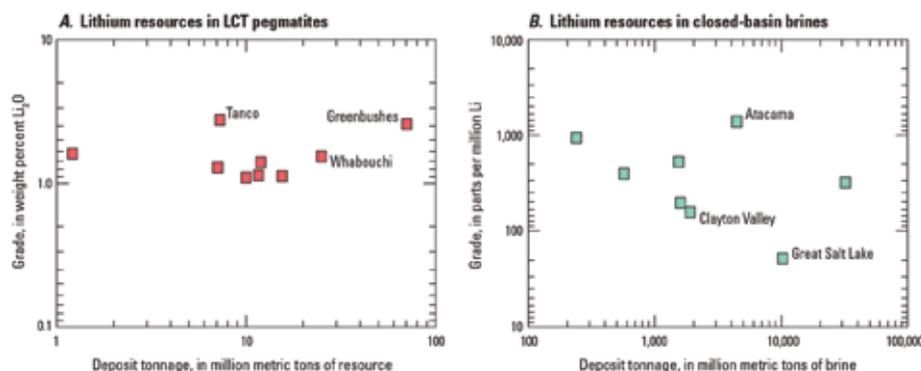
Tom Benson, who spoke at the AEMA meeting on “Li enrichment in intracontinental rhyolite magmas leads to large Li clay deposits in caldera basins,” said lake sediments preserved within intracontinental rhyolitic calderas formed on the eruption and weathering of lithium-enriched magmas have the potential to host large lithium clay deposits.

As a researcher in the Department of Geological Sciences in Stanford University, he and his coworkers compared lithium concentrations of magmas formed in various tectonic settings using in situ trace-element measurements of quartz-hosted melt inclusions to demonstrate that moderate to extreme lithium enrichment occurs in magmas that incorporate felsic continental crust.

“Cenozoic calderas in western North America and in other intracontinental settings that generated such magmas are promising new targets for lithium exploration because lithium leached from the eruptive products by meteoric and hydrothermal fluids becomes concentrated in clays within caldera lake sediments to potentially economically extractable levels,” said Benson.

Figure 5

Plots of lithium grade and tonnage for selected world deposits. (Source: U.S. Geological Survey)



Reserves and resources

The USGS reported that global lithium resources now total more than 39 Mt (43 million st), which is nearly 3,000 times current annual production. The plots of grade versus tonnage shown in Fig. 5 give an indication of the sizes of deposits that might remain to be found. With the potentially huge lithium battery market for hybrid and electric vehicles, more exploration is taking place, and new deposits will likely be discovered, the agency said. ■