

September 7, 2017

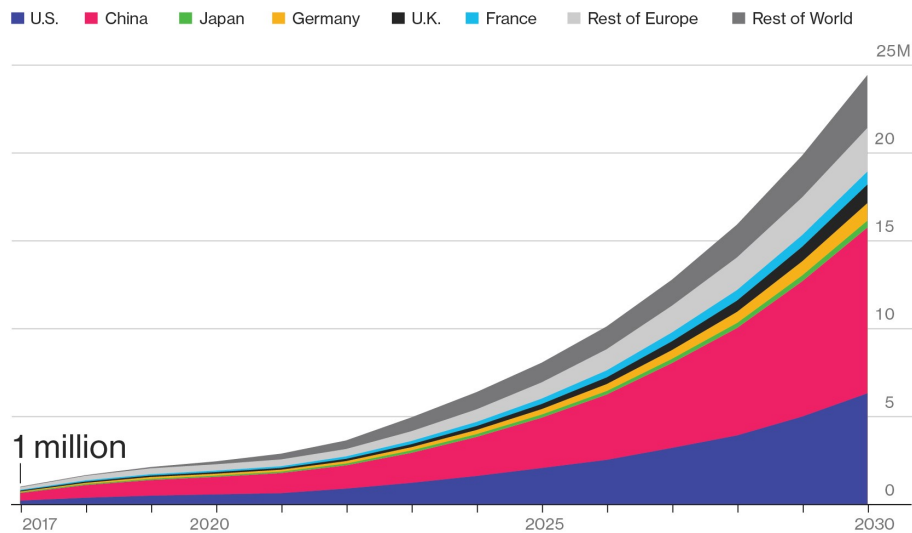
We're Going to Need More Lithium

● There's plenty in the ground to meet the needs of an electric car future, but not enough mines.

By Jessica Shankleman, Tom Biesheuvel, Joe Ryan, and Dave Merrill

Starting about two years ago, fears of a lithium shortage almost tripled prices for the metal, to more than \$20,000 a ton, in just 10 months. The cause was a spike in the market for electric vehicles, which were suddenly competing with laptops and smartphones for lithium ion batteries. Demand for the metal won't slacken anytime soon—on the contrary, electric car production is expected to increase more than thirtyfold by 2030, according to Bloomberg New Energy Finance.

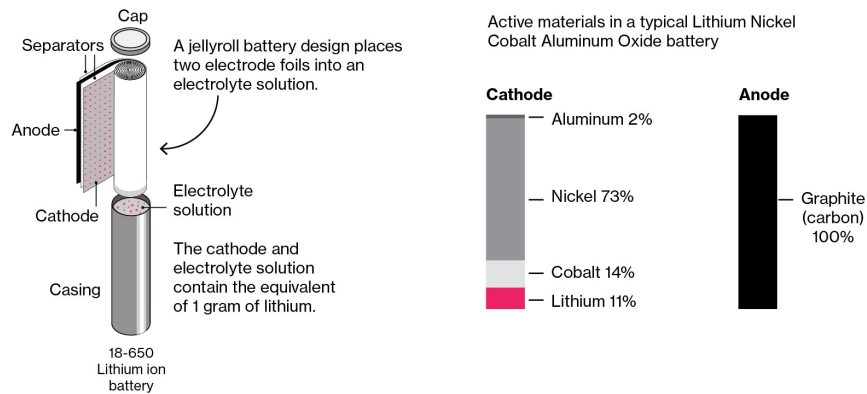
Annual global electric vehicle sales are forecast to hit 24.4 million by 2030



Rest assured, Earth has the lithium. The next dozen years will drain less than 1 percent of the reserves in the ground, BNEF says. But battery makers are going to need more mines to support their production, and

they'll have to build them much more quickly than anyone thought.

Material Components of a Lithium Ion Battery

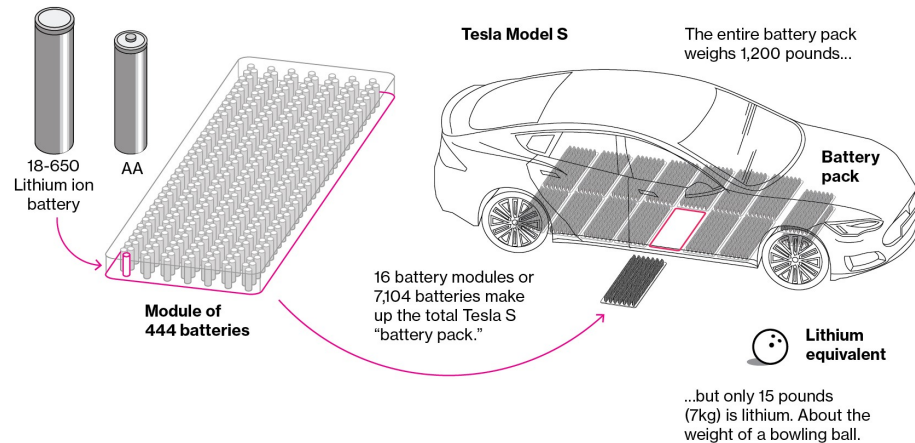


SOURCE: BLOOMBERG NEW ENERGY FINANCE

By 2030, Tianqi Lithium, SQM, Albemarle, and FMC, the companies that dominate the business, will have to supply enough lithium to feed the equivalent of 35 plants the size of the Tesla Gigafactory now being built in Nevada, according to BNEF. The total investment in new mines, including some for other elements used in lithium ion batteries, will likely range from \$350 billion to \$750 billion, according to analysts at researcher Sanford C. Bernstein & Co.

Tesla's Battery Pack

The Tesla Model S includes more than 7,000 individual batteries, which are similar in size to the AA batteries used in TV remotes.



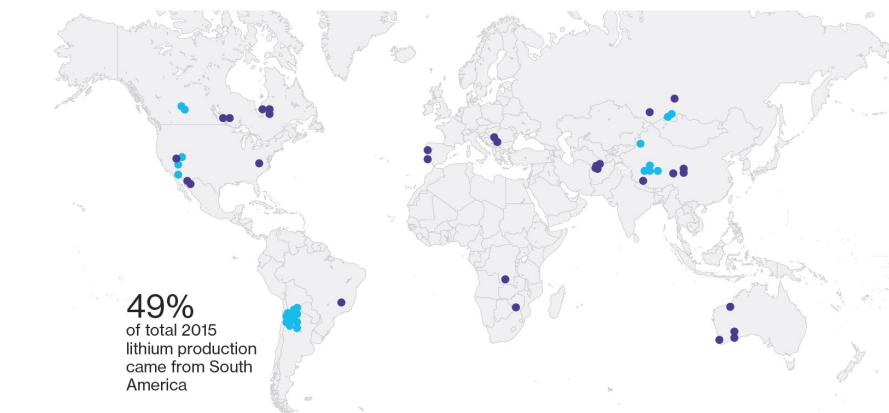
SOURCES: TESLA, DUNDEE SECURITIES CORP., BLOOMBERG RESEARCH

Miners must tread into sensitive areas, some with government caps on the amount of lithium that can be dug up. About half the world's reserves are in Chile, predominantly in the arid Atacama Plateau, which straddles the border with Argentina and is home to herders worried about the pollution and water shortages that tend to accompany the mining process, as well as the potential damage to sites they consider sacred. Another deposit is in the picturesque English county of Cornwall, famed for its clotted cream and pirate cove beaches.

Where All of That Metal Will Come From

Lithium is mined on six continents. Even if the market triples, there are 185 years' worth of reserves in the ground, Deutsche Bank estimates.

Major lithium deposits by type
 ● Brine ● Hard rock



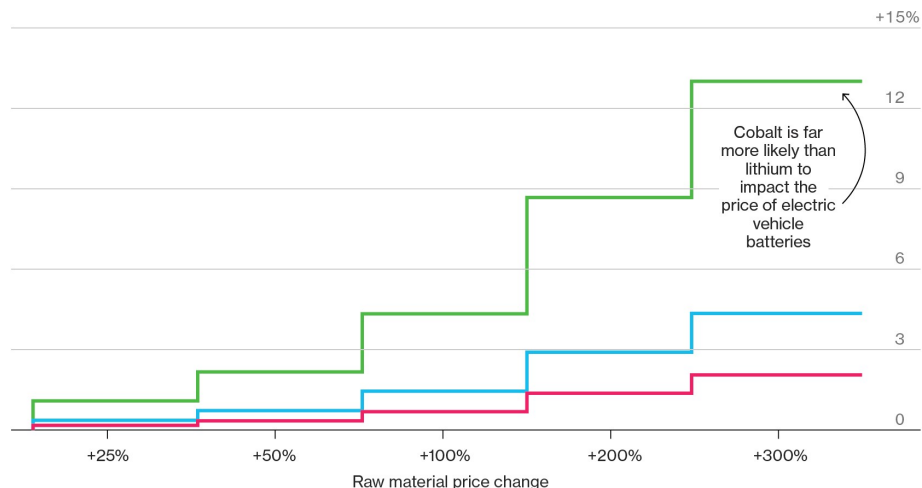
SOURCES: DEUTSCHE BANK, USGS, BLOOMBERG NEW ENERGY FINANCE

Mining companies have promised to add 20 lithium production sites to the 16 currently operating, but the concern remains that they won't be finished in time to satisfy rising demand. (The first new mine is scheduled to open in 2019.) Mark Cutifani, chief executive officer of mining company Anglo American Plc, sees the opposite problem as more likely. "There are a lot of projects out there, and they'll end up oversupplying the market," he says.

High Lithium Prices Are Not a Deal Breaker

Even if the price of lithium soars 300 percent, battery pack costs would rise only by about 2 percent.

Battery pack cost increase
 — Lithium — Nickel — Cobalt



SOURCE: BLOOMBERG NEW ENERGY FINANCE

And even if the companies struggle a bit to keep pace with demand, the global scramble may never be reflected in the sticker price of a Tesla or a MacBook Pro, says Edward Spencer, a senior consultant at London-based researcher CRU International Ltd. "The cost of lithium is absolutely nothing compared to the overall price of the vehicle," Spencer says.

Lithium is, as Tesla Inc. co-founder Elon Musk has called it, “the salt on the salad.” He’ll just need to make sure he’s got a steady supply.

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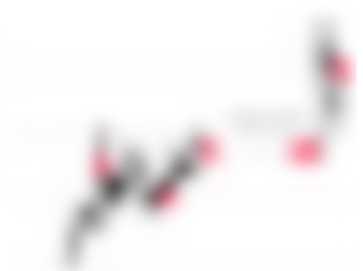
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