

Reserves

Worldwide identified reserves in 2018 are estimated by the US Geological Survey (USGS) to be 16 million tonnes, though an accurate estimate of world lithium reserves is difficult. One reason for this is that most lithium classification schemes are developed for solid ore deposits, whereas brine is a fluid that is problematic to treat with the same classification scheme due to varying concentrations and pumping effects. The world has been estimated to contain about 14 million tonnes of lithium reserves. A total of 75% of everything can typically be found in the ten largest deposits of the world. Another study noted that 83% of the geological resources of lithium are located in six brine, two pegmatite, and two sedimentary deposits.

The world's top 3 lithium-producing countries from 2016, as reported by the US Geological Survey are Australia, Chile and Argentina. The intersection of Chile, Bolivia, and Argentina make up the region known as the Lithium Triangle. The Lithium Triangle is known for its high quality salt flats including Bolivia's Salar de Uyuni, Chile's Salar de Atacama, and Argentina's Salar de Arizaro. The Lithium Triangle is believed to contain over 75% of existing known lithium reserves. Deposits are found in South America throughout the Andes mountain chain. Chile is the leading producer, followed by Argentina. Both countries recover lithium from brine pools. According to USGS, Bolivia's Uyuni Desert has 5.4 million tonnes of lithium. Half the world's known reserves are located in Bolivia along the central eastern slope of the Andes. In 2009, Bolivia negotiated with Japanese, French, and Korean firms to begin extraction.

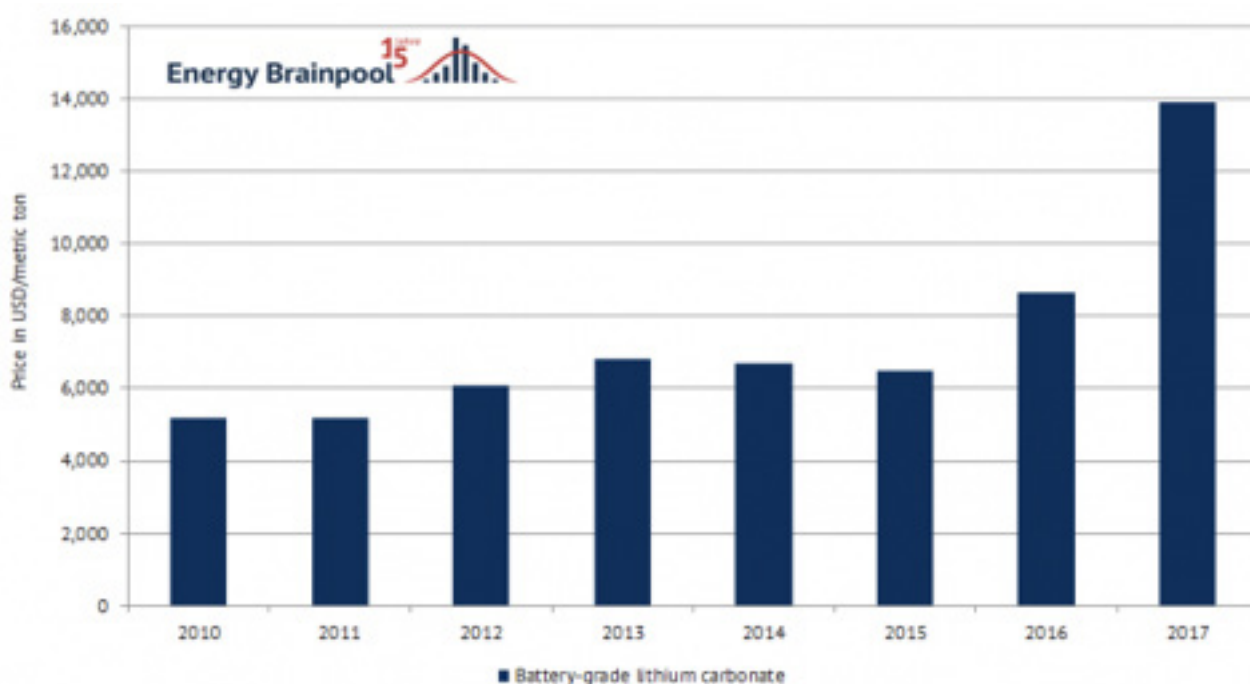
On 9 June 2014, the Financialist stated that demand for lithium was growing at more than 12% a year. According to Credit Suisse, this rate exceeds projected availability by 25%. The publication compared the 2014 lithium situation with oil, whereby "higher oil prices spurred investment in expensive deepwater and oil sands production techniques"; that is, the price of lithium will continue to rise until more expensive production methods that can boost total output receive the attention of investors.

The price of lithium has grown by at least 270 percent since 2010 caused by anxiety about lithium's availability. In 2010, lithium sold for \$5,180 per metric ton. By 2012, the cost was over \$6,000 per metric ton, and by the end of 2017, a metric ton was going for about \$14,000 – a 270 percent increase over 2010 levels. Figure 3 (Source: USGS) demonstrates this sharp increase in prices.

Another problem is that researchers do not seem to have an accurate tally of exactly how much lithium there actually is. Five different estimates of global lithium reserves made between 2008 and 2010 arrived at five very different numbers. The lowest estimate was 3.9 million metric tons, while the highest figure was 10 times as high. To meet the rising demand for more lithium, lithium mining operations have pledged to open 20 new production sites to the 16 that are currently in operation.

According to Argonne National Laboratory ; "the available materials will not be depleted in the foreseeable future. ... Known lithium reserves could meet world demand to 2050."

While devices that contain lithium can be recycled, there is no



recycling technology capable of yielding lithium pure enough for use in new lithium ion batteries. Going forward, lithium-consuming industries will need to collaborate in order to develop a recycling processes and infrastructure that can better recover lithium and the other precious materials that go into lithium ion batteries.

We've gone electric, and there's no going back at this point. Lithium is our new fuel, but like fossil fuels, the reserves we're currently tapping into are finite – and that's what investors can take to the bank.



At the moment, the vast majority of car batteries are made using lithium. Lithium ion batteries are smaller and more efficient than alternatives. If lithium were to become scarce, it would eventually threaten the production of electric cars, and push up prices in the meantime.

The mass-production of electric vehicles has been halted for a long time by an insufficient supply of batteries. While there were not many batteries being made, it made the electric cars prohibitively expensive. However, this has changed recently with projects like Tesla's Gigafactory, and other large factories. More and more people are investing in lithium mining companies, as their value continues to climb.

The falling price of electric cars has led to a huge rise in the number of EV drivers; ownership has now reached 2 million for the first time. Several of the biggest car manufacturers have very recently announced their move to all-electric and hybrids by 2019 – so batteries are soon to be in demand on a totally different scale.

Some of those opposed to the wider adoption of electric vehicles have been keen to spread speculation of a supposed lithium shortage. Opinion is split – even among experts – as to whether this is true. You could point to the fact that some of the doubters (such as petrol and diesel car manufacturers) have ulterior motives; but the fact stands that lithium is finite resource, and it will run out at some point.

The following article “Could a lithium shortage derail electric car boom?” written by James Stafford for oilprice.com was published 10:03 AM EDT Aug 26, 2016.

suspect electric vehicles are too much buzz and not enough real future. You may, in short, be a lithium skeptic, one of many. And yet, despite this skepticism, lithium demand is rising steadily and sharply, and indications that a shortage may be looming are very real.

It won't be a shortage in terms of 'peak lithium'; rather, it will be a game of catch-up with the electric car boom, with miners hustling to explore and tap into new reserves.

Consider the number of battery gigafactories that are being built around the world. We have all heard about Tesla's Nevada facility that will at full capacity produce enough batteries to power 500,000 electric cars per year by 2020.

This, as the carmaker proudly notes, is more than the global total lithium ion battery production for 2013. That's a pretty impressive rate of demand growth over just three years—but this growth also represents the culmination of a sea change in the way we think.

Lithium is powering pretty much everything upon which our present depends on and our future is being built. It's a viable alternative to petrol and in consumer electronics market segment alone, there is no sign of contraction – only expansion. Think the Internet of things, or smart houses, or smart cities, eventually. All these fascinating ideas are powered in some way by lithium.

But the real and present coup has been launched by electric vehicles. Forecasts from market research firms seem to be unanimous: EVs are on the rise, EVs are hot, and EVs will be increasingly in demand as people all over the world are

eagerly encouraged to cut their carbon footprint. According to Lux Research, the EV market will grow to \$10 billion within the next four years. Navigant Research forecasts EV sales will rise from 2.6 million last year to more than 6 million in 2024. So, whether we like it or not, EVs are coming — and in force.

Indeed, says Nevada Energy Metals executive Malcolm Bell, “It may be time to start worrying about a shortage, but it’s not a question of whether we have enough lithium—it’s a question of tapping into new reserves. Those who don’t see the supply wall looming, will hit with a resounding thud. Those who start tapping into new reserves will be extremely well-positioned for the future.”

From where everyone is standing right now, it may seem that the world’s got a fair amount of lithium. According to global estimates by the U.S. Geological Survey, there is enough lithium in the world – 13.5 million metric tons of it – to last us over 350 years in batteries.

What’s missing from this prediction, however, is ... the future, and indeed, the present. This calculation takes into account only the current rate of lithium ion battery usage. It does not account for the entrance of EVs into the mainstream. It does not account for Tesla, not to mention the growing ranks of Tesla rivals. And it most certainly doesn’t account for what is by all means a pending energy revolution that sees lithium as its leader.

Already, the present is clear: Demand is growing fast, faster than production, and for now this new demand is coming increasingly from the electric vehicle industry.

Tesla’s is by no means the only battery gigafactory out there. There are others being built around the world (at least 12, according to Benchmark Mineral Intelligence) and these gigafactories will raise the global demand for lithium batteries to some 122 GWh by 2020. That’s up from 35 GWh currently. It’s a phenomenal rise over a very short period of time.

In the U.S., there is already one gigafactory—Tesla’s, in Nevada—operating. A second gigafactory is in the works, courtesy of LG Chem. Brine-based lithium production in the country is concentrated in one place only, at least for now, and this place is Nevada. That’s because it is the only confirmed place with lithium deposits. The biggest actively mined area is the Clayton Valley, with presence from both mining majors like Albermarle and smaller, pure-play lithium miners such as Nevada Energy Metals. This makes Clayton Valley ground zero for the U.S. lithium rush and everyone wants to be there, but it’s the pure play miners who are set to explode onto this scene from an investors’ perspective.

Clayton Valley can hardly contain the lithium rush, and it is already time to look in the surrounding areas to secure future supply for soaring demand predictions. Those with enough foresight are diversifying their Nevada holdings and banking

on geological clues that suggest there’s plenty more lithium in Tesla’s backyard, and whoever gets to it first will be far ahead of the game.

“When everyone starts paying attention to Nevada’s geology, we’ll see a land rush that makes the current one pale by comparison,” says Bell, who heads of acquisitions for Nevada Energy Metals, one of the pure play movers in this playing field that sees the wider lithium potential in Nevada.

“Nevada’s geothermal footprints are large and extend well beyond the Clayton Valley. If you put a mirror up to Clayton Valley, there is endless opportunity here. The real race here is to create the next U.S. lithium powerhouse,” says Bell.

The best way to secure an investment foothold in lithium right now is to think outside the box and look for those companies who see the bigger picture.

But you also have to understand the supply and demand picture here.

Macquarie Research estimates that in 2015 demand for lithium already exceeded supply, while this year, lithium output will again fall short of demand.

In 2017, thanks to so much new production capacity the metal’s fundamentals will near an equilibrium, which will last for about a year before deficit rears its head once again—but this time the deficit will stick. Despite new efforts to ramp up supply, it will take a while before supply corresponds to the demand.

The future is pretty clear: We’re looking at a period of shortage, and shortage is where the savvy investors make real money. The lithium feeding frenzy has only just begun. Consumer electronics keeps it safe and steady, as always; the electric vehicle boom skews the demand picture dramatically, and the future’s energy storage and powerwall evolutions take it over the edge.

The reserves are there, and there’s geologists estimate there’s plenty of unproven reserves out there as well—it’s just a matter of who finds them first, and who starts extracting first.

Lithium has the purest of fundamentals of any ‘commodity’ out there, and the next oil barons look set to actually be lithium barons. In fact, in this respect, electric vehicles will likely be the cause of the next oil crisis. Demand and supply are simple and shockingly visible, and that means there’s a lot of new money floating around for lithium exploration. If you’re not a believer, the immediate future will sweep you off of your feet.

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