Lithium Is Set To Soar - A 2025 Price Forecast

Global X Lithium ETF (LIT) - Jan. 8, 2020

Summary

Due mostly to the rapid adoption of EVs, lithium is seeing incredible growth in demand, which should reach 1.637 million tonnes in 2025.

Fears of oversupply have been overblown, and demand will once again outweigh supply by the end of the year, which should be sustained throughout the foreseeable future.

Fears of lithium carbonate becoming obsolete because of lithium hydroxide are overblown, and the metal will be able to see sustained demand due to factors such as cost and accessibility.

I anticipate a turn of lithium's price in the second half of this year with both carbonate and hydroxide prices reaching $12,000 per tonne by the end of the year.

In 2025, I expect lithium carbonate to reach a price of $13,000 per tonne while hydroxide should be priced at around $16,500 per tonne.

Lithium is a rare metal that is the backbone to almost all current batteries. Batteries have been around for decades, but electric vehicles ("EVs") are the most recent cause for the surge in demand for lithium ion batteries. This recent surge in demand has caused lithium miners to up their game and deliver higher amounts of lithium than they ever have before. While this initially caused lithium's price to skyrocket, because the supply failed to meet the new-found demand, the price was brought back down as production began to meet, and then exceed, the demand. This article will discuss the growth of available lithium, its demand through the foreseeable future, and what that means for its price. I will also discuss investment opportunities that can become available based off of lithium's future price. By the end of this article, even those that find this market to be completely foreign will have the know-how to make educated decisions in the world of lithium.

Rapidly Growing Market

The demand for lithium has skyrocketed in recent years, propelled by the rise of EVs. All across the world, cars are trading in their internal combustion engines ("ICE") for an electric motor and battery pack, but China is no doubt leading the charge. In 2018, 4% of China's car sales were EVs (author's calculations assuming 28 million total sales and 1.1 million EV sales), but this number is projected to skyrocket to 25% in 2025, as opposed to the previously expected 20%. For a market expected to reach 35 million vehicles by 2025, after reaching 30 million in 2020, this 25% of sales would create 8.75 million EV sales in China alone. But China's not alone. The United States, the second largest, single-country, market in the world, is projected to reach 17.7 million sales in 2025, after 17.2 million sales in 2018. This is much slower growth, but it still represents a large market where 1.4 million EVs are expected to be sold in 2025. Recent legislative efforts are also working to increase this by extending EV incentives for buyers, though they've been unsuccessful thus far. In Europe, EV sales are projected to surpass US EV sales by 2025, with 6.3 million EVs sold in 2025, but blowing China out of the water in per-capita sales. 48.3% of Norway's vehicle sales in 2018 were EVs, the most of any country in the world, and the country expects to sell only EVs in 2025 and beyond. These 6.3 million EV sales will mark huge growth over the 195,000 sold in 2018. The sales are expected to be bolstered by dramatic growth in variety and availability of EVs across the continent. India will have 7.4 million vehicle sales by 2025, up from 4.4 million in 2018, and with the country continuing to incentivize EVs to reduce their terrible pollution problems, an urgent problem for the country and its government, a large number of those could be EVs in 2025.

So, while each of these individual areas seeing EV growth is clearly a positive for the EV market, and lithium as a byproduct, how many EVs will actually be sold in 2025? Well, according to a report by Frost & Sullivan, covered by the Economic Times, we can expect 34 million EVs to be sold in 2025 across the world. The report also shows rapid growth to continue, with 121.2 million EVs sold in 2030 and 636.7 million sold in 2040. This growth also makes the multi-billion dollar investments of multiple car manufacturers, such as Volkswagen (OTCPK:VWAGY) and General Motors (GM), seem quite wise, and their vehicles should also further the adoption of EVs with variation and brand loyalty.

Pictured above is a Chevy Volt battery pack via Clean Technica

Cars are leading the EV revolution, but there are other vehicles that have been touched by the electric revolution as well. When the term EV is used, it is almost always referring to a car, or light truck (it's how I've been using it throughout this article as well), but cars and light trucks aren't the only type of vehicles out there. Through my analysis of Tesla's (NASDAQ:TSLA) battery storage business, I discovered that, although making up the vast minority of production, less than 1% of Tesla's total American vehicle output not including Cybertruck, Tesla's Semi will consume 46.7% of total battery production at Gigafactory 1. This highlights the importance of semi trucks for the lithium supply chain is quite large despite them making up such a small portion of EVs. The electrification of the semi-truck market would result in almost as much of a lithium demand spike as cars and light trucks, especially in China. Global medium to heavy truck sales are expected to grow by 33% from 2018 until 2025 (author's calculation using data from Global Market Insights). In 2017, there were 3,742,000 medium or heavy trucks sold across the world's major markets, though including all markets may bring this figure above 4 million units and growth into 2018 almost surely would. 33% growth from the approximated 4 million sales in 2018 would mean 5.33 million medium to large truck sales in 2025. Of this number, likely around 60% of these trucks will be electric, implying a sale of 3.198 million electric semi-truck sales in 2025.

There are many other smaller vehicles, such as motorcycles, which will have a noticeable, albeit small, impact on lithium demand, so I will review them a bit more briefly. Growing with 10.35% CAGR, the electric motorcycle market should reach 35.955 million in 2025 after seeing a market of 18.045 million in 2018. Buses are also beginning to make their transition to battery power with 39,000 sales worldwide last year (author's calculations using separate Bloomberg reports [1,2]). This is actually expected to slow to 20,300 sales in 2025 (author's calculations using a Bloomberg report) as China, by far the largest market, becomes saturated.

Vehicles aren't the only source for battery, and lithium, demand. Companies such as Tesla are pioneering large-scale energy storage systems that are beginning to have increasingly high demand. In Australia, Tesla has proven that its utility battery projects are not only possible but incredibly cost effective. Peaker plants will likely become a thing of the past as these efficiencies make it incredibly unwise to keep them operating. However, peaker plants may not be the only things to go. Traditional coal or nuclear power plants could be replaced by battery storage systems connected to wind, solar, or even hydro power in due time. Home, or office, energy storage systems, which are often coupled with solar systems, are expected to reach an annual deployment of 10.6 GW in 2025. For utilities and their large-scale projects, they're going to need 6.6 GW of battery storage potential in 2025 to satisfy their project needs (author's calculations based off of 10.6 GW for grid-connected-storage and 17.2 GW total battery storage in 2025). Adding both of these battery storage needs, we find that we're going to need a total of 17.2 GW of battery storage in 2025.

All of these vehicles and storage facilities would require *1.637 million tonnes of lithium by 2025* in order to be produced. When considering the mere 269,000 tonnes of lithium required in 2018, it becomes evident how incredible this growth really is. To calculate this, I used the average battery pack for each vehicle (cars or light trucks, medium to heavy trucks, motorcycles, and buses) and a conversion of 0.3359 kg of lithium required for every kWh battery storage (author's calculations using mass of battery per kWh, components of lithium-ion batteries, and battery composition by percent mass). For battery storage units, I used a conversion of kW into kWh, assuming six hour duration, to find the kWh value and convert that into lithium using the same conversion above.

2025 Energy Requirements and Resulting Lithium Demand

EVs	2025 (GWh)	2025 (tonnes)
Cars and Light Trucks	1,700	571,030
Medium to Light Tucks	2,558.4	859,367
Motorcycles	503.37	169,082
Buses	7.613	2,557
Total EV	4,769.383	1,602,036
Energy Storage	**2025 (GW)**	**2025 (tonnes)**
Home Storage	10.6	21,363
Utility Storage	6.6	13,302
Total Energy Storage	17.2	34,665
Total Lithium	xxxxxxxxxxxxxxx	1,636,701

Growing Supply

There is no question that the market for lithium is growing. However, the concern by market analysts lies with the potential for a dramatic oversupply as producers all flood in to capitalize on this new-found demand. From this, there is expected to be significant growth into 2025, with estimates topping the lithium supply at 1.5 million metric tonnes. Based off of my prior estimates, this would be insufficient to fulfill the demand for lithium that will hit the market in 2025. However, with hard-rock mines able to reach production in, best-case, three years, it is possible that this supply grows again to try and meet the incoming lithium demand. Don't fret, another dramatic oversupply in the near future is quite unlikely due to the financial inability for many producers to increase their production anytime soon. Additionally, with companies like Nemaska Lithium (OTCQX:NMKEF) being hit especially hard, it seems that producers have learned their lesson and won't repeat the mistakes of their past.

An image of lithium salt via Bloomberg

Even with supply forecasts growing, this doesn't actually equate to more lithium entering the market. The material must be tested and approved before being implemented in the supply chain which, according to Benchmark Minerals, can take up to 13 months. This often overlooked step is a key factor in limiting the immediate growth of the lithium market and allowing demand to grow past supply. A limiter like this is important for the market to act as a sort of buffer when lithium supply may grow too fast. What this means here, though, is that the one and a half million tonnes of new lithium to be produced in 2025 may not even see any use during that year, causing an even greater divide between lithium's demand and its supply.

Carbonate v. Hydroxide

When discussing lithium, there are two different types that are being referred to - lithium carbonate and lithium hydroxide. The metals, while similar, have some key differences in their chemical structure that lends them well for different uses. For lithium hydroxide, the chemical makeup lends it to be more compatible with highly energy dense, nickel-rich, batteries than lithium carbonate. This is what is driving many electric automakers to explore its uses for their own EVs because higher energy density means greater ranges, one of the most important factors when customers are considering an EV. Unfortunately, these batteries haven't yet been perfected. Hydroxide is more expensive than carbonate to obtain, but that isn't the worst of concerns for the metal. NMC 811 cathodes, which is the energy-dense cathode that requires lithium hydroxide, are quite unstable. The article that I cited seems to be a bit overly-bullish on the implementation of NMC 811 cathodes, which still haven't seen close to mass adoption. There will likely need to be years of further development before they can successfully be implemented in EVs. Beyond safety and cost concerns though, China's aggressive incentives for the advancement of energy-dense cathodes have been removed. This decreases the motivation to further this technology and the cost-effectiveness of using the, currently, more expensive battery.

Even as hydroxide will likely become a more viable alternative in the future, this doesn't mean the carbonate is doomed. The other most important factor when customers are considering an EV is cost. With the rise in demand for lithium hydroxide, when it becomes a viable alternative, will come a rise in price for the precious metal. While this likely won't completely prevent it from being used in EVs, it could prevent its usage in battery storage systems. Since weight and size don't really matter for these systems, especially because carbonate batteries are still relatively close in energy density, the cost becomes the most important factor which would in turn would make lithium carbonate the most reasonable metal for battery storage systems. Many industry experts, while expecting lithium carbonate to be surpassed by hydroxide in demand in 2025 or later, expect that demand for carbonate will still continue to grow at a CAGR of around 11%. This provides ample demand for carbonate even as hydroxide rises in popularity when its volatility is solved.

Another important piece of the puzzle is how to obtain each metal. Previously, lithium hydroxide was produced by treating lithium carbonate that had been produced from brine mines, a costly process. However, spodumene, a hard rock mine that allows companies to mine hydroxide directly, has allowed producers to bypass this process and bring down the cost of obtaining hydroxide so much so that hydroxide is now cheaper to get than carbonate when using spodumene. But there are some complications with this process.

As Benchmark Minerals explained,
"Offtake arrangements have often been structured to allow for a return for spodumene producers, which in many cases are still operating at above their target cost levels. As a result, you are left with the cost of feedstock material proving prohibitive to China's chemical converters taking hydroxide production costs below brine alternatives, even when bypassing the carbonate production route."

Essentially, the process that was meant to reduce the price of harvesting lithium hydroxide is now more expensive than the old method due to various agreements that were made to finance the mines. Beyond the demand hike that hydroxide should see, the actual costs associated with obtaining hydroxide remain higher than carbonate which should further their price difference.

Cost Projections

Now, it's time to put all of this information together. The most important part of this article, while it's good to hear that, long term, demand shouldn't actually be outpaced by supply, is what this will do to the cost of lithium, both carbonate and hydroxide. Joe Lowry runs a podcast, Global Lithium Q&A, where he holds discussions with different lithium experts. On last year's final episode, Lowry, by himself, discusses his own expectations for the market. A minute and twelve seconds in, Lowry says, "I still believe that the long-term new normal for battery-quality lithium carbonate is in the, uhh, twelve, twelve plus range." He later goes on to say that he thinks carbonate will remain between $12,000 to $14,000, long term, referring to the price by the tonne, the standard unit of measurement for lithium. In terms of when this will happen, Lowry holds a similar outlook as Benchmark Minerals. On a different podcast with many of Benchmark's top analysts, the analysts, at roughly forty five and a half minutes in, state that they see the price begin to turn in the second half of 2020. Lowry, on his own, reiterated this outlook, two minutes and twenty seconds in, saying that carbonate should be at least $12,000 per tonne by 2021's open, growing in a "hockey stick" pattern.

This isn't the first time I've referenced Benchmark Minerals, and for good reason, but using their guidance, along with Lowry's, for such an important piece of this article requires further justification. The company recently briefed the White House on the battery supply chain, trusted by the United States' highest level of government as a knowledgeable guide for their evolving policy on the battery metals supply chain. Benchmark has established this prestige through their years of analysis as the top price reporting and projection agency in the world.

Joe Lowry isn't just some chump either. Lowry has served as the president of Asia Lithium, the Global Sales and Business Development Director of FMC, and many other jobs in the lithium supply chain, according to his LinkedIn page. Since 1989, he has been involved with the lithium supply chain directly and has a greater understanding of it as a result, leading to the success of his Global Lithium Podcast and his high reputation in the industry. The projections by Lowry and Benchmark take all of the evidence supporting the industry's growth that I've provided and allow me to use their expertise to finalize this report with lithium carbonate and hydroxide price forecasts.

For my long-term price projections, I will start first with lithium carbonate. Similar to Lowry and Benchmark Minerals, I also see the market reversing positively in the second half of 2020, as demand edges over supply. This inverse should lead to quite a steep climb for the price too. As Simon Moores, the Managing Director of Benchmark Minerals Intelligence, said on lithium prices (at 45:35) "I think when it turns, it turns very quickly." This means that, while lithium carbonate's bottom is near, it shouldn't be there too long. Lithium carbonate currently sells for $8,750 per tonne. By the end of this year though, it should be selling for $12,000 per tonne - 37% growth. However, once this price is reached, growth should slow, at a CAGR of around 2%, reaching $13,000 by 2025. This price was determined using the consistent growth of lithium demand, outpacing that of its supply (especially for carbonate), with pointers from Lowry and Benchmark in mind. Additionally, lithium's price has followed similar trends in the past, growing in line with which the demand exceeds supply. Similar to Lowry, I also see lithium carbonate having a ceiling of $14,000 per tonne as supply shouldn't be lagging as far behind demand as it was in 2018.

Hydroxide has a bit of a different path ahead of it. To find the price of hydroxide, I'll use carbonate as a base and discuss hydroxide's price relative to carbonate. As a substance that is cheaper to mine, but in higher demand, finding which factor weighs more on its price depends on when it's being bought. As time goes on, I anticipate that demand will have an increasingly large impact on hydroxide as the current oversupply starts to become an undersupply. However, this may take a bit longer than carbonate to kick in. The reason I believe this to be the case is the dramatic rise of spodumene mines recently and lack of NMC 811 cathode adoption that may contribute to a prolonged oversupply. Because of this, hydroxide should stay at around $12,000 per tonne by the end of 2020, up from $10,750 per tonne now, right around carbonate, but see a rise to around $16,500 per tonne by the end of 2025. This would be a 27.03% premium over carbonate's price, compared to 22.86% now, which is due to a rise in demand and relative fall in supply.

Market Mispricing

As producers realized the incredible growth that lithium was about to have, they all flooded in to try and meet that demand and capitalize off of it. This caused our lithium crash. However, something interesting happened. Now, producers aren't investing in much production down the line because they haven't been making nearly as large of a return on their investment as they were initially supposed to, resulting in a bit of a "paradox." An article by Benchmark Minerals, Lithium's Price Paradox, introduced this concept to me, and I found it to be an incredibly important piece of lithium's value assessment, detailing why it is mispriced. For those interested in a more technical and in-depth analysis on this specific topic, I'd recommend reading their article, but I will recount the piece's most pertinent arguments and provide my own analysis to compliment the piece here.

This idea of a lithium price paradox is the most apt way I have found to describe the mispricing of lithium. The first component to consider is the slowing growth of supply. As lithium becomes less valuable, there is less motivation and funding to create more supply and, therefore, many expansions have been put on hold, or canceled. Because of this, *2020 will have less than 40% of the initially projected lithium supply as it was supposed to*. Additionally, of the new lithium supply coming online, 75% is lithium hydroxide, which, due to what I've already discussed, demonstrates a strong demand for carbonate in the near future. Essentially, there has been a strong turn in sentiment, resulting in a delay in production without much chance of supply meeting the demand in the near future. Supply growth has been hyped up far past its reality, and most investors seem to continue to buy into this hype even as lithium supply begins to level with the demand. As demand will surpass demand again, this market mispricing will be realized, and lithium will again be valued as it should.

Investment Strategy

The surge seen in 2018 led to a market correction, once more mines came online, and investors that had entered the market hopeful of an EV revolution to bolster their lithium investments fled fearing that a dramatic oversupply would wipe their earnings. Now, even as lithium prices are still 50% greater than they were at the end of 2015, many lithium producers, like Albemarle Corporation (ALB), are up just under 20% since the end of 2015. It's also not like the company hasn't seen growth in that time, bringing new mines into production and improving their financial health as well. So, why is the growth so low? Well, there really is no good reason. The sentiment in the lithium sector is just so low that these companies have been subject to such dramatic hits. With lithium set to boom and the market sentiment bound to flip as a result, I would recommend taking a long position in a couple of companies that I will discuss below.

The best way to take advantage of this market surge depends on the type of investor you are. Personally, I would choose to take advantage of this through investment in junior mining companies, but those who wish for a less-risky investment should choose more established players like Albemarle, Sociedad Química y Minera (NYSE:SQM), or Ganfeng (SHE:002460) (standard risks associated with trading on foreign markets apply). Another approach would be to invest in lithium directly through the Global X Lithium ETF (NYSEARCA:LIT), which would provide less exposure to politics and business operations as there are with lithium mining companies. The ETF takes a mix of both hydroxide and carbonate, so keep that in mind if you do choose to go long with this particular investment strategy. This would also probably be your safest bet and would likely perform similarly to more established miners, but without business operations to worry about. Additionally, the ETF should be more resistant to any possible downturns in the stock market within these five years, making it a safer bet for a longer play.

Based off of the above growth projections of lithium for 2020, the Global X Lithium ETF should grow by around 34.27% this year and a total of around 50.98% by 2025 from the time this article has been published (author's calculations with weighted averages of the growth of hydroxide and carbonate using recent production totals). The earlier growth will be propelled by carbonate, while hydroxide's growth will be responsible for the later growth. So, if you're not looking for too much risk and are willing to play a long game, I would recommend investing in the ETF as opposed to these more established miners, though portfolio diversity doesn't hurt.

My top pick for junior minors is Lithium Americas (NYSE:LAC). One of my previous articles details the strong growth potential of the company, focusing on one of its two projects under development, and I continue to believe that the company has tremendous growth in its future. A quick demonstration of Lithium Americas' potential value is that Ganfeng recently gave Lithium Americas $160 million in order to increase their stake in Cauchari-Olaroz, Lithium Americas' smaller project under development, by 12.5%. This would give that single project a total value of $1.28 billion, but keep in mind that it is the lesser of the two projects. If we apply this same value to Thacker Pass, using the significantly higher production, slightly higher margins, and later production date, the project has a value of $1.984 billion, of which Lithium Americas owns 100% of. Due to their 50% stake of Cauchari-Olaroz, this mine is worth just $640 million to them, but the two together are worth $2.624 billion. This basic valuation is just the current value of the mines and as neither mine has begun production, their future value should become much higher with growth in revenue and reduction of company debt. Nonetheless, Lithium Americas' current market capitalization is just under $289 million, an 89% discount to this basic valuation. This demonstrates quite a discrepancy between what insiders value the company at and how it is currently being valued. This potential for growth, coming from the value of lithium and the company itself, is what makes this company my favorite lithium bet, but the risk that comes with it, especially its debt load, is noticeably higher than the ETF or more established players.