

Lithium: Powering a Global Revolution

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WORLDVIEW

Lithium: Powering a Global Revolution

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- Demand for lithium-ion batteries will continue to rise as the world's roadways and power grids incorporate more battery-powered technologies.
- Of the world's major lithium producers, Australia and Argentina are poised to take best advantage of the growing demand for the metal.
- Bolivia, on the other hand, could miss its opportunity over the next decade to step in to fill the gaps in the global lithium supply.

The world is slowly breaking its dependence on fossil fuels. Global policy, along with economic considerations and technological developments, has helped to usher in a new era in which oil will have lost its prominence as the world diversifies its energy sources. Although that day is still at least a decade away, the transition is in progress. And batteries are leading the charge.

Today, lithium-ion batteries are the gold standard in battery technology, not only in transportation but also, increasingly, for grid storage. That doesn't mean lithium is the "new oil." The amount of lithium required to build a battery that can power an electric vehicle pales in comparison to the quantity of oil it takes to continually fuel an internal combustion engine. In terms of energy storage and supporting electrical grids, moreover, lithium-ion batteries are in no danger of superseding natural gas anytime soon. But demand for the technology is expected to keep growing, and at a rate that will soon outpace current lithium production. The world's lithium resources are almost certainly adequate to satisfy the rising demand for the material. Whether production can keep up, however, will depend on the handful

of countries that are poised to dominate the global supply of the world's lightest metal.

An Insular Industry

The world derives the vast majority of its lithium supply by extracting the metal from a mineral called spodumene or from the evaporation of brine deposits. Evaporation is typically a cheaper option than is mining, though the lithium it yields often is of lower quality. Thanks to skyrocketing prices for the metal over the past few years, both processes currently are economically viable. But cost isn't the only concern. A small number of countries contain most of the world's spodumene reserves and brine deposits. Australia and Chile are the world's top lithium producers, while Bolivia holds the largest potential resources. Argentina completes South America's so-called lithium triangle. China, meanwhile, is also a significant producer. Together, these five countries account for most of the world's lithium supply. And just six companies dominate production.

Breaking into the lithium market is no small feat. For one thing, getting an extraction and processing operation off the ground can take up to seven years, depending on the type of facility. For another, lithium isn't traded like a normal commodity. Long-term production contracts are the norm in the industry, and countries that extract and process lithium salts from brine or spodumene deposits use these deals to help determine plans to expand their operations. Despite the challenges, several minor producers are trying to make inroads into the lithium sector, hoping to take advantage of an increasingly attractive market.

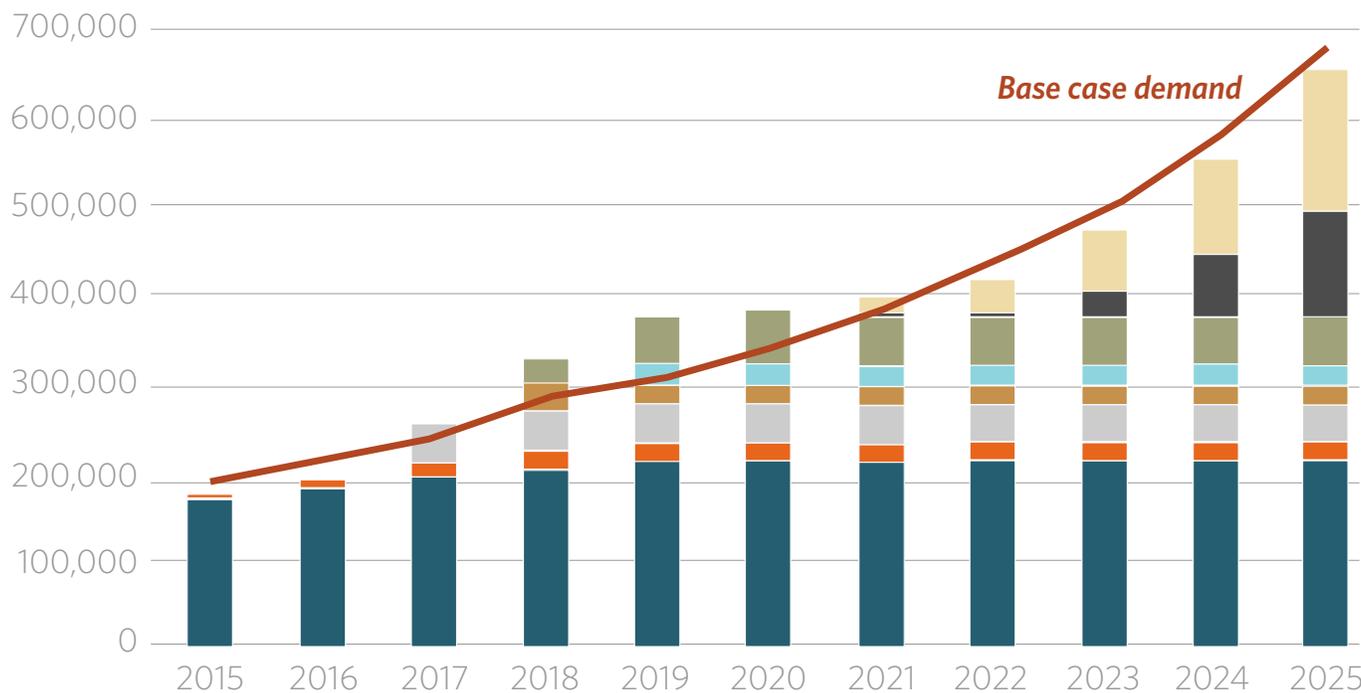
Lithium Supply and Demand Forecast

To satisfy the growing demand expected in the next several years, the world's lithium production capacity will need to expand considerably. Many projects to construct new facilities or enlarge existing ones are already underway.

WHERE THE LITHIUM WILL COME FROM

- Total existing supply
- Mount Catlin
- Mount Marion
- Mount Caitlin expansion
- Pigangoora-Altura
- Pigangoora
- Olaroz expansion
- Olaroz expansion
- Unspecified mineral
- Unspecified brine

METRIC TONS



Source: Canaccord Genuity estimates

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The As, B and Cs of Lithium

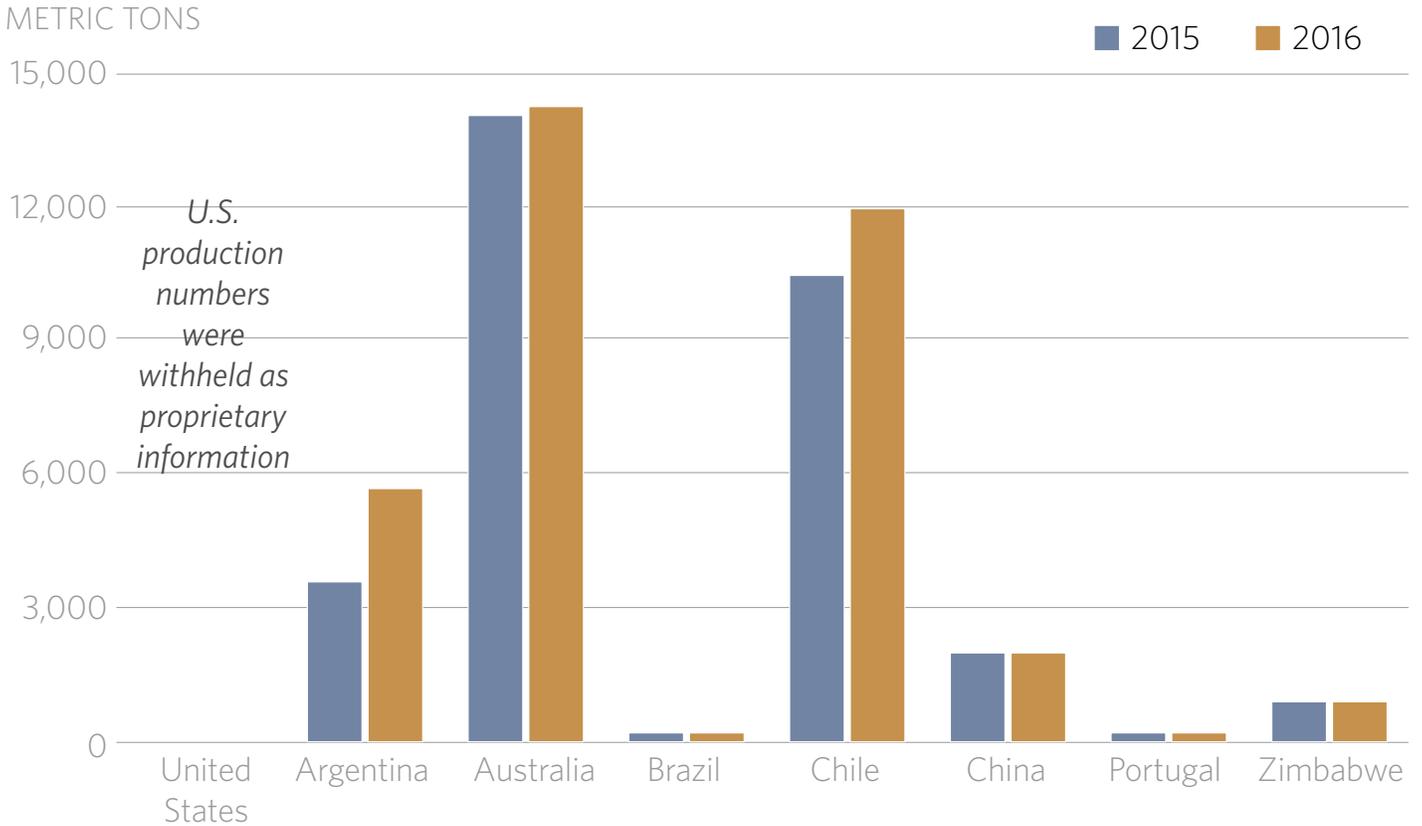
Beyond the logistical difficulties of boosting production, geopolitics will play a central role in determining how quickly the lithium market expands. Whether Argentina can continue to ramp up production, for example, depends in large part on how its next presidential election plays out in 2019. The country's lithium production increased by 60 percent in 2016, and the government projects that its output will triple in the next five or seven years.

If President Mauricio Macri seeks and wins re-election, his administration will probably continue its efforts to facilitate the lithium sector's development as part of a larger push to promote energy investment. If voters return the presidency to a leftist administration, on the other hand, Argentina's next leader could abandon or reverse Macri's attempts to draw investors to the lithium sector, and to the country more broadly. Either way, Argentina is unlikely to eclipse Australia in lithium production.

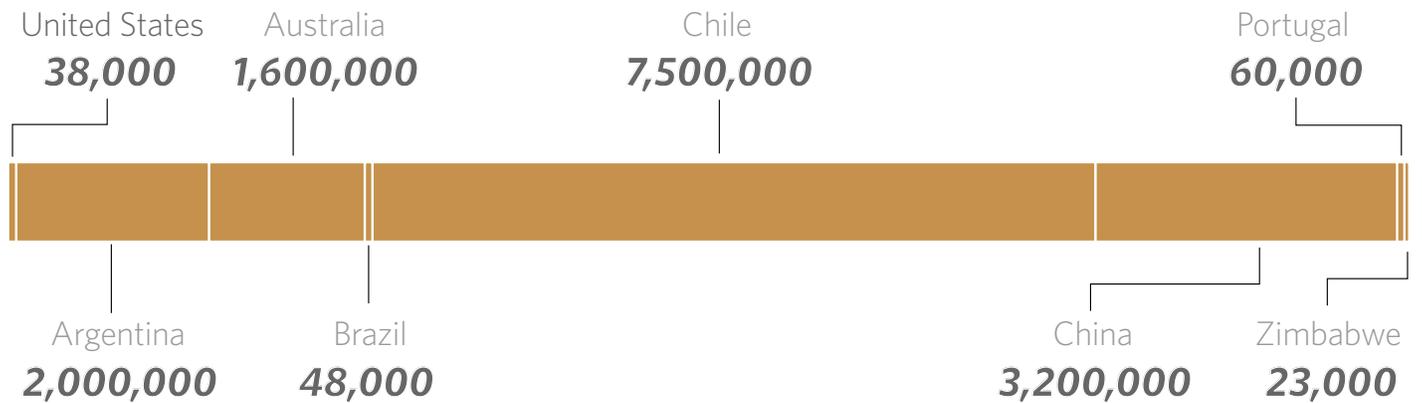
Lithium Production

Increased use of lithium-based battery technology will support growing demand over the next decade, and probably beyond. The world's ample reserves of lithium are concentrated in just a handful of countries. Of these, Australia and Argentina appear best poised to take advantage of the lithium market's growth.

NATIONAL TOTALS



NATIONAL RESERVES* IN METRIC TONS



*Reserve numbers do not account for additional potential, yet-to-be-explored resources. For example, Bolivia's resources, which are suspected to reach 9 million metric tons, are not accounted for in the official global reserve tally.
 Source: U.S. Geological Survey, Mineral Commodity Summaries, January 2017



Given its ample reserves, its existing operations and its geographic proximity to and friendly trade relations with China, Australia is a natural choice for Chinese companies looking to secure their lithium supply. China, of course, is a formidable producer in its own right, but its reserves are typically of sub-standard quality and its existing facilities operate below capacity. As a result, Chinese companies are investing in other countries' lithium sectors to ensure they have the lithium they need to power China's growing fleet of electric vehicles and supply its large battery-manufacturing facilities. Sichuan Tianqi Lithium Industries, in fact, already owns a majority stake in large mines at Australia's massive Greenbush reserves, and it has plans to open another processing facility in Kwinana in western Australia in 2018.

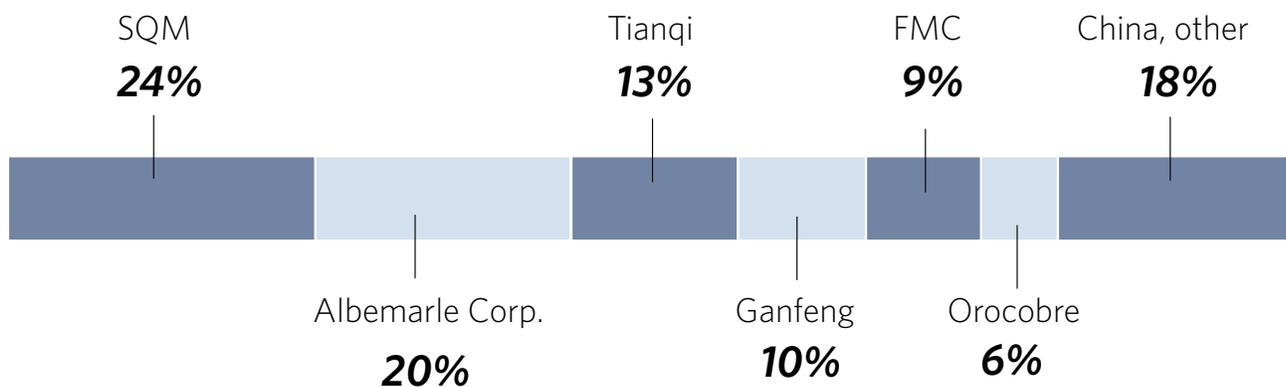
Across the Pacific, the salt brine deposits high in the Andes Mountains have become the envy of lithium producers worldwide. Chile, which remains a world leader in lithium production, has so far had the most success exploiting the resource, thanks to its pro-business government and commodities-dependent economy. But its current production policy leaves little room for future expansion. To prevent overexploitation, the government has given lithium strategic status, which limits the amount each producer can extract from a given site. Chilean firm Sociedad Quimica y Minera, or SQM is em-

broiled in a legal battle with Chile's government over royalty payments. By contrast, the only other operator active in the country, U.S. chemical company Albemarle Corp., has found a way around the restriction by striking a value-added deal with the government that grants it extra quota space.

Just north and east of Chile, Bolivia boasts the world's largest untapped lithium resources. Between its geographic limitations and its political environment, however, the country may struggle to realize its lithium sector's potential. Bolivia is landlocked, meaning that it must rely on its coastal neighbors to export its goods abroad. The country has recently made some headway in its attempts to mend ties with longtime rival Chile and secure sovereign access to the Pacific Ocean. Nevertheless, without a coast of its own, Bolivia will always be at risk of losing its outlet to the global market. And that's only part of the problem.

Though the populist government has been slowly relaxing its restrictions on businesses operating in country, Bolivia still allows only state-owned firms to extract lithium brine. (Foreign companies can participate in the processing stage in partnership with state firms.) But because Bolivian companies lack the technical know-how required for the mining process, the country's operations remain in their trial stages, over budget and behind schedule.

Companies Producing Lithium



Source: Roskill

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Environmental protests from the country's indigenous populations could also threaten lithium production in the future. Despite its potential, Bolivia is a long way from becoming the "Saudi Arabia of lithium," as some in the country (and some outside of it) had hoped.

As more and more "gigafactories" crop up in the coming years, mainly in the United States, China and Europe, lithium-ion batteries will become even more prevalent. Lithium supplies, in turn, will gain prominence on a geopolitical scale. Of the world's

major producers, Australia and Argentina are best positioned to increase their share of the burgeoning market, while Bolivia will struggle to capitalize on the energy revolution underway before a new alternative energy source supersedes the lithium-ion battery. The technology's position at the top of the battery pile is only temporary, after all, and eventually energy storage solutions made with more abundant materials such as sodium or magnesium will rise in its place. In the meantime, though, lithium will bring a small number of countries in the Southern Hemisphere into the global spotlight. □



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