

LITHIUM

(Data in metric tons of lithium content unless otherwise noted)

Domestic Production and Use: The only lithium production in the United States was from a brine operation in Nevada. Two companies produced a wide range of downstream lithium compounds in the United States from domestic or imported lithium carbonate, lithium chloride, and lithium hydroxide. Domestic production data were withheld to avoid disclosing company proprietary data.

Although lithium markets vary by location, global end-use markets are estimated as follows: batteries, 65%; ceramics and glass, 18%; lubricating greases, 5%; polymer production, 3%; continuous casting mold flux powders, 3%; air treatment, 1%; and other uses, 5%. Lithium consumption for batteries has increased significantly in recent years because rechargeable lithium batteries are used extensively in the growing market for portable electronic devices and increasingly are used in electric tools, electric vehicles, and grid storage applications. Lithium minerals were used directly as ore concentrates in ceramics and glass applications.

| Salient Statistics—United States: | 2015 | 2016 | 2017 | 2018 | 2019^e |
|---|-------------|-------------|-------------|-------------|-------------------------|
| Production | W | W | W | W | W |
| Imports for consumption | 2,750 | 3,140 | 3,330 | 3,420 | 2,500 |
| Exports | 1,790 | 1,520 | 1,960 | 1,660 | 1,700 |
| Consumption, estimated ¹ | 2,000 | 3,000 | 3,000 | 3,000 | 2,000 |
| Price, annual average, battery-grade lithium carbonate, dollars per metric ton ² | 6,500 | 8,650 | 15,000 | 17,000 | 13,000 |
| Employment, mine and mill, number | 70 | 70 | 70 | 70 | 70 |
| Net import reliance ³ as a percentage of estimated consumption | >25 | >50 | >50 | >50 | >25 |

Recycling: One domestic company has recycled lithium metal and lithium-ion batteries since 1992 at its facility in British Columbia, Canada. In 2015, the company began operating the first U.S. recycling facility for lithium-ion vehicle batteries in Lancaster, OH.

Import Sources (2015–18): Argentina, 53%; Chile, 40%; China, 3%; and other, 4%.

| Tariff: Item | Number | Normal Trade Relations 12–31–19 |
|-----------------------------|---------------|--|
| Other alkali metals | 2805.19.9000 | 5.5% ad val. |
| Lithium oxide and hydroxide | 2825.20.0000 | 3.7% ad val. |
| Lithium carbonate: | | |
| U.S. pharmaceutical grade | 2836.91.0010 | 3.7% ad val. |
| Other | 2836.91.0050 | 3.7% ad val. |

Depletion Allowance: 22% (Domestic), 14% (Foreign).

Government Stockpile:⁴

| Material | Inventory As of 9–30–19 | FY 2019 | | FY 2020 | |
|---|------------------------------------|-----------------------------------|--------------------------------|-----------------------------------|--------------------------------|
| | | Potential Acquisitions | Potential Disposals | Potential Acquisitions | Potential Disposals |
| Lithium cobalt oxide (kilograms, gross weight) | 750 | — | — | — | — |
| Lithium nickel cobalt aluminum oxide (kilograms, gross weight) | 1,620 | — | — | — | — |
| Lithium-ion precursors (kilograms, gross weight) | — | 19,000 | — | — | — |

Events, Trends, and Issues: Excluding U.S. production, worldwide lithium production in 2019 decreased by 19% to 77,000 tons of lithium content from 95,000 tons of lithium content in 2018 in response to lithium production exceeding consumption and decreasing lithium prices. Global consumption of lithium in 2019 was estimated to be about 57,700 tons of lithium content, an increase of 18% from 49,100 tons of lithium content in 2018. However, consumption was lower than anticipated by the lithium industry owing to China scaling back subsidies on electric vehicles, consumers reducing lithium inventories, and lower electric vehicle sales volumes.

LITHIUM

Spot lithium carbonate prices in China decreased from approximately \$11,600 per ton at the beginning of the year to about \$7,300 per ton in December. For large fixed contracts, the annual average U.S. lithium carbonate price was \$13,000 per metric ton in 2019, a 24% decrease from that of 2018. Spot lithium hydroxide prices in China decreased from approximately \$15,500 per ton at the beginning of the year to about \$8,000 per ton in December. Spot lithium metal (99.9% Li) prices in China decreased from approximately \$120,000 per ton at the beginning of the year to about \$82,000 per ton in December.

Six mineral operations in Australia, two brine operations each in Argentina and Chile, and one brine and one mineral operation in China accounted for the majority of world lithium production. Owing to overproduction and decreased prices, several established lithium operations postponed capacity expansion plans. Junior mining operations in Australia, Canada, and Namibia ceased production altogether.

Lithium supply security has become a top priority for technology companies in the United States and Asia. Strategic alliances and joint ventures among technology companies and exploration companies continued to be established to ensure a reliable, diversified supply of lithium for battery suppliers and vehicle manufacturers. Brine-based lithium sources were in various stages of development in Argentina, Bolivia, Chile, China, and the United States; mineral-based lithium sources were in various stages of development in Australia, Austria, Brazil, Canada, China, Congo (Kinshasa), Czechia, Finland, Germany, Mali, Namibia, Portugal, Serbia, Spain, and Zimbabwe; and lithium-clay sources were in various stages of development in Mexico and the United States.

World Mine Production and Reserves: Reserves for Argentina, Australia, Brazil, Chile, the United States, and Zimbabwe were revised based on new information from Government and industry sources.

| | Mine production | | Reserves ⁵ |
|-----------------------|---------------------------|---------------------------|------------------------|
| | 2018 | 2019 ^e | |
| United States | W | W | 630,000 |
| Argentina | 6,400 | 6,400 | 1,700,000 |
| Australia | 58,800 | 42,000 | ⁶ 2,800,000 |
| Brazil | 300 | 300 | 95,000 |
| Canada | 2,400 | 200 | 370,000 |
| Chile | 17,000 | 18,000 | 8,600,000 |
| China | 7,100 | 7,500 | 1,000,000 |
| Namibia | 500 | — | NA |
| Portugal | 800 | 1,200 | 60,000 |
| Zimbabwe | 1,600 | 1,600 | 230,000 |
| Other ⁷ | — | — | <u>1,100,000</u> |
| World total (rounded) | <u>⁸95,000</u> | <u>⁸77,000</u> | <u>17,000,000</u> |

World Resources: Owing to continuing exploration, identified lithium resources have increased substantially worldwide and total about 80 million tons. Lithium resources in the United States—from continental brines, geothermal brines, hectorite, oilfield brines, and pegmatites—are 6.8 million tons. Lithium resources in other countries have been revised to 73 million tons. Lithium resources, in descending order, are: Bolivia, 21 million tons; Argentina, 17 million tons; Chile, 9 million tons; Australia, 6.3 million tons; China, 4.5 million tons; Congo (Kinshasa), 3 million tons; Germany, 2.5 million tons; Canada and Mexico, 1.7 million tons each; Czechia, 1.3 million tons; Mali, Russia, and Serbia, 1 million tons each; Zimbabwe, 540,000 tons; Brazil, 400,000 tons; Spain, 300,000 tons; Portugal, 250,000 tons; Peru, 130,000 tons; Austria, Finland and Kazakhstan, 50,000 tons each; and Namibia, 9,000 tons.

Substitutes: Substitution for lithium compounds is possible in batteries, ceramics, greases, and manufactured glass. Examples are calcium, magnesium, mercury, and zinc as anode material in primary batteries; calcium and aluminum soaps as substitutes for stearates in greases; and sodic and potassic fluxes in ceramics and glass manufacture.

^eEstimated. W Withheld to avoid disclosing company proprietary data. NA Not available. — Zero.

¹Defined as production + imports – exports. Rounded to one significant digit to avoid disclosing company proprietary data.

²Source: Industrial Minerals, IM prices: Lithium carbonate, large contracts, delivered continental United States.

³Defined as imports – exports + adjustments for Government and industry stock changes.

⁴See Appendix B for definitions.

⁵See Appendix C for resource and reserve definitions and information concerning data sources.

⁶For Australia, Joint Ore Reserves Committee-compliant reserves were 1.7 million tons.

⁷Other countries with reported reserves include Finland, Mali, and Mexico.

⁸Excludes U.S. production.