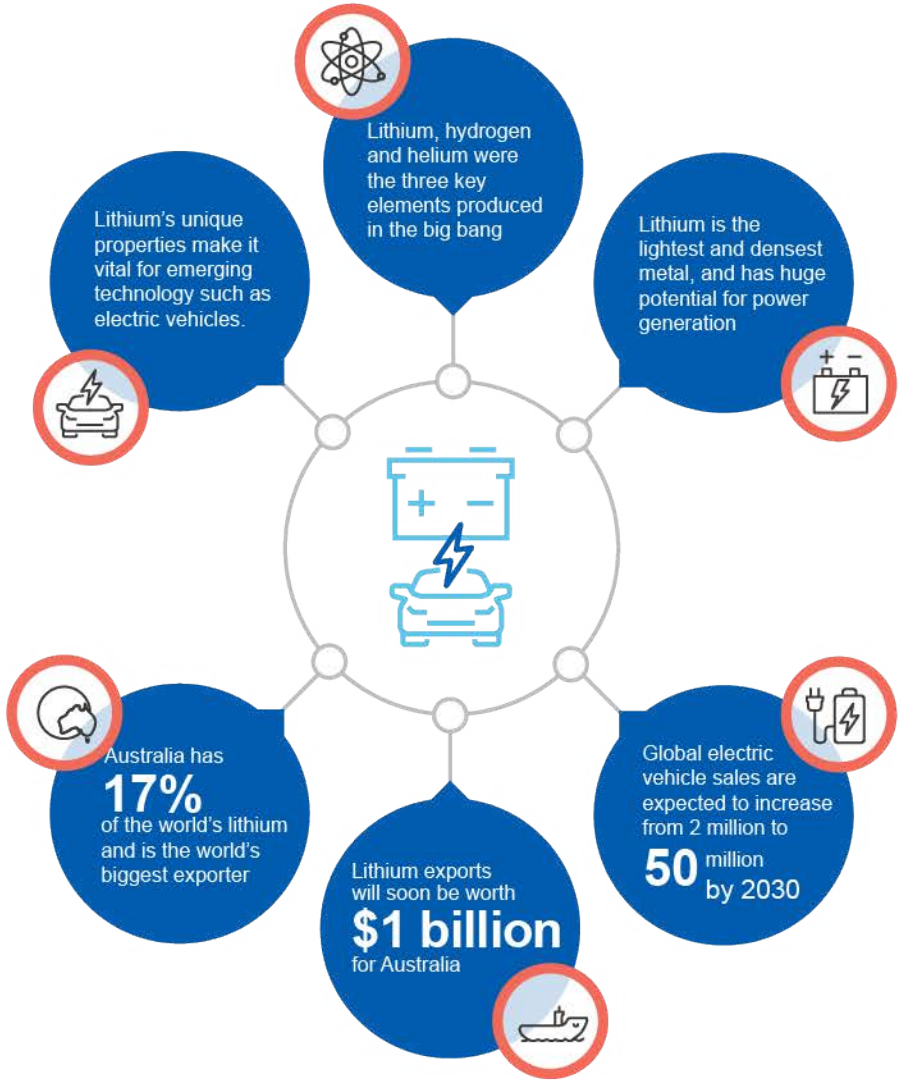
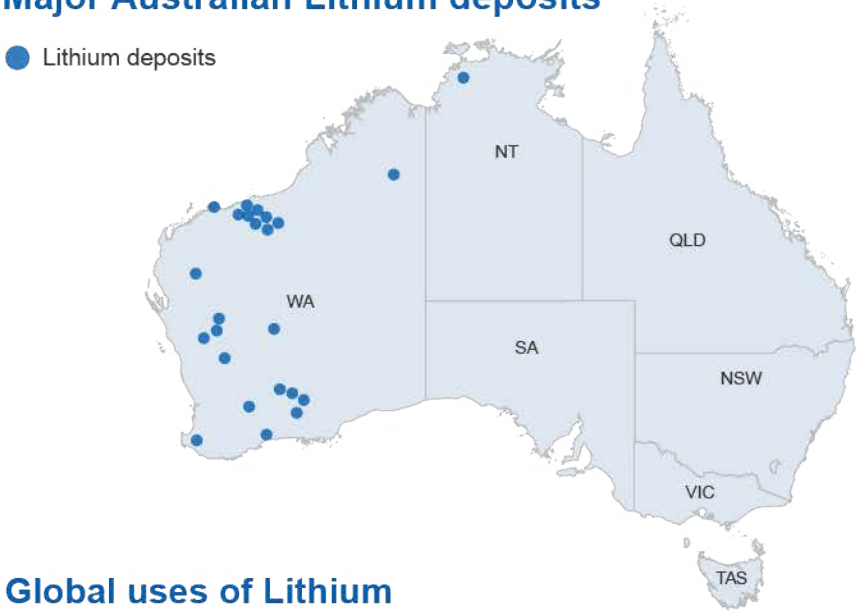
Lithium

Resources and Energy Quarterly June 2019



Major Australian Lithium deposits



Global uses of Lithium

46%
Rechargeable batteries

26%
Ceramics & glass

11%
Greases & polymers

11%
Other uses

4%
Industrial powders

2%
Air treatments

15.1 Summary

- The lithium hydroxide price is expected to ease from $US16,139 a tonne in 2018 to around US$14,080 in 2019. Prices are expected to fall further in 2020 before recovering slightly, to US$12,500 in 2021.
- Australian lithium production is expected to increase from an estimated 272,266 tonnes (in lithium carbonate equivalent terms) in 2018–19 to around 335,000 tonnes by 2020–21, as the Greenbushes mine is upgraded and several newer mines ramp up.
- Rising production and new value-adding refineries are forecast to push export revenue up to $1.4 billion by 2020–21.

15.2 Prices

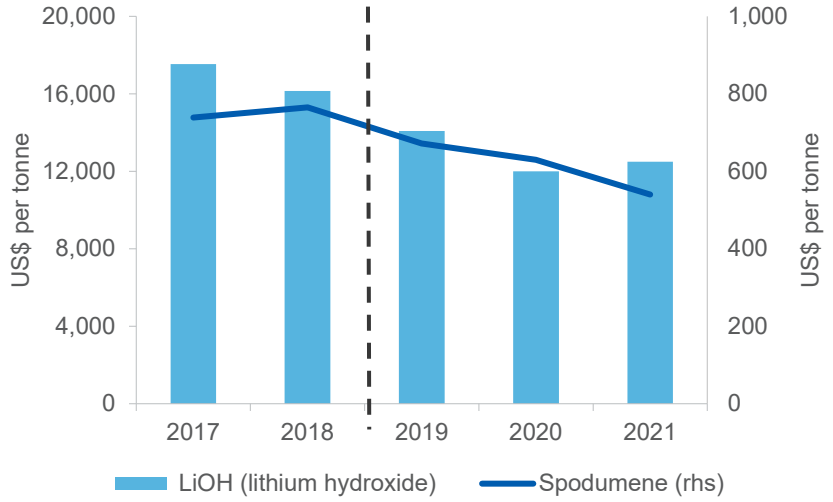
Lithium prices are expected to keep falling in the short term

Lithium hydroxide prices have been trending down since their peak in late 2018. The fall in prices has been led by China, where price drops have been large enough to more than offset stable or rising prices in other countries. In recent months spot prices have fallen more sharply than contract prices, with the latter responding more slowly to oversupply.

Lithium hydroxide prices are projected to fall by around 15 per cent in 2019, as oversupply persists and inventories grow. Over the outlook period, the supply surplus is projected to gradually close, with the price expected to start turning around after 2020 (Figure 15.1). Spodumene ore — the precursor material for lithium hydroxide — is expected to face a longer period of oversupply, with prices remaining soft through the whole outlook period.

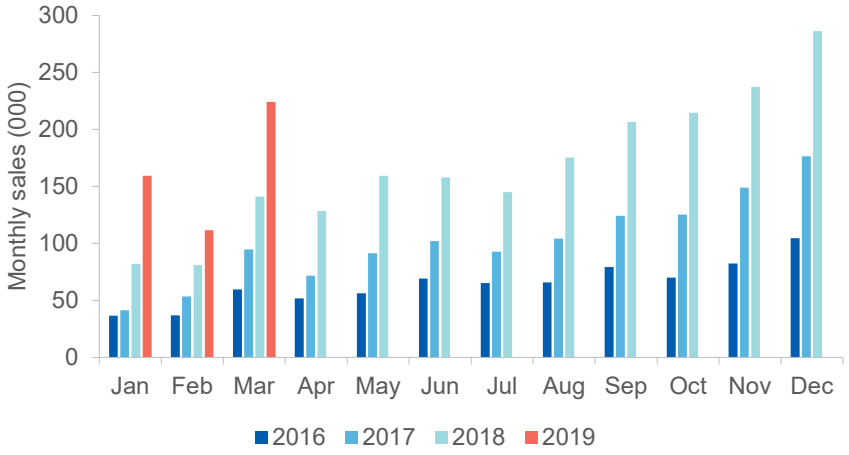
The present lithium oversupply is a side effect of miners attempting to position output to meet an expected rapid rise in future demand. Electric vehicle (EV) sales have risen by more than 50 per cent relative to the same point in 2018, and the rate of growth is accelerating (Figure 15.2). The fact that supply is being triangulated against future demand makes it somewhat unlikely that oversupply will correct in the very near future. However, demand growth is likely to outstrip supply by around 2023.

Figure 15.1: Comparative price, spodumene ore / lithium hydroxide



Source: Roskill (2019); Department of Industry, Innovation and Science (2019)

Figure 15.2: Monthly electric vehicle sales



Source: Inside EVs (2019) Monthly Sales Scorecard. Based on reconciled monthly or quarterly total sales data reported by major plug-in automakers.

15.3 World consumption

Lithium supply chains are becoming more mature

Global lithium imports (and consumption) have lifted significantly in the first quarter of 2019, mirroring a spike at the start of 2018. If the trend continues to follow that of the previous year, some easing is likely to have occurred in the June quarter, which may add to price deflation in mid-year.

Japan is currently the largest importer of refined lithium, ahead of South Korea. Japanese imports are linked to the country's emerging role as a producer of electric vehicle technology used by firms such as Panasonic and Tesla. Imports are drawn from Chinese suppliers, with lithium supply chains now solidifying between China, Japan, and markets in the EU and the US. A second supply chain — albeit smaller — is growing between Korean technology producers and suppliers in Chile and China.

These two supply chains are likely to become far more significant over time, with a complex network developing between new electric vehicle facilities in China, Germany, South Korea, and the US. Rising EV sales is expected to account for the vast majority of growth in lithium use for the foreseeable future (Figure 15.3).

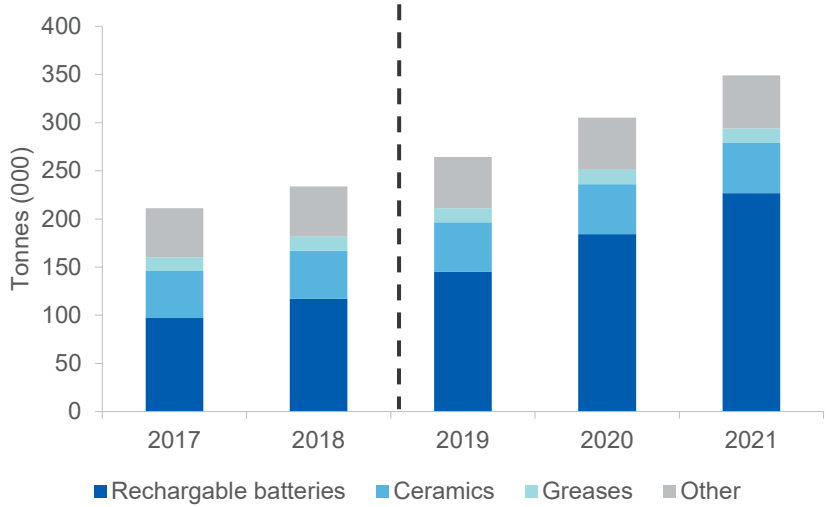
The ramp-up in electric vehicle and battery facilities is projected to lift lithium demand over the outlook period, from 234,000 tonnes in 2018 to more than 349,000 tonnes by 2021. EV sales are expected to rise further still beyond the outlook period (Figure 15.4) before flattening out at the end of the 2020s.

15.4 World production

Production chains are growing in volume and complexity

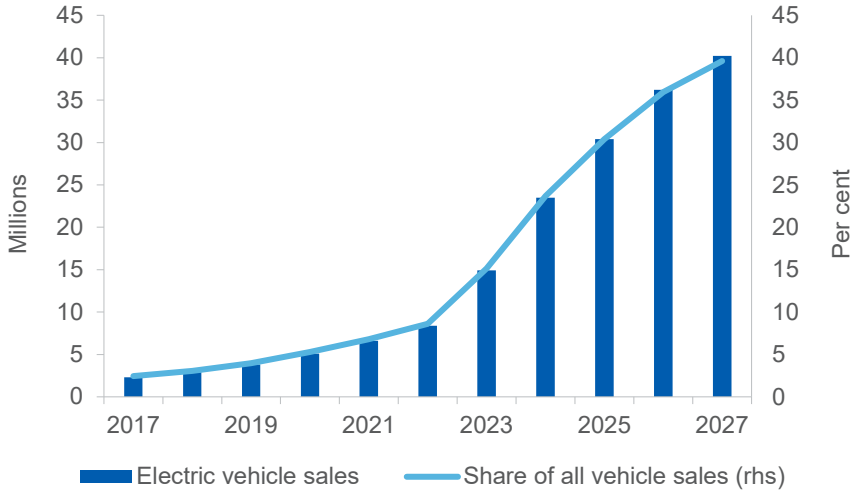
Lithium production chains are evolving rapidly, with a shift in the market towards the use of hard rock deposits. Lithium hydroxide produced by hard rock is more amenable to high-temperature sintering, which makes it more suitable for use in high-nickel products such as batteries. Hard rock production involves pulverising the ore to extract raw material, processing to produce concentrates, and mixing of concentrates with nickel, manganese and cobalt to produce oxides that combine with electrolytes.

Figure 15.3: Lithium usage by product



Source: Roskill (2019); Department of Industry, Innovation and Science (2019). 'Other' includes glass, powders, primary batteries, and air treatments.

Figure 15.4: Long-term electric vehicle sales projection



Source: Department of Industry, Innovation and Science (2019)

Many countries are investing in facilities to target each of these steps. European countries have announced an intention to bring as many of these production stages as possible into the EU, with China following a similar path. These investments should reduce the risk of future bottlenecks and support a more stable and integrated lithium market.

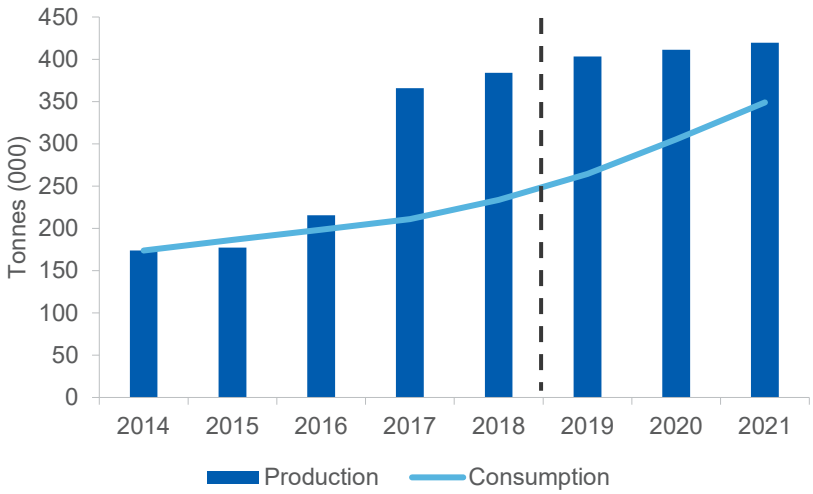
Hard rock lithium production is also benefiting from new problems with brine production, which competes with it. Although large reserves of lithium exist in brine in Chile and China (Figure 15.6), exploitation requires high volumes of water, which has made it contentious in some South American regions. SQM — a large brine producer — has recently been required to submit a $US25 million environmental compliance plan, and has shut down a well deemed to be excessively affecting desert trees and vegetation. Albermarle has also been forced to halt engineering work at its La Negra project in Chile due to concerns over water usage.

Some brine facilities have progressed in recent months, with SQM receiving environmental approval for constructions at Salar de Atacama and Salar del Carmen in Chile. However, final approvals will take more time, and hard rock production is expected to dominate global growth over the outlook period, accounting for virtually all of the projected expansion from 384,000 tonnes in 2018 to 420,000 tonnes by 2021 (Figure 15.5).

In the longer term, lithium recycling is likely to start substituting for mined production. Recycling methods used for copper and lead have little application for lithium. However, Volkswagen Group has recently announced proposals to develop a cost-effective lithium recycling process. The Group plans to construct a custom-built facility to investigate lithium recycling methods by the end of 2019. The US Energy Department has also announced plans for a research centre to examine lithium-ion battery recycling. The facility has been granted initial funding of US$15 million.

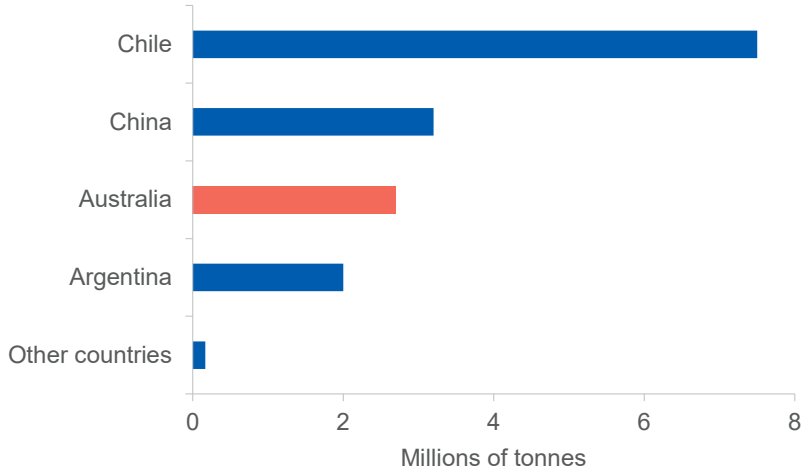
Large-scale lithium recycling is unlikely to occur much before 2030, when batteries start reaching end of life in large quantities. However, recycling plants may prove crucial in the long-term; not just as a means to reduce the material and energy cost of electric cars, but also to ensure long-term matching between lithium supply and demand.

Figure 15.5: Lithium production and use



Source: Roskill (2019); Department of Industry, Innovation and Science (2019).

Figure 15.6: Contained lithium reserves



Source: US Geological Survey (2018); Department of Industry, Innovation & Science (2019).

15.5 Australia

Production is expected to grow further over the next two years

Australian output dominated global growth in 2018, with production commencing at several sites in Western Australia. These include Pilbara Minerals' Pilgangoora mine, Altura Mining's Pilgangoora mine (albeit with disruptions from Cyclone Veronica), and Alliance Mineral Assets' Bald Hill operation. Production at the Bald Hill Mine rose strongly in the March quarter 2019, with growth of more than 20 per cent relative to the December quarter. Output of mineral concentrates from the mine is expected to have passed 30,000 tonnes in the March quarter.

Pilbara's Pilgangoora mine appears to have more potential than previously expected. In March Pilbara released the results of a study suggesting that its planned phase 3 expansion will produce around 1,200 tonnes of spodumene concentrate each year for around 15 years. Operating costs for the site — estimated at US$291 per tonne — are relatively modest and below current prices. Galaxy Resources has also announced an upgrade on its earlier estimate of mineral deposits at the Mt Cattlin mine.

New production (and a ramp up from mines completed in 2018) should see output rise over the outlook period. Talison Lithium's expanded Greenbushes mine is set to add significantly to output growth over the next year. Overall spodumene production is estimated to have reached 272,000 tonnes in 2018–19, and is forecast to hit 335,000 tonnes by 2020–21.

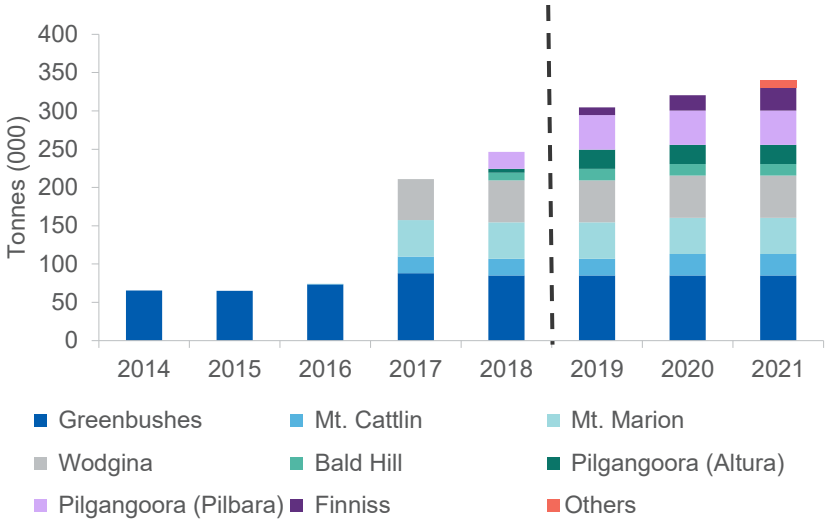
Exports are set to grow strongly over the outlook period

Export volumes are projected to track with production, since Australia currently has no domestic use of spodumene. Falling prices will create headwinds for export values in the short-term, though construction of hydroxide refineries should add to export values late in the outlook period. Export values are projected to reach $1.4 billion by 2020–21 (Figure 15.8).

Revisions to the outlook

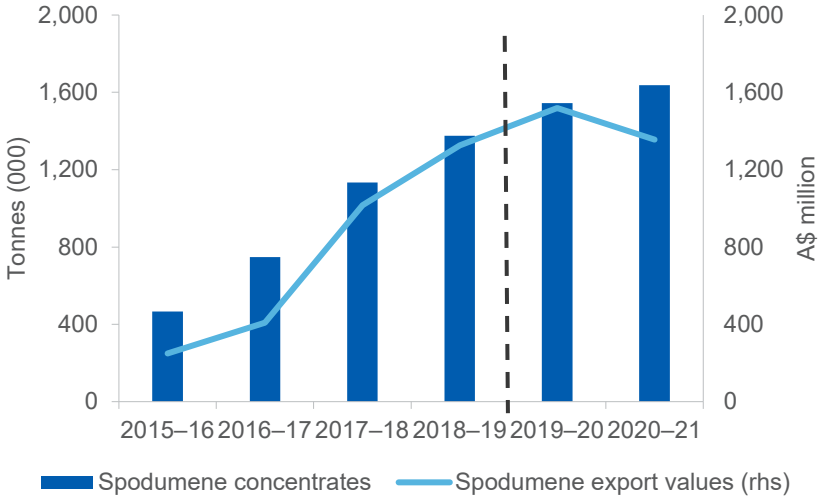
Australia's export earnings forecasts have not been revised significantly from those in the March 2019 *Resources and Energy Quarterly*.

Figure 15.7: Australian spodumene ore production (LCE*)



Source: Company reports, Roskill (2019); Department of Industry, Innovation and Science (2019). *LCE denotes lithium carbonate equivalent measure.

Figure 15.8: Australian spodumene exports



Source: Roskill (2019); Department of Industry, Innovation and Science (2019).

Table 15.1: Lithium outlook

World	Unit	2018	2019[f]	2020[f]	2021[f]	Annual percentage change 2019[f]	2020[f]	2021[f]
Lithium production [a]	kt	384	403	411	420	5.0	2.0	2.0
Consumption	kt	234	264	305	349	13.1	15.4	14.4
Stocks	kt	533	672	778	849	26.0	15.8	9.1
– weeks of consumption		118.6	132.2	132.6	126.5	11.4	0.4	-4.6
Spodumene price								
– nominal	US$/t	765	672	630	540	-12.2	-6.3	-14.3
– real [b]	US$/t	782	672	616	517	-14.1	-8.4	-16.1
Lithium hydroxide price								
– nominal	US$/t	16,139	14,080	12,000	12,500	-12.8	-14.8	4.2
– real [b]	US$/t	16,505	14,080	11,730	11,957	-14.7	-16.7	1.9
Australia	**Unit**	**2017–18**	**2018–19[s]**	**2019–20[f]**	**2020–21f[f]**	**2018–19[s]**	**2019–20[f]**	**2020–21f[f]**
Mine production [a]	kt	251	272	318	335	8.5	17.0	5.0
Export volume [c]	kt	1 134	1 376	1 545	1 638	21.3	12.3	6.0
– nominal value [s]	A$m	1,016	1,327	1,519	1,355	30.6	14.5	-10.8
– real value [bs]	A$m	1,020	1,327	1,483	1,291	30.1	11.8	-13.0

Notes: **a** Lithium Carbonate Equivalent. This is a measure of the quantity of refined product produced from spodumene ore. **b** In 2019 calendar year US dollars; **c** Spodumene concentrates; **f** Forecast; **s** Estimate; **r** Compound annual growth rate

Sources: Department of Industry, Innovation and Science (2019); Company reports; Roskill (2019); Government of Western Australia Department of Mines, Industry Regulation and Safety (2019)