Lithium

Major Australian Lithium deposits

World consumption

- 46% Rechargeable batteries
- 26% Ceramics & glass
- 11% Greases & polymers
- 11% Other uses
- 4% Industrial powders
- 2% Air treatments

Lithium facts

- Electric vehicle sales are expected to increase from 2m to 28m by 2030
- Australia to export $1bn in lithium exports in 2019–20
- Australia has 30% of the world's lithium resources
- Commissioning at the Kwinana lithium refinery has been placed on hold

Australia’s lithium

- Biggest exporter in the world
- Produced 55% of the world's lithium in 2019
- 2nd refinery is under construction
15.1 Summary
- The spodumene price (delivered to China) fell by 17 per cent to US$425 a tonne in the first five months of 2020. Prices are forecast to remain flat at US$425 a tonne in 2021 and 2022 until increasing electric vehicle uptake makes shortages possible after 2022.
- Australian lithium production is expected to fall from 208,000 tonnes (lithium carbonate equivalent) in 2019–20 to 146,000 tonnes in 2021–22, after a sharp pullback in 2020–21 (to 131,000 tonnes) due to continued weakness in spodumene prices.
- After falling from $1.0 billion in 2019–20 to $0.6 billion in 2020–21, Australian lithium export earnings are forecast to partly recover to $0.7 billion by 2021–22.

15.2 Prices
Lithium prices have declined across the board
Lithium carbonate prices (delivered to China) declined by 14 per cent to US$6,800 a tonne from the start of the year to mid-June, and by 46 per cent year-on-year. This compared with price declines in Europe of 18 per cent for the same period and 35 per cent year-on-year to US$7,350 a tonne (delivered).

Lithium hydroxide prices (delivered to China) fell by 32 per cent to US$7,508 a tonne from the start of the year to mid-June, and declined by 41 per cent year-on-year. This compared with a price decline of 7.5 per cent into Europe for the same period and a 31 per cent year-on-year decline to US$9,250 a tonne (delivered).

Spodumene prices (delivered to China) declined by 17 per cent to US$425 a tonne from the start of the year to mid-June, and 33 per cent year-on-year (Figure 15.1).

Prices are expected to remain flat until after 2022 when the market is expected to tighten as electric vehicle manufacturers continue their expansions. These expansions are expected to increase lithium demand, buoyed by battery prices falling towards US$100 a kilowatt hour.
15.3 World consumption

Strong consumption growth is likely over the outlook period

Despite the COVID-19 induced slump in automotive sales globally, China’s imports of lithium carbonate were up 544 per cent year-on-year for April and up 284 per cent for the four months, January to April 2020, on a year-on-year basis as falling prices encouraged large orders. The increased volumes were based on a cost reduction to China of 41 per cent for the year-on-year comparison. China’s imports of lithium hydroxide were also up 262 per cent, month-on-month for April as trade reopened after the COVID-19 outbreak. This, coupled with offtake agreements undertaken during COVID-19, suggest that the appetite for lithium is quite strong. In South Korea lithium carbonate imports increased 28 per cent month-on-month in April as trade resumed post the COVID-19 outbreak.

Global lithium demand is forecast to rise from 258,000 tonnes (lithium carbonate equivalent) in 2020 to around 414,000 tonnes by 2022 as car plants in Germany and China commence production and ramp up, after being slowed down by COVID-19 (Figure 15.2). Electric vehicles sales are forecast to drop by 18 per cent in 2020 due to the effects of COVID-19. Global electrical vehicle sales slumped by 44 per cent for the March quarter, but were offset by stronger European sales based on emissions restrictions due to come into force on 1 January 2021.

China electric vehicle subsidies change again

China has extended its electric vehicle subsidies again, with scaled reductions from 10 per cent to 30 per cent over the next three years for vehicles with a maximum price of US$42,400. This has led to a change in battery chemistry away from cobalt and back to lithium iron phosphate batteries, supporting recent increases in the lithium trade. The scaling back of subsidies may again bring consumption forward as it did in early 2019, especially after record sales of the Tesla Model 3 in China during May 2020. This accelerating of sales may counteract the effects of COVID-19, which has pushed electric vehicle sales out by an estimated 12 months (Figure 15.3). Additionally, Germany recently announced incentives to support electric vehicle sales.

New energy vehicle sales in China were down 30 per cent in April to 64,000 vehicles. However, first time buyers in particular are entering the market and purchasing in order to avoid perceived COVID-19 risks associated with public transit but it is not clear yet whether their purchases favour electric cars, although these are much easier to register in China.

Tesla’s Shanghai factory is producing around 10,000 cars per month. The recent change in China’s subsidies for electric vehicles resulted in Tesla dropping prices on the Model 3 in order to retain subsidies. Additionally, changes in battery technology could see cobalt free batteries in the Model 3 in 2021 with costs lower than US$100 a kilowatt hour, proving an upside risk to demand. This cost threshold was thought to be reached by 2027 as little as 18 months ago; demonstrating the strongly disruptive innovation characteristics of the lithium market. Tesla also filed a patent for a single crystal nickel-cobalt-aluminium cathode that may extended battery life three-fold and thereby potentially accelerate lithium demand.

Electric vehicles are becoming increasingly economical

Sales of electric vehicles rose in Europe and the United Kingdom over the March quarter despite the effects of COVID-19. Volkswagen dropped prices on the e-Golf to US$27,000 in the lead up to the release of the ID.3, giving indications that the price crossover point for electric vehicles versus the internal combustion engine is close in Europe. US$10,000 discounts on the e-Bolt by General Motors during the COVID-19 pandemic have also brought the crossover point for internal combustion engine versus electric vehicle much closer in the US. In India the crossover point has already been reached for two wheelers, which are the preferred commuting and delivery option. This presents opportunities for Australia, with ASX listed Neometals pursuing these on a number of fronts in India (Figure 15.4).

Europe proposes COVID-19 renewables stimulus package

Europe is proposing a COVID-19 stimulus package focussed on renewable energy. If the package is approved, it may increase the demand for lithium in Europe. ASX listed Vulcan Energy is pursuing opportunities for ‘zero carbon lithium production’ from geothermal power in Germany.
15.4 World production

Production may fall but offtake agreements are increasing

Global production reached 486,000 tonnes of lithium carbonate equivalent in 2019, but is forecast to fall to 466,000 tonnes in 2022. After adjusting demand for the lead time in battery manufacturing (12 months) and mine production for refinery losses; stockpiles at mines, ports and warehouses fall to an equivalent of around six months of supply (Table 15.1).

The gap between production and consumption may be smaller than it appears: after mined production is refined, supply decreased to 337,600 tonnes of lithium carbonate equivalent in 2019. Given the potential for supply chain disruption demonstrated by COVID-19, this makes for potentially tighter market conditions. This is consistent with recent strong lithium carbonate purchasing by China, and with offtake agreements for spodumene signed between Pilbara Minerals / Yibin Tianji and Altura / Hunan Yongshan Lithium Co. Ltd.

COVID-19 has so far not disrupted production in Chile, but operations were temporarily curtailed in Argentina and China. Profit margin declines in Chile have been tempered by both falls in royalties for brine producers — as a result of lower prices — and falls in fuel and re-agent costs.

Australian production was down in the March quarter, due to continued low prices. Despite lower mine production, electric vehicle manufacturers continued to push forward with production plans. This may tighten the demand supply gap sooner rather than later.

World production is forecast to fall to 373,000 tonnes in 2020, down from 486,000 tonnes in 2019. Production is forecast at 460,000 tonnes in 2021, and 466,000 tonnes (lithium carbonate equivalent) by 2022. Continued lithium price weakness — exacerbated by the COVID-19 pandemic — is extending timelines for producers in a potentially unsustainable manner, particularly for high cost spodumene producers. This could lead to supply becoming highly concentrated (with almost 50 per cent in the hands of three entities), and make the market vulnerable to supply deficits in late 2022.
Due to the COVID-19 pandemic, a pullback in capital expenditure is expected in the short to medium term. The US$330 million expansion plans of Chilean lithium carbonate producer, Sociedad Química y Minera de Chile (SQM) may be scaled back or delayed if current weak market conditions persist. Livent, with operations in Argentina, has also cut capital expenditure for 2020 by 50 per cent to US$115 million. Delays are also likely in Argentina for other projects and expansions.

Delays are mooted in Western Australia for the Kemerton lithium hydroxide plant being developed by Albemarle, on top of delays for its La Negra III & IV expansions in Chile. Consequently, Australia’s lithium hydroxide output forecast (Figure 15.5) has been lowered from the March 2020 Resources and Energy Quarterly number; and is now dependent on the outcome of ownership changes at the Kwinana lithium refinery and the attendant expertise that may be required for the ramp up of production at that operation.

**Figure 15.5: World lithium hydroxide production**

![Graph showing world lithium hydroxide production](source: BloombergNEF (2020); Department of Industry, Science, Energy and Resources (2020))

### 15.5 Australia

**Exports forecast to dip before recovering**

Exports of spodumene are estimated to earn $1.0 billion in 2019–20. Continued low prices may see revenue fall to $0.6 billion in 2020–21. Possible production from lithium hydroxide refineries is forecast to raise export earnings to $0.7 billion by 2021–22.

**Production is forecast to dip before recovering**

Production for the March quarter reported to the ASX at the end of April and from other data providers showed a decrease by 18 per cent, although shipments only decreased by 14 per cent as miners continue to deplete stockpiles. Production is forecast to increase over the outlook period with a price induced slowdown in the short term, followed by a recovery expected towards the end of 2022, as lithium hydroxide production rises (Figure 15.6). Battery manufacturers such as Contemporary Amperex Technology Co. Limited (CATL), through their chemical suppliers, continue to try to secure long term supply in spodumene. This is reflected in their recent offtake with Pilbara Minerals via a related party, Yibin Tianji. Both Pilbara Minerals / Yibin Tianji and Altura / Hunan Yongshan Lithium Co. Ltd recently secured offtake agreements. These agreements both reference the spodumene price against other refined lithium products and costs in perhaps a more synergistic partnership.

The production outlook has grown more volatile, with most Australian producers no longer quoting prices received and costs of production. Instead there is continued quoting of recovery rates for spodumene, with Pilbara Minerals achieving recoveries in their target range of 72 to 78 per cent. Other Australian producers, excluding Greenbushes, have achieved only 55 to 60 per cent recovery, with higher recoveries becoming harder to achieve as producers shift to campaign style operations and stockpile processing due to low spodumene prices. Recent offtake agreements may provide some relief in this area.

Whilst spodumene production in Australia has continued to scale back during the March quarter, lithium hydroxide production was placed on hold.
Tianqi announced the cessation of commissioning of the Kwinana lithium hydroxide plant in late March. Additionally, Tianqi announced a potential partial sale of Greenbushes and the Kwinana plant, aimed at offsetting the debt taken on to buy a large stake in SQM but the sale process has reportedly been suspended. Albemarle were understood to have preemptive rights in any offer. SQM’s stated aim of increasing production and dominating the market is well documented, with over 20 per cent of SQM held by Tianqi. It is reported that another Chinese entity may take up parent company Chengdu Tianqi’s controlling stake in Tianqi, with perhaps a minority stake for CATL. This potential industry change comes on the back of World Bank modelling that suggests a ten-fold increase in lithium production is needed by 2050 in order to meet the targets of the Paris Agreement.

Smaller Australian producers are likely to continue to examine their strategic alliances with respect to the stability of longer term offtake. India’s successful price crossover from internal combustion engines to electric vehicles in the two wheel market represents another potential market for Australian spodumene exports as well as a potential assets for acquirers or joint venture partners from India.

Australian producers were forecast to ramp up hydroxide production at Kwinana, Kemerton and Mt Holland. However, commissioning risks have proven significant, given Kwinana’s recent changes. Value adding offshore may prove more attractive, as Pilbara Minerals is pursuing with POSCO.

As noted in the March 2020 Resources and Energy Quarterly, a key risk to the forecast is that margins for lithium hydroxide are insufficient to attract capital. Adding to this is now a lack of commissioning success at Kwinana.

Revisions to the forecast

Continued low lithium prices have seen export revenue forecasts for 2020–21 decrease by 12 per cent to $0.6 billion. Exports in 2021–22 have been revised down by 47 per cent from $1.3 billion to $0.7 billion (Figure 15.7), reflecting the relatively weak price environment and further potential commissioning difficulties for lithium hydroxide refineries.
Table 15.1: Lithium Outlook

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Notes: <sup>a</sup>Lithium Carbonate Equivalent: This is a measure of the quantity of refined product; <sup>b</sup>Demand is ahead of consumption by approximately 12 months due to the lead time required in battery manufacturing; <sup>c</sup>Stockpile estimates possibly inaccurate due to changing specifications. Calculated from residual after losses from refining and allowing for lead time in battery manufacturing; <sup>d</sup>In 2020 US dollars; <sup>e</sup>Spodumene concentrates: 2018–19 products include direct ship ore, 4 per cent Li₂O concentrate and 6 per cent concentrate, thereafter mostly 6 per cent Li₂O concentrate, stockpiles run down in 2019–20; <sup>f</sup>Forecast; <sup>g</sup>In 2019–20 Australian dollars; <sup>s</sup>Estimate.

Source: ABS (2020) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Company reports; Department of Industry, Science, Energy and Resources (2020); Roskill (2020); Government of Western Australia Department of Mines, Industry Regulation and Safety (2020)