Lithium

Resources and Energy Quarterly March 2019

Lithium, hydrogen and helium were the three key elements produced in the big bang.

Lithium's unique properties make it vital for emerging technology such as electric vehicles.

Lithium is the lightest and densest metal, and has huge potential for power generation.

Australia has 17% of the world's lithium and is the world's biggest exporter.

Lithium exports will soon be worth $1 billion for Australia.

Global electric vehicle sales are expected to increase from 2 million to 50 million by 2030.

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 back from $US16,139 a tonne in 2018 to around $US15,600 in 2019 (in real terms). Prices are expected to fall further by 2021, before recovering to around $US13,700 a tonne by 2024.
- Australian lithium production is expected to increase from 251,000 tonnes (in lithium carbonate equivalent terms) in 2017–18 to around 419,000 tonnes by 2023–24, 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 from an estimated $1.0 billion in 2017–18 to $1.5 billion in real terms by 2023–24.

15.2 Prices
Prices are on a downward trend — for now
Prices for lithium hydroxide peaked in September and October before edging back amidst global oversupply and a large decline in prices in China. Lithium prices are projected to drop further as inventories continue to build. However, this will likely reverse in later years as inventories start contracting in the 2020s. The removal of bottlenecks at the refining stage should start to improve market and price stability for lithium. Lithium demand will be driven by electric vehicle sales, which are expected to keep rising as their prices approach those of petrol vehicles (Figure 15.1).

The lithium hydroxide price is projected to drop from $US16,139 a tonne in 2018 to $US15,620 in 2019, with further falls in subsequent years as inventories build. However, some recovery to around $US13,700 a tonne is expected by 2024 (Figure 15.2).

Prices for spodumene ore — the precursor for lithium — are expected to drop more sharply than for the refined product, reflecting its even greater oversupply and the excess of primary production relative to refinery capacity. Some stabilisation is expected late in the outlook period, but spodumene prices are projected to fall in real terms, from $US783 a tonne in 2018 to $US466 by 2024.
15.3 World consumption

Lithium demand is rising rapidly — and the growth rate is set to increase. Lithium has multiple uses, but electric vehicle batteries are expected to account for virtually all demand growth over the outlook period (Figure 15.3). Prices for electric vehicles are expected to match those of petrol-based vehicles by around 2023, with electric vehicle sales projected to surge as the price crossover draws closer.

Anticipating this, construction of electric vehicle and battery facilities is ramping up rapidly, especially in China. Honda and GAC Group have recently announced US$469 million will be invested to build an electric vehicle plant in China in the wake of the country’s pivot towards more stringent green car standards. Dongfeng Honda is expected to open an electric vehicle plant in Wuhan province in late 2019. VW Group in China is constructing a large electric vehicle factory, capable of producing 300,000 vehicles annually from 2020. The Wanxiang Group plan to invest more than US$10 billion to build a massive electric vehicle and battery factory. Samsung has recently announced it will invest US$1.15 billion to expand battery production at its existing facilities in China. LG Chem will also spend US$1.07 billion to expand two battery plants in China by 2020, and a further US$1.8 billion to develop a new car battery plant in Nanjing.

Outside of China, BMW has recently announced plans to invest US$225 million to develop electric vehicle capacity at its factory in Munich. SK Innovation, a South Korean company, will invest US$1 billion to build a new battery plant in the US. Slightly offsetting this, the TerraE consortium’s plan for a battery factory in Germany has fallen through, after partner companies failed to provide sufficient funds. The factory was to have produced 34GWh in annual battery output from 2028.

The ramp-up in electric vehicle and battery facilities is projected to lift lithium demand almost four-fold over the outlook period, from 234,000 tonnes in 2018 to more than 830,000 tonnes by 2024. Electric vehicle sales are expected to rise further still after 2024 (Figure 15.4) before flattening out at the end of the 2020s.
15.4 World production

A second wave of lithium supply will be needed in the early 2020s

A mine supply surplus is expected until 2022, with refining and conversion emerging as a significant bottleneck. The production of spodumene ore is expected to flatten over the next 2-3 years, as ore prices drop and suppliers face a choice between selling at a loss and curtailing output. However, rapid growth in demand is expected to overtake supply and produce a supply deficit by the early 2020s (Figure 15.5), with a second wave of added supply entering the market in response by 2024.

South American production growth is slowing, with firms at various stages of the mining and refining process struggling for finance in an environment of easing prices. In Chile — which holds the largest deposits (Figure 15.6) — government restrictions on water usage and limits on lithium extraction permits are expected to weigh on brine production in early 2019. Production at the La Negra facility in Chile also continues to be affected by lingering technical issues. Codelco — a large state-owned company — also appears to be withdrawing from lithium production in favour of copper, which will considerably reduce Chile’s future output.

Partly offsetting this, NRG metals recently reported a maiden resource estimate of 571 thousand tonnes (kt) of Lithium Carbonate Equivalent (LCE) at its Hombre Muerto North deposit. LSC Lithium also reported a resource estimate of 939kt LCE at its Pastos Grande project in Argentina.

In China, salt lake production from large projects in Qinghai province has proven to be relatively resilient, despite a difficult winter. Although China remains significantly behind Chile and Australia as a producer, it is likely that Chinese supply may be more reliable than previously expected, with further growth likely over time. China is investing in expanded output, beginning with debottlenecking at the substantial Tianqi facility in 2019.

Recycling and secondary markets remain nascent for lithium. Only around 2 per cent of lithium battery products are recycled in Australia, compared to 98 per cent of lead acid batteries. Increased recycling is likely to be important in helping supply keep pace with lithium demand after 2022.

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**Figure 15.5: Lithium production and use**

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

**Figure 15.6: Contained lithium reserves**

15.5 Australia

Production is expected to grow further over the next two years

Australia is the largest global lithium supplier, and is expected to consolidate in 2019 with rising output from a number of mines (Figure 15.7). SQM and Kidman Resources have released updated mineral resources estimates for their jointly-owned Mount Holland mine in Western Australia. The mine holds a large deposit, summing to 94,200 tonnes, with a mineral resource grading of 1.5%. Other lithium deposits are also being explored at Ravensthorpe, Mount Edwards, Pilgangoora, and Poona.

Higher spodumene ore output will feed a string of refineries under construction, which will beneficiate the ore into higher-value lithium hydroxide. These include Talison Lithium’s facility at Greenbushes (expected to commence production by 2020), Kidman’s new Western Australian refinery (expected to commence in 2021), and facilities owned by Mineral Resources and Neometals. The largest facility — a joint project of Albermarle and Mineral Resources — is expected to be capable of refining 100,000 tonnes of lithium hydroxide per year from 2022.

Overall, production of lithium content in Australia is projected to lift from 251,000 tonnes in 2017–18 to 419,000 tonnes by 2023–24.

Exports are set to grow strongly over the outlook period

Export volumes are projected to track with production, since Australia has minimal domestic use of spodumene. However, export values are expected to follow a more mixed trajectory; facing headwinds in the short term, as oversupply leads to lower prices, but gaining strength closer to 2024, as lithium hydroxide refineries commence production. These refineries will add to the value and quality of lithium exports, pushing earnings up to a projected $1.5 billion in real terms by 2024 (Figure 15.8).

Revisions to the outlook

Australia’s forecast lithium export earnings for 2018–19 and 2019–20 have been adjusted up slightly in light of additional data emerging on the valuation of spodumene ores in the US market.
### Table 15.1: Lithium outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>CAGR</th>
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<tbody>
<tr>
<td>Lithium production</td>
<td>kt</td>
<td>384</td>
<td>403</td>
<td>411</td>
<td>420</td>
<td>432</td>
<td>545</td>
<td>686</td>
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<tr>
<td>Consumption</td>
<td>kt</td>
<td>234</td>
<td>264</td>
<td>305</td>
<td>349</td>
<td>403</td>
<td>594</td>
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<tr>
<td>Stocks</td>
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<td>672</td>
<td>778</td>
<td>849</td>
<td>878</td>
<td>829</td>
<td>682</td>
<td>4.2%</td>
</tr>
<tr>
<td>– weeks of consumption</td>
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<td>118.6</td>
<td>132.2</td>
<td>132.6</td>
<td>126.5</td>
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<td>72.5</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>– nominal</td>
<td>US$/t</td>
<td>765</td>
<td>720</td>
<td>630</td>
<td>540</td>
<td>500</td>
<td>510</td>
<td>520</td>
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<tr>
<td></td>
<td>Usc/lb</td>
<td>35</td>
<td>33</td>
<td>29</td>
<td>24</td>
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<td>24</td>
<td>7.3%</td>
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<tr>
<td>– real b</td>
<td>US$/t</td>
<td>783</td>
<td>720</td>
<td>616</td>
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<tr>
<td></td>
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<td>Mine production</td>
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<td>335</td>
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<td>372</td>
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<td>1 545</td>
<td>1 638</td>
<td>1 701</td>
<td>1 825</td>
<td>2 073</td>
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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; z Projection; 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)