Further information
For more information on data or government initiatives please access the report from the Department’s website at: www.industry.gov.au/oce

Editor
David Thurtell

Chapter Authors
Macroeconomic outlook: Thuong Nguyen and David Thurtell
Resources and energy overview: David Thurtell and Nikolai Drahos
Steel and iron ore: Joseph Moloney
Metallurgical and thermal coal: Monica Philalay
Gas: David Whitelaw
Oil: Kate Martin
Gold: Thuong Nguyen
Aluminium, alumina and bauxite: Andrea Bath
Uranium, copper, nickel and zinc: Mark Gibbons
Special topic Asian LNG trade and Australian LNG imports: Nikolai Drahos

Acknowledgements
The authors would like to acknowledge the contributions of:
Melissa Bray, Ken Colbert, Laura Ling, Kelly O’Brien and Monica Conaghan.

Cover image source: Shutterstock
© Commonwealth of Australia 2018
ISSN 1839-500
Vol. 8, no. 2
This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced or altered by any process without prior written permission from the Australian Government. Requests and inquiries concerning reproduction and rights should be addressed to:
Department of Industry, Innovation and Science, GPO Box 9839, Canberra ACT 2601 or by emailing chiefeconomist@industry.gov.au.

Creative Commons Licence
With the exception of the Coat of Arms, this publication is licensed under a Creative Commons Attribution 3.0 Australia Licence. Creative Commons Attribution 3.0 Australia Licence is a standard form license agreement that allows you to copy, distribute, transmit and adapt this publication provided that you attribute the work.
A summary of the licence terms is available from: http://creativecommons.org/licenses/by/3.0/au/deed.en
The full licence terms are available from: http://creativecommons.org/licenses/by/3.0/au/legalcode
The Commonwealth’s preference is that you attribute this publication (and any material sourced from it) using the following wording:
Source: Licensed from the Commonwealth of Australia under a Creative Commons Attribution 3.0 Australia Licence.
Contents

Foreword ii
About this edition iii

1. Overview 1
2. Macroeconomic outlook 9
3. Steel 17
4. Iron Ore 21
5. Metallurgical coal 28
6. Thermal coal 35
7. Gas 42
8. Oil 52
9. Uranium 60
10. Gold 66
11. Aluminium, alumina and bauxite 72
12. Copper 79
13. Nickel 86
14. Zinc 91
15. Special Topic — Asian LNG trade and Australian LNG imports 96

Trade summary charts and tables 109
Appendix A 116
Foreword

Commodity prices have followed an unusually well-linked trend over the last 15 years. Prices rose virtually in unison during the initial years of the commodity boom, when the demand for base metals and coal rose sharply across Asia. As massive investment subsequently kicked in, prices stabilised and then declined across the board amidst unprecedented waves of new supply. The price ebb proved shorter than expected, however, with prices rallying again for nearly all commodities about two years ago. A major factor in the rebound was moves by China to cut loss-making in its domestic production of resource and energy commodities such as coal, aluminium, steel and iron ore.

The well-known commodity cycle story has evolved in two significant ways in the past two quarters. First, it has become clear that the price rebound — initially expected to be temporary — has turned out to be more robust than expected. Prices have, on balance, held their position, supported by another surge of infrastructure and energy demand across emerging Asia. China’s demand, long expected to ease, has not fallen as swiftly or as sharply as expected. Other countries, including India and Indonesia, have increased their commodity imports.

The second thing to note is the increasing variance in price trends among individual commodities. The previously overwhelming movements — when commodity prices rose and fell in remarkable unison — appear now to be diverging. Some commodities are experiencing rising prices and consumption, while others are falling. The factors influencing price movements vary increasingly between commodities as well. No single overarching trend now defines resource and energy commodity markets. This may be regarded as a return to normality following the largest demand investment boom in history. But it also signals the emergence of a more complex set of market conditions and a more unpredictable long-term direction.

It is our view that Australia’s commodity export earnings will largely hold their current level in aggregate terms over the next two years. A lift from $226 billion in 2017–18 (already a record high) to $238 billion by 2018–19 is expected. After this, lower prices are expected to reduce export revenue slightly, to $232 billion by 2019–20. Within this aggregate, however, we anticipate some significant divergence in conditions for the different commodities. Gas exports are set to rise strongly, as huge investments in supply meets massive new demand from Asia. Conditions for coal producers are more mixed, with metallurgical coal demand easing slightly, while earnings for thermal coal remain largely stable. Earnings for iron ore are likely to soften a little, but base metals such as copper and nickel — which play an important role in developing new technologies and energy storage — are showing increasingly strong prospects.

Commodity producers are operating in a rapidly changing market, with conditions now less homogenous than they have been for more than 10 years. The era of across-the-board investment and production cycles has passed, with most of the largest projects now at or beyond the point of completion. The next round of investments are expected to be more modest, and their success will depend more than ever on shrewd judgement. Which commodities are likely to present the greatest opportunities? How can technology be employed to contain costs and improve efficiency? Where will the demand spikes occur next? The opportunities are there, but judgement and innovation will be needed to unlock them.

David Turvey
Acting Chief Economist
Department of Industry, Innovation and Science
About this edition

The Resources and Energy Quarterly contains the Office of the Chief Economist’s forecasts for the value, volume and price of Australia’s major resources and energy commodity exports.

Each June edition of the Resources and Energy Quarterly features a ‘short term’ (two year) outlook for Australia’s major resource and energy commodity exports.

Underpinning the forecasts contained in the Resources and Energy Quarterly is the Office of the Chief Economist’s outlook for global resource and energy commodity prices, demand and supply. The forecasts for Australia’s resource and energy commodity exporters are reconciled with this global context.

Resources and Energy Quarterly publication schedule

<table>
<thead>
<tr>
<th>Publication</th>
<th>Expected release date</th>
<th>Outlook period</th>
<th>Special focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 2018</td>
<td>2 July 2018</td>
<td>Australian data: 2019–20 World data: 2020</td>
<td>Australian east coast gas market</td>
</tr>
<tr>
<td>September 2018</td>
<td>2 October 2018</td>
<td>Australian data: 2019–20 World data: 2020</td>
<td>TBA</td>
</tr>
<tr>
<td>December 2018</td>
<td>7 January 2019</td>
<td>Australian data: 2020–21 World data: 2021</td>
<td>Resources and Energy Major Projects</td>
</tr>
<tr>
<td>March 2019</td>
<td>April 2019</td>
<td>Australian data: 2023–24 World data: 2023</td>
<td>Medium term outlook</td>
</tr>
</tbody>
</table>

Source: Department of Industry, Innovation and Science (2018)
Overview
Resources and Energy Quarterly June 2018

Resources and energy sector

- **7.8%** of Australia’s GDP growth in the March quarter of 2018
- **7%** share of Australia’s GDP in 2016–17
- **53%** Australia’s goods and services exports in 2016–17
- **234,000** people employed (as at May 2018)
- **68%** Australia’s goods exports in 2016–17

Australia’s resources and energy exports, A$billion

- Iron ore
  - 2016–17: $55b
  - 2017–18: $50b
  - 2019–20: $55b
- Met Coal
  - 2016–17: $42b
  - 2017–18: $40b
  - 2019–20: $32b
- Other
  - 2016–17: $24b
  - 2017–18: $20b
  - 2019–20: $19b
- LNG
  - 2016–17: $6b
  - 2017–18: $6b
  - 2019–20: $6b
- Thermal coal
  - 2016–17: $6b
  - 2017–18: $6b
  - 2019–20: $6b
- Base metals
  - 2016–17: $6b
  - 2017–18: $6b
  - 2019–20: $6b
- Gold
  - 2016–17: $6b
  - 2017–18: $6b
  - 2019–20: $6b

Major markets for Australia’s resources and energy exports, 2016–17 (A$billion)

- EU28: 11
- India: 11
- South Korea: 16
- Japan: 36
- China: 78
1.1 Summary

- Resource and energy commodity prices rose firmly during the June quarter, the latter driven by strong demand and concerns about supply.
- Growth in global industrial production and manufacturing output appears to have peaked in the first-half of 2018, suggesting that resource commodity prices may generally have set their highs for the cycle.
- Australia’s resources and energy export volumes are expected to continue to grow at a robust pace over the next year — driven by LNG — but grow less quickly in 2019–20.
- With oil (and hence LNG) prices expected to hold some of their recent gains, exports in 2018–19 are expected to be a record $238 billion.

1.2 Export values

Australia’s export values to reach record high in 2018–19

The Office of the Chief Economist’s (OCE) Resources and Energy Export Values Index (preliminary estimate) rose by 18 per cent year-on-year in the June quarter 2018. This was due to an 11 per cent rise in prices and a 6.5 per cent rise in volumes. Export values are estimated to have grown by 18 per cent in 2017–18, to reach $226 billion, a record in nominal terms.

In 2018–19, an expected 2.0 per cent drop in prices is forecast to partly offset the impact of an 8.0 per cent increase in export volumes. As a result, the value of resource and energy exports is forecast to rise by 5.1 per cent to a record $238 billion.

2019–20 is forecast to see export values drop by 2.3 per cent to $233 billion, as a 6.1 per cent fall in prices is only partly offset by a 3.5 per cent rise in volumes.

Commodity returns were lifted by a depreciation in the Australian dollar

In Australian dollar terms, the OCE Resources and Energy Commodity Price Index grew by 5.1 per cent in the June quarter 2018 (preliminary estimate), to be 13.0 per cent higher than a year earlier.
Roughly two thirds of the rise in commodities prices in AUD terms was due to a depreciation in the Australian dollar against the US dollar. In US dollar terms, commodity prices rose by 1.6 per cent.

Prices for resources commodities rose by 3.7 per cent, while prices of energy commodities grew by 6.8 per cent in the June quarter 2018 in Australian dollar terms.

A surge in the (Australian dollar) prices of oil, LNG and thermal coal drove the rise in energy prices. Oil rose as the market anticipated tighter supply on lower Iranian and Venezuelan exports. Iran oil exports are expected to decline as a result of the US Administration’s withdrawal of the US from the Iran nuclear deal. The price received by Australian LNG exporters (which is mostly on oil-linked contracts) rose more than 11 per cent. LNG spot prices in Asia declined as strong winter heating demand abated and fewer production outages affected supply.

1.3 Prices

The iron ore price was supported by the recent ramp up in China’s steel production (following winter production cuts and a seasonal rebound in demand from the construction and manufacturing sectors). The iron ore price is forecast to gradually decline over the next two years, as Chinese steel production eases and Australian and Brazilian supplies grow.

Thermal coal spot prices rebounded from early weakness to finish down modestly in the June quarter. Prices are expected to ease through the latter half of 2018 and early 2019, as supply rises and demand moderates. Metallurgical coal spot prices declined noticeably in the June quarter, though declines early in the quarter were largely reversed in early June. Price swings were largely driven by variations in Chinese demand, with concerns about weaker Australian supply supporting prices.

The gold price recently drifted below the US$1,310–1,360 an ounce range it had traded since the early days of 2018. Gold’s losses could have easily been worse considering the strength of the US dollar and rising bond yields; safe haven demand appears to have helped support the price.
The rising US dollar and higher real US Treasury bond yields are expected to weigh on gold prices over the next two years. However, rising inflation and growing investor caution over the outlook for the global economy are expected to raise the demand for gold as an inflation hedge and a safe haven.

Base metal prices were mixed in the June quarter, with particularly upward moves in aluminium as US tariffs and sanctions on Rusal led to concerns about supply. Zinc prices appear to have peaked, as supply improves. The copper price finally broke decisively through the US$7,000 per tonne mark, but may fall back over the rest of 2018. The lack of mine supply is expected to become a big issue in 2019 and 2020, driving prices higher.

The two year outlook for base metals prices is mixed. The aluminium price is likely to hold at relatively high levels, as China rationalises its production capacity. Nickel is forecast to be relatively stable, while zinc and copper prices are forecast to show opposite moves, as supply factors impact.

**Figure 1.5: Base metal spot prices**

![Graph showing base metal spot prices](image)

Notes: Prices are in US dollars, and are the international benchmark prices

**1.4 Export volumes**

**Export volumes to grow, driven by LNG and iron ore**

The 6.9 per cent year-on-year gain in the OCE’s Resources and Energy Export Volumes Index (preliminary estimate) in the June quarter 2018 took the index to a new record high. The strong growth was boosted by weak exports in the June quarter 2017, when Cyclone Debbie cut exports of metallurgical coal.

LNG export volumes declined in the June quarter as Asian demand eased after the end of winter. The completion of the three remaining LNG projects currently under construction — Wheatstone, Ichthys and Prelude — over the rest of 2018, should boost resources and energy export volumes growth over the forecast period.

Iron ore supported growth in overall resources and energy export volumes in the June quarter, growing by almost 12 per cent. Growth in iron ore exports is forecast to be 3.2 per cent in 2018-19, before moderating to 1.3 per cent in 2019–20. Higher volumes will be driven by productivity improvements and replacement mines at Rio Tinto and BHP’s operations, as well as the commissioning and ramp up of some smaller projects, including Mount Gibson Iron’s Koolan Island. Higher volumes will be partly offset by the closure of some mines due to depletion, and the announced cessation of production at Cliff’s Koolyanobbing mine in late 2018.

Metallurgical coal export volumes appear to have recovered further in the June quarter, and are forecast to grow modestly in 2018–19 and 2019–20. Strong prices will encourage a rise in production and export volumes. However, the potential capacity losses from proposed changes to Aurizon’s maintenance schedule (the rail network operator of the Central Queensland Coal Network) continues to present a risk to the outlook.

Thermal coal export volumes are forecast to rise modestly in the next two years. The only substantial addition over the outlook period is MACH Energy’s Mount Pleasant mine, which is expected to start operations later in 2018 and gradually ramp up to 7.5 million tonnes of output annually.
Exports of gold and most base metals are forecast to grow modestly over the forecast period. The collective gains of aluminium, alumina and bauxite in 2017-18 will likely be maintained. Metal production has been incentivised by more supportive price environment in recent quarters. In particular, the volume of copper exports, which took a hit in 2016–17 is forecast to show strong growth in the forecast period. The growth will be largely due to a return to normal operations at existing mines such as Rocklands, Cadia Valley and Mount Lyell. Zinc exports dropped by a third in 2016–17, but are expected to grow by 28 per cent in 2018–19. New Century Resources, which acquired the Century mine — once the world’s largest zinc mine — in 2017, is seeking to extract ore from the mine’s huge tailings dam, which potentially holds more than 2.3 million tonnes of zinc.

1.5 Contribution to GDP growth and investment

Mining industry continues to support overall economic growth

Australia’s Gross Domestic Product (GDP) grew by 1.0 per cent in the March quarter 2018, with mining industry value-added also growing by 1.0 per cent. The mining industry directly accounted for 7.8 per cent of the growth in Australia’s GDP in the quarter.

Oil and gas extraction and iron ore mining have been the largest contributors to mining industry value-added growth in the last two years, propelled by growing export volumes. In the case of oil and gas extraction, the contribution of rapidly growing export volumes has been partially offset by declining investment (from a high base). In the coming few years, it is likely that slowing exports growth, coupled with low investment, will see a declining contribution from the oil and gas sector to Australia’s GDP growth. Nonetheless, the absolute value of oil and gas’s contribution to Australia’s economy will remain high for many years to come. The contribution of mining services (particularly exploration services) and other mining to GDP is expected to grow in the coming quarters, as a more supportive price environment (for gold, base metals and lithium) incentivises exploration activities.
Mining investment appears to be bottoming out

Investment in Australia’s mining industry eased in the March quarter 2018, and is expected to be little changed through the remainder of the year. Mining investment is expected to have declined by around 5–10 per cent in 2017–18, to around $35 billion. This follows several years of sharp declines from the 2012–13 peak, when investment reached $95 billion.

These figures are in line with those of the OCE Resources and Energy Major Projects survey published in the December 2017 Resources and Energy Quarterly, which points to a small downturn in mining investment in the short-term and then a levelling out in capex by the sector. A slight lift in publicly announced projects and projects under consideration should help to place a floor under mining investment beyond 2017–18.

Oil and gas investment remains the largest driver of recent declines in overall capital spending, reflecting the progressive completion of the biggest LNG projects. Investment in the sector dropped by 13 per cent in the March quarter, to be down 25 per cent through the year. Projects completed or virtually completed include the US$54 billion Gorgon LNG, as well as the substantial Wheatstone, Ichthys, and Prelude projects.

Coal mining investment picked up from its historically low level of a year ago, though some ground was lost in the latest quarter. Investment in metal ore mining rose by 36 per cent year-on-year. Investment is responding to recent strong gains in prices for copper, nickel and zinc, and on signs that higher demand growth for these metals will be sustained.

1.6 Revisions to the outlook

The outlook for Australia’s resources and energy export earnings in 2017–18 has been revised down by around $3.3 billion from the March 2018 Resources and Energy Quarterly. The downward revision reflects lower iron ore production and higher domestic consumption, as well as lower prices for metallurgical coal. The forecast for Australia’s resources and energy export earnings has been revised up by $7.8 billion (2018–19) and $6.1 billion (2019–20), reflecting the larger than previously forecast rise in energy prices, and a weaker outlook for the AUD-USD exchange rate.
Figure 1.10: Australia’s major resource and energy commodity exports

<table>
<thead>
<tr>
<th>Commodity</th>
<th>2018–19(^f)</th>
<th>2019–20(^f)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>volume</td>
<td>EUV</td>
</tr>
<tr>
<td>Iron ore</td>
<td>▲ 3</td>
<td>▼ 4</td>
</tr>
<tr>
<td>Metallurgical coal</td>
<td>▲ ▼ –5</td>
<td>▶ 4</td>
</tr>
<tr>
<td>LNG</td>
<td>▲ ▼ 19</td>
<td>▼ 18</td>
</tr>
<tr>
<td>Thermal coal</td>
<td>▼ ▼ –1</td>
<td>▶ 10</td>
</tr>
<tr>
<td>Gold</td>
<td>▼ ▼ ▼ 0</td>
<td>▼ 1</td>
</tr>
<tr>
<td>Alumina</td>
<td>▼ ▼ ▼ ▼ ▼</td>
<td>▼ 13</td>
</tr>
<tr>
<td>Copper</td>
<td>▼ ▼ ▼ ▼ ▼</td>
<td>▼ 6</td>
</tr>
<tr>
<td>Crude oil</td>
<td>▼ ▼ ▼ ▼ ▼</td>
<td>▼ 16</td>
</tr>
<tr>
<td>Aluminium</td>
<td>▼ ▼ ▼ ▼ ▼</td>
<td>▼ 12</td>
</tr>
<tr>
<td>Zinc</td>
<td>▼ ▼ ▼ ▼ ▼</td>
<td>▼ 21</td>
</tr>
<tr>
<td>Nickel</td>
<td>▼ ▼ ▼ ▼ ▼</td>
<td>▼ 11</td>
</tr>
<tr>
<td>Lead</td>
<td>▼ ▼ ▼ ▼ ▼</td>
<td>▼ 19</td>
</tr>
</tbody>
</table>

Notes: per cent change is compound annual growth (CAGR) from 2016–17 to the specified year; f forecast.
### Table 1.1: Outlook for Australia’s resources and energy exports

<table>
<thead>
<tr>
<th>Unit</th>
<th>2016–17</th>
<th>2017–18&lt;sup&gt;a&lt;/sup&gt;</th>
<th>2018–19&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2019–20&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2017–18</th>
<th>2018–19&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2019–20&lt;sup&gt;f&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources and energy</td>
<td>A$m</td>
<td>204,130</td>
<td>226,312</td>
<td>238,183</td>
<td>232,692</td>
<td>5.2</td>
<td>–2.3</td>
</tr>
<tr>
<td>– real&lt;sup&gt;b&lt;/sup&gt;</td>
<td>A$m</td>
<td>208,131</td>
<td>226,312</td>
<td>232,714</td>
<td>222,128</td>
<td>2.8</td>
<td>–4.5</td>
</tr>
<tr>
<td>Energy</td>
<td>A$m</td>
<td>85,328</td>
<td>101,929</td>
<td>115,863</td>
<td>109,829</td>
<td>13.7</td>
<td>–5.2</td>
</tr>
<tr>
<td>– real&lt;sup&gt;b&lt;/sup&gt;</td>
<td>A$m</td>
<td>87,000</td>
<td>101,929</td>
<td>113,203</td>
<td>104,843</td>
<td>11.1</td>
<td>–7.4</td>
</tr>
<tr>
<td>Resources</td>
<td>A$m</td>
<td>118,802</td>
<td>124,383</td>
<td>122,320</td>
<td>122,863</td>
<td>–1.7</td>
<td>0.4</td>
</tr>
<tr>
<td>– real&lt;sup&gt;b&lt;/sup&gt;</td>
<td>A$m</td>
<td>121,131</td>
<td>124,383</td>
<td>119,511</td>
<td>117,285</td>
<td>–3.9</td>
<td>–1.9</td>
</tr>
</tbody>
</table>

Notes: <sup>b</sup> In 2017–18 Australian dollars; <sup>f</sup> forecast; <sup>s</sup> estimate.

### Table 1.2: Australia’s resources and energy commodity exports, selected commodities

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alumina</strong></td>
<td>kt</td>
<td>18,230</td>
<td>17,638</td>
<td>–1.1</td>
<td>A$m</td>
<td>6,655</td>
</tr>
<tr>
<td><strong>Aluminium</strong></td>
<td>kt</td>
<td>1,329</td>
<td>1,380</td>
<td>3.8</td>
<td>A$m</td>
<td>3,167</td>
</tr>
<tr>
<td><strong>Copper</strong></td>
<td>kt</td>
<td>920</td>
<td>1,030</td>
<td>1.3</td>
<td>A$m</td>
<td>7,569</td>
</tr>
<tr>
<td><strong>Gold</strong></td>
<td>t</td>
<td>334</td>
<td>356</td>
<td>2.2</td>
<td>A$m</td>
<td>18,013</td>
</tr>
<tr>
<td><strong>Iron ore</strong></td>
<td>Mt</td>
<td>818</td>
<td>887</td>
<td>2.7</td>
<td>A$m</td>
<td>62,617</td>
</tr>
<tr>
<td><strong>Nickel</strong></td>
<td>kt</td>
<td>190</td>
<td>194</td>
<td>0.7</td>
<td>A$m</td>
<td>2,275</td>
</tr>
<tr>
<td><strong>Zinc</strong></td>
<td>kt</td>
<td>1,008</td>
<td>1,601</td>
<td>16.7</td>
<td>A$m</td>
<td>2,688</td>
</tr>
<tr>
<td><strong>LNG</strong></td>
<td>Mt</td>
<td>52</td>
<td>77</td>
<td>13.7</td>
<td>A$m</td>
<td>22,308</td>
</tr>
<tr>
<td><strong>Metallurgical coal</strong></td>
<td>Mt</td>
<td>177</td>
<td>200</td>
<td>4.2</td>
<td>A$m</td>
<td>35,335</td>
</tr>
<tr>
<td><strong>Thermal coal</strong></td>
<td>Mt</td>
<td>202</td>
<td>201</td>
<td>0.1</td>
<td>A$m</td>
<td>18,902</td>
</tr>
<tr>
<td><strong>Oil</strong></td>
<td>kbd</td>
<td>221</td>
<td>355</td>
<td>17.2</td>
<td>A$m</td>
<td>5,476</td>
</tr>
<tr>
<td><strong>Uranium</strong></td>
<td>t</td>
<td>7,081</td>
<td>7,240</td>
<td>0.7</td>
<td>A$m</td>
<td>596</td>
</tr>
</tbody>
</table>

Notes: <sup>f</sup> forecast; CAGR is compound annual growth rate in percentage terms from 2016–17 to 2019–20.
The global economy continues to grow at a solid pace, with world output forecast to grow by 3.9% in 2018.

**Drivers** — low inflation, rising business confidence, tax cuts in the United States

**Risks** — Trade tensions between the US and China, geopolitical tensions in the Middle East and the Korean peninsula, rising debt levels in China
2.1 Summary

- The global economy continues to grow at a solid pace, with world growth forecast to be 3.9 per cent in 2018 and in 2019 and 3.8 per cent in 2020.
- Trade tensions between the US and its major trading partners present potential risks to confidence and global economic growth.

2.2 Global economy

The global economy performed well in the first quarter of 2018, led by stronger than expected growth in major advanced and emerging economies. The United States economy grew by 2.8 per cent year-on-year, Japan by 1.0 per cent, the Eurozone by 2.4 per cent and South Korea by 2.9 per cent. Of the key emerging economies, China grew by 6.8 per cent (year-on-year), while India grew by 7.7 per cent (year-on-year).

The strong growth in the global economy has been helped by rising manufacturing activity. However, manufacturing activity may have peaked. The global manufacturing Purchasing Managers Index (PMI) was at 53.1 in May 2018, down from a cycle high of 54.5 in December 2017, indicating the global manufacturing sector continues to expand, but at a slower pace. China, the US, Japan and the EU all have manufacturing PMIs above the 50 level, pointing to ongoing growth in the large manufacturing sectors in the short term, which should flow through to global metal demand.

Global economic conditions are expected to remain firm over the next two and a half years. Uniform firm growth recorded in the March quarter is expected to continue. According to the International Monetary Fund’s (IMF) World Economic Outlook released in April 2018, advanced economies are expected to continue to expand above their potential GDP growth rates until 2019, before decelerating. Economic growth in emerging and developing economies is also expected to rise before levelling off in 2020. The cuts to corporate and personal income taxes in the United States are likely to support global economic growth, but risk pushing up US interest rates further than they might otherwise go. Despite rising inflation in some advanced economies, and increased financial market volatility in early 2018, the IMF has projected the global economy to grow by 3.9 per cent annually in 2018 and 2019, and by 3.8 per cent in 2020.
With the exception of the US, inflation and wage growth in most of the advanced economies remains subdued, and are forecast to gather pace only very gradually given slack in labour markets. Subdued wage growth in many advanced economies reflects low inflation and inflation expectations. Slow wage growth is constraining the demand for goods and services, and it is not yet clear when wage growth will pick up among advanced nations.

The risks to the global outlook seem skewed to the downside. Increased protectionism, geopolitical tensions in the Middle East, and the financial vulnerabilities of countries such as Italy and Argentina, all have potential to hurt global growth. Trade tensions between the US and its major trading partners have the potential to undermine confidence and hinder global economic output; the past decade has seen world trade as a proportion of world GDP rise noticeably. The US Administration has imposed US$50 billion in tariffs on US imports from China. China has retaliated by imposing US$50 billion in tariffs on imports of US products.

The US Administration has also exited from the Joint Comprehensive Plan of Action (JCPOA) — an agreement between Iran and six world powers (including the US) signed in 2015. The agreement removed economic and financial sanctions on Iran in exchange for curbs to the country’s nuclear weapon program. The decision raises the risk of conflict in the Middle East, which could disrupt global oil supply and hurt household and business confidence.

Tensions could also reignite on the Korean peninsula, where there are ongoing negotiations between the United States and its allies and North Korea. The US is seeking changes in North Korea’s nuclear armament program, in exchange for an easing of financial and trade sanctions by the major world powers. Territorial disputes in the South China Sea also remain a threat to regional and global security.

On the upside, monetary conditions in the major world economies are still relatively loose. The successful implementation of China’s Belt and Road Initiative is also expected to facilitate greater regional integration over and beyond the outlook period.
2.3 United States

The US economy grew by 2.2 per cent year-on-year in the March quarter 2018, as consumer spending grew at the weakest pace in nearly 5 years.

Partial indicators suggest strong GDP growth is likely to have been recorded in the June quarter. Manufacturing activity in the world’s largest economy continued to expand. The US ISM Manufacturing Index rose to 58.7 in May 2018 from 57.2 in April 2018, as new orders, production and employment were stronger. The unemployment rate fell to 3.8 per cent in May 2018 — a multi-decade low. Initial jobless claims data point to a further decline in US unemployment over the near term. Wage growth is accelerating, and the likelihood is that the increase in labour costs will flow through to increased prices.

10 year US Treasury yields briefly reached 3.12 per cent on 17 May 2018 — the highest level in nearly 7 years — on indications of higher inflation and the potential for tighter monetary policy, i.e., faster/larger hikes in the official US (Federal Funds) interest rate. In the US, rising bond yields push up the cost of borrowing, hurting capital expenditure and dwelling investment.

Large corporate and personal income tax cuts (US$1.5 trillion), strong US consumer confidence and a robust labour market, suggest that the world’s largest economy will continue to grow firmly in the coming quarters. However, the US tax cuts and infrastructure spending measures are resulting in higher government bond issuance, also putting upward pressure on US bond yields.

The US Federal Reserve is expected to lift interest rates further over the coming eighteen months, in order to contain inflation. Increases in US interest rates have high potential to flow on to other nations, particularly those nations running large current account deficits. Already, capital flows back to the US (seeking the higher yields on offer) have led the central banks of nations such as Indonesia, Turkey and Argentina to raise interest rates to defend their currencies. Higher interest rates impact on economic activity in those countries, with flow-on effects to their trading partners.
2.4 China

The Chinese economy grew by 6.8 per cent year-on-year in the first quarter of 2018, propelled by a strong performance of the service sector — which grew by 7.5 per cent year-on-year. Strong exports helped offset the impact of weak infrastructure investment (up 7.5 per cent, slowing from the 18 per cent growth rate in 2017) and slumping property sales (up only 2.4 per cent, slowing from the 11 per cent growth rate in 2017), due to stricter financial regulations. As China’s traditional growth engines — manufacturing and construction — slow, services need to take over as the driver of growth in the Chinese economy.

China’s industrial production increased by 6.8 per cent year-on-year in May 2018, driven by increased output of manufacturing (up 6.6 per cent), and electricity, gas and water production (up 12.2 per cent). The output of the mining sector grew by 3.0 per cent, as steel and aluminium producers ramped up their production following the end of the winter production curtailments.

China’s Markit manufacturing PMI was 51.1 in May 2018, unchanged from April but down from 51.6 in February 2018. The survey suggests that China’s factories have maintained solid overall growth despite the government’s tougher environmental policies, a slowing housing market and looming trade tensions with the United States.

Chinese authorities have implemented various property control policies since early 2017 — to limit speculative activities and a property bubble — and achieved some success in slowing property price growth. The newly built commercial residential buildings prices in China’s 70 cities grew at a more moderate pace in early 2018, easing from a monthly average year-on-year growth of 8.5 per cent in 2017 to 5.5 per cent in the first five months of the year. The volume of residential buildings under construction increased by 2.7 per cent in 2017, and by just 2.1 per cent in the first five months of 2018.

China’s economic growth is expected to moderate to 6.6 per cent in 2018, 6.4 per cent in 2019 and 6.3 per cent in 2020. Growth is expected to slow as financial, housing and fiscal tightening measures take effect, measures to cut pollution intensify, and net exports diminish — due to the growing trade dispute with the US.

Growing concerns over debt levels in China represent the main risk to the outlook. As of 2017, the ratio of debt to GDP in China was 250 per cent — with corporate debt reaching 160 per cent of GDP, household debt 49 per cent, government debt 19 per cent, and bank debt reaching 20 per cent of GDP. To address the rising debt issue, the central government has vowed to take measures to deleverage the economy, including avoiding further large injections of central bank support. These measures are likely to have a direct impact on economic growth, with flow-on effects to commodity exporters.
China’s Monetary Conditions Index fell to its lowest level in 29 months in April 2018. The People’s Bank of China (PBOC) is expected to keep its lending rate unchanged at 4.35 per cent until at least the end of 2019. However, in late June, the PBOC announced that Reserve Requirement Ratio (RRR) — the amount of cash that some banks are required to hold as reserves — would be lowered by 50 basis points in July 2018. A further cut (of 25 basis points) is expected in 2019; this will bring the RRR down to 16 per cent by the end of 2019.

2.5 Other economies

Japan

The Japanese economy grew by 1.0 per cent year-on-year in the March quarter 2018, propelled by solid exports, private investment and spending toward the hosting of the Summer Olympics in 2020. Total machine orders rose 6.5 per cent year-on-year in May, to JPY 7.1 trillion. Japan’s manufacturing PMI declined to 52.8 in May 2018 from 53.8 in April, as output and new orders rose at a slower pace and employment expanded at a slower rate. The economy is expected to grow at 1.2 per cent in 2018, as rising employment, income and consumer sentiment contribute to a recovery in domestic consumption.

Exports are expected to remain strong, in particular to the US and China, driven by stronger demand for machinery and equipment. Private capital expenditure is expected to grow firmly, underpinned by slowing but still elevated corporate earnings, the need to replace ageing capital stock, and construction investment for the Tokyo Olympics.

The Bank of Japan (BoJ) announced on 27 April 2018 that it is continuing with its quantitative and qualitative monetary easing, with inflation expected to approach its 2 per cent target in the coming year or two.

South Korea

South Korea’s economy grew by 2.9 per cent year-on-year in the March quarter 2018, driven by strong domestic demand. Domestic demand rose, as job and wage growth accelerated, and the property market improved. Private consumption is expected to benefit from a recent rise in the minimum wage, and government support for employment and social programs. Investment growth is expected to remain positive, and net exports are also expected to contribute to growth.

Economic growth is forecast to slow to 3.0 per cent in 2018, 2.9 per cent in 2019, and 2.8 per cent in 2020. While they appear to have started well, a failure in implementing the agreements signed between the US and North Korea at the Singapore summit could impact South Korean confidence.

Europe

The Eurozone economy grew by 2.9 per cent year-on-year in the March quarter 2018, largely driven by increased private consumption and investment. The latest Composite PMI readings points to another relatively soft GDP result in the June quarter 2018.

In May 2018, the Eurozone’s manufacturing PMI continued to slide from its 3-year high of 60.6 in December 2017, falling to 55.5. Severe cold weather and some other temporary factors, such as an inconclusive German elections that spread over five months, were the main contributing factors to the fall. Despite this decline, the Eurozone’s PMI is still well above 50 —
Figure 2.9: Eurozone Composite PMI and Real GDP

![Graph showing Eurozone Composite PMI and Real GDP from Dec-98 to Dec-18.](image)

Source: Bloomberg (2018); International Monetary Fund (2018)

indicating that sentiment among manufacturers is positive. Economic growth is forecast to be at 2.5 per cent in 2018, before declining to 1.8 per cent in 2020. Moderate but sustained rises in wages and recovering asset prices, are expected to boost household incomes and wealth.

In the United Kingdom, GDP grew by just 0.1 per cent in the March quarter 2018. Economic activity is expected to rebound as winter weather disruptions recede. With inflation continuing to edge down, the Bank of England is under less pressure to tighten monetary policy.

In Italy, the new coalition government — the 5-Star Movement and Northern League — was formed in June 2018 after three months of political deadlock following inconclusive March 4 elections. The Italian Government has vowed to overhaul European Union (EU) rules on budgets and immigration.

In Germany, concerns are growing as Chancellor Angela Merkel’s Bavarian allies threaten to defy her by implementing a plan to limit immigration. The decision is likely to destabilise the three-month old coalition government.

Another concern in Europe is the worsening economic and financial conditions in Turkey. The country’s currency (the Lira) has depreciated by more than 17 per cent against the US dollar since the start of 2018. Turkey’s central bank has raised interest rates sharply to try to stop the Lira from falling further. The President is planning to take more control over monetary policy following his election victory in June 2018. This intervention is expected to cause more concern to local and global investors. Turkey’s inflation and interest rates are high, at 10.85 and 8 per cent, respectively. It has one of the largest trade deficits in the G–20 groups of nations.

India

India’s real GDP growth rate rose to 7.7 per cent in the March quarter, as the economy recovered further from temporary disruptions related to the currency exchange initiative — which abolished high value currency notes in November 2016 — and the rollout of the goods and services tax.

A major recapitalisation plan for the public sector banks is now underway, which seeks to accelerate the work out of non-performing loans. Legal improvements are also coming into effect through new insolvency and bankruptcy laws. India still has reform challenges in its labour market and education systems, and also significant room to reduce trade barriers and deregulate the economy. Import tariffs in India, at about 15 per cent, are above average for the region.
<table>
<thead>
<tr>
<th>Economic growth</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced economies</td>
<td>2.3</td>
<td>2.5</td>
<td>2.2</td>
<td>1.7</td>
</tr>
<tr>
<td>United States</td>
<td>2.3</td>
<td>2.9</td>
<td>2.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Japan</td>
<td>1.7</td>
<td>1.2</td>
<td>0.9</td>
<td>0.3</td>
</tr>
<tr>
<td>Eurozone</td>
<td>2.7</td>
<td>2.5</td>
<td>2.1</td>
<td>1.8</td>
</tr>
<tr>
<td>Germany</td>
<td>2.5</td>
<td>2.5</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td>France</td>
<td>1.8</td>
<td>2.1</td>
<td>2.0</td>
<td>1.8</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1.8</td>
<td>1.6</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>South Korea</td>
<td>3.1</td>
<td>3.0</td>
<td>2.9</td>
<td>2.8</td>
</tr>
<tr>
<td>New Zealand</td>
<td>3.0</td>
<td>2.9</td>
<td>2.9</td>
<td>3.0</td>
</tr>
<tr>
<td>Emerging economies</td>
<td>4.8</td>
<td>4.9</td>
<td>5.1</td>
<td>5.1</td>
</tr>
<tr>
<td>Emerging Asia</td>
<td>6.5</td>
<td>6.5</td>
<td>6.6</td>
<td>6.5</td>
</tr>
<tr>
<td>ASEAN-5d</td>
<td>5.3</td>
<td>5.3</td>
<td>5.4</td>
<td>5.4</td>
</tr>
<tr>
<td>China</td>
<td>6.9</td>
<td>6.6</td>
<td>6.4</td>
<td>6.3</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>2.8</td>
<td>1.9</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>India</td>
<td>6.7</td>
<td>7.4</td>
<td>7.8</td>
<td>7.9</td>
</tr>
<tr>
<td>Latin America</td>
<td>1.3</td>
<td>2.0</td>
<td>2.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Middle East</td>
<td>2.2</td>
<td>3.2</td>
<td>3.6</td>
<td>3.5</td>
</tr>
<tr>
<td>World</td>
<td>3.8</td>
<td>3.9</td>
<td>3.9</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Inflation rate:

| United States | 2.1  | 2.4  | 2.2  | 1.9  |

Notes: a Assumption; b Year-on-year change; c Weighted using purchasing power parity (PPP) valuation of country gross domestic product by IMF; d Indonesia, Malaysia, the Philippines, Thailand and Vietnam; e Excludes Hong Kong

Source: IMF (2018) World Economic Outlook; Department of Industry, Innovation and Science
Steel

Steel consumption per capita (kilograms per person), 2016

Steel use by sector

Major steel producers, 2017

China 49%
European Union 10%
Rest of the world 18%
Japan 6%
India 8%
United States 5%
South Korea 4%
Russia 4%

50% Construction
16% Mechanical machinery
13% Automotive
5% Infrastructure
4% Transportation
2% Consumer goods
3.1 Summary

- World steel production increased in the five months to May 2018, driven by firm global economic growth, high steel prices and margins, and robust production in China.
- China’s steel production and consumption is forecast to taper off over the outlook period, reflecting a slow-down in construction activity, stricter environmental policies and supply-side reforms.
- The threat of escalating protectionist policies by the US Administration remains a risk to the outlook for major steel exporters.

3.2 World consumption and production

**China’s steel production boosted by high prices and strong demand**

Chinese steel production grew by 5.4 per cent year-on-year in the March quarter 2018, driven by high prices and margins. China’s steel price index increased 15 per cent year-on-year in the five months to May 2018. China’s steel prices were buoyed by falling inventories driven by shortages (stemming from production restrictions over winter) and strong domestic demand.

Chinese production continues to gradually shift towards electric arc furnace (EAF) steelmaking and higher (government-mandated) scrap utilisation in basic oxygen furnaces. China’s pig iron production declined by 1.1 per cent in the same period, as a result of winter restrictions on blast furnaces.

China’s apparent steel consumption increased by 7.0 per cent year-on-year in the first four months to April driven by stronger end user demand across a broad range of industries and partly due to data revisions as some previously illegal production is now captured in official statistics (apparent consumption is derived from production minus net exports).

**China’s steel production projected to gradually decline**

China’s steel production — accounting for 49 per cent of world steel production — is forecast to decline by 1.0 per cent in 2018, largely due to elevated 2017 production figures (2017 production data captured increased output at ‘legal’ facilities which replaced previously unreported production at ‘illegal’ induction furnaces that were closed last year). Production is expected to ramp up in the absence of pollution controls (which hit winter production) over the July and September quarters — allowing steelmakers to take advantage of currently high profit margins. Production is expected to be absorbed by domestic consumption in 2018 — the purchasing Managers’ Index (PMI) for China’s steel industry reached a two-year high in March and remained expansionary in April and May, pointing to robust demand for steel over the coming months.

**Figure 3.1: Profit margins for Chinese steel makers**

![Graph showing profit margins for Chinese steel makers]

*Notes: Monthly averages for integrated BOF steel mills  
Source: Bloomberg (2018) China BOF Steel Profit Index*

China’s steel consumption is forecast to taper in 2019 and decline by 0.5 per cent year-on-year, to 766 million tonnes in 2020, largely driven by an expected slowdown in urban residential construction and infrastructure investment. Government efforts to cool the property market — including purchasing restrictions, caps on prices on new properties, and increased down payment requirements — are expected to weigh on steel consumption.
China’s steel production is expected to decline over the outlook period to 2020, driven by moderating consumption, and a suite of government policies, including stricter environmental regulations, supply-side reforms, a shift in focus from ‘quantity to quality’, and reducing debt.

China’s steel exports decreased by 17 per cent year-on-year in the first five months of 2018 to 29 million tonnes, driven by higher domestic consumption. Exports are expected to pick up towards the end of the outlook period, supported by new trade routes opened up by the One Belt One Road Initiative and growing demand in South East Asia.

**Figure 3.2: China’s steel consumption, production and exports**


India set to become the second largest steel producer in 2018

India is expected to overtake Japan as the world’s second largest steel producer in 2018, with production reaching 108 million tonnes. Higher production will be driven by the ongoing expansion of steel-making capacity. India’s steel consumption is forecast to grow over the outlook period, driven by rapid urban population growth, substantial government investment in infrastructure, housing and urban development and the expansion of the manufacturing sector. India’s steel production is forecast to grow by 6.7 per cent annually to reach 123 million tonnes in 2020, representing 7.1 per cent of world production.

Favourable economic conditions supporting the steel industry elsewhere

Japan’s crude steel production started the year steady, growing 0.7 per cent year-on-year in March quarter 2018. Steel production is forecast to grow modestly in the short-term, supported by a rebound in capital expenditure, export growth in the automobile and manufacturing sectors, and demand from 2020 Olympics-related projects.

South Korea’s steel production grew by 2.8 per cent year-on-year, in the March quarter 2018, supported by high prices, and is expected to remain stable in the short-term. Growth is expected to be supported by robust domestic consumption, rising exports and a recovery in the shipbuilding industry — on the back of improvements in the number of new orders of ships.

Steel output in United States to be boosted by tariffs on imports

Steel production in the United States grew by 2.2 per cent year-on-year in the March quarter, to 21 million tonnes — the highest quarterly production since late 2014. US steelmakers have benefited from rising domestic steel prices, driven by import tariffs and, to a lesser extent, by higher domestic demand. US steel makers will benefit from a 25 per cent tariff on some imported steel. The steel products subject to the tariff are estimated at around 18 per cent of total iron and steel imports to the US and will impact most US steel trade partners — only Australia, Argentina, Brazil and South Korea are currently exempt from the tariffs.

Emerging economies to increasingly drive steel demand growth

Steel production in emerging economies (ex-China) grew by 3.4 per cent in the March quarter 2018, driven by improved global economic conditions and industrial production, and a recovery in prices and profitability — on the back of a sharp decline in steel exports from China.

Steel production in emerging economies (ex-China) is forecast to grow at a modest annual average rate of 2.6 per cent a year to 2020, driven by a positive outlook for global economic growth and ongoing urbanisation and infrastructure investment in emerging economies.
Table 3.1: World steel consumption and production

<table>
<thead>
<tr>
<th>Crude steel consumption</th>
<th>2017*</th>
<th>2018†</th>
<th>2019†</th>
<th>2020†</th>
<th>2018†</th>
<th>2019†</th>
<th>2020†</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union 28</td>
<td>172</td>
<td>175</td>
<td>177</td>
<td>179</td>
<td>1.8</td>
<td>1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>United States</td>
<td>107</td>
<td>111</td>
<td>112</td>
<td>111</td>
<td>4.0</td>
<td>1.0</td>
<td>–1.0</td>
</tr>
<tr>
<td>Brazil</td>
<td>22</td>
<td>23</td>
<td>23</td>
<td>23</td>
<td>0.7</td>
<td>1.7</td>
<td>1.5</td>
</tr>
<tr>
<td>Russia</td>
<td>43</td>
<td>42</td>
<td>42</td>
<td>42</td>
<td>–0.9</td>
<td>0.3</td>
<td>0.0</td>
</tr>
<tr>
<td>China</td>
<td>785</td>
<td>776</td>
<td>770</td>
<td>766</td>
<td>–1.1</td>
<td>–0.8</td>
<td>–0.5</td>
</tr>
<tr>
<td>Japan</td>
<td>75</td>
<td>73</td>
<td>73</td>
<td>72</td>
<td>–3.1</td>
<td>0.5</td>
<td>–1.8</td>
</tr>
<tr>
<td>South Korea</td>
<td>59</td>
<td>59</td>
<td>59</td>
<td>59</td>
<td>–0.1</td>
<td>–0.3</td>
<td>–0.4</td>
</tr>
<tr>
<td>India</td>
<td>96</td>
<td>102</td>
<td>108</td>
<td>115</td>
<td>5.3</td>
<td>6.1</td>
<td>6.3</td>
</tr>
<tr>
<td>World steel consumption</td>
<td>1698</td>
<td>1726</td>
<td>1737</td>
<td>1748</td>
<td>1.6</td>
<td>0.7</td>
<td>0.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Crude steel production</th>
<th>2017*</th>
<th>2018†</th>
<th>2019†</th>
<th>2020†</th>
<th>2018†</th>
<th>2019†</th>
<th>2020†</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Union 28</td>
<td>168</td>
<td>172</td>
<td>176</td>
<td>178</td>
<td>2.4</td>
<td>1.8</td>
<td>1.2</td>
</tr>
<tr>
<td>United States</td>
<td>82</td>
<td>86</td>
<td>90</td>
<td>90</td>
<td>5.4</td>
<td>4.3</td>
<td>0.1</td>
</tr>
<tr>
<td>Brazil</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>–1.2</td>
<td>0.3</td>
<td>0.8</td>
</tr>
<tr>
<td>Russia</td>
<td>71</td>
<td>72</td>
<td>72</td>
<td>72</td>
<td>0.6</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td>China</td>
<td>844</td>
<td>836</td>
<td>827</td>
<td>825</td>
<td>–1.0</td>
<td>–1.0</td>
<td>–0.3</td>
</tr>
<tr>
<td>Japan</td>
<td>105</td>
<td>106</td>
<td>108</td>
<td>109</td>
<td>1.5</td>
<td>2.1</td>
<td>0.8</td>
</tr>
<tr>
<td>South Korea</td>
<td>71</td>
<td>71</td>
<td>71</td>
<td>70</td>
<td>–0.2</td>
<td>–0.3</td>
<td>–0.4</td>
</tr>
<tr>
<td>India</td>
<td>101</td>
<td>108</td>
<td>115</td>
<td>123</td>
<td>6.5</td>
<td>6.8</td>
<td>6.9</td>
</tr>
<tr>
<td>World steel production</td>
<td>1684</td>
<td>1721</td>
<td>1736</td>
<td>1745</td>
<td>2.2</td>
<td>0.9</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Notes: * estimate † forecast.
Source: World Steel Association (2018); Department of Industry, Innovation and Science (2018)
Iron Ore
Resources and Energy Quarterly June 2018

818 million tonnes exported in 2016–17
That’s enough to build 9,700 Sydney Harbour bridges
$63 billion exported in 2016–17

Australia’s iron ore key export destinations, 2016–17

83% China
8% Japan
6% South Korea
2% Taiwan
1% Rest of the world

Major Australian iron ore deposits (Mt)
• <229
• 230–813
• 814–1,777
• 1,778–3,042
• 3,043–5,446
• >5,447

Deposit
Operating mine

Global share of iron ore exports in 2016

53% Australia
24% Brazil
4% South Africa
3% Ukraine
3% Canada
13% Rest of the world

Global share of iron ore imports in 2016

67% China
10% European Union
8% Japan
5% South Korea
10% Rest of the world
4.1 Summary

- The iron ore price is forecast to decline to US$51 a tonne (FOB Australia) in 2020, as a result of a forecast decline in steel production in China and a well-supplied seaborne market.
- Australia’s iron ore export volumes are forecast to increase from 846 million tonnes in 2017–18, to 887 million tonnes in 2019–20, driven by the ramp up in production by Australia’s largest producers.
- The value of Australia’s iron ore exports is forecast to decrease from $62 billion in 2017–18 to $55 billion in 2019–20, driven by lower prices offsetting growth in export volumes.

4.2 Prices

Iron ore prices diverge on quality

The iron ore price (FOB Australia) increased 2.9 per cent year-on-year in the June quarter of 2018, to average US$58 a tonne. The price was supported by the recent ramp up in China’s steel production (following winter production cuts and a seasonal rebound in demand from the construction and manufacturing sectors).

The price difference between premium and lower grade ores reached a historic high in April, driven by high steel margins which incentivise Chinese steel makers to use higher grade iron ore. The price spread is expected to narrow as steel production ramps up in China over the next few months, weighing on steel prices and profit margins and reducing incentives to purchase (more expensive) higher grade ores. Nevertheless, with an expected ongoing government push to improve air quality through increasingly stringent air pollution policies, the spread is not expected to return to historical levels.

Iron ore price forecast to gradually decline following short term support

The iron ore price is forecast to average US$59 a tonne (FOB Australia) in 2018, with high steel prices, a positive outlook for industrial production and a seasonal rebound in construction activity in China’s spring months all expected to provide some price support.
The iron ore price is forecast to gradually decline to average US$51 a tonne (FOB Australia) in 2019 and 2020, as a result of moderating demand and growing supply, particularly from Brazil (as Vale’s S11D project continues to ramp up).

China’s steel sector is expected to continue to be characterised by ongoing capacity reductions and policies to address air pollution (see the Steel chapter). These factors are expected to provide some short term support to steel prices, and consequently, the iron ore price, which tracks steel prices very closely.

However, weaker steel production eventually also means weaker demand for iron ore. At the forecast price of US$51 a tonne, the vast majority of Australian producers are expected to remain highly profitable.

### 4.3 World trade

**China’s iron ore imports projected to gradually decline**

China’s iron ore imports held steady at 447 million tonnes in the five months to May 2018, as a 3.9 per cent increase in imports from Australia offset declines elsewhere. During the March quarter, Australia’s iron ore exports accounted for 64 per cent of China’s iron ore imports, while Brazil accounted for 20 per cent. Import demand held steady as lower steel demand due to winter production cuts, was offset by restocking demand in the lead up to Chinese New Year.

China’s iron ore imports are forecast to gradually decline at an average annual rate of 0.6 per cent over the outlook period, to reach 1.07 billion tonnes in 2020. The outlook for China’s iron ore import demand is driven by a projected decline in steel production (see the Steel chapter).

### Figure 4.3: Projected iron ore margins by mine in 2020, based on projected price of US$51 a tonne (FOB Australia)

Notes: Margins are based on a projected iron ore price of US$51 a tonne (FOB Australia); Production is in dry metric tonnes.
Source: AME Group (2018)
The effect of declining steel production on iron ore imports is expected to be partially offset by a projected decline in China’s iron ore production. China’s iron ore reserves are largely low grade, with an average iron content of around 30 per cent compared to the benchmark of 62 per cent. Stringent environmental policies are expected to encourage steel makers’ preference for high grade imported ores and result in several closures over the outlook period, reducing domestic iron ore production. Authorities revoked about a third of iron ore mining licenses in 2017, in line with the government’s stricter environmental policies. Conversely, some uneconomic mines may continue to operate, particularly those that are vertically integrated with steel mills or located inland with lower transport costs to nearby steel mills.

**Figure 4.4: China’s iron ore imports and production**

![Graph showing iron ore production and imports from 2013 to 2019 for Australia, Brazil, Rest of World, and Total Imports.](image)

**Notes:** China’s iron ore production is quality adjusted.

---

**India set to become a net importer of iron ore in 2019**

Indian consumption of iron ore is expected to exceed domestic production marginally in 2019, and by over 5 million tonnes in 2020, making India a net importer of iron ore.

India’s iron ore production is forecast to decline to 175 million tonnes in 2018. The decline will be driven by the cancellation of mining permits (representing 20 million tonnes of predominantly low-grade iron ore, mostly exported to China) in Goa, due to renewal issues. India’s iron ore production is forecast to reach 197 million tonnes in 2020, underpinned by rapidly growing demand from the domestic steel industry.

**World export volumes forecast to rise, primarily from Brazil**

The seaborne iron ore market is forecast to be well-supplied in the short term, with world iron ore exports forecast to grow by 4.3 per cent and 1.9 per cent in 2018 and 2019, respectively.

Exports from Brazil are forecast to grow by 4.1 per cent and 7.8 per cent over the same period, as Vale’s S11D project at the Carajás complex ramps up production to 400 million tonnes by 2019. Anglo American’s Minas-Rio expansion is also expected to reach full capacity of 26.5 million tonnes by 2020. Settlement negotiations concerning the Samarco mine in Brazil over civil claims totalling near US$48 billion were extended over June 2018. The mine has been closed since the tailings dam burst in November 2015 but could return to production by 2019 if environmental licenses can be obtained.

Australia is also expected to contribute to export growth over the short term, as Rio Tinto and BHP continue to ramp up towards record production levels. BHP is expected to expand capacity at its Port Headland operations to reach 290 million tonnes by mid-2019. In May, Fortescue Metals approved the development of their Eliwana mine in the Pilbara region of Western Australia, expected to produce 30 million tonnes annually commencing in 2020. World export growth is forecast to rise by 0.5 per cent to 1,660 million tonnes in 2020, as Australia and Brazil benefit from the ramp up in production at new mines and expansions.
4.4 Australia

Australia’s iron ore export volumes continue to grow

Australia’s iron ore export volumes grew by 3.4 per cent to 199 million tonnes in the March 2018 quarter. Growth was led by productivity improvements at Rio Tinto’s Pilbara operations and the ramp of its recently commissioned Silvergrass iron ore mine, as well as improved rail performance at BHP’s operations.

Export volumes are estimated to have grown by 3.4 per cent in 2017–18 to 846 million tonnes, driven by the ramp up of Silvergrass and improvements to rail infrastructure. This is expected to offset lower production from BHP, which downgraded their guidance by 4.5 million tonnes to 237 million tonnes for 2017–18, reflecting train reliability issues.

Volumes are expected to increase by 3.5 per cent to 876 million tonnes in 2018–19 and a further 1.3 per cent to 887 million tonnes in 2019–20, marking the end of major expansions and additions. Higher volumes will be driven by productivity improvements and replacement mines at Rio Tinto and BHP’s operations — as they attempt to reach their long-term production targets — as well as the commissioning and ramp up of some smaller projects, including Mount Gibson Iron’s Koolan Island. Higher volumes will be partly offset by the closure of some mines due to depletion, and the announced cessation of production at Cliff’s Koolyanobbing mine in late 2018.

Two large scale projects in the pipeline beyond the current outlook include Fortescue’s Eliwana and BHP’s South Flank projects. Both are expected to commence production in 2020–21, and produce 30 million and 80 million tonnes annually, respectively, with south flank to replace the existing production of Yandi as it ramps down by 2022.

Australia’s iron ore export earnings to be weighed down by lower prices

Despite high production and export volumes, lower prices saw export earnings decrease to $15 billion in the March quarter 2018, down 14 per cent year-on-year.

Australia’s iron ore export values are estimated to have declined by 1.2 per cent in 2017–18 to $62 billion, as lower prices offset growth in export volumes. Export values are forecast to decline noticeably in 2018–19 and 2019–20, falling by 6.7 and 4.0 per cent, respectively. Declining export earnings will be driven lower by iron ore prices.

Revisions to export earnings

Australia’s iron ore export earnings in 2017–18 have been revised down by $3.5 billion. The revision reflects lower than expected iron ore prices and production coupled with higher domestic consumption — Australian steel production rose by 11 per cent year-on-year in the March quarter.

Iron ore exploration expenditure decreased in the December 2017 quarter

Australia’s iron ore exploration expenditure totalled $50 million in the March 2018 quarter, a decline of 6.4 per cent year-on-year. Iron ore exploration expenditure is likely to have largely bottomed out, with ongoing investment increasingly needed to replace depleting reserves.

Figure 4.5: Australia’s iron ore export volumes and values

![Graph showing iron ore export volumes and values](source: ABS (2018) International Trade, Australia, 5454.0; Department of Industry, Innovation and Science (2018))
## Table 4.1: World trade in iron ore

<table>
<thead>
<tr>
<th></th>
<th>Million tonnes</th>
<th>Annual percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2017(^a)</td>
<td>2018(^f)</td>
</tr>
<tr>
<td>Total world trade</td>
<td>1,554</td>
<td>1,621</td>
</tr>
<tr>
<td><strong>Iron ore imports</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European Union 28</td>
<td>144</td>
<td>157</td>
</tr>
<tr>
<td>Japan</td>
<td>127</td>
<td>131</td>
</tr>
<tr>
<td>China</td>
<td>1,075</td>
<td>1,093</td>
</tr>
<tr>
<td>South Korea</td>
<td>72</td>
<td>76</td>
</tr>
<tr>
<td>India</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td><strong>Iron ore exports</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>827</td>
<td>860</td>
</tr>
<tr>
<td>Brazil</td>
<td>384</td>
<td>399</td>
</tr>
<tr>
<td>India</td>
<td>29</td>
<td>11</td>
</tr>
<tr>
<td>Ukraine</td>
<td>33</td>
<td>32</td>
</tr>
</tbody>
</table>

Notes: \(^a\) Estimate; \(^f\) Forecast.
Source: World Steel Association (2018); International Trade Centre (2018); Department of Industry, Innovation and Science (2018)
Table 4.2: Iron ore outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2017</th>
<th>2018f</th>
<th>2019f</th>
<th>2020f</th>
<th>2018f</th>
<th>2019f</th>
<th>2020f</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pricesbc</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– nominal</td>
<td>US$/t</td>
<td>64.0</td>
<td>59.4</td>
<td>51.1</td>
<td>51.0</td>
<td>–7.2</td>
<td>–14.0</td>
<td>–0.1</td>
</tr>
<tr>
<td>– reald</td>
<td>US$/t</td>
<td>65.5</td>
<td>59.4</td>
<td>50.0</td>
<td>49.0</td>
<td>–9.3</td>
<td>–15.9</td>
<td>–2.0</td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Steelhs</td>
<td>Mt</td>
<td>5.35</td>
<td>5.40</td>
<td>5.40</td>
<td>5.40</td>
<td>1.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>– Iron ore</td>
<td>Mt</td>
<td>872.5</td>
<td>896.2</td>
<td>916.5</td>
<td>927.8</td>
<td>2.7</td>
<td>2.3</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Exports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steel</td>
<td>Mt</td>
<td>1.00</td>
<td>0.88</td>
<td>0.93</td>
<td>0.93</td>
<td>–12.2</td>
<td>5.8</td>
<td>0.0</td>
</tr>
<tr>
<td>– nominal value</td>
<td>A$m</td>
<td>875</td>
<td>788</td>
<td>701</td>
<td>701</td>
<td>–9.9</td>
<td>–11.0</td>
<td>0.0</td>
</tr>
<tr>
<td>– real valueli</td>
<td>A$m</td>
<td>892</td>
<td>788</td>
<td>685</td>
<td>669</td>
<td>–11.6</td>
<td>–13.1</td>
<td>–2.3</td>
</tr>
<tr>
<td>Iron ore</td>
<td>Mt</td>
<td>817.9</td>
<td>845.8</td>
<td>875.7</td>
<td>886.9</td>
<td>3.4</td>
<td>3.5</td>
<td>1.3</td>
</tr>
<tr>
<td>– nominal value</td>
<td>A$m</td>
<td>62,617</td>
<td>61,844</td>
<td>57,730</td>
<td>55,437</td>
<td>–1.2</td>
<td>–6.7</td>
<td>–4.0</td>
</tr>
<tr>
<td>– real valueli</td>
<td>A$m</td>
<td>63,844</td>
<td>61,844</td>
<td>56,405</td>
<td>52,921</td>
<td>–3.1</td>
<td>–8.8</td>
<td>–6.2</td>
</tr>
</tbody>
</table>

Notes: b fob Australian basis; c Spot price, 62 per cent iron content basis; d In 2018 US dollars; h Crude steel equivalent; Crude steel is defined as the first solid state of production after melting. In ABS Australian Harmonized Export Commodity Classification, crude steel equivalent includes most items from 7206 to 7307, excluding ferrous waste and scrap and ferroalloys; i In 2017–18 Australian dollars; f Forecast; s Estimate.

Metallurgical Coal
Resources and Energy Quarterly June 2018

Australia is the largest exporter of metallurgical coal. Australia accounts for around 17% of world production.

About 800kg of metallurgical coal is needed per every tonne of steel produced.

Metallurgical coal is a non-substitutable raw material in the production of steel from iron ore.

There is more than 200 million tonnes of metallurgical coal in every wind turbine.

177 million tonnes exported in 2016–17 valued at $35 billion.

Australia’s metallurgical coal key export destinations, 2016–17:

- Taiwan: 5%
- Other: 14%
- Japan: 20%
- China: 22%
- India: 24%
- South Korea: 10%
- Netherlands: 5% (shared with South Korea)

Share of world metallurgical coal exports, 2017:

- Australia: 54%
- USA: 16%
- Canada: 9%
- Mongolia: 8%
- Russia: 6%
- Other: 7%

Share of world metallurgical coal imports, 2017:

- Japan: 25%
- China: 24%
- India: 17%
- South Korea: 17%
- European Union: 14%
- Taiwan: 2%
- Rest of the world: 15%
5.1 Summary

- The metallurgical coal spot price is forecast to decline from an average of US$193 a tonne in 2018 to US$148 a tonne in 2020, with the impacts of improved supply combined with weakening demand from China expected to outweigh growing demand from India.
- Australia’s export volumes are forecast to grow from 182 million tonnes in 2017–18 to 200 million tonnes in 2019–20, reflecting a recovery after Cyclone Debbie in 2017, and modest growth from new capacity.
- Australia’s metallurgical coal export earnings are expected to have reached a record $38 billion in 2017–18. Earnings are forecast to decline to $32 billion in 2019–20, as lower prices offset rising export volumes.

5.2 Prices

Metallurgical coal price forecast to ease

The premium hard coking coal (HCC) spot price (FOB Australia) averaged US$191 a tonne in the June quarter. Spot prices for metallurgical coal declined sharply from mid-March to late-April, as a result of subdued import demand from China. A subsequent rebound in demand from Asia and concerns over supply shortages has provided price support, with the spot price returning to over US$200 a tonne in mid-June.

The premium HCC spot price is forecast to steadily decline over the outlook period, from an average of US$193 a tonne in 2018 to US$148 a tonne in 2020, weighed down by softening demand from China. Softer demand from China is expected to be underpinned by a gradual decline in steel output. Nevertheless, growing demand elsewhere in the world, particularly India, and relatively constrained growth in global supply, are expected to provide some support to prices, which are expected to remain well above the lows of 2016.

The departure away from bilateral negotiations of the quarterly benchmark price for premium HCC towards the adoption of spot price indexation has continued in 2018. This reflects the broader trend of an evolving market, with growing spot market activity, the adoption of price benchmarks, and the growing use of derivatives.
5.3 World trade

The first half of 2018 saw a continuation of the pickup in global economic growth and industrial production which has supported global steel output and thus demand for metallurgical coal. At the same time, Australia’s exports of metallurgical coal have been constrained by weather, industrial and transport disruptions. Major importers have been increasingly turning to alternative sources of supply, with notable increases in exports from the United States and Canada. Export growth from these countries are expected to slow as prices soften and Australia’s supply normalises.

World trade in metallurgical coal is forecast to grow by 5.1 per cent in 2018 to 334 million tonnes — driven by a recovery in Australian exports and strong global steel output — before growth slows to 2.7 per cent in 2019 and to 0.9 per cent 2020. Australia is forecast to account for 58 per cent of the seaborne market at the end of the outlook period, a small decline from 60 per cent in 2016, but up from an estimated 54 per cent in 2017.

World imports

China’s metallurgical coal imports forecast to gradually decline

China’s metallurgical coal imports declined by 35 per cent year-on-year in the year to April, despite steel production growing over the same period. Import demand for metallurgical coal has been weighed down by high seaborne metallurgical coal prices, which has encouraged steel producers to draw down on stocks or use more competitively priced domestic coal. Metallurgical coal demand may have also been affected by the growing use of higher quality iron ore in China’s steel mills, which allows the same volume of output to be produced with fewer coal inputs.

China’s imports of metallurgical coal are expected to recover briefly, on the back of accelerating steel production growth. However, beyond 2018 imports are forecast to follow a gradual downwards trajectory, underpinned by a slow decline in steel output and the use of high grade iron ore.

India to become the world’s largest importer of metallurgical coal by 2020

There has been strong growth in India’s imports of metallurgical coal in the year to date, driven by the ongoing expansion of India’s steel sector. India imported 11 million tonnes of metallurgical coal from Australia in the March quarter, an increase of 22 per cent year-on-year, while imports from North America grew by 146 per cent to 2.5 million tonnes. India’s steel mills have turned to North America (particularly the United States) as an alternative source of supply after weather-related supply disruptions in Australia. Growth in imports from the North American region is expected to soften as prices decline and supply from Australia normalises.

India’s imports of metallurgical coal are set to grow steadily over the outlook period, driven by demand from its rapidly growing steel sector. India has only limited domestic production of metallurgical coal, and is forecast to overtake China as the world’s largest importer of metallurgical coal by 2020, when imports are forecast to reach 69 million tonnes.

Figure 5.3: Monthly Asian imports vs Australian exports

Source: IHS (2018)
Japan and South Korea’s imports of metallurgical coal to grow modestly

Japan’s imports of metallurgical coal declined by 7.7 per cent year-on-year in the March quarter, before rebounding in April, growing by 10 per cent year-on-year. Japan’s imports of metallurgical coal are forecast to grow modestly over the outlook period, with Japan’s steel sector expected to be supported by a rebound in capital expenditure, export growth in the automobile and manufacturing sectors, and demand from 2020 Olympics-related projects. However, the US steel tariffs, from which Japan is not exempt, presents a risk to the outlook.

South Korea’s imports of metallurgical coal declined by 2.2 per cent year-on-year in the March quarter, before a subsequent rebound in April of 10 per cent year-on-year. South Korea’s imports of metallurgical coal are forecast to grow modestly, with its steel sector buoyed by growing domestic demand and rising exports.

World exports

United States exports to hold some of their recent gains

Metallurgical coal exports from the United States have continued to grow in early 2018, with an increase of 22 per cent year-on-year in the March quarter. Export growth has been driven by high prices and disruptions to Australian supply, which has resulted in Asian countries diversifying their sources of supply. Notably, exports of metallurgical coal from the United States to India tripled year-on-year in the March quarter of 2018, and grew by a robust 71 per cent to Japan over the same period.

Exports of metallurgical coal from the United States are forecast to ease over the outlook period, as softening metallurgical coal prices make some of the higher cost operations uneconomic. Nevertheless, the United States is expected to hold some of its gains in the seaborne metallurgical coal market in the short-term. The US Energy Information Administration is forecasting exports to decline from 2017 volumes, but remain higher than 2016 export volumes of 37 million tonnes. In 2017, higher volumes were driven by the gap in the market left by the impact of Cyclone Debbie.

Russia’s exports are forecast to modestly increase

Russia’s metallurgical coal exports are forecast to grow modestly over the outlook period, supported by increased sales to the Asian market. As the country’s reserves of metallurgical coal are not as extensive as its reserves of thermal coal, Russia’s ability to capture substantial market share is expected to be limited over the outlook period.

Mongolia’s exports hampered by bottlenecks at the China border

Mongolia’s exports of metallurgical coal declined by 27 per cent year-on-year in the March quarter of 2018. Exports to China — its primary trading partner for metallurgical coal — continued to be affected by ongoing transportation bottlenecks at the border, as the customs authorities implemented new policies to address the smuggling of other products. The planned construction of a new route should relieve congestion pressures. In the meantime, exports are forecast to remain subdued over the outlook period.

Figure 5.4: Annual change in world metallurgical exports

Source: IEA (2018); Department of Industry, Innovation and Science (2018)
5.4 Australia

Metallurgical coal exports likely to have reached a record high in 2017–18
Australia’s exports of metallurgical coal declined by 5.8 per cent year-on-year to $9.4 billion in the March quarter of 2018. Despite higher spot prices, export earnings were weighed down by lower contract prices. Export earnings were also affected by flat export volumes — while output grew by 6.7 per cent year-on-year to 49 million tonnes in the March quarter, exports were affected by weather-related disruptions and rail and port maintenance work. Australia’s metallurgical coal export earnings are estimated to have reached $38 billion in 2017–18, an increase of 6.2 per cent and a record high (in nominal terms). Higher export earnings reflect both higher average prices and higher production and export volumes.

Metallurgical coal export earnings are forecast to decline by 5.7 per cent to $35 billion in 2018–19, and by a further 11 per cent to $32 billion in 2019–20. A forecast rise in production and export volumes (supported by the ramp up of QCoal’s Byerwen mine and BHP’s Blackwater and Caval Ridge Southern Circuit projects) is expected to be more than offset by the impact of a forecast decline in prices.

Potential capacity losses from proposed changes to the maintenance schedule of Aurizon, the rail network operator of the Central Queensland Coal Network (CQCN), due to enforced cuts to its revenue, present a risk to the outlook. In September, the Queensland Competition Authority is expected to make a final decision on whether Aurizon will need to charge $1 billion less for maintenance than it asked for over the next four years. Aurizon may also have to trim, by $100 million annually, charges to coal miners for operating and maintaining the four-network CQCN system.

Minor downwards revision to export earnings for 2017–18
Export earnings for 2017–18 have been revised down by $2.7 billion from the March 2018 edition of the Resources and Energy Quarterly. The revision reflects lower than expected spot prices and export volumes in the March and June quarters of 2018. Forecasts for 2018–19 and 2019–20 are broadly unchanged from the March 2018 forecasts.
Table 5.1: World trade in metallurgical coal

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>2017\textsuperscript{s}</th>
<th>2018\textsuperscript{f}</th>
<th>2019\textsuperscript{f}</th>
<th>2020\textsuperscript{f}</th>
<th>Annual percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>World trade</td>
<td>Mt</td>
<td>318</td>
<td>334</td>
<td>343</td>
<td>346</td>
<td>5.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metallurgical coal imports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European Union 28</td>
<td>Mt</td>
<td>41</td>
<td>44</td>
<td>46</td>
<td>47</td>
<td>9.0</td>
</tr>
<tr>
<td>Japan</td>
<td>Mt</td>
<td>50</td>
<td>51</td>
<td>51</td>
<td>52</td>
<td>0.5</td>
</tr>
<tr>
<td>South Korea</td>
<td>Mt</td>
<td>32</td>
<td>36</td>
<td>37</td>
<td>37</td>
<td>14.5</td>
</tr>
<tr>
<td>China</td>
<td>Mt</td>
<td>70</td>
<td>68</td>
<td>68</td>
<td>68</td>
<td>–2.5</td>
</tr>
<tr>
<td>India</td>
<td>Mt</td>
<td>48</td>
<td>58</td>
<td>63</td>
<td>69</td>
<td>19.8</td>
</tr>
<tr>
<td>Metallurgical coal exports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>Mt</td>
<td>173</td>
<td>189</td>
<td>199</td>
<td>201</td>
<td>9.5</td>
</tr>
<tr>
<td>Canada</td>
<td>Mt</td>
<td>28</td>
<td>26</td>
<td>27</td>
<td>27</td>
<td>–7.3</td>
</tr>
<tr>
<td>United States</td>
<td>Mt</td>
<td>50</td>
<td>50</td>
<td>46</td>
<td>45</td>
<td>–1.3</td>
</tr>
<tr>
<td>Russia</td>
<td>Mt</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Notes: \textsuperscript{s} Estimate. \textsuperscript{f} Forecast.
Source: IHS (2018); Department of Industry, Innovation and Science (2018)
### Table 5.2: Metallurgical coal outlook

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contract prices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– nominal</td>
<td></td>
<td>US$/t</td>
<td>210.1</td>
<td>197.6</td>
<td>156.8</td>
<td>147.9</td>
<td>–6.0</td>
<td>–20.6</td>
<td>–5.7</td>
</tr>
<tr>
<td>– real&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td>US$/t</td>
<td>215.1</td>
<td>197.6</td>
<td>153.5</td>
<td>142.0</td>
<td>–8.1</td>
<td>–22.3</td>
<td>–7.4</td>
</tr>
<tr>
<td><strong>Spot prices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– nominal</td>
<td></td>
<td>US$/t</td>
<td>189.5</td>
<td>192.7</td>
<td>154.9</td>
<td>147.7</td>
<td>1.7</td>
<td>–19.6</td>
<td>–4.6</td>
</tr>
<tr>
<td>– real&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td>US$/t</td>
<td>194.0</td>
<td>192.7</td>
<td>151.6</td>
<td>141.9</td>
<td>–0.6</td>
<td>–21.3</td>
<td>–6.4</td>
</tr>
<tr>
<td><strong>World production</strong></td>
<td></td>
<td>Mt</td>
<td>1,102</td>
<td>1,124</td>
<td>1,120</td>
<td>1,112</td>
<td>2.0</td>
<td>–0.4</td>
<td>–0.7</td>
</tr>
<tr>
<td><strong>World consumption</strong></td>
<td></td>
<td>Mt</td>
<td>1,076</td>
<td>1,091</td>
<td>1,092</td>
<td>1,088</td>
<td>1.4</td>
<td>0.0</td>
<td>–0.3</td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td>Mt</td>
<td>184.0</td>
<td>187.7</td>
<td>204.6</td>
<td>207.1</td>
<td>2.0</td>
<td>9.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Export volume</td>
<td></td>
<td>Mt</td>
<td>177.2</td>
<td>181.5</td>
<td>197.8</td>
<td>200.3</td>
<td>2.4</td>
<td>9.0</td>
<td>1.3</td>
</tr>
<tr>
<td>– nominal value&lt;sup&gt;e&lt;/sup&gt;</td>
<td>A$m</td>
<td>35,335</td>
<td>37,521</td>
<td>35,401</td>
<td>31,577</td>
<td>6.2</td>
<td>–5.7</td>
<td>–10.8</td>
<td></td>
</tr>
<tr>
<td>– real value&lt;sup&gt;i&lt;/sup&gt;</td>
<td>A$m</td>
<td>36,027</td>
<td>37,521</td>
<td>34,588</td>
<td>30,143</td>
<td>4.1</td>
<td>7.8</td>
<td>12.9</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**<br>
<sup>d</sup> In 2018 US dollars. <sup>e</sup> Contract price assessment for high-quality hard coking coal. <sup>i</sup> In 2017–18 Australian dollars. <sup>f</sup> forecast. <sup>g</sup> Hard coking coal fob Australia east coast ports.

**Source:** ABS (2018) International Trade in Goods and Services, Australia, 5368.0; Department of Industry, Innovation and Science (2018); IHS (2018)
Australia exported 202 million tonnes of thermal coal in 2016–17, valued at $19 billion.

79% of Australia’s thermal coal is exported.

1 tonne of coal powers the average Australian household for approximately 4 months.

Australian thermal coal (key export destinations), 2016–17

- Japan: 41%
- China: 21%
- South Korea: 14%
- Taiwan: 13%
- Malaysia: 3%
- India: 2%
- Other: 6%
6.1 Summary

- Thermal coal prices have been supported by strong demand from Asia and constrained supply. However with the recent market tightness coming from largely transitory factors, the spot price is forecast to fall from an average of US$99 a tonne in 2018 to US$74 a tonne in 2020.

- Australia’s thermal coal export earnings are estimated to have reached a record $23 billion in 2017–18, driven by high prices. Export values are forecast to decline to $19 billion in 2019–20, as a result of lower prices and broadly flat export volumes, at around 200 million tonnes.

6.2 Prices

Strong demand pushes prices higher

The Newcastle benchmark spot price averaged US$104 a tonne in the June quarter, retracing the sharp fall in March with a strong rally throughout April to June. The spot price has been buoyed by a tighter market, with limited growth in supply combining with strong demand from Asia. Import demand from China has been supported by hotter than average temperatures, weak hydro power output, and limited growth in domestic supply. South Korea’s imports have also increased as a result of a substantial drop in nuclear power output. Supply in South Africa has been diverted to domestic power-generating facilities, impacting exports.

The spot price is forecast to remain well supported over the next few months, as a result of a relatively tight market. However, with most of the contributing factors expected to be temporary, the price is forecast to decline from late 2018, to average US$74 a tonne in 2020 as import demand growth slows relative to supply. Both China and India are expected to increase domestic thermal coal output.

Negotiations between Glencore and Japan’s Tohuku Electric to set the price for a thermal coal supply contract for the 2018–19 Japanese financial year (JFY 2018 to March 2019) have ended without a settlement, 3 months after the official deadline of 1 April. Prices may now need to be settled by an alternative method, such as an index basis (as for metallurgical coal for the past year).
6.3  World trade

World thermal coal markets have tightened in recent months on a combination of factors, including strong demand across Asia and constrained supply growth. World trade in thermal coal is forecast to remain broadly steady in 2018 at 1.06 billion tonnes, before modestly declining to 1.04 billion tonnes in 2020, underpinned by growing domestic supply in both China and India, and a gradual shift away from coal-fired power generation in most industrialised countries.

World imports

Government policy continues to drive the outlook for China’s coal markets. China’s imports of thermal coal surged in the first three months of the year, to be up 26 per cent year-on-year. There has been strong demand for coal-fired power, due to hotter than usual weather and low reservoir levels, which have constrained hydro power output. Coal output has also been subdued as a result of environmental checks and rail maintenance.

Figure 6.3: China’s power output, year-on-year change

China’s imports of thermal coal are forecast to remain solid over the next few months, before declining over the rest of the outlook period, easing from 188 million tonnes in 2017 to 171 million tonnes in 2020. Higher domestic coal output is expected to substitute for imports. Despite ongoing capacity cuts, the addition of new capacity is expected to result in a net increase in output.

Policy changes have continued to drive China’s coal markets, and remain the key risk underpinning the outlook for thermal coal imports. Recent policies include the sporadic banning of imports of coal to certain ports, and a suite of measures to cool domestic thermal coal markets, which could drive a gradual shift away from imports. These measures include targeting domestic spot prices at below RMB570 (around US$90) a tonne, boosting supply under long-term contracts to 200–300 million tonnes, and increasing supply from the key thermal coal-producing provinces of Shanxi, Inner Mongolia and Shaanxi by 250 million tonnes this year.

India’s thermal coal imports forecast to grow modestly

India’s thermal coal imports grew by 22 per cent year-on-year in the first three months of 2018, before declining by 6.5 per cent in April as a result of a government directive to divert Coal India’s supply to utilities. India’s imports of thermal coal are forecast to grow marginally over the outlook period, as growth in consumption outpaces domestic supply growth. The expansion of the domestic coal industry still faces a range of infrastructure, regulatory and environmental challenges. However, government policy remains focused on self-sufficiency, with recent policy changes allowing private companies (rather than only state-owned mines) to commercially mine coal. Higher than expected production from the domestic coal industry and the possibility of further measures to encourage higher domestic production could weigh on import demand.

Coal will continue to be a key source of power in Japan

Japan’s imports of thermal coal remained broadly steady year-on-year over the first four months of 2018. Japan’s thermal coal imports are forecast to rise slightly in the second half of 2018, but fall modestly in 2019 and 2020 as nuclear reactors restart.
Japan’s Ministry of Economy, Trade and Industry (METI) released a draft update to the Basic Energy Plan in May 2018. The plan has retained the 2030 target energy mix from the previous plan (released in 2014), with coal to account for 26 per cent of power generation in 2030. The target implies a small reduction in coal’s share of power generation from 2017 levels of 31 per cent, but nevertheless, reflects an ongoing dependence on coal as a key source of low-cost, stable base-load power in Japan.

South Korea’s proposed cap on sulphur may change sources of imports
South Korea’s thermal coal imports declined by 3.5 per cent year-on-year in the March quarter of 2018, before a 22 per cent year-on-year jump in April. There has been a substantial rise in coal-fired power generation as a result of a drop in nuclear power output, with 11 of 24 of South Korea’s nuclear reactors offline due to outages and maintenance. South Korea’s imports of thermal coal are forecast to gradually decline over the outlook period, as a result of broader government efforts to shift away from coal-fired power generation.

There has been a proposed restriction on the sulphur content of coal imports of 0.4 per cent, which has the potential to change market dynamics. However, there remains some uncertainty regarding the details of the policy. The new restriction may result in a shift away from Australian thermal coal, which is high energy, but has higher average sulphur content than coal from Russia, Indonesia and South Africa.

World exports
Indonesia’s coal exports forecast to remain broadly steady
Indonesia’s coal exports have been affected by adverse weather conditions affecting loading and production. Exports are forecast to remain broadly steady over the outlook period, with production growth constrained by a shortage of equipment. The outlook for Indonesia’s coal exports is subject to some uncertainty, as the government seeks to balance security of supply for its growing coal-fired power generation fleet (from example, through setting a domestic price cap) against the risk of dampening incentives for further growth in exploration and investment activity.

Russian exports are set to continue their recent strength
Russia’s thermal coal exports grew by 13 per cent year-on-year in the March quarter of 2018. Thermal coal export growth is set to continue, supported by growing sales to the Asian market and the weak Ruble.

South Africa’s export growth constrained by a range of issues
South Africa’s exports of thermal coal have declined in recent months, as a result of strong domestic demand, shortages at Eskom (the state-owned major power utility), and a range of production, transport, equipment and weather issues. South Africa’s thermal coal exports are forecast to be flat over the forecast period, as some of these issues continue to constrain supply growth.

Thermal coal exports from the United States are forecast to drift lower
Thermal coal exports from the United States increased by 22 per cent in the first three months of 2018, driven by higher prices and strong demand. The US Energy Information Administration is forecasting a decline in thermal coal exports over the next two years, as prices decline.

Figure 6.4: Thermal coal exports

Source: IEA (2017); Department of Industry, Innovation and Science (2018)
6.4 Australia

Thermal coal export earnings likely to reach a record high in 2017–18

In the March quarter 2018, thermal coal export earnings increased by 13 per cent year-on-year to $5.5 billion, as higher prices more than offset a minor decline in production and export volumes — which were temporarily affected by weather and transport issues.

High prices are estimated to have driven Australia’s thermal coal export earnings to a record high $23 billion in 2017–18 — an increase of 20 per cent from the previous financial year.

The outlook for Australia’s thermal coal exports is broadly unchanged from the March 2018 Resources and Energy Quarterly. Australia’s export earnings are forecast to remain broadly steady at $23 billion in 2018–19, and then decline by 14 per cent to $19 billion in 2019–20.

The sharp decline in 2019–20 export earnings will be the result of a forecast decline in prices, which is expected to more than offset the impact of minor growth in the volume of thermal coal exports.

The only substantial addition to production over the outlook period is MACH Energy’s Mount Pleasant mine, which is expected to commence operations later in 2018 and gradually ramp up to 7.5 million tonnes of output annually.

Coal exploration expenditure may have bottomed out

Australia’s coal exploration expenditure was $36 million in the March quarter of 2018, a decrease of 6.7 per cent from the December quarter of 2017, but an increase of 52 per cent year-on-year.

There are firmer prospects for a modest recovery in coal exploration, on the back of the recent improvement in market conditions. In May 2018, the Queensland Government called for tenders to explore more than 540 square kilometres in the Bowen, Surat and Galilee Basins for coal, which is likely to support further growth in exploration activity.
Table 6.1: World trade in thermal coal

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>2017&lt;sup&gt;s&lt;/sup&gt;</th>
<th>2018&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2019&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2020&lt;sup&gt;f&lt;/sup&gt;</th>
<th>Annual percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2018&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>World trade</td>
<td>Mt</td>
<td>1,058</td>
<td>1,058</td>
<td>1,046</td>
<td>1,036</td>
<td>–0.1</td>
</tr>
<tr>
<td>Thermal coal imports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asia</td>
<td>Mt</td>
<td>761</td>
<td>790</td>
<td>785</td>
<td>774</td>
<td>3.9</td>
</tr>
<tr>
<td>China</td>
<td>Mt</td>
<td>188</td>
<td>186</td>
<td>178</td>
<td>171</td>
<td>–1.2</td>
</tr>
<tr>
<td>India</td>
<td>Mt</td>
<td>152</td>
<td>160</td>
<td>162</td>
<td>164</td>
<td>5.1</td>
</tr>
<tr>
<td>Japan</td>
<td>Mt</td>
<td>142</td>
<td>146</td>
<td>144</td>
<td>143</td>
<td>2.8</td>
</tr>
<tr>
<td>South Korea</td>
<td>Mt</td>
<td>110</td>
<td>116</td>
<td>110</td>
<td>105</td>
<td>5.5</td>
</tr>
<tr>
<td>Thermal coal exports</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>Mt</td>
<td>200</td>
<td>197</td>
<td>200</td>
<td>202</td>
<td>–1.8</td>
</tr>
<tr>
<td>Colombia</td>
<td>Mt</td>
<td>82</td>
<td>80</td>
<td>81</td>
<td>83</td>
<td>–3.0</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Mt</td>
<td>374</td>
<td>377</td>
<td>371</td>
<td>367</td>
<td>0.6</td>
</tr>
<tr>
<td>Russia</td>
<td>Mt</td>
<td>151</td>
<td>154</td>
<td>156</td>
<td>160</td>
<td>1.8</td>
</tr>
<tr>
<td>South Africa</td>
<td>Mt</td>
<td>76</td>
<td>76</td>
<td>77</td>
<td>77</td>
<td>–0.2</td>
</tr>
<tr>
<td>United States</td>
<td>Mt</td>
<td>33</td>
<td>50</td>
<td>49</td>
<td>47</td>
<td>50.3</td>
</tr>
</tbody>
</table>

Notes: <sup>f</sup> forecast; <sup>s</sup> estimate

Source: IHS (2018); Department of Industry, Innovation and Science (2018)
Table 6.2: Thermal coal outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2017</th>
<th>2018&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2019&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2020&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2018&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2019&lt;sup&gt;f&lt;/sup&gt;</th>
<th>2020&lt;sup&gt;f&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contract prices</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– nominal</td>
<td>US$/t</td>
<td>84</td>
<td>97</td>
<td>84</td>
<td>74</td>
<td>15.5</td>
<td>–13.4</td>
<td>–11.9</td>
</tr>
<tr>
<td>– real&lt;sup&gt;e&lt;/sup&gt;</td>
<td>US$/t</td>
<td>86</td>
<td>97</td>
<td>82</td>
<td>71</td>
<td>13.3</td>
<td>–15.4</td>
<td>–13.9</td>
</tr>
<tr>
<td><strong>Spot prices</strong>&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– nominal</td>
<td>US$/t</td>
<td>88</td>
<td>99</td>
<td>84</td>
<td>74</td>
<td>13.6</td>
<td>–16.1</td>
<td>–11.4</td>
</tr>
<tr>
<td>– real&lt;sup&gt;e&lt;/sup&gt;</td>
<td>US$/t</td>
<td>90</td>
<td>99</td>
<td>82</td>
<td>71</td>
<td>11.0</td>
<td>–17.9</td>
<td>–13.0</td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>Mt</td>
<td>254.2</td>
<td>254.8</td>
<td>251.4</td>
<td>254.6</td>
<td>0.2</td>
<td>–1.3</td>
<td>1.3</td>
</tr>
<tr>
<td>Export volume</td>
<td>Mt</td>
<td>201.7</td>
<td>200.5</td>
<td>198.7</td>
<td>201.2</td>
<td>–0.6</td>
<td>–0.9</td>
<td>1.3</td>
</tr>
<tr>
<td>– nominal value</td>
<td>A$m</td>
<td>18,902</td>
<td>22,710</td>
<td>22,667</td>
<td>19,465</td>
<td>20.2</td>
<td>–0.2</td>
<td>–14.1</td>
</tr>
<tr>
<td>– real value&lt;sup&gt;h&lt;/sup&gt;</td>
<td>A$m</td>
<td>19,272</td>
<td>22,710</td>
<td>22,147</td>
<td>18,581</td>
<td>17.8</td>
<td>–2.5</td>
<td>–16.1</td>
</tr>
</tbody>
</table>

Notes: b Japanese Fiscal Year (JFY), starting April 1, fob Australia basis. Australia–Japan average contract price assessment for steaming coal with a calorific value of 6700 kcal/kg gross air dried; c In current JFY US dollars; d fob Newcastle 6000Kcal; e In 2018 US dollars; f forecast; h In 2017–18 Australian dollars

Source: ABS (2018) International Trade in Goods and Services, Australia, Cat. No. 5368.0; IHS (2018); NSW Coal Services (2018); Queensland Department of Natural Resources and Mines (2018); Company Reports; Department of Industry, Innovation and Science (2018)
Gas

Resources and Energy Quarterly June 2018

LNG is natural gas cooled to −162°C

2nd largest LNG exporter in the world

52 million tonnes

41% rise from 2015–16 export volumes

Combined nameplate capacity of Australia’s 10 LNG projects is 88 million tonnes per annum

Australia’s LNG key export destinations, 2016–17

- 48% Japan
- 29% China
- 11% South Korea
- 7% Singapore
- 3% India
- 3% Rest of the world

Most Australian LNG is sold on oil-linked contracts

Global share of LNG exports in 2017

- 27% Qatar
- 20% Australia
- 9% Malaysia
- 7% Nigeria
- 6% Indonesia
- 31% Rest of the world

Global share of LNG imports in 2017

- 28% Japan
- 13% South Korea
- 13% China
- 6% India
- 6% Taiwan
- 34% Rest of the world

Australia’s LNG projects and gas basins
7.1 Summary

- The value of Australia’s LNG exports is forecast to increase from $30.8 billion in 2017–18 to $42.4 billion in 2019–20, driven by higher volumes and higher prices. LNG is forecast to overtake metallurgical coal as Australia’s 2nd highest resource export by value in 2018–19.
- The completion of the final three Australian LNG projects by the end of 2018 will underpin the strong growth in export volumes and bring total export capacity to 88 million tonnes. LNG exports are projected to reach 77 million tonnes in 2019–20.
- LNG contract prices — at which most Australian LNG is sold — are projected to increase, in line with oil prices. The average price of Australian LNG is expected to increase to $10.5 a gigajoule in 2019–20, up from $8.1 a gigajoule in 2016–17.
- Spot prices in Asia have recovered from their lows of 2016, but are expected to moderate and then decline, as new capacity enters the global LNG market over 2018 and 2019.

7.2 Prices

LNG contract prices follow oil prices upwards

Oil-linked pricing has been the dominant pricing mechanism in Asia since Japan began importing LNG (in the late 1960s) as a substitute for oil in power generation. Prices in US$ per MMbtu are generally set by applying a scaling factor (of around 14 per cent) to the Japan-Customs-cleared Crude oil price index (JCC) in US$ per barrel, with a lag of three to four months.

The JCC has been increasing steadily from a low of US$41.9 a barrel in 2016 to US$54.1 a barrel in 2017. It is expected to reach an average of US$69.4 a barrel in 2018, before easing to US$65.9 a barrel by 2020. This will support a significant increase in LNG contract prices in the second half of 2018 and into 2019.

On this basis, prices for Australian LNG exports (FOB) are projected to rise from $8.1 a gigajoule in 2016–17 to $10.5 a gigajoule in 2019–20.

US LNG contracts offer an alternative to oil-linked pricing. Prices are indexed to the Henry Hub pricing point in Louisiana, plus shipping and liquefaction tolling fees. The Henry Hub index averaged US$2.49 per MMbtu in 2016 and US$2.96 per MMbtu in 2017. In an environment of rising oil prices, US LNG exports will become increasingly attractive for buyers. However, the limited capacity of the Panama Canal (the fastest route from the US east coast terminals to Asia) could potentially limit growth in US exports to Asia.

Volatile LNG spot prices expected to ease

North East Asia spot prices have recovered from the lows of 2016, and reached seasonal highs of over US$10 per MMbtu (A$12.3 a gigajoule) in the March quarter 2018. The recent peak in spot prices was related to unplanned outages at some overseas LNG plants, and strong winter heating demand in Asia, particularly in China and South Korea.

Figure 7.1: Gas and LNG prices, monthly

Notes: Henry Hub is the US domestic gas reference price.
Source: Argus (2018); Bloomberg (2018)
Spot prices have retreated recently following the passing of the northern hemisphere winter, but seasonal peaks driven by winter heating demand are expected to continue over the forecast period. The combination of rapid demand growth in China, coupled with insufficient facilities for seasonal gas storage, is expected to maintain upward pressure on spot prices during the northern winters.

The North East Asia spot price is expected to trend down over 2018 and 2019, as significant new LNG capacity enters the market from Australia and the US, outpacing growth in global demand. The new US projects offer more flexible contract arrangements than traditional suppliers, creating a more liquid and responsive spot market. The market is not expected to tighten again until after 2020, when supply and demand rebalance.

**Figure 7.2: Domestic and Asian spot prices**

![Graph showing domestic and Asian spot prices]

Note: The domestic price is the average of the Wallumbilla and east coast capital spot prices. Source: Argus (2018); AEMO (2018)

**East coast domestic prices and LNG spot prices**

East coast domestic prices have not followed the sharp movements in LNG spot price netbacks over the last six months. Asian LNG spot prices have more than doubled, rising from $6.84 a gigajoule in July 2017 to $13.93 a gigajoule in January 2018, before falling back to $9.22 a gigajoule in April 2018. However, wholesale spot prices in eastern Australia have been relatively stable, showing a steady decline over 2017 after peaking in the March quarter 2017.

The reasons for this disconnect are unclear, but may include logistical difficulties in arranging spot sales, the difficulties in varying production from coal seam gas fields in response to short term sales opportunities, and low summer demand on the east coast.

### 7.3 World trade

**Strong growth in global demand led by China**

After a period of relatively low growth in the LNG market between 2012 and 2016, world LNG imports grew rapidly at around 10 per cent from 2016 to 2017 to reach approximately 290 million tonnes. About half of this expansion in trade arose from a 40 per cent gain in China’s annual LNG imports, but there was also strong growth in Europe and a number of emerging Asian markets.

Import growth is expected to continue at a similar rate over 2018, before moderating over 2019 and 2020. LNG demand will be increasingly affected by nuclear restarts in Japan, increased pipeline imports into China, and more subdued conditions in emerging markets which are more sensitive to movements in LNG prices. Global trade is expected to reach over 360 million tonnes in 2020, 25 per cent higher than in 2017.

Global LNG liquefaction capacity increased in 2017 — though at a slower rate than demand — as a number of new projects came online in Australia, the US, Malaysia and Russia. Capacity is expected to continue to expand over 2018 and 2019, as the Australian plants currently under construction enter service, and as another four US projects reach completion.

The rapid rate of demand growth over 2017 and 2018 has postponed the arrival of over-capacity in the LNG market. However, given the expected moderation in growth rates after 2018, and the continued expansion of
committed liquefaction capacity, excess capacity is expected to emerge in 2019 and 2020, taking some pressure off spot prices. The market is expected to rebalance after 2020, as demand growth absorbs the available capacity, prompting investment in new supply capacity. This will require final investment decisions (FID) on new projects within the next few years, given the typical 4–5 year period between FID and production.

**Figure 7.3: Global nameplate liquefaction capacity and LNG demand**

This high growth rate is expected to continue over 2018, particularly in emerging Asian markets. Import growth is expected to moderate in subsequent years, as competition from alternative fuels begins to weigh on gas demand, and higher oil prices flow through into higher LNG prices.

**Figure 7.4: LNG import forecasts**

**7.4 World imports**

Global LNG imports to grow rapidly over 2018

Post-Fukushima, global LNG imports grew at a modest annual rate of 2.5 per cent between 2012 and 2016. However, growth accelerated to 10 per cent in 2017, as pent-up demand took advantage of additions to global LNG liquefaction capacity, and buyers responded to low spot and oil-linked LNG prices. Growth in imports came mainly from China and Europe, but there was also a significant expansion in non-traditional Asian markets.

Japanese imports to show a marginal decline

Japan sources almost all its gas from LNG imports, and has been the leading buyer of LNG in the world since the 1970s. Japan's LNG imports were stable over 2016 and 2017, at around 84 million tonnes a year. Demand picked up again in the first three months of 2018, reaching two-year highs. With two thirds of gas demand used in power generation in Japan, the outlook for LNG imports depends heavily on competition from nuclear reactors, coal and renewables.

The main factor affecting the outlook for gas demand is the rate at which moth-balled nuclear reactors are re-commissioned. Seven reactors (out of a total of around 50) had been re-commissioned as of April 2018, and...
there are applications to restart an additional 17. There is considerable uncertainty about the rate and number of restarts, given public opposition and legal challenges. The outlook to 2020 is for only a minor reduction in LNG imports, to around 80 million tonnes. However, there is downside risk to this outlook if oil prices remain high, or if nuclear restarts accelerate.

Modest growth projected for South Korea’s imports

Annual LNG imports to South Korea grew from 34 million tonnes in 2016 to around 38 million tonnes in 2017. Growth was strong over the last six months of 2017 and into 2018. This reflected the seasonal nature of demand in South Korea, with the recent peaks associated with a cold northern hemisphere winter. In conjunction with similar winter spikes in China and Japan, spot prices in north east Asia almost doubled.

Approximately half of South Korea’s gas consumption is used for power generation (although gas provides only 17 per cent of power), and demand is sensitive to competition from nuclear, coal and renewable generation. Outages and safety concerns at a number of nuclear reactors stimulated demand for LNG in 2017, although these reactors are expected to return to service during 2018, putting downward pressure on gas demand.

The long run trend in South Korea’s LNG imports has been relatively stable since 2010, and imports are expected to show only modest growth over the outlook period. As is the case in China, the outlook has upside risk if concerns over air pollution at coal-fired power stations lead to constraints on coal utilisation. The South Korean energy ministry has announced plans to increase the share of natural gas and renewables in power generation, but changes are not likely to take effect until after 2022.

China overtakes South Korea as second largest importer in 2017

China’s imports of 39 million tonnes of LNG in 2017 have slightly edged out South Korea as the world’s second largest LNG importer. Annual growth was over 40 per cent between 2016 and 2017, making up almost half of the growth in global LNG trade. Imports grew strongly from October 2017 into the winter heating season before declining in the March quarter 2018. The surge in demand was caused by a combination of a cold winter and government policies aimed at reducing air pollution in urban areas — by converting from coal to gas for power generation and home heating.

Figure 7.5: Asian LNG imports monthly, 2016–2018

Underground gas storage is used in many countries to balance winter heating peaks with gas stored over the summer (see box 7.1). China plans to increase underground storage capacity, but this is not expected to keep pace with demand growth, and seasonal demand will continue to put pressure on LNG spot prices in the northern winter.

China’s gas demand is expected to grow strongly, supported by government targets to increase the use of gas to 10 per cent of primary energy consumption by 2020, a doubling from the energy share in 2015. Growth is expected in all sectors, including the transport sector.

The rapid expansion of LNG imports will continue over 2018, but growth is expected to stabilise by 2020, as local production continues to expand and pipeline imports increase from Central Asia and Russia. Recent trade negotiations between the US and China may impact sales of US LNG to China, but it is too early to tell how this will affect imports from Australia. Australia is a major LNG supplier to China, contributing to about 45 per cent of imports into China in 2017.
Europe and emerging Asian economies to drive long-term demand growth

European LNG demand reached 46 million tonnes in 2017, growing by 20 per cent from 2016. Imports are expected to grow strongly to 2020 despite relatively flat growth in gas consumption. LNG imports are being driven by long-term declines in domestic gas production, particularly from the earthquake-prone Groningen field in the Netherlands, as well as limited prospects for growth in pipeline imports from Russia. LNG is seen as a means to diversify energy supply sources.

LNG imports to emerging Asian countries also grew strongly in 2017, to around 35 million tonnes. Growth is expected to continue to 2020, making emerging Asia the main driver of LNG import growth in the global market. This growth will be led by India and Pakistan, the largest gas consumers in this group. LNG imports in India are expected to grow by 75 per cent from 19 million tonnes in 2017 to about 33 million tonnes in 2020, whilst Pakistan will more than double imports from 5 million tonnes in 2017 to 13 million tonnes in 2020. Amongst the other emerging economies, the strongest growth prospect is Indonesia, expected to take 12 million tonnes in the west of the archipelago in 2020, despite large LNG exports from east Indonesia.

The strong growth in emerging Asia is being facilitated by the use of Floating Storage and Regasification Units (FSRUs), which provide a low cost avenue for relatively small LNG import volumes to enter a developing market. Similar technology has been proposed for LNG imports into Australia (see Chapter 15 of this publication Asian LNG trade and Australian LNG imports).

Oil-linked pricing is dominant in Asia, so higher oil prices could dampen LNG demand in emerging nations. The use of alternative pricing models indexed to the LNG supply and demand fundamentals has the potential to support further growth in these markets.

An additional emerging market for LNG is as a bunkering fuel for shipping. This could be a significant growth area for LNG, but it is not expected to make serious inroads until 2020.

7.5 World exports

A major expansion of world LNG supply capacity is underway

After relatively modest growth from 2012 to 2016, LNG liquefaction capacity is expected to grow 40 per cent from 2016 to 2020 to meet pent-up demand in Europe and Asia. The principal source of new capacity will be the US, followed by Australia and Russia.

Figure 7.6: Global LNG supply capacity

Notes: Nameplate capacity in millions of tonnes per annum
Source: Nexant (2018); Department of Industry, Innovation and Science (2018)

Qatar, currently the world’s largest producer, announced plans in April 2017 to end its moratorium on new gas development in its North field, and to increase LNG export capacity by 30 per cent from the current level of 77 million tonnes. However, this is not expected to take place for at least five years and does not affect the current outlook.

In Australia, the current wave of LNG plant construction is almost over (as discussed below). In Russia, the first train at the 16.5 million tonne Yamal LNG project in the Arctic Circle began operations in late 2017. All three trains are expected to be operational by 2020.
The US is on track to have 70 million tonnes of nameplate capacity — the nominal maximum annual production capacity of an LNG plant — operational by the end of 2019. As of April 2018, four trains are operating at Sabine Pass, Louisiana (18 million tonnes) and one train at Cove Point, Maryland (5.3 million tonnes). In 2017, over 50 per cent of US sales were to Mexico, South Korea and China, and higher prices in Asia are likely to attract more sales there.

There are four more US plants under construction, plus an additional train at Sabine Pass. These plants are Elba Island, Freeport, Corpus Christi and Cameron. Approximately 30 million tonnes is expected to be operational by the end of 2018, and the remainder by the end of 2019. There are also prospects under consideration for additional trains at Sabine Pass and Corpus Christi in the US, which could take total nameplate to 79 million tonnes by the end of 2020.

Whilst global LNG import growth is sufficient to absorb this new capacity over 2018, slowing demand growth in 2019 and 2020 is expected to create a short period of excess supply.

**Box 7.1: Meeting seasonal gas demand with underground storage**

Gas consumption can be highly seasonal, particularly when there is a large heating demand in the residential market. During the winter heating season there will be large spikes in gas demand on very cold days, which can significantly exceed the average daily load. It can be very expensive to provide sufficient supply capacity to meet these extreme demand profiles, since both production, transmission and distribution assets must be sized to meet the peak day demand.

The problem is most acute in cold climates. In Victoria, where there is a significant residential heating load, the peak days can be three times higher than the summer demand. The problem is even more acute in Beijing, where the government has strongly encouraged gas heating as a means to reduce pollution from coal fired heating.

The rapid growth of gas demand in China has been matched with very high growth in winter peak demand. This has put severe pressure on the supply system, particularly over the most recent winter. The supply crunch was associated with a surge in the North East Asian spot price, which only began to abate after the northern hemisphere winter.

The most common solution to this problem in the gas industry is to include underground gas storage (UGS) in the gas supply chain. These are mainly depleted gas reservoirs, but can also include aquifers, depleted oil reservoirs and salt caverns. Gas is pumped into the underground storage during the summer when demand is low, and withdrawn into the gas network in the winter when demand is peaking. Ideally, the storages should be near the centres of demand, as this allows the investment in gas supply and transmission infrastructure to be minimised.

In Victoria, a 26 petajoule UGS has been established at Iona in the south west. This is approximately 12 per cent of total Victorian demand, consistent with the global average. However, in China the rapid growth in demand has not been matched with growth in UGS, which is currently only about three to four per cent of demand.

China is planning major investments in UGS to bring capacity to five per cent of demand by 2020. PetroChina is constructing two facilities at Chongqing and plans six more in south west China. However, unlike the US where UGS is 17 per cent of demand, China does not have an abundance of suitable geological locations. Reservoirs are deeper and more prone to faulting, which makes it more difficult to establish a sealed storage.

Until storage makes greater inroads in the gas supply chain, China is likely to experience tight conditions in the winter, meaning that the winter spikes in LNG spot prices will continue for the foreseeable future.

**7.6 Australia**

LNG export earnings driven by higher export volumes and prices

The value of Australia’s LNG exports increased by 47 per cent year-on-year in the March quarter 2018, driven largely by increases in volumes as projects under construction came on-line.
Australia’s LNG export earnings are forecast to increase by 37 per cent from an estimated $30.8 billion in 2017–18 to $42.4 billion in 2019–20. As Figure 7.7 shows, rising export values will be driven by both higher export volumes and higher prices.

Figure 7.7: Annual growth in Australia’s nominal LNG export values, contributions from prices and export volumes

![Graph showing annual growth in Australia's nominal LNG export values, contributions from prices and export volumes.]

Notes: Log change is used to approximate percentage change.
Source: ABS (2018); Department of Industry, Innovation and Science (2018)

Export volumes are expected to increase by 24 per cent from 62 million tonnes in 2017–18 to 77 million tonnes in 2019–20, as the remaining LNG plants currently under construction come on-line. Prices will rise by 11 per cent from $9.5 a gigajoule to $10.5 a gigajoule over the same period, as higher oil prices flow through to LNG contract prices.

Current wave of LNG projects to be completed by the end of 2018

The remaining LNG projects currently under construction in Australia — Wheatstone (train 2), Ichthys and Prelude — are expected to be completed by the end of this year. This will bring export nameplate capacity to 88 million tonnes.

Train one of Chevron’s Wheatstone project in Western Australia is already operational. Train two is expected to commence operations by the end of June 2018, with total nameplate capacity reaching 8.9 million tonnes over the third quarter 2018.

Figure 7.8: Australia’s LNG exports and LNG plant capacity utilisation

![Graph showing Australia’s LNG exports and LNG plant capacity utilisation.]

Notes: Utilisation as a share of nameplate capacity.
Source: Department of Industry, Innovation and Science (2018)

The Ichthys project, with a nameplate capacity of 8.9 million tonnes, is on track to commence production from the Darwin plant early in the September quarter of 2018. The Prelude project in offshore Western Australia, with a capacity of 3.6 million tonnes, is the world’s second Floating LNG project (the first being Petronas FLNG in Malaysia) and the largest floating vessel in the world. A cooldown cargo was delivered in April 2018 to chill the storage tanks, and the project is expected to be exporting LNG by the fourth quarter of 2018.

The prospects for further capacity expansions at existing plants are limited over the outlook period. The entry of new US LNG capacity over 2018 and 2019 is expected to create a period of excess supply, which will dampen incentives for additional brownfields expansions at Australian plants.
However, debottlenecking — the optimisation of plant operations in the light of operational experience — is a standard procedure after construction of new plants. Additional capacity could be added depending on the state of the LNG market.

Figure 7.9: Asia to remain main destination for Australian exports

Japan has traditionally been the main destination for Australian LNG, but exports to China and South Korea have increased significantly since the current wave of capacity expansion began. Japan currently takes around 45 per cent of Australia’s exports, whilst China’s market share has risen to almost one third. These shares are expected to be unchanged out to 2020.

Oil prices drive Australian LNG prices higher

The majority of Australian LNG is sold to Asian customers under contracts linked to the Japan Custom-Crude (JCC) price, which tends to track the Brent crude oil price. JCC oil prices have been rising steadily, from a low of US$41.9 per barrel in 2016 to a forecast high of US$69.4 per barrel in 2018, but are forecast to fall to US$65.4 per barrel in 2020.

On the basis of these price forecasts, the average LNG price for Australian exports is projected to rise from $8.1 a gigajoule in 2016–17 to $10.5 a gigajoule in 2019–20. LNG spot prices in north east Asia are expected to track downwards from current seasonal highs, as new capacity enters the market from Australia, the US and Russia.

Figure 7.10: Australian LNG export prices and the JCC price

Notes: Export prices are export unit values. JCC forecast derived from Brent oil forecast.
Source: ABS (2018); Department of Industry, Innovation and Science (2018)

Uncertainties remain in the outlook for Australia’s LNG exports

Australia’s LNG exports are forecast to reach 77 million tonnes a year by 2019–20, which is approximately 88 per cent of nameplate capacity, down from 91 per cent in 2016–17. The modest decline in capacity utilisation is related to the excess global capacity expected over 2019 and 2020, and the option in some LNG contracts for buyers to reduce offtake to ‘take-or-pay’ levels to take advantage of low spot prices. However, as the last year has shown, both demand and LNG prices can change significantly in response to multiple global influences. In the face of this volatility, there are significant upside and downside risks for the outlook period.
### Table 7.1: Gas outlook

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>2017</th>
<th>2018&lt;sup&gt;i&lt;/sup&gt;</th>
<th>2019&lt;sup&gt;i&lt;/sup&gt;</th>
<th>2020&lt;sup&gt;i&lt;/sup&gt;</th>
<th>Annual percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>World</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JCC oil price&lt;sup&gt;a&lt;/sup&gt;</td>
<td>US$/bbl</td>
<td>54.1</td>
<td>69.4</td>
<td>65.4</td>
<td>65.9</td>
<td>28.4</td>
</tr>
<tr>
<td>– nominal</td>
<td>US$/bbl</td>
<td>55.3</td>
<td>69.4</td>
<td>64.0</td>
<td>63.3</td>
<td>25.5</td>
</tr>
<tr>
<td>– real&lt;sup&gt;b&lt;/sup&gt;</td>
<td>US$/bbl</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas production&lt;sup&gt;f&lt;/sup&gt;</td>
<td>Bcm</td>
<td>3 726.1</td>
<td>3 836.3</td>
<td>3 878.5</td>
<td>3 940.1</td>
<td>3.0</td>
</tr>
<tr>
<td>Gas consumption&lt;sup&gt;f&lt;/sup&gt;</td>
<td>Bcm</td>
<td>3 739.0</td>
<td>3 825.1</td>
<td>3 884.7</td>
<td>3 937.2</td>
<td>2.3</td>
</tr>
<tr>
<td>LNG trade&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Mt</td>
<td>289.6</td>
<td>322.1</td>
<td>344.6</td>
<td>362.8</td>
<td>11.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Bcm</td>
<td>105.3</td>
<td>121.3</td>
<td>140.6</td>
<td>143.0</td>
<td>15.2</td>
</tr>
<tr>
<td>– Eastern market</td>
<td>Bcm</td>
<td>54.3</td>
<td>56.6</td>
<td>59.9</td>
<td>56.9</td>
<td>4.2</td>
</tr>
<tr>
<td>– Western market</td>
<td>Bcm</td>
<td>49.6</td>
<td>63.3</td>
<td>71.9</td>
<td>73.4</td>
<td>27.5</td>
</tr>
<tr>
<td>– Northern market&lt;sup&gt;c&lt;/sup&gt;</td>
<td>Bcm</td>
<td>1.3</td>
<td>1.4</td>
<td>8.8</td>
<td>12.7</td>
<td>4.5</td>
</tr>
<tr>
<td>LNG export volume&lt;sup&gt;d&lt;/sup&gt;</td>
<td>Mt</td>
<td>52.1</td>
<td>61.7</td>
<td>73.3</td>
<td>76.6</td>
<td>18.3</td>
</tr>
<tr>
<td>– nominal value</td>
<td>A$m</td>
<td>22,308</td>
<td>30,842</td>
<td>43,481</td>
<td>42,446</td>
<td>38.3</td>
</tr>
<tr>
<td>– real value&lt;sup&gt;e&lt;/sup&gt;</td>
<td>A$m</td>
<td>22,745</td>
<td>30,842</td>
<td>42,482</td>
<td>40,519</td>
<td>35.6</td>
</tr>
<tr>
<td>LNG export unit value&lt;sup&gt;f&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– nominal value</td>
<td>A$/GJ</td>
<td>8.1</td>
<td>9.5</td>
<td>11.2</td>
<td>10.5</td>
<td>16.9</td>
</tr>
<tr>
<td>– real value&lt;sup&gt;e&lt;/sup&gt;</td>
<td>A$/GJ</td>
<td>8.3</td>
<td>9.5</td>
<td>11.0</td>
<td>10.0</td>
<td>14.6</td>
</tr>
<tr>
<td>– nominal value</td>
<td>US$/MMBtu</td>
<td>6.5</td>
<td>7.8</td>
<td>9.3</td>
<td>8.7</td>
<td>20.2</td>
</tr>
<tr>
<td>– real value&lt;sup&gt;e&lt;/sup&gt;</td>
<td>US$/MMBtu</td>
<td>6.6</td>
<td>7.8</td>
<td>9.1</td>
<td>8.3</td>
<td>17.9</td>
</tr>
</tbody>
</table>

Notes: <sup>a</sup> JCC stands for Japan Customs-cleared Crude; <sup>b</sup> Production includes both sales gas and gas used in the production process (i.e. plant use) and ethane. Historical gas production data was revised in the June quarter 2017 to align with Australian Petroleum Statistics published by the Department of Environment and Energy; <sup>c</sup> Gas production from Bayu-Undan Joint Production Development Area is not included in Australian production. Browse basin production associated with the Ichthys project is classified as Northern market; <sup>d</sup> 1 million tonnes of LNG is equivalent to approximately 1.36 billion cubic metres of gas; <sup>e</sup> In 2017–18 Australian dollars; <sup>f</sup> Forecast; <sup>g</sup> 1 MMBtu is equivalent to 1.055 GJ; <sup>h</sup> In 2018 US dollars; <sup>s</sup> Estimate; <sup>t</sup> 2017 is an estimate.

Source: ABS (2018) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Department of Industry, Innovation and Science (2018); Company reports; Nexant World Gas Model (2018)
Oil
Resources and Energy Quarterly June 2018

Around 70% of crude and condensate production comes from the Carnarvon basin in WA.

Australia’s production of crude and condensate peaked in 2000, at 41,300 ML.

Around 17% of refinery feedstock is domestically produced. On average 83% is imported.

Australia’s refinery production:
- 44% Automotive gasoline
- 35% Diesel
- 14% Aviation turbine fuel
- 3% LPG
- 2% Fuel oil
- 1% Other

Top import petroleum sources 2016-17 million litres:

1. Malaysia 10236.966
2. Korea 9309.7722
3. Singapore 8993.8316
4. Japan 4973.742
5. UAE 3420.568

Note: excludes natural gas imports

Historic price snapshot:
Brent crude oil in the last five years (US$ per barrel)

- Highest price: $117 on 6/09/2013
- 2018 average: $70
- Lowest price: $26 on 19/01/2016
8.1 Summary

- Geopolitical tensions and uncertainty around world production led to sharp oil price increases in the first half of 2018, which are expected to moderate over the outlook period. In 2018 the Brent spot price is forecast to average US$70 a barrel.
- Higher condensate production from the new LNG projects is expected to support export volumes increasing from 230 thousand barrels a day in 2017–18 to 355 thousand barrels a day in 2019–20.
- The value of Australia’s crude and condensate exports is forecast to increase from $7.1 billion in 2017–18 to $11 billion in 2019–20, driven by higher volumes and higher prices.
- There are a number of risks to the outlook — production changes from OPEC and the US, as well low stock levels, could lead to volatility in forecast prices.

8.2 Prices

Geopolitical shocks lead to spike in oil prices

Lower OPEC production from Venezuela, geopolitical events including the conflict in Syria and renewed US sanctions prompted a jump in oil prices in the June 2018 quarter. In May, the Brent crude oil spot price reached US$80 a barrel, the highest level in three years. In-line with higher prices, healthy consumption growth and continued output constraint from OPEC and Russia, oil stocks drawn down. The Brent spot price averaged US$74 in the June quarter.

Uncertain outlook for oil prices

Prices are expected to moderate over the outlook period, as OPEC production controls are revised upwards to counter lower Iranian and Venezuelan output, and US production continues grow. The Brent oil spot price is expected to retreat slightly from recent highs to average US$70 a barrel in 2018, US$15 higher than 2017. The oil price outlook is very uncertain, however with the OPEC agreement due to expire at the end of 2018 and stagnating world consumption, prices are expected to moderate further, averaging US$65–66 a barrel in 2019 and 2020.
8.3 World oil consumption

World oil consumption is forecast to average 99 million barrels a day in 2018, 1.1 per cent higher than 2017. By the end of the outlook period, consumption is forecast to reach 101 million barrels a day in 2020. Marginal increases in world consumption will be supported by growing consumption in non-OECD economies, however high oil prices and volatility in oil prices may weigh on future consumption. Future oil consumption will be effected by lower than expected economic growth or reduced trade activity.

Non-OECD economic growth supports oil consumption

Strong economic conditions in non-OECD countries are expected to support oil consumption growth over the next two years. Consumption in China is forecast to increase by around 3.3 per cent a year, reaching 14 million barrels a day in 2020. Improved economic conditions, expanding vehicle fleets and higher air traffic in India are expected to contribute to oil consumption increasing by around 5.2 per cent a year, reaching 5.4 million barrels a day in 2020.

Recent increases in oil prices, if sustained, may have a dampening effect on future consumption growth. A number of countries have recently removed oil price subsidies, which may result in higher price exposure. Policy driven fuel-switching in heating use — substituting fuel-oil for gas — is increasing in China, the Middle East and in some European countries.

Economic activity important for continuing OECD consumption

Oil consumption in major OECD economies is expected to continue at current levels, supported by firm economic growth. Although there is a general trend towards decarbonisation in many of these countries, the transport sector is the largest consumer of oil in most countries, and significant shifts in fuel sources and expected to take some time. Over the outlook period OECD consumption is expected to be stagnant — in 2020 consumption is forecast to be similar to current levels, at 48 million barrels a day.
8.4 World oil production

Higher world oil production, supported by increased US and OPEC production, is expected over the outlook period. World oil production is forecast to increase by an average 2.1 per cent a year over the next two years, to reach 102 million barrels a day in 2020. At this rate, world production growth is expected to exceed consumption growth over the outlook period.

OPEC+ reaches agreement goal, however future production uncertain

The OPEC and Russia production agreement, which has been enacted since the start of 2017, has supported higher prices and achieved the target of lower oil stocks. The agreement was extended to 2018 and compliance has been very strong — total production below the target. Lower production was partly due to deteriorating Venezuelan output, which has fallen sharply in the last two years; 2018 production to June was 50 per cent lower than 2017, with no sign of recovery. To address concerns on future production shortages, particularly with future sanctions on Iran, OPEC and other agreement countries, including Russia, recently agreed to increase output. Producers agreed to increase production to achieve 100 per cent compliance, an additional 0.5 million barrels a day, to the market. This is expected to be a minimum amount, actual production increases may be higher.

Iran’s oil production and trade sanctions

In May, the US Administration withdrew the United States from the Joint Comprehensive Plan of Action (JCPA) nuclear deal with Iran, resulting in sanctions set to be reimposed in the December quarter 2018. Iran’s oil production had been steadily increasing since sanctions imposed in 2012 were lifted in 2014. Production reached 2.6 million barrels a day in the March 2018 quarter. Iran’s production dropped by 940 thousand barrels a day between 2011 and 2013 when sanctions were previously imposed. The impact of renewed sanctions across Iran’s major export partners is unclear, some partners including China, Russia and Turkey may find ways to continue imports. Trade with other partners has already started decreasing.

**Figure 8.5: OPEC production and Iranian production under sanctions**


Infrastructure constraints limit strong US production increases

US oil production forecasts continue to be revised up, with strong expected growth in conventional crude production and liquids relating to shale gas. The US accounts for around 15 per cent of world production, and is expected to increase production by an average 8.0 per cent a year over the outlook period. Oil production is forecast to increase from 13 million barrels a day in 2017, to reach 17 million barrels a day in 2020.

Productivity in some major US basins is starting to stabilise, including in the Permian basin, which accounts for just under half of US oil production. However the number of oil rigs, and drilled but uncompleted wells, continues to grow. As a number of major pipelines reach full capacity, infrastructure constraints may limit ongoing increases or result in wells being shut down. Alternative, more expensive, transport facilities may be utilised, before development pipeline projects are completed towards the end of the outlook period. Logistical factors, like pipeline constraints, labour shortages and road congestion, as well as declining well productivity, is expected to weigh on future production growth.
8.5 Australia’s production and trade

Export earnings growth supported by oil prices and condensate production

Higher oil prices and expanding volumes contributed to Australia’s petroleum exports reaching $2.0 billion in the March 2018 quarter, 45 per cent higher than in the same period last year.

Over the next two years, export earnings are forecast to continue increasing, in line with higher oil prices and condensate production related to the new LNG production facilities. Earnings are forecast to increase from $7.1 billion in 2017–18 to $11 billion in 2019–20.

Export volumes growth driven by condensate production

In the March quarter 2018, crude and condensate exports were around 248 thousand barrels a day, 21 per cent higher than in the same period last year. Export volumes are forecast to increase by around 24 per cent a year over the outlook period, from 230 thousand barrels a day in 2017–18 to 355 thousand barrels a day in 2019–20. Significant new condensate production from western and Northern Australia, which is primarily directed to export markets, will account for this growth in volumes.

Lower crude oil production outweighed by higher condensate production

Australia’s crude and condensate production averaged 282 thousand barrels a day in March 2018 quarter. This was an annual increase of 5.3 per cent; a strong increase in condensate production offset the impact of lower crude oil production.

Around 80 per cent of Australia’s condensate is produced in the Carnarvon Basin in offshore Western Australia, where production from the Gorgon LNG and Wheatstone LNG operations has expanded in the last year. The majority of Australia’s crude production is also in the Carnarvon basin, which showed an annual decrease of 7.8 per cent in the March 2018 quarter.

These production trends are expected to continue, production is forecast to increase from 292 thousand barrels a day in 2017–18 to 437 thousand barrels a day in 2019–20.
This significant increase in output is due to the expected commissioning of the LNG projects in Western Australia and the Northern Territory. Although there have been some project delays, all projects are expected to be operational by the end of 2018, with a combined condensate capacity of 165 thousand barrels a day. The largest producer of condensate will be the Icthys LNG project, expected to start operating around the middle of this year, adding 100 thousand barrels a day of condensate capacity. These projects mark the end of significant production increases; declining crude production is expected to be the major feature going forward. However, one project in the pipeline is Woodside’s Greater Enfield project, which has a capacity of 40,000 thousand barrels a day and is expected to come online in the middle of 2019.

Exploration expenditure

Australia’s petroleum exploration expenditure was $183 million in the March 2018 quarter, 48 per cent lower than the same period last year. Lower oil prices have contributed to the trend of declining exploration activity.

Australia’s petroleum refinery activity

In the March quarter 2018, refinery production was equivalent to 484 thousand barrels a day, 9.3 per cent higher than in the same period last year. Total refined product imports were 667 thousand barrels a day in the March quarter 2018, little changed from the same quarter in 2017. The imported share of total refinery products has historically been around 62 per cent of total consumption.

Over the outlook period, refinery production is expected to remain steady, aside from routine maintenance and downtime. There is some capacity investment in storage facilities being undertaken at Shell’s Altona refinery over the outlook period, however in addition to this, Australia’s refineries will need to make significant investment decisions around facility turnaround maintenance beyond the outlook period. In 2019–20, refinery production is forecast to average 469 thousand barrels a day.

Figure 8.8: Petroleum exploration expenditure


Figure 8.9: Consumption and production of refined products, 2016–17

Notes: Consumption relates to sale of products
Source: Australian Petroleum Statistics (2018)
### Table 8.1: Oil outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>Annual percentage change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>mb/d</td>
<td>97.4</td>
<td>99.6</td>
<td>101.5</td>
<td>102.3</td>
<td>2.2</td>
</tr>
<tr>
<td>Consumption</td>
<td>mb/d</td>
<td>97.8</td>
<td>98.9</td>
<td>100.2</td>
<td>101.2</td>
<td>1.1</td>
</tr>
</tbody>
</table>

**WTI crude oil price**

- Nominal US$/bbl 50.8 65.2 61.0 61.5 28.2 –6.4 0.9
- Real US$/bbl 52.0 65.2 59.7 59.1 25.3 –8.4 –1.0

**Brent crude oil price**

- Nominal US$/bbl 54.3 69.5 65.4 65.9 27.9 –5.9 0.8
- Real US$/bbl 55.6 69.5 64.0 63.3 24.9 –7.9 –1.0

**Australia**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>kb/d</td>
<td>283</td>
<td>292</td>
<td>354</td>
<td>437</td>
<td>3.4</td>
<td>21.0</td>
</tr>
<tr>
<td>Export volume</td>
<td>kb/d</td>
<td>221</td>
<td>230</td>
<td>299</td>
<td>355</td>
<td>4.1</td>
<td>29.9</td>
</tr>
<tr>
<td>Nominal value</td>
<td>A$m</td>
<td>5,476</td>
<td>7,088</td>
<td>9,484</td>
<td>11,311</td>
<td>29.4</td>
<td>33.8</td>
</tr>
<tr>
<td>Real value</td>
<td>A$m</td>
<td>5,583</td>
<td>7,088</td>
<td>9,266</td>
<td>10,797</td>
<td>27.0</td>
<td>30.7</td>
</tr>
<tr>
<td>Imports</td>
<td>kb/d</td>
<td>351</td>
<td>378</td>
<td>368</td>
<td>363</td>
<td>7.9</td>
<td>–2.9</td>
</tr>
<tr>
<td>LPG production</td>
<td>kb/d</td>
<td>52</td>
<td>50</td>
<td>87</td>
<td>104</td>
<td>–4.4</td>
<td>75.3</td>
</tr>
</tbody>
</table>

**Refined products**

- Refinery production | kb/d | 471 | 488 | 479 | 469 | 3.6 | –2.0 | –1.9 |
- Export volume | kb/d | 18 | 17 | 17 | 17 | –7.3 | 0.4 | 0.6 |
- Import volume | kb/d | 616 | 644 | 653 | 667 | 4.6 | 1.4 | 2.1 |
- Consumption | A$m | 1,004 | 1,077 | 1,044 | 1,059 | 7.3 | –3.1 | 1.5 |

**Notes:**
- a: Number of days in a year is assumed to be exactly 365; b: in 2018 calendar year dollars; c: Primary products sold as LPG; d: Domestic sales of marketable products; f: forecast; g: in 2017–18 financial year Australian dollars. A barrel of oil equals 158.987 litres. Source: ABS (2018), cat. No. 5464.0; International Energy Agency (2018); Department of Industry, Innovation and Science (2018).
Uranium

Resources and Energy Quarterly June 2018

Australia holds 31% of the world’s proven uranium reserves

Australia is the 3rd largest producer of uranium in the world

Australia produces and exports more than 7,000 tonnes of uranium every year

Uranium makes up 11% of global electricity generation

There are 245 civil research reactors operating across 55 countries

There are 447 nuclear power reactors across 31 countries, with 60 more being built

Major Australian uranium deposits (tonnes)
- <2,967
- 2,968–9,762
- 9,763–17,571
- 17,572–59,338
- >59,339

Deposit
Operating mine

Uranium required in 2017 (tonnes)

<table>
<thead>
<tr>
<th>Country</th>
<th>Uranium Required (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>17,847</td>
</tr>
<tr>
<td>France</td>
<td>9,216</td>
</tr>
<tr>
<td>Russia</td>
<td>7,767</td>
</tr>
<tr>
<td>China</td>
<td>7,757</td>
</tr>
<tr>
<td>South Korea</td>
<td>4,816</td>
</tr>
<tr>
<td>Japan</td>
<td>2,517</td>
</tr>
</tbody>
</table>
9.1 Summary

- Uranium spot prices have stabilised after years of declines, and are expected to start rising slowly over the outlook period, reaching US$28 a pound by 2020.
- Australian production is expected to remain largely steady, at around 7,000 tonnes annually over the outlook period. However, some increase in output is expected at Olympic Dam following the completion of recent mine upgrades.
- Australia’s uranium export earnings are forecast to increase slightly over the outlook period, reaching almost $700 million by 2019–20. This is in line with slow growth in prices.

9.2 Prices

Prices have stabilised, and are forecast to gradually increase

Uranium spot prices appear to have stabilised following six years of decline. After bottoming out at US$18 a pound in late 2017, prices have recovered to an average of US$22.73 a pound in May. This levelling out comes amidst a belated slowing in inventory build and a narrowing of the supply surplus following a series of production cuts at large mines in Kazakhstan and Canada.

It is expected that prices will begin a very slow ascent from here, with supply and consumption of uranium edging closer to balance and inventories beginning to stabilise. Prices are projected to rise from US$23.30 in 2018 to US$26.20 in 2019 and US$28.00 in 2020. At this level, uranium will remain a loss-making commodity for most producers, and prices are likely to adjust only slowly to changes in market conditions due to the scale of inventories accumulated over the last seven years.

Importantly however, significant new nuclear energy capacity is now under construction around the world, and persistent low prices have led to sharp falls in the long-run development of uranium resources. This is likely to result in much greater upward price pressure over the longer term.
9.3 World consumption

Nuclear power growth is moderate — but a new region is showing interest

Uranium use is projected to grow from 85,000 tonnes in 2018 to 94,300 tonnes by 2020. This will be driven in large part by China, which completed its Sanmen nuclear plant in the June quarter and has several other reactors within months of completion. Approvals for future plant constructions in China are also picking up following a slackening in 2017.

Demand is also rising in Japan, which re-connected unit 4 of its Ohi nuclear plant in May, and its Genkai 4 unit in June. South Korea, which currently has almost half of its nuclear fleet offline for maintenance, is expected to increase its demand in 2019. Russia has also completed its floating Akademik Lomonosov plant, which is capable of providing mobile power generation and desalination to virtually any coastal location.

New markets also appear to be emerging for nuclear power in the Middle East. Russia’s State Atomic Energy Corporation has recently signed a contract to construct four 1200 MW reactors in Egypt. This follows an earlier announcement of four 1400 MW units to be constructed in the United Arab Emirates by South Korean companies. Turkey has announced plans to build a huge 4800 MW nuclear project. It is likely that 11,000 MW of new nuclear capacity will be constructed in the Middle East by 2030.

In the US, Terrestrial Energy USA and Energy Northwest have signed a memorandum of understanding on constructing the world’s first Integral Molten Salt Reactor (IMSR). IMSRs use a liquid fuel mix which is incapable of melting down. The elimination of meltdown risk removes the need for the expensive reactor shields and cooling facilities used in traditional reactors. IMSRs could be commercialised by the 2020s.

9.4 World production

Mine output has contracted in response to excessive supply

Mine production is expected to rebound slightly, following significant cuts in output from large mines in Canada, Niger, and Kazakhstan. These cuts reduced overall world production sharply to 60,600 tonnes in 2018.
Some of these cuts are scheduled to wind back over the outlook period, leading to a rise in mine production to 69,700 tonnes by 2020. Supply is also expected to be supported by higher secondary output (which encompasses material entering the market from sources other than mines). This added secondary output includes higher inventory run-down by large utilities and sales from the United States Enrichment Corporation.

Although supply is likely to grow moderately over time, it is expected that overall output and demand will move much nearer to parity over the next two years. However, this is unlikely to produce any dramatic effect on prices given the scale of inventories accumulated since Fukushima.

A potential risk does exist with regard to long-term uranium supply. The sustained stretch of low uranium prices has led to significant reductions in the investment pipeline across many African countries and among traditional producers. This has greatly reduced the potential scale of future supply. Uranium markets have a tendency to adjust slowly to changes due to the quantity of safeguards and regulations applying at all steps of their supply chains. The current lack of investment in new supply could thus result in a sustained supply crunch in the future, which may take significant time to address. Nuclear technology has improved significantly in recent years, making it more attractive to countries seeking low-carbon, dispatchable energy.

9.5 Australia

Australia’s uranium exploration continues to fall away

Only $1.9 million was spent on uranium exploration in the March quarter 2018: a drop from an already-low level of $2.9 million spent in the December quarter. Uranium exploration is now largely confined to South Australia, tailing off in all other states.

Considerable uranium deposits remained untapped across Western Australia and the Northern Territory, but any significant pickup in exploration activity will depend on a sustained rise in the uranium price.
Production is expected to remain largely steady over the next two years

Australian production is expected to lift from 6,631 tonnes in 2017–18 to 7,140 tonnes in 2018–19 and 7,240 tonnes in 2019–20. This reflects a return to normal production at Olympic Dam, which had reduced output in 2017 as a result of long-planned mine upgrades. Production at the mine has now returned to its pre-upgrade level, and is expected to rise further.

Low prices have otherwise created minimal incentive for new mines or upgrades, and none are expected over the outlook period. However, Vimy Resources Limited has recently released the first Mineral Resource estimate for its newly acquired Angulari deposit. This Northern Territory deposit is expected to hold around 26 million pounds of U3O8 at a cut-off grade of 0.15 per cent. At current price levels, the mine is not considered to be economical, but a higher price outlook will improve its potential considerably in the future.

Conditions for exporters remain difficult, but Australia is still well placed

Export values are expected to change minimally over the outlook, rising from $642 million in 2017–18 to $651 million in 2018–19 and $693 million in 2019–20. In volume terms, exports are expected to edge back from 7,661 tonnes in 2017–18 to 7,240 tonnes by 2019–20. The export result for 2017–18 was inflated by the timing of shipments, and a small correction is thus expected. It is generally assumed that exports will stay in the same stable trajectory as production, as Australia exports virtually all mined output and has only negligible domestic use. Nuclear power generation in Australia is confined to a single 20MW reactor at Lucas Heights, which makes medical isotopes.

Exporters are expected to face tough conditions over the outlook period, due to weak prices and the expiration of some legacy contracts. However, conditions are expected to improve gradually as prices begin a slow rise from the historical lows of late 2017. Australia’s largest uranium mine (Olympic Dam) is among the most efficient uranium operations in the world, making Australia relatively well placed to ride out difficult conditions.
### Table 9.1 Uranium outlook

<table>
<thead>
<tr>
<th></th>
<th>World</th>
<th>Unit</th>
<th>2017</th>
<th>2018(^a)</th>
<th>2019(^f)</th>
<th>2020(^f)</th>
<th>2018(^a)</th>
<th>2019(^f)</th>
<th>2020(^f)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Africa(^b)</td>
<td></td>
<td>kt</td>
<td>9.1</td>
<td>9.8</td>
<td>10.0</td>
<td>10.0</td>
<td>7.6</td>
<td>1.6</td>
<td>0.5</td>
</tr>
<tr>
<td>Canada</td>
<td></td>
<td>kt</td>
<td>15.6</td>
<td>8.6</td>
<td>15.4</td>
<td>16.7</td>
<td>–44.8</td>
<td>78.9</td>
<td>8.0</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td></td>
<td>kt</td>
<td>26.7</td>
<td>24.3</td>
<td>24.3</td>
<td>24.7</td>
<td>–8.8</td>
<td>0.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td>kt</td>
<td>3.6</td>
<td>3.7</td>
<td>3.7</td>
<td>3.8</td>
<td>2.3</td>
<td>0.0</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Consumption</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td></td>
<td>kt</td>
<td>10.4</td>
<td>12.9</td>
<td>16.3</td>
<td>21.1</td>
<td>24.0</td>
<td>26.3</td>
<td>29.1</td>
</tr>
<tr>
<td>European Union 28</td>
<td></td>
<td>kt</td>
<td>22.9</td>
<td>22.6</td>
<td>23.7</td>
<td>23.4</td>
<td>–1.5</td>
<td>4.9</td>
<td>–1.2</td>
</tr>
<tr>
<td>Japan</td>
<td></td>
<td>kt</td>
<td>1.3</td>
<td>1.6</td>
<td>1.9</td>
<td>1.9</td>
<td>25.0</td>
<td>18.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Russia</td>
<td></td>
<td>kt</td>
<td>7.9</td>
<td>8.0</td>
<td>8.0</td>
<td>8.1</td>
<td>1.0</td>
<td>0.1</td>
<td>0.8</td>
</tr>
<tr>
<td>United States</td>
<td></td>
<td>kt</td>
<td>21.8</td>
<td>21.8</td>
<td>21.8</td>
<td>21.7</td>
<td>0.0</td>
<td>0.0</td>
<td>–0.7</td>
</tr>
<tr>
<td><strong>Spot price</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spot price(^c)</td>
<td></td>
<td>US$/lb</td>
<td>21.7</td>
<td>23.2</td>
<td>26.2</td>
<td>28.0</td>
<td>7.3</td>
<td>12.9</td>
<td>6.9</td>
</tr>
<tr>
<td>Real(^d)</td>
<td></td>
<td>US$/lb</td>
<td>22.2</td>
<td>23.2</td>
<td>25.7</td>
<td>26.9</td>
<td>4.8</td>
<td>10.5</td>
<td>4.9</td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine production</td>
<td></td>
<td>t</td>
<td>7,295</td>
<td>6,631</td>
<td>7,140</td>
<td>7,240</td>
<td>–9.1</td>
<td>7.7</td>
<td>1.4</td>
</tr>
<tr>
<td>Export volume</td>
<td></td>
<td>t</td>
<td>7,081</td>
<td>7,661</td>
<td>7,140</td>
<td>7,240</td>
<td>8.2</td>
<td>–6.8</td>
<td>1.4</td>
</tr>
<tr>
<td>– nominal value</td>
<td></td>
<td>A$m</td>
<td>596</td>
<td>642</td>
<td>651</td>
<td>693</td>
<td>7.7</td>
<td>1.5</td>
<td>6.4</td>
</tr>
<tr>
<td>– real value(^d)</td>
<td></td>
<td>A$m</td>
<td>608</td>
<td>642</td>
<td>636</td>
<td>662</td>
<td>5.6</td>
<td>–0.8</td>
<td>4.0</td>
</tr>
<tr>
<td>Average price</td>
<td></td>
<td>A$/kg</td>
<td>84.2</td>
<td>83.8</td>
<td>91.2</td>
<td>95.8</td>
<td>–0.5</td>
<td>8.9</td>
<td>5.0</td>
</tr>
<tr>
<td>– real(^d)</td>
<td></td>
<td>A$/kg</td>
<td>85.8</td>
<td>83.8</td>
<td>89.1</td>
<td>91.4</td>
<td>–2.4</td>
<td>6.4</td>
<td>2.6</td>
</tr>
</tbody>
</table>

**Notes:** \(^b\) includes Niger, Namibia, South Africa, Malawi and Zambia; \(^c\) in 2018 US dollars; \(^d\) in 2017–18 Australian dollars; \(^f\) forecast; \(^s\) estimate

**Source:** Australian Department of Industry, Innovation and Science (2018); Cameco Corporation (2018); Ux Consulting (2018) Uranium Market Outlook

Resources and Energy Quarterly **June 2018**
Gold

Resources and Energy Quarterly June 2018

Australia is the 2nd largest producer of gold in the world.

288 tonnes of gold produced by Australia in 2016–17

8.9% of world mine gold supplied by Australia in 2016–17

World record find
Australia holds the record for the world’s largest gold nugget weighing 72 kg, found in Victoria in 1869.

Major Australian gold deposits (t)
- <20
- 21–70
- 71–185
- 186–473
- 474–1,027
- >1,028

Deposit
Operating mine

Key jewellery consumer markets (tonnes)

573
53%
Jewellery

648
25%
Gold coins and bars

124
5%
Global Backed Exchange Traded Funds

46
9%
Central Bank Reserves

45
7%
Electronics and Industrial

44
1%
Dental and medical

Global uses of gold

China
India
United States
UAE
Iran
Hong Kong

World map showing major gold deposits in Australia.
10.1 Market summary

- Geopolitical risks and trade tensions are likely to push gold prices up to an average of US$1,380 an ounce in 2019.
- The value of Australia’s gold exports is forecast to grow through the outlook period, reaching a peak of $20 billion in 2019–20, propelled by increased production and export volumes (356 tonnes).
- However, a rising US dollar will limit the upside for the price of gold.

10.2 Prices

Gold prices rose steadily in first half of 2018

The gold price has recently dropped below the US$1,310–1,360 an ounce range traded since the early days of 2018. Gold had been supported by the weaker US dollar and rising US-China trade tensions. The scepticism of investors towards equities — following successive all-time highs and two sell-offs in early February and late March 2018 — was also a supporting factor. However, recent demand for gold has been constrained by strong economic growth across the major economies and the continued preference for equities by some investors. Rising US 10-year Treasury bond yields have also hurt gold, as has some easing in geopolitical tensions between the US and North Korea.

Gold continues to perform well in the short-term

Gold is expected to perform well in the second half of 2018 and the subsequent two years, as political uncertainty drives investment in bars and bullion-backed investment funds. Trade tensions between the US and China are expected to continue through to 2019, and possibly 2020. Geopolitical tensions in the Middle East — linked to the Gaza conflict, Syria’s civil war and the possible failure of the Joint Comprehensive Plan of Action (JCPOA) relating to Iran’s nuclear materials programme — are yet another source of upside for gold. Any sustained overheating in the US economy would likely see inflation rise and gold demand rise, as investors seek an inflation hedge. Rising inflation would likely also push US Treasury bond prices down. Gold is likely to benefit in the short run, with the price likely to increase by around 8 per cent in 2018, to average US$1,352 an ounce. The price should rise to an average US$1,380 an ounce in 2019. Steadier US bond prices are forecast to cause the gold price to fall back in 2020, declining by 4.4 per cent to average US$1,320 an ounce.

10.3 Consumption

World gold consumption declined in the March quarter 2018

World gold demand fell by 7 per cent in the March quarter 2018 — the largest first quarter fall since 2008 — as gold prices stagnated, and the threat of rising interest rates led investors to seek higher returns elsewhere. Demand for bars and coins decreased by 14 per cent, driven by lower purchases in China, Germany and the US, where high equity valuations and strong economic growth dampened demand for gold.

Exchange traded funds (ETFs) holdings of gold dropped by 66 per cent year-on-year to 32 tonnes, from 96 tonnes in the March quarter 2017.

Figure 10.1: Gold price and US dollar

Jewellery fabrication declined by 2 per cent year-on-year, driven by weaker consumption in India.

Offsetting India’s falling demand was a 7 per cent year-on-year rise in China’s jewellery demand — its highest growth in three years. Demand from the official sector rose by 41 per cent year-on-year, to 116 tonnes in the March quarter 2018. Russia, Turkey and Kazakhstan accounted for the bulk of the reminder of the increase. Technology — a growing source of gold demand — also contributed through greater usage in electronic applications such as bonding wire and wireless chips.

**World consumption forecasts to increase from 2018 to 2020**

World gold consumption is forecast to increase at an average annual growth rate of 2 per cent from 2018 through to 2020, reaching 4,369 tonnes in 2020. The growth is expected to be largely driven by higher jewellery consumption from China and India.

Chinese jewellery demand is forecast to grow at an average annual rate of 3.5 per cent, driven by new designs and gifting occasions rather than the bargain hunting that fuelled the spike in demand in 2013. In India, a strong demand growth forecast is propelled by robust economic growth, improved consumer sentiment and, paradoxically, rising gold prices.

Growth in global gold consumption is also expected to be driven by rising industrial demand and official sector purchases. Gold has long been central to innovations in electronics and can be used to create conducting plastics and specialised pigments. Electronics consumption rose 4.6 per cent year-on-year in the March quarter 2018, and is forecast to continue to grow over the rest of the outlook period.

The official or government sector is expected to remain a net buyer throughout the forecast period. The need to diversify central bank reserves is the key driver of many central banks’ growing appetite towards gold.

Ongoing geopolitical risks are also providing support to higher demand. These centre on the Middle East, where a deterioration in US–Iran relations could spark a new tussle between the two countries.

**Figure 10.2: World gold consumption**


### 10.4 Production

World gold supply rose by 3.1 per cent in the March quarter 2018, to 1,064 tonnes, mainly driven by an increase in world mine production. The new capacity additions in Russia and Africa offset the reduction in output from China. Lower output from China — the world’s largest producer — reflects the impact of tighter environmental regulations, which led to the closure of several mines in early 2018. In Russia, Nordgold has produced the first gold from its 7.5 tonnes per annum Gross mine. In Burkina Faso, Endeavour Mining’s 8.1 tonnes per annum Hounde mine also commenced production in the March quarter 2018.

The Lihir mine in Papua New Guinea (PNG) — Newcrest’s biggest gold mine — has struggled to achieve its potential since being acquired in 2010, with regular failures and breakdowns within its ore processing plant. However, such breakdowns have been less common in recent years. Lihir produced 7.3 tonnes of gold in the March quarter 2018, and is well-placed to sustain annual gold production at about 31 tonnes in the next few years.
World gold production is forecast to reach a peak of 3,409 tonnes in 2019, but decline slightly in 2020, to 3,397 tonnes. Several new projects and expansions in Russia and Canada are expected to support higher mine supply in 2019, more than offsetting declining supply from the United States and Peru. Production in Canada is forecast to rise by 11 tonnes year-on-year in 2019. In contrast, gold production in the United States reached a ten-year high in 2017 of 246 tonnes, and is forecast to decline over the short and medium term, as long established mines reach the end of their production life. Russia’s Nataklka project is expected to reach full capacity in 2018 and produce 15 tonnes per year.

10.5 Australia

Exploration expenditure continues to increase in trend terms

Australia’s gold exploration expenditure rose by 21 per cent year-on-year in the March quarter 2018, to $187 million, likely driven by higher gold prices in 2017. Western Australia remained the centre of gold exploration activity in Australia, accounting for 74 per cent (or 138 million) of total gold exploration expenditure.

Australian gold production increased in the March quarter 2018

Australia’s gold production increased by 8.2 per cent year-on-year in the March quarter 2018, to 74 tonnes, propelled by improved production in several large gold mines in Western Australia. AngloGold Ashanti’s Sunrise Dam production increased by 46 per cent year-on-year, to 2.6 tonnes. Newmont’s Tanami production rose by 57 per cent year-on-year, to 3.6 tonnes, driven by higher throughput and ore grade milled.

However, production at Newcrest’s Cadia mine decreased by 15 per cent year-on-year in the March quarter 2018, to 4.4 tonnes, as one of the mine’s two tailings dams suffered a wall slide on 9 March 2018. In April 2018, the company received approval from the NSW Department of Planning and Environment to use an old, nearby mine pit as a temporary tailings dam. Newcrest will forego up to 3 million ounces of unmined gold as part of its plan to deal with the tailings dam breach. The mine is expected to return to full production soon.

Newmont’s Boddington gold mine production decreased by 19 per cent year-on-year in the March quarter 2018, to 5.1 tonnes, due to lower ore grades and lower recoveries.

Australian gold production forecast to grow in the short term

Australian gold production is estimated to have grown by 5.3 per cent in 2017–18. Production is forecast to grow by 3.7 per cent in 2018–19, and by 2.5 per cent in 2019–20 to reach 322 tonnes. The growth is driven by new mines expected to come online over the forecast period. Dacian’s Mt Morgans poured first gold in March 2018 after an 11 month construction period. The mine is forecast to add at least 6 tonnes of gold to Australia’s annual gold production. Gascoyne Resources’s 3 tonnes per annum Dalgaranga mine produced its first gold at the end of May 2018. In addition, Gold Roads’ Gruyere gold mine (annual production of 7 tonnes) is expected to come online in early 2019. While the Super Pit gold mine produced 5.3 tonnes of gold in the March quarter 2018, a rock fall incident in mid-May 2018 is estimated to have reduced the mine’s production in the June quarter 2018.

Australian gold exports increased strongly in the March quarter 2018

Australia’s gold export earnings increased by 39 per cent year-on-year in the March quarter 2018 to $5.4 billion, propelled by higher production and export volumes. Over this period, export volumes rose by 32 per cent to 99 tonnes. The very large jump in exports was driven by increased local mine production and increased imports of gold dore from Papua New Guinea for refining — the Ok Tedi mine in PNG is ramping up production, which is shipped to Perth Mint for further processing and re-export.

Exports forecast to continue to grow until 2019–20

Australia’s gold exports are forecast to grow through the outlook period, to a peak of $20 billion in 2019–20. This growth reflects expected rises in local gold production and export volumes.

The risk to this assessment is an upward movement in gold prices, due to geopolitical tensions in the Middle East, and political uncertainty in Europe. Similar events in the past have often led to greater demand for safe haven assets such as gold.

Figure 10.5: Australia’s gold exports

### Table 10.1: Gold outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2017</th>
<th>2018</th>
<th>2019f</th>
<th>2020f</th>
<th>2018</th>
<th>2019f</th>
<th>2020f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total demand</td>
<td>t</td>
<td>4,109</td>
<td>4,192</td>
<td>4,286</td>
<td>4,369</td>
<td>2.0</td>
<td>2.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Fabrication consumption</td>
<td>t</td>
<td>2,493</td>
<td>2,556</td>
<td>2,671</td>
<td>2,725</td>
<td>2.5</td>
<td>4.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Mine production</td>
<td>t</td>
<td>3,298</td>
<td>3,324</td>
<td>3,409</td>
<td>3,397</td>
<td>0.8</td>
<td>2.6</td>
<td>–0.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Price</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal</td>
<td>US$/oz</td>
<td>1,257</td>
<td>1,352</td>
<td>1,380</td>
<td>1,320</td>
<td>7.6</td>
<td>2.1</td>
<td>–4.4</td>
</tr>
<tr>
<td>Reald</td>
<td>US$/oz</td>
<td>1,287</td>
<td>1,352</td>
<td>1,351</td>
<td>1,268</td>
<td>5.1</td>
<td>–0.1</td>
<td>–6.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine production</td>
<td>T</td>
<td>288</td>
<td>303</td>
<td>314</td>
<td>322</td>
<td>5.3</td>
<td>3.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Export volume</td>
<td>T</td>
<td>334</td>
<td>339</td>
<td>337</td>
<td>356</td>
<td>1.6</td>
<td>–0.7</td>
<td>5.8</td>
</tr>
<tr>
<td>Nominal value</td>
<td>A$m</td>
<td>18,013</td>
<td>18,330</td>
<td>18,505</td>
<td>19,528</td>
<td>1.8</td>
<td>1.0</td>
<td>5.5</td>
</tr>
<tr>
<td>Real valuee</td>
<td>A$m</td>
<td>18,366</td>
<td>18,330</td>
<td>18,081</td>
<td>18,641</td>
<td>–0.2</td>
<td>–1.4</td>
<td>3.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Price</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal</td>
<td>A$/oz</td>
<td>1,720</td>
<td>1,665</td>
<td>1,709</td>
<td>1,705</td>
<td>–3.2</td>
<td>2.6</td>
<td>–0.2</td>
</tr>
<tr>
<td>Real</td>
<td>A$/oz</td>
<td>1,754</td>
<td>1,665</td>
<td>1,670</td>
<td>1,627</td>
<td>–5.0</td>
<td>0.3</td>
<td>–2.5</td>
</tr>
</tbody>
</table>

Notes: 
- **b** includes jewellery consumption and industrial applications; 
- **c** London Bullion Market Association PM price; 
- **d** In 2018 calendar year US dollars; 
- **e** In 2017–18 financial year Australian dollars; 
- **f** Forecast; 
- **s** Estimate.

Aluminium, alumina and bauxite

Australia’s global ranking

- 1st: Alumina exporter
- 1st: Bauxite producer
- 2nd: Alumina producer

3 stages of producing aluminium

1. Mining bauxite ore
2. Refining to recover alumina
3. Smelting to make aluminium

Map of Australia showing major alumina deposits (Gt)

- <0.01
- 0.02-0.03
- 0.04-0.09
- 0.10-0.20
- 0.21-0.44
- >0.45

Key consumer markets for aluminium (tonnes)

1. China 32 million
2. United States 5.6 million
3. Germany 2.2 million
4. Japan 2 million
5. South Korea 1.4 million
6. India 1.2 million

Global uses of aluminium

- 41% Transport and manufacturing
- 20% Packaging
- 14% Construction
- 8% Electrical
- 7% Consumer durables
- 7% Machinery
- 3% Other
11.1 Summary

- Uncertainty in global aluminium supply chains is expected to drive prices up during 2018 to US$2,138 a tonne for aluminium and US$401 a tonne for alumina. Prices are forecast to decline to US$2,062 a tonne for aluminium and US$358 a tonne for alumina by 2020.
- Australia’s aluminium and alumina exports are expected to remain steady through to 2019–20 at 1.4 million tonnes and 18 million tonnes per annum. Bauxite exports are forecast to increase from 27 million tonnes in 2017–18 to reach 30 million tonnes in 2019–20.
- Total Australian export value of aluminium, alumina and bauxite are forecast to decline from an estimated $14 billion in 2017–18 to $13 billion in 2019–20, reflecting a decline in prices.

11.2 Prices

Uncertainty in aluminium markets drove prices up during the June quarter.

Aluminium and alumina prices have reached multi-year highs during the June quarter 2018, as the US administration placed sanctions on United Company Rusal — the world’s second largest aluminium supplier, with 6 per cent of both global aluminium and alumina production. The company’s operations are globally integrated, drawing on supplies of bauxite and alumina for its own refiners and smelters, in addition to supplying to other operations outside of Russia.

The London Metal Exchange (LME) spot price for aluminium reached a seven-year high at US$2,603 a tonne on April 19th 2018. The Free On Board (FOB) Australia alumina price reached a historical high at US$643 a tonne on May 1st 2018. Aluminium and alumina prices increased due to concerns of supply shortages resulting from the sanctions.

The US administration relaxed the sanctions in late April, giving buyers an extended period to end contracts with United Company Rusal and the opportunity for Oleg Deripaska — the major shareholder of Rusal and the target of the sanctions — to divest and relinquish majority ownership of the company. Oleg Deripaska has taken steps to have the sanctions lifted on the company by resigning as director.

Prices have also been buffeted by uncertainty associated with the recent imposition of tariffs on some US aluminium imports. Prices are forecast to fall further and stabilise by the end of 2018, to average US$2,138 a tonne for aluminium and US$401 a tonne for alumina.

Prices to fall modestly in 2019 and 2020

The LME aluminium spot price and the FOB Australian alumina price are estimated to fall from 2018 levels. In 2020, the LME aluminium spot price is estimated to average US$2,062 a tonne. The FOB Australian alumina price is estimated to average US$358 a tonne. The decline in prices will come as supply concerns ease.

Despite the forecast declines, prices for 2019 and 2020 are still high relative to previous years, as capacity controls and restrictions on production due to air pollution concerns continue to keep the market tight in China — the world’s largest aluminium and alumina producer. The Chinese Government’s focus on decreasing air pollution is expected to continue until at least 2020. The policy is helping not only improve the air quality in China’s major cities, but also reducing the likelihood of aggressive capacity expansion in China.

Figure 11.1: World aluminium and alumina prices

11.3 Consumption

China and the US driving global consumption

Global aluminium consumption fell by 2.3 per cent year-on-year in the March quarter of 2018, driven primarily by declines in consumption in China (down 1.6 per cent year-on-year) and the US (down 17 per cent year-on-year). China accounts for 54 per cent of world aluminium consumption, and the US accounts for 9.5 per cent. Sales in the Chinese automotive sector (one of the country’s largest aluminium consumers) grew by 1.5 per cent year-on-year. However, global vehicle sales for the March quarter of 2018 were down year-on-year by 2.3 per cent.

World alumina consumption decreased by 1.9 per cent year-on-year in the March quarter 2018, driven by lower alumina usage in China (down 3.4 per cent year-on-year) — the world’s largest alumina consumer. Declines in alumina consumption broadly matched aluminium output for the quarter. In 2018, consumption of both aluminium and alumina will benefit from firm growth in global industrial production, with aluminium demand forecast to rise by 2.7 per cent to 61 million tonnes. World alumina consumption is also forecast to rise, by 2.6 per cent to 115 million tonnes, as aluminium smelter capacity returns from winter production cuts in China.

Aluminium demand continues to grow

Over the forecast period, world primary aluminium demand is projected to grow at an average annual growth rate of 2.4 per cent, to reach 64 million tonnes in 2020. China’s aluminium consumption is expected to continue to grow firmly over the next two years (reaching 35 million tonnes in 2020), supported by strengthening residential and infrastructure construction. Outside of China, growth in global economic activity is expected to be driven by the US, Eurozone, and emerging/developing economies.

A significant driver of aluminium demand is expected to come from cars, particularly energy efficient vehicles with a rising portion of aluminium components. Demand for automobiles is expected to remain strong through to 2020. The Chinese Government is promoting the use and production of energy-efficient cars (utilising higher aluminium content) to reduce vehicle weight. It is now targeting 2 million units to be sold in 2020.

Figure 11.2: World aluminium and alumina consumption


Other potential areas of increasing aluminium demand are the manufacture of busbars — strips of metal used to conduct electricity — (traditionally used copper), and the construction of China’s high voltage and ultra-high voltage electrical networks.

Growth in alumina demand in line with aluminium production

World alumina consumption is projected to grow at an average annual rate of 2.1 per cent, reaching 120 million tonnes in 2020 — in line with the average annual growth rate of aluminium production. This reflects a future of more strictly controlled capacity approvals in China’s aluminium production, and the growth of recycled aluminium.

China continues to be the largest alumina consumer in the world — accounting for 54 per cent of global alumina demand — reaching 65 million tonnes in 2020. For elsewhere in the world, the Middle East’s alumina consumption is projected to increase from 8 million tonnes to reach 11 million tonnes in 2020, driven by growing aluminium production in Iran as well as the Gulf Cooperation Council — which comprises Bahrain, Oman, Saudi Arabia, Qatar and the UAE.
11.4 Production

World output of aluminium, alumina and bauxite continues to rise in 2018

World aluminium production decreased by 0.7 per cent year-on-year for the first five months of 2018, to 32 million tonnes, driven by Chinese aluminium production (down 2.7 per cent year-on-year). The decline in Chinese aluminium production occurred while winter production cuts were in place as part of the focus on reducing air pollution. Global production is estimated to reach 61 million tonnes in 2018, with curtailed capacity expected to return during the remainder of the year.

Chinese alumina refineries increased production to meet increased demand for aluminium before the 2017–18 winter production cuts, lifting global production by 9.1 per cent in 2017 to reach 126 million tonnes. World alumina production declined by 5.0 per cent year-on-year for the first four months of 2018, driven by the reduction in Chinese production. World alumina production is estimated to increase modestly from 2017 levels to reach 128 million tonnes in 2018 to meet demand for global aluminium. A risk to this assessment is the Alunorte refinery in Brazil, where production has temporarily been halted due to environmental considerations. The refinery has an annual capacity of 6.4 million tonnes.

Global bauxite production increased 8.9 per cent year on year for the March 2018 quarter, driven by increased production in Guinea, up 49 per cent. Australia — the world’s largest bauxite producer — had its production increase by 6.7 per cent year-on-year. Global bauxite production for 2018 is estimated to increase by 7.6 per cent in 2018, to 319 million tonnes.

Environmental regulation in China to slow world aluminium/alumina output

Over the outlook period, world aluminium production is forecast to grow at an average annual growth rate of 2.4 per cent, reaching 64 million tonnes by 2020. Supply growth is expected to be slowed by environmental initiatives in China, which seek to control capacity expansion and reduce air pollution in major cities. Small and inefficient Chinese aluminium smelters may choose permanent closure under the laws, which allow them to sell their capacity quota to new or larger more efficient operations.
World alumina production is forecast to increase at an annual average rate of 1.4 per cent, reaching 132 million tonnes in 2020. This growth rate is slower than that of the last few years, due to China’s supply reforms — which include capacity swaps, winter production cuts, and illegal capacity cuts.

New alumina capacities are not only subject to policy restraints, but also the availability of bauxite. Refining operations are typically set up close to quality bauxite sources in order to establish integrated supply chains. Indonesia, where there are bauxite rich regions, is expected to increase alumina production as new refineries come in to operation during 2019.

The Chinese Hongqiao Group is expanding bauxite exports from Guinea to China, and the company’s future refinery developments are being planned in closer proximity to bauxite resources in Guinea and Indonesia.

A new refinery is expected to begin production in 2019 in the UAE, with a capacity of 2 million tonnes per annum. The refinery will use bauxite imported from Guinea. In India, Vedanta has obtained permission from the Odisha State Government to expand its Lanjigarh Alumina refinery from 1 million tonnes per annum to 6 million tonnes per annum. The company is able to purchase bauxite — a longstanding supply problem constraining capacity — from the state-run Odisha Mining Corporation on a long term basis.

Australia and Guinea to drive rising global bauxite output in 2019 and 2020

World bauxite production is forecast to grow at an annual rate of 5.6 per cent to reach 355 million tonnes by 2020. The gains will be driven by new capacity in Australia — notably the commissioning of Bauxite Hill and Amrun projects — and in Guinea. Guinea is currently the world’s third largest bauxite producer. The Chinese transformer-production firm Tebian Electric Apparatus Stock Company has invested US$2.8 billion to build a 10 million tonne per annum bauxite mine in Guinea, with production due to commence in mid-2019.

11.5 Australia’s exports and production

High prices to drive strong exports in 2017–18

Higher aluminium and alumina prices contributed to a 22 per cent year-on-year rise in total aluminium, alumina and bauxite export values for the first four months of 2018. In 2017–18, Australia’s aluminium, alumina and bauxite exports are estimated to grow strongly, up 27 per cent from 2016–17, to $14 billion. The increase is driven by strong prices in 2017–2018, the result of the US administration’s sanctions on Rusal.

Lower prices lead to weaker export outlook to 2019–20

After reaching an 11-year high of $14 billion in 2017–18, Australia’s alumina and bauxite exports are forecast to fall by an average 3.3 per cent annually, to $13 billion by 2019–20, driven by an expected fall in aluminium and alumina prices. Environmental priorities are likely to remain an important influence on the Chinese aluminium, alumina and bauxite industries, and hence, Australian alumina and bauxite exporters. The Chinese President is committed to curb air pollution in major Chinese cities, and is expected to close smelters and refineries which fail to meet new environmental regulations. This will reduce demand for Australian alumina and bauxite in the short term.

The majority (87 per cent) of Australia’s aluminium and alumina production is destined for export markets. Although there are emerging opportunities for Australia from the forecast high aluminium and alumina prices, exports are likely to be constrained by capacity limits and increased competition from low-cost producers in other nations. Australia is exempt from the US aluminium tariffs, and so has an opportunity to expand sales into the US. In addition, Australian alumina exports into the US could rise if idle US aluminium capacity is restarted as a result of the tariffs.

Steady aluminium/alumina 2017–18 output, but moderate growth in bauxite

Australia is estimated to have produced 1.6 million tonnes of primary aluminium in 2017–18, up 3.4 per cent from 2016–17. The increase is attributed to the return of full production to the Portland Aluminium smelter where production was cut during December 2016, due to a power outage.
Alumina output in Australia fell by 2.7 per cent year-on-year in the March quarter 2018, driven by lower output at the Queensland Alumina Limited refinery due to maintenance activity. In 2017–18, Australian alumina output is estimated to have been steady at 20 million tonnes. Australia’s bauxite output rose by 6.7 per cent year-on-year in the March quarter 2018 to about 22 million tonnes. The new Bauxite Hills mine started operating in April 2018, with initial planned annual output of 2 million tonnes, rising to 6 million tonnes in the next 3 years. Australian bauxite output is estimated at 90 million tonnes in 2017–18, up 5.6 per cent.

New capacity to contribute to strong growth in bauxite production

With no planned expansions to smelter or refinery capacity in the short-term, output is forecast to remain at 1.6 million tonnes per annum for aluminium and 20 million tonnes for alumina through to 2019–20. Bauxite production is projected to grow at an annual average rate of 7.1 per cent, to 104 million tonnes in 2019–20. The strong growth is due to the addition of new capacity at the Bauxite Hills and Amrun projects (the latter expected to start production during 2019). Another potential addition to Australia’s bauxite production is Queensland’s Urquhart mine. The owners obtained a mining lease from the Queensland Government in early 2018, and mining is pending final approvals and the completion of infrastructure.
### Table 11.1: Aluminium, alumina and bauxite outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2017</th>
<th>2018(^i)</th>
<th>2019(^f)</th>
<th>2020(^f)</th>
<th>Annual percentage change</th>
<th>2018(^i)</th>
<th>2019(^f)</th>
<th>2020(^f)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary aluminium</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>kt</td>
<td>59,755</td>
<td>61,005</td>
<td>62,514</td>
<td>63,637</td>
<td>2.1</td>
<td>2.5</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td>kt</td>
<td>59,266</td>
<td>60,853</td>
<td>62,317</td>
<td>63,802</td>
<td>2.7</td>
<td>2.4</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Closing stocks(^s)</td>
<td>kt</td>
<td>2,282</td>
<td>2,107</td>
<td>1,943</td>
<td>1,795</td>
<td>–7.6</td>
<td>–7.8</td>
<td>–7.6</td>
<td></td>
</tr>
<tr>
<td>- weeks of consumption</td>
<td></td>
<td>2.0</td>
<td>1.8</td>
<td>1.6</td>
<td>1.5</td>
<td>–10.0</td>
<td>–10.0</td>
<td>–9.8</td>
<td></td>
</tr>
<tr>
<td><strong>Prices aluminium</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- nominal</td>
<td>US$/t</td>
<td>1,969</td>
<td>2,138</td>
<td>2,066</td>
<td>2,062</td>
<td>8.6</td>
<td>–3.4</td>
<td>–0.2</td>
<td></td>
</tr>
<tr>
<td>- real(^d)</td>
<td>US$/t</td>
<td>2,016</td>
<td>2,138</td>
<td>2,022</td>
<td>1,980</td>
<td>6.1</td>
<td>–5.4</td>
<td>–2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Prices alumina spot</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- nominal</td>
<td>US$/t</td>
<td>351</td>
<td>401</td>
<td>360</td>
<td>358</td>
<td>14.1</td>
<td>–10.2</td>
<td>–0.5</td>
<td></td>
</tr>
<tr>
<td>- real(^d)</td>
<td>US$/t</td>
<td>360</td>
<td>401</td>
<td>352</td>
<td>344</td>
<td>11.5</td>
<td>–12.2</td>
<td>–2.4</td>
<td></td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary aluminium</td>
<td>kt</td>
<td>1,518</td>
<td>1,569</td>
<td>1,568</td>
<td>1,568</td>
<td>3.4</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>Alumina</td>
<td>kt</td>
<td>20,599</td>
<td>20,367</td>
<td>20,418</td>
<td>20,451</td>
<td>–1.1</td>
<td>0.3</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Bauxite</td>
<td>Mt</td>
<td>84.9</td>
<td>89.7</td>
<td>98.0</td>
<td>104.2</td>
<td>5.6</td>
<td>9.3</td>
<td>6.3</td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary aluminium</td>
<td>kt</td>
<td>189</td>
<td>172</td>
<td>188</td>
<td>188</td>
<td>–9.0</td>
<td>9.3</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td><strong>Exports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary aluminium</td>
<td>kt</td>
<td>1,329</td>
<td>1,396</td>
<td>1,380</td>
<td>1,380</td>
<td>5.0</td>
<td>–1.1</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>- nominal value</td>
<td>A$m</td>
<td>3,167</td>
<td>3,878</td>
<td>3,766</td>
<td>3,629</td>
<td>22.5</td>
<td>–2.9</td>
<td>–3.6</td>
<td></td>
</tr>
<tr>
<td>- real value(^e)</td>
<td>A$m</td>
<td>3,229</td>
<td>3,878</td>
<td>3,680</td>
<td>3,464</td>
<td>20.1</td>
<td>–5.1</td>
<td>–5.9</td>
<td></td>
</tr>
<tr>
<td>Alumina</td>
<td>kt</td>
<td>18,230</td>
<td>17,902</td>
<td>17,515</td>
<td>17,638</td>
<td>–1.8</td>
<td>–2.2</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>- nominal value</td>
<td>A$m</td>
<td>6,655</td>
<td>8,772</td>
<td>8,226</td>
<td>8,070</td>
<td>31.8</td>
<td>–6.2</td>
<td>–1.9</td>
<td></td>
</tr>
<tr>
<td>- real value(^e)</td>
<td>A$m</td>
<td>6,786</td>
<td>8,772</td>
<td>8,037</td>
<td>7,704</td>
<td>29.3</td>
<td>–8.4</td>
<td>–4.1</td>
<td></td>
</tr>
<tr>
<td>Bauxite</td>
<td>kt</td>
<td>24,851</td>
<td>27,453</td>
<td>25,963</td>
<td>30,475</td>
<td>10.5</td>
<td>–5.4</td>
<td>17.4</td>
<td></td>
</tr>
<tr>
<td>- nominal value</td>
<td>A$m</td>
<td>1,042</td>
<td>1,169</td>
<td>1,214</td>
<td>1,226</td>
<td>12.2</td>
<td>3.8</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>- real value(^e)</td>
<td>A$m</td>
<td>1,062</td>
<td>1,169</td>
<td>1,186</td>
<td>1,170</td>
<td>10.0</td>
<td>1.5</td>
<td>–1.3</td>
<td></td>
</tr>
<tr>
<td><strong>Total value</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- nominal value</td>
<td>A$m</td>
<td>10,864</td>
<td>13,819</td>
<td>13,207</td>
<td>12,926</td>
<td>27.2</td>
<td>–4.4</td>
<td>–2.1</td>
<td></td>
</tr>
<tr>
<td>- real value(^e)</td>
<td>A$m</td>
<td>11,077</td>
<td>13,819</td>
<td>12,903</td>
<td>12,339</td>
<td>24.8</td>
<td>–6.6</td>
<td>–4.4</td>
<td></td>
</tr>
</tbody>
</table>

Notes: \(^b\) Producer and LME stocks; \(^c\) LME cash prices for primary aluminium; \(^d\) In 2018 calendar year US dollars; \(^e\) In 2017–18 financial year Australian dollars; \(^s\) Estimate; \(^f\) Forecast

Source: ABS (2018) International Trade in Goods and Services, 5368.0; AME Group (2018); LME (2018); Department of Industry, Innovation and Science (2018); International Aluminium Institute (2018); World Bureau of Metal Statistics (2018)
Copper
Resources and Energy Quarterly June 2018

Australia is the 7th largest producer of copper in the world.

Copper is 100% recyclable and nearly 80% of the copper that has ever been produced is still in use today.

The average home contains 180 kg of copper.

Australia is the world’s 3rd largest exporter of copper ores and concentrates.

Key copper consumer markets (thousand tonnes), 2017

Major Australian copper deposits (Mt)

- <0.01
- 0.02
- 0.03–0.8
- 0.9–2.1
- 2.2–6.8
- >6.8

- Deposit
- Operating mine

Global uses of copper

- Equipment: 31%
- Building Construction: 30%
- Infrastructure: 15%
- Transport: 12%
- Industrial: 12%
12.1 Summary

- A rise in copper consumption is expected to push copper prices up from an average of US$6,462 in 2018, to US$7,910 a tonne by 2020.
- Australia’s copper exports are forecast to rise from 897,000 tonnes in 2017–18 to over 1 million tonnes in 2019–20 (in metal content terms). This reflects an increase in production from several existing mines.
- The value of Australia’s copper exports is projected to increase from $8.5 billion in 2017–18 to $11.5 billion by 2019–20. This reflects higher production in the short-term and price growth late in the outlook period.

12.2 Prices

Copper prices continued their recovery in early 2018

The London Metal Exchange (LME) copper price rose from US$6,808 in the December quarter to US$6,959 in the March quarter. This appears to lock in a price rise that began in the latter half of 2017, and which followed five years of declines. The rise reflects strong industrial production and growing demand for energy infrastructure and technology.

Copper prices are expected to taper in the short term

The LME copper price topped US$7,000 at points in February and remained at just under that level until May, when prices eased back slightly. Prices are likely to be constrained during 2018 by strong supply and a gradual slowing of economic growth in China.

Although mined supply is expected to grow, recycled supply is likely to fall due to China’s recent cuts in importation of scrap copper for recycling. Copper recycling can dial up and down rapidly, and it has often acted as a stabiliser for copper prices — adding to supply in high price environments, and reducing when prices are low. It is likely that other countries will replace China in the recycling market over time, but in the interim prices may lose a degree of stability. Potential supply shocks including industrial disruption from the Escondida mine in Chile also add to price uncertainty.
On balance, it is expected that copper prices will yield some of their recent gains in the short-term as supply expands relative to demand. Prices are expected to average just under US$6,500 in 2018. However, rising industrial production — and growing use of copper in emerging fields such as renewable energy and electric vehicles — should support demand and push prices up again in 2019 and 2020.

12.3 World consumption

Copper consumption is set for solid growth over the next two years

Global copper consumption is projected to rise from 24.5 million tonnes in 2018, to 25.4 million tonnes in 2019 and 26.1 million tonnes in 2020, growing at an average rate of around 3 per cent a year. Higher copper consumption reflects growing global industrial production and a ramp-up in development of copper-intensive technologies and consumer items.

China — which consumes about half of all copper — remains critical to the copper outlook. However, its economic growth trajectory has become increasingly difficult to predict. China’s growth is subject to several significant policy influences, including a policy-induced pivot towards ‘higher quality’ — or more environmentally sustainable — growth. This shift is playing out amidst a broader and longer-term transition towards a more consumer- and services-based economic model. Growth in Chinese power grid and fixed asset investment has been easing since 2016, with overall investment now beginning to decline in absolute terms. China’s importance in the global copper market means even small changes in its economy have significant implications for copper consumption.

Some of the risk around China may be ameliorated by an expansion in copper use among other countries in Asia, as well as growing global demand for renewable energy and electric vehicles. Electric vehicles contain an average of 90 kilograms of copper — well above the 25 kilograms used on average in petrol vehicles. Output of electric vehicles is expected to increase by more than half over the next two years, resulting in 150,000 tonnes of extra copper demand globally by 2019.
12.4 World production

World copper mine production has been constrained by supply disruptions

Copper production in 2017 was temporarily constrained by disruptions to supply: export restrictions in Indonesia and industrial action in Chile affected several very large mines. These disruptions persisted into the March quarter 2018, which saw output edge just below 5 million tonnes.

World mine production is expected to recover rapidly

Global copper mine production is forecast to rise from 21.4 million tonnes in 2018 to 22.3 million tonnes in 2019, and then to 23.0 million tonnes in 2020. Major producers are expected to unveil a range of new mines and expansions, and disruptions are likely to wind down.

A total of 780,000 tonnes of new supply is expected to be added in 2018, as a result of expanded capacity from new projects. The bulk of this new capacity is expected to come from two key mines: First Quantum Minerals’ Cobre Panama, with an estimated annual capacity of 330,000 tonnes, and the new Qulong copper mine in Tibet, operated by Tibet Julong Mining, which is expected to supply 120,000 tonnes.

Higher output will also be supported by a range of expansions to existing mines. These include two large upgrades in Chile and Peru, which are expected to add a total of 100,000 tonnes in new capacity. A further 190,000 tonnes of additional supply is expected from small upgrades across a range of producing countries. Partly offsetting this, refined supply from India is likely to be curtailed, after India’s Tamil Nadu State announced that it would seek the closure of Vedanta’s copper smelter in Thoothukudi. The smelter, which provides around 1.7 per cent of global supply, has long been a source of environmental protests.

Global production is also subject to other significant risks. Among these are the prospects of renewed industrial action at the Escondida mine in Chile, which accounts for around 4.5 per cent of global production.
A breakdown in contract renegotiations at the mine resulted in an output decline of more than 60 per cent in the March quarter 2017, and subsequent efforts to lock in an advance deal failed. However, contract renegotiations appear now to be moving in a positive direction, with the latest wage offer being provisionally accepted (although negotiations over working conditions remain ongoing).

Solid inventories for copper should provide some degree of cushioning against potential disruptions.

World refined copper output is expected to rise over the outlook period

World refined copper output is expected to grow from a record 24.4 million tonnes in 2018 to 25.0 million tonnes in 2019 and 25.5 million tonnes in 2020. Higher refined output will be driven by new refineries and expansion projects in China, supported by some growth in Europe and southern Asia.

Significant changes are underway in markets for secondary production. These markets supply around 4 million tonnes of copper from recycled sources each year. The changes are largely driven by China, which is the largest recycler of copper scrap. China cut its imports of copper scrap by almost 40 per cent in volume terms in the March quarter, following directives from its Ministry of Ecology and Environment which reflected a broader reform in China’s waste management and recycling systems, and led to the immediate banning of low grade scrap imports. Supply of recycled copper will likely be suppressed over the outlook period, but ultimately a diversion of imports to nearby countries such as Thailand and the Philippines should see normal supply resume.

Accordingly, production of recycled copper is forecast to ease from 4.0 million tonnes in 2017 to 3.8 million tonnes by 2019, and then rebound to 4.3 million tonnes by 2020. Over the longer term, supply from recycled sources is expected to rise as countries expand their recycling operations. Greater quantities of copper are likely to return to markets over time as growing numbers of electronic consumer goods reach end of life, and are scrapped.

Figure 12.7: Copper stocks by location


Figure 12.8: Secondary copper production and price

Source: Bloomberg Statistics (2018); Department of Industry, Innovation and Science (2018)
12.5 Australia

Copper exports are expected to keep rising over the outlook period

Australia’s copper export earnings are estimated to have lifted by 11.9 per cent to $8.5 billion in 2017–18. This is partly due to higher prices and partly a result of larger output from South Australia, where REX Minerals’ new Hillside mine is expected to commence in the near future. The recommencement of full operations following upgrades at Olympic Dam has also supported a rise in exports in the second half of the year. Most growth in Australian exports in recent years has been in ore and concentrates, which supply China’s growing refinery capacity.

Figure 12.9: Australia’s copper exports

The value of Australia’s copper export earnings is projected to increase from $8.5 billion in 2017–18 to $9.2 billion in 2018–19, with an even sharper rise (to $11.5 billion) projected for 2019–20. This is largely a result of an expected rise in copper prices and expanded output (or a return to normal output) at several significant mines towards the end of the outlook period.

These include Newcrest’s sizeable Cadia Valley mine, which is expected to ramp up its production significantly in 2019 following a prolonged slowdown, which began in 2017 due to seismic activity. Other mines returning to normal production include CuDeco’s Rocklands mine in Queensland, which was temporarily suspended amidst safety concerns, and Sterlite Industries Mount Lyell mine, which is returning from a temporary period of care and maintenance, in early 2019.

Mine production will be supported by rising output from existing mines

Australian production is projected to rise from 898,000 tonnes in 2017–18 to just over 1 million tonnes in 2019 and 2020. This is largely a result of a return to normal production among existing mines at Cadia Valley, Mount Lyell and Rocklands, though Oz Minerals may also open a new mine in Carrapateena in 2020.

Although short-term prospects for new production sources are modest, eleven copper projects remain in the investment pipeline, and the expected growth in world prices should significantly improve the prospects for some of these projects over the longer term.

Exploration expenditure is gradually rising

Exploration spending lifted marginally, from $42.4 million in the December quarter to $46.2 million in the March quarter 2018. The lift was a result of higher exploration activity in NSW and South Australia.

Exploration appears to be recovering gradually, after falling by around 75 per cent from its 2011–12 peak (when exploration averaged more than $110 million per quarter).
### Table 12.2: Copper outlook

<table>
<thead>
<tr>
<th></th>
<th>World</th>
<th>Unit</th>
<th>2017</th>
<th>2018(^a)</th>
<th>2019(^f)</th>
<th>2020(^f)</th>
<th>2018(^a)</th>
<th>2019(^f)</th>
<th>2020(^f)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–mine</td>
<td>kt</td>
<td>20,193</td>
<td>21,351</td>
<td>22,310</td>
<td>23,049</td>
<td>5.7</td>
<td>4.5</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>–refined</td>
<td>kt</td>
<td>23,522</td>
<td>24,412</td>
<td>25,027</td>
<td>25,511</td>
<td>3.8</td>
<td>2.5</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td><strong>Consumption</strong></td>
<td>kt</td>
<td>23,733</td>
<td>24,488</td>
<td>25,436</td>
<td>26,118</td>
<td>3.2</td>
<td>3.9</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>Closing stocks</td>
<td>kt</td>
<td>1,063</td>
<td>1,016</td>
<td>1,018</td>
<td>805</td>
<td>–4.4</td>
<td>0.2</td>
<td>–20.9</td>
<td></td>
</tr>
<tr>
<td>–weeks of consumption</td>
<td></td>
<td>2.3</td>
<td>2.2</td>
<td>2.1</td>
<td>1.6</td>
<td>–7.4</td>
<td>–3.6</td>
<td>–22.9</td>
<td></td>
</tr>
<tr>
<td><strong>Prices LME</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–nominal</td>
<td>US$/t</td>
<td>6,164</td>
<td>6,462</td>
<td>7,063</td>
<td>7,910</td>
<td>4.8</td>
<td>9.3</td>
<td>12.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>USc/lb</td>
<td>280</td>
<td>293</td>
<td>320</td>
<td>359</td>
<td>4.8</td>
<td>9.3</td>
<td>12.0</td>
<td></td>
</tr>
<tr>
<td>–real(^b)</td>
<td>US$/t</td>
<td>6,310</td>
<td>6,462</td>
<td>6,913</td>
<td>7,598</td>
<td>2.4</td>
<td>7.0</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>USc/lb</td>
<td>286</td>
<td>293</td>
<td>314</td>
<td>345</td>
<td>2.4</td>
<td>7.0</td>
<td>9.9</td>
<td></td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mine output</td>
<td>kt</td>
<td>917</td>
<td>898</td>
<td>1,019</td>
<td>1,034</td>
<td>–2.1</td>
<td>13.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Refined output</td>
<td>kt</td>
<td>448</td>
<td>367</td>
<td>409</td>
<td>397</td>
<td>–18.0</td>
<td>11.3</td>
<td>–3.0</td>
<td></td>
</tr>
<tr>
<td><strong>Exports</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–ores and cons.(^c)</td>
<td>kt</td>
<td>1,752</td>
<td>1,938</td>
<td>2,200</td>
<td>2,336</td>
<td>10.6</td>
<td>13.5</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>–refined</td>
<td>kt</td>
<td>413</td>
<td>333</td>
<td>375</td>
<td>364</td>
<td>–19.5</td>
<td>12.7</td>
<td>–2.9</td>
<td></td>
</tr>
<tr>
<td>–total metallic content</td>
<td>kt</td>
<td>920</td>
<td>897</td>
<td>1,003</td>
<td>1,030</td>
<td>–2.5</td>
<td>11.7</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td><strong>Export value</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>–nominal</td>
<td>A$m</td>
<td>7,569</td>
<td>8,467</td>
<td>9,214</td>
<td>11,498</td>
<td>11.9</td>
<td>8.8</td>
<td>24.8</td>
<td></td>
</tr>
<tr>
<td>–real(^d)</td>
<td>A$m</td>
<td>7,717</td>
<td>8,467</td>
<td>9,003</td>
<td>10,976</td>
<td>9.7</td>
<td>6.3</td>
<td>21.9</td>
<td></td>
</tr>
</tbody>
</table>

Notes: \(^a\) In 2018 calendar year US dollars; \(^b\) Quantities refer to gross weight of all ores and concentrate; \(^c\) In 2017–18 financial year Australian dollars; \(^d\) Forecast; \(^e\) Estimate

Nickel
Resources and Energy Quarterly June 2018

Australia produces >200 thousand tonnes of nickel each year.
10% of world nickel mined is in Australia.
Nickel exports contribute more than $2b to Australia’s economy.

Key nickel consumer markets (tonnes)
- United States: 146,000
- European Union: 323,000
- China: 1,094,000
- Japan: 148,000

Major Australian nickel deposits (Mt)
- <0.05
- 0.06–0.21
- 0.22–0.58
- 0.59–0.83
- 0.84–1.69
- >1.70

Global uses of nickel

- 68% Stainless steel
- 16% Alloys
- 9% Plating
- 3% Casting
- 3% Batteries
- 1% Other
13.1 Summary

- Nickel prices are expected to rise above US$13,400 a tonne in 2018, supported by increased stainless steel demand. Prices are then expected to largely hold this level over the rest of the outlook period, with marginal declines towards the end as supply lifts.
- Strong demand conditions are expected to encourage development of two new mines in Western Australia, which will drive a lift in production from 163,000 tonnes in 2017–18 to 178,000 tonnes by 2019–20.
- A significant upgrade to the Kwinana nickel refinery should also see Australia’s refined and intermediate nickel production rise — from 134,000 to 157,000 tonnes by 2019–20.
- Strong prices, in conjunction with rising mined and refined production, should see Australia’s nickel export earnings lift from $2.3 billion in 2017–18 to $2.8 billion by 2019–20.

13.2 Prices

Nickel prices are still growing from a low point reached in mid–2017

Nickel prices faced significant upward pressure in the June quarter, rising from just over US$13,000 a tonne at the start of April to US$13,600 a tonne by the end, and then to over US$15,450 a tonne in early June. Prices have been supported by the emergence of a significant supply deficit driven by higher stainless steel production.

Prices are expected to hold onto much of their recent gains over the remainder of 2018, easing off only slightly towards the end of the year — as growth in the production of stainless steel slows marginally, and the supply of pig-iron nickel picks up. Prices are expected to continue easing marginally out to 2020, as new supplies of pig iron continue to enter the market. However, longer-term demand for new battery and medical technology (nickel is the biggest component of most medical implants) is expected to start adding more significant price pressures in the refined nickel market towards the end of the outlook period.

13.3 World consumption

Rising stainless steel and battery output is driving nickel usage

Nickel consumption is expected to rise from 2.3 million tonnes in 2018 to 2.5 million tonnes by 2020. This will be driven by increased demand for stainless steel, which is growing by around 5 per cent each year. A rapid roll-out of stainless steel smelters in China and Indonesia is currently underway. Smelters in these nations now account for half of all nickel use.

Rising use of stainless steel is driving up the demand for nickel pig iron — a cheaper alloy used as a substitute for pure nickel. This is leading to higher nickel pig iron production across Indonesia. Nickel ore and connected nickel pig iron production is increasingly shifting into a separate supply chain, splitting away from the markets for high grade and pure nickel used for energy storage and superalloys. The pig iron market is likely to grow strongly over the outlook period, while the high grade market is expected to pick up just beyond the outlook period, as battery and electric vehicle demand becomes increasingly important.

Figure 13.1: Nickel LME spot prices and stocks

13.4 World production

Production growth is being supported by several new mines
Nickel supply has risen significantly in recent quarters, and growth is expected to continue. Mine output is projected to rise from 2.3 million tonnes in 2018 to 2.5 million tonnes in 2019 and 2.6 million tonnes in 2020. Refined output is expected to grow a little more rapidly, as output from Chinese smelters increases and improvements in efficiency reduce wastage from ores.

Some recent mine cutbacks have added to price pressures. Vale — a large global producer of nickel — announced in May that its investment projects in Canada and New Caledonia will be pared back, removing almost 500,000 tonnes of production over the outlook period. This is expected to help keep the nickel market relatively right, and reflects efforts by the firm to protect its reserves.

New nickel mines are commencing in Indonesia in response to growing demand for nickel pig iron in China. Indonesia has also relaxed some export controls, allowing greater export of nickel ore from the country. Environmental reviews in the Philippines are also expected to conclude by the end of the June quarter, and suspended mines may then be allowed to start producing again if environmental requirements are met. World production growth is thus expected to slightly exceed consumption growth, leading to a gradual narrowing of the supply deficit out to 2020.

13.5 Australia

Exploration expenditure was flat in the March quarter
Exploration for nickel and cobalt largely stabilised in the March quarter, with $46 million spent. While this represents minimal change from the $48.6 million spent in the December quarter, it is more than double the spending of a year ago. Price growth has led to greater interest in nickel discovery, with the bulk of growth in exploration spending occurring among the large untapped deposits of Western Australia.
Australian production is expected to rebound from a low point

Over the forecast period, Australia’s nickel production is expected to rapidly recover from a period of significant mine and facility closures in 2016 and 2017. Mine production is expected to rise from an estimated 163,000 tonnes in 2017–18 to 168,000 tonnes in 2018–19 and 178,000 tonnes in 2019–20.

This recovery reflects some small rises in output from existing mines, as well as the opening of two additional mines in Western Australia: Mincor’s mine at Kambalda, and Poseidon Nickel’s new mine at Mount Windarra.

Australia’s annual refined and intermediate nickel production is expected to rise from 134,000 tonnes to 157,000 tonnes over the outlook period. This is largely the result of a projected rise in output from BHP’s Kwinana plant, where upgrades are expected to lift nameplate capacity to 100,000 tonnes a year from April 2019.

The upgraded facility will use both nickel and sulphuric acid from the Kalgoorlie nickel smelter to produce nickel sulphate for use in electric batteries. The $60 million upgrade reflects BHP’s efforts to supply the rising electric vehicle market, and strength in this market could support a second upgrade to the facility (which would double capacity to 200,000 tonnes) sometime in the early 2020s.

Export earnings are expected to rebound in line with production

Australia’s nickel export earnings have dropped for several successive years, but are expected to bottom out at $2.3 billion in 2017–18. These export earnings figures have been revised up from March 2018 Resources and Energy Quarterly estimates, reflecting an earlier than expected beginning of the recovery in nickel prices.

Export earnings are forecast to rise to $2.5 billion in 2018–19, and then to $2.8 billion in 2019–20. This rise is largely the result of the expansion currently underway in the Kwinana refinery, which is expected to significantly increase exports of refined nickel from mid–2019.
### Table 13.1: Nickel outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2017</th>
<th>2018*</th>
<th>2019f</th>
<th>2020f</th>
<th>2018*</th>
<th>2019f</th>
<th>2020f</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– mine</td>
<td>kt</td>
<td>2,145</td>
<td>2,264</td>
<td>2,452</td>
<td>2,586</td>
<td>5.5</td>
<td>8.3</td>
<td>5.5</td>
</tr>
<tr>
<td>– refined</td>
<td>kt</td>
<td>2,079</td>
<td>2,194</td>
<td>2,377</td>
<td>2,490</td>
<td>5.5</td>
<td>8.3</td>
<td>4.8</td>
</tr>
<tr>
<td>Consumption</td>
<td>kt</td>
<td>2,162</td>
<td>2,286</td>
<td>2,401</td>
<td>2,503</td>
<td>5.7</td>
<td>5.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Stocks</td>
<td>kt</td>
<td>417</td>
<td>325</td>
<td>301</td>
<td>289</td>
<td>–21.9</td>
<td>–7.4</td>
<td>–4.2</td>
</tr>
<tr>
<td>– weeks of consumption</td>
<td></td>
<td>10.0</td>
<td>7.4</td>
<td>6.5</td>
<td>6.0</td>
<td>–26.2</td>
<td>–11.8</td>
<td>–8.1</td>
</tr>
<tr>
<td>Price LME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– nominal</td>
<td>US$/t</td>
<td>10,404</td>
<td>13,444</td>
<td>13,525</td>
<td>13,250</td>
<td>29.2</td>
<td>0.6</td>
<td>–2.0</td>
</tr>
<tr>
<td>– refined</td>
<td>Us/c/lb</td>
<td>472</td>
<td>610</td>
<td>613</td>
<td>601</td>
<td>29.2</td>
<td>0.6</td>
<td>–2.0</td>
</tr>
<tr>
<td>– real b</td>
<td>US$/t</td>
<td>10,650</td>
<td>13,444</td>
<td>13,237</td>
<td>12,726</td>
<td>26.2</td>
<td>–1.5</td>
<td>–3.9</td>
</tr>
<tr>
<td>– refined</td>
<td>Us/c/lb</td>
<td>483</td>
<td>610</td>
<td>600</td>
<td>577</td>
<td>26.2</td>
<td>–1.5</td>
<td>–3.9</td>
</tr>
<tr>
<td>Australia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– mine c</td>
<td>kt</td>
<td>201</td>
<td>163</td>
<td>168</td>
<td>178</td>
<td>–18.8</td>
<td>2.8</td>
<td>6.1</td>
</tr>
<tr>
<td>– refined</td>
<td>kt</td>
<td>112</td>
<td>108</td>
<td>122</td>
<td>141</td>
<td>–3.5</td>
<td>13.2</td>
<td>15.6</td>
</tr>
<tr>
<td>– intermediate</td>
<td></td>
<td>37</td>
<td>26</td>
<td>16</td>
<td>16</td>
<td>–29.9</td>
<td>–37.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Export volume ds</td>
<td>kt</td>
<td>190</td>
<td>192</td>
<td>172</td>
<td>194</td>
<td>0.8</td>
<td>–10.1</td>
<td>12.9</td>
</tr>
<tr>
<td>– nominal value e</td>
<td>kt</td>
<td>2,275</td>
<td>2,343</td>
<td>2,524</td>
<td>2,823</td>
<td>3.0</td>
<td>7.7</td>
<td>11.8</td>
</tr>
<tr>
<td>– real value e</td>
<td>kt</td>
<td>2,320</td>
<td>2,343</td>
<td>2,466</td>
<td>2,694</td>
<td>1.0</td>
<td>5.3</td>
<td>9.3</td>
</tr>
</tbody>
</table>

Notes: b In 2018 calendar year US dollars; c Nickel content of domestic mine production; d Includes metal content of ores and concentrates, intermediate products and nickel metal; e In 2017–18 financial year Australian dollars; f Forecast, s Estimate

Source: ABS (2018) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Company reports; Department of Industry, Innovation and Science; International Nickel Study Group (2018); LME (2018); World Bureau of Metal Statistics (2018)
Zinc
Resources and Energy Quarterly March 2018

Australia produces more than 800,000 tonnes of zinc each year.

Zinc exports contribute more than $2.5 billion to the Australian economy.

Australia holds 20% of the world's known zinc resources.

Key zinc consumer markets:
1. China - 6,724kt
2. United States - 819kt
3. India - 689kt
4. South Korea - 622kt
5. Germany - 481kt
6. Japan - 470kt

Major Australian zinc deposits (Mt):
- <0.01
- 0.02-0.03
- 0.04-0.09
- 0.10-0.20
- 0.21-0.44
- >0.45

Deposit
Operating mine

Global uses of zinc:
- 50% galvanise steel
- 17% diecasting
- 17% make brass and bronze alloys
- 6% rolled zinc
- 6% chemicals
- 4% other
14.1 Summary

- Zinc prices are expected to edge back from a peak in the first half of 2018 — falling from US$3,155 a tonne in 2018 to US$2,625 a tonne by 2020 — as supply closes the gap with demand.
- Australia’s production is expected to rise sharply over the next year, before stabilising as mines reach their maximum output and prices ease. Export volumes are projected to rise from 1.1 million tonnes of metal content in 2017–18 to 1.6 million tonnes by 2019–20.
- Export values are expected to lock in the substantial gains recorded in 2017–18, remaining largely steady at around $3.8 billion each year over the outlook period.

14.2 Prices and stocks

Zinc prices are expected to peak in 2018

The LME zinc price has edged back after an extremely strong March quarter, falling from US$3,540 a tonne in February to US$3,191 in April and under US$3,100 in May/June. Prices are expected to ease a little further over the remainder of 2018, as demand growth continues to soften and new supply enters the market, narrowing the supply deficit.

This price decline is expected to persist into 2019, as new supply from a range of mines around the world begins to enter markets in late 2018 and 2019. Prices are forecast to ease to US$2,850 a tonne in 2019. A further fall to US$2,625 is forecast for 2020, as the market moves into surplus. By this point, much (but not all) of the demand-fuelled price gain of 2017 will have been reversed.

14.3 World consumption

Consumption growth is expected to moderate over the outlook period

World refined zinc consumption is forecast to lift from 14.6 million tonnes in 2018 to 15.6 million tonnes by 2020. China remains the key player in global zinc demand, accounting for around half of all zinc consumption. However, it is likely to face a slight decline in its top-level growth figures,
as its government seeks to reduce environmental degradation and shift China towards a more service and consumer-oriented economy. Housing construction in China remains healthy for the time being, but some softening remains in prospect given the scale of private debt. The Belt and Road Initiative represents a strong potential future source of zinc demand, but the scale of initiatives to be undertaken over the next two years is relatively modest in comparison to the long-term trajectory. As such, zinc consumption over the next two years is expected to remain relatively solid, but with a slight softening in its growth rate.

14.4 World production

Mine output should lift sharply towards the end of the outlook period

Previous falls in zinc prices led to many mines closing or reducing their output in 2016. Prices have since rebounded, and capital has been rapidly deployed to restore production and unlock new deposits. However, mines are yet to fully ramp back up, as restarting production requires hiring and training, site inspections and the (re)deployment of equipment.

More than 500,000 tonnes of new supply is forecast to enter markets in 2018, with more to follow in 2019. Most of this will be through re-openings and expansions of existing facilities, though several substantial new mines (including Ironbark’s Citronen project, Arizona Mining’s Hermosa project, and the Khnaiguiyah project in Saudi Arabia) could potentially add to supply towards the end of the outlook period.

Supply is forecast to rise from 14.0 million tonnes in 2018 to 14.7 million tonnes in 2019, then 15.3 million tonnes in 2020. This exceeds growth in demand, and should allow inventories to start recovering by 2020.

Refined production is expected to rise in line with mine output

Mine concentrates are expected to be in shortfall during the bulk of the outlook period, which will constrain growth in zinc refining. Refining capacity will be brought on line as the availability of raw material improves. Refined output is forecast to rise from 14.3 million tonnes in 2018 to 15.7 million tonnes by 2020.

14.5 Australia

Exploration expenditure has edged back after a brief surge

Exploration spending for silver, lead and zinc dropped to $18.6 million in the March quarter, from $29.3 million in the December quarter. This remains well above the level of a year ago, when spending dropped to a low of $7.7 million. However, with zinc prices showing signs of turning down, it is possible that exploration spending will ease back over the next year.

Unlike many other commodities, silver lead and zinc exploration is largest among the eastern states, with more than half of spending occurring in NSW and Queensland.

**Figure 14.3: Australia’s silver, lead and zinc exploration expenditure**

Australian mined production is recovering, due to a surge in investment. Australia’s metal content production eased marginally in the March quarter — from 245,000 tonnes to 239,000 tonnes — largely due to a slight drop in production from Glencore’s McArthur River mine, which produced at very high levels in December.

Annual production is forecast to rise significantly in 2018. Significant capital was invested in Australia following the 2017 zinc price surge. This investment has made zinc an outlier in the base metal complex (which has generally seen investment fall substantially). Australia’s production of zinc is forecast to lift from 944,000 tonnes in 2017–18 to 1.3 million tonnes in 2018–19 and 1.4 million tonnes by 2019–20.

The Century mine — once the world’s largest zinc mine — is set to re-commence operations in late 2018. New Century Resources, which acquired the mine in 2017, is seeking to extract ore from the mine’s tailings dam, which potentially holds more than 2.3 million tonnes of zinc. Feasibility studies are also underway on whether extraction can extend out to nearby resources, extending the project’s life out to the 2030s.

MMG’s Dugald River project is also expected to make a substantial contribution to production over the outlook period. This deposit holds large, high-quality zinc reserves, and MMG has already invested more than A$1 billion to open up the resource. Production has been ramping up steadily for six months, with a new processing plant now attached to the project.

Zinc exports are expected to grow in line with rising production. Australia has relatively modest domestic zinc use. As a result, the export outlook is expected to largely follow the production outlook, with exports of ore and ore concentrates expected to rise from 1.8 million tonnes in 2017–18 to 2.9 million tonnes by 2019–20.

Export earnings are projected to largely hold their value, with higher volumes counteracting expected declines in prices. Earnings are projected to increase from $3.8 billion in 2017–18 to $3.9 billion in 2018–19, before settling back to $3.8 billion again in 2019–20.
### Table 14.1: Zinc outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2017</th>
<th>2018(^a)</th>
<th>2019(^f)</th>
<th>2020(^z)</th>
<th>2018(^s)</th>
<th>2019(^f)</th>
<th>2020(^z)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– mine</td>
<td>kt</td>
<td>13,306</td>
<td>13,957</td>
<td>14,666</td>
<td>15,319</td>
<td>4.9</td>
<td>5.1</td>
<td>4.4</td>
</tr>
<tr>
<td>– refined</td>
<td>kt</td>
<td>13,597</td>
<td>14,278</td>
<td>15,037</td>
<td>15,733</td>
<td>5.0</td>
<td>5.3</td>
<td>4.6</td>
</tr>
<tr>
<td><strong>Consumption</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kt</td>
<td></td>
<td>14,071</td>
<td>14,563</td>
<td>15,085</td>
<td>15,638</td>
<td>3.5</td>
<td>3.6</td>
<td>3.7</td>
</tr>
<tr>
<td><strong>Closing stocks</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kt</td>
<td></td>
<td>1,035</td>
<td>751</td>
<td>703</td>
<td>798</td>
<td>–27.5</td>
<td>–6.3</td>
<td>13.5</td>
</tr>
<tr>
<td>– weeks of consumption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>–29.9</td>
<td>–9.6</td>
<td>9.5</td>
</tr>
<tr>
<td><strong>Price</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– nominal</td>
<td>US$/t</td>
<td>2,894</td>
<td>3,155</td>
<td>2,850</td>
<td>2,625</td>
<td>9.0</td>
<td>–9.7</td>
<td>–7.9</td>
</tr>
<tr>
<td>– real(^b)</td>
<td>US$/t</td>
<td>2,962</td>
<td>3,155</td>
<td>2,789</td>
<td>2,521</td>
<td>6.5</td>
<td>–11.6</td>
<td>–9.6</td>
</tr>
<tr>
<td>– nominal</td>
<td>USc/lb</td>
<td>131</td>
<td>143</td>
<td>129</td>
<td>119</td>
<td>9.0</td>
<td>–9.7</td>
<td>–7.9</td>
</tr>
<tr>
<td>– real(^b)</td>
<td>USc/lb</td>
<td>134</td>
<td>143</td>
<td>127</td>
<td>114</td>
<td>6.5</td>
<td>–11.6</td>
<td>–9.6</td>
</tr>
</tbody>
</table>

### Australia

<table>
<thead>
<tr>
<th>Unit</th>
<th>2016–17</th>
<th>2017–18(^a)</th>
<th>2018–19(^f)</th>
<th>2019–20(^z)</th>
<th>2017–18(^s)</th>
<th>2018–19(^f)</th>
<th>2019–20(^z)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mine output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kt</td>
<td>843</td>
<td>944</td>
<td>1,307</td>
<td>1,438</td>
<td>12.0</td>
<td>38.5</td>
<td>10.0</td>
</tr>
<tr>
<td><strong>Refined output</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kt</td>
<td>466</td>
<td>468</td>
<td>500</td>
<td>500</td>
<td>0.4</td>
<td>6.8</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Export volume</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– ore and conc. (^c)</td>
<td>kt</td>
<td>1,479</td>
<td>1,768</td>
<td>2,631</td>
<td>2,940</td>
<td>19.6</td>
<td>48.7</td>
</tr>
<tr>
<td>– refined</td>
<td>kt</td>
<td>372</td>
<td>402</td>
<td>356</td>
<td>357</td>
<td>8.1</td>
<td>–11.6</td>
</tr>
<tr>
<td>– total metallic content</td>
<td>kt</td>
<td>1,008</td>
<td>1,149</td>
<td>1,468</td>
<td>1,601</td>
<td>14.1</td>
<td>27.7</td>
</tr>
<tr>
<td><strong>Export value</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– nominal</td>
<td>A$m</td>
<td>2,688</td>
<td>3,774</td>
<td>3,949</td>
<td>3,820</td>
<td>40.4</td>
<td>4.7</td>
</tr>
<tr>
<td>– real(^d)</td>
<td>A$m</td>
<td>2,740</td>
<td>3,774</td>
<td>3,859</td>
<td>3,646</td>
<td>37.7</td>
<td>2.3</td>
</tr>
</tbody>
</table>

**Notes:** \(^a\) In 2018 US dollars; \(^c\) Quantities refer to gross weight of all ores and concentrates; \(^d\) In 2017–18 Australian dollars; \(^f\) Forecasts; \(^s\) Estimate

**Source:** ABS (2018) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Company reports; Department of Industry, Innovation and Science; International Lead Zinc Study Group (2018); LME (2018); World Bureau of Metal Statistics (2018)
Asian LNG trade has changed

- Small number of buyers vs. Many buyers
- Point-to-point trade vs. Portfolio players
- Long-term contracts vs. Spot and short-term trade at 27%
- Oil-linked pricing vs. Various pricing mechanisms
- Inflexible contract terms vs. More flexible contracts

The case for LNG imports

- The southern market may require additional gas
- But piping gas from the North is costly
- LNG imports are being considered

Potential LNG imports and southern gas demand

- Potential LNG imports
- Southern gas demand 2017
15.1 Introduction

Australia may well become the world’s largest LNG exporter at the same time it becomes an LNG importer. Australia is on track to surpass Qatar as the world’s largest LNG exporter around the turn of the decade. At the same time, there are four proposals for an LNG import terminal that could see LNG imports begin as soon as 2020.

Technological developments and changing business practices in the LNG industry have enabled countries like Australia to consider importing relatively small volumes of LNG. Before the turn of the millennium, LNG trade in Asia was characterized by a point-to-point business model, long-term contracts, oil-linked pricing and inflexible non-pricing contractual terms.

Around the turn of the millennium, LNG markets began to change. Floating Storage and Regasification Unit (FSRU) technology allowed buyers to start purchasing LNG more quickly and at a lower cost. Spot and shorter-term trading markets began to grow, providing buyers with access to different pricing arrangements, shorter contract lengths and more flexible contract terms.

There are several reasons why LNG imports into the southern part of Australia’s east coast gas market are being considered. Southern production will potentially fall short of southern demand in coming years, and pipeline imports from Queensland are relatively expensive. Meanwhile, Asian LNG spot and short-term prices are expected to decline, at least in the short-term, as additions to global production capacity outweigh new demand.

However, challenges to importing LNG remain. Asian LNG spot and short-term prices are currently elevated, at levels above Australian domestic gas prices. It is possible that Asian LNG spot and short-term prices may not decline as far as some expect, or remain low for a protracted period of time. Meanwhile, purchasing commitments from a significant number of domestic buyers, or a large energy retailer, will likely be required to underwrite the economics of an LNG import terminal.

This chapter examines the issue of importing LNG into Australia’s east coast gas market. Section 2 looks at how changes in the way LNG is traded have enabled countries to import small volumes of LNG economically. Section 3 examines why LNG imports into Australia’s east coast gas market are being considered, and looks at proposals for an LNG import terminal. Section 4 discusses some of the key issues affecting the commercial viability of LNG imports into Australia.

15.2 Asian LNG trade

The LNG business model before 2000 was different to today’s

Global LNG trade has changed substantially since it began in 1960s. LNG trade in Asia — which began in 1969, when Japan received its first cargo of the liquefied fuel from Alaska — has been no exception.

Before the turn of the millennium, the LNG business was characterized by point-to-point trade. The typical LNG project sold gas to a small group of buyers, with dedicated ships taking gas between the seller’s liquefaction plant and the buyers’ regasification terminals.

LNG was traded on long-term contracts, sometimes in excess of 20 years. LNG projects require a large upfront capital investment, and long-term contracts provided LNG project developers with the certainty of returns required to gain financial support from project lenders.

These long-term contracts often included inflexible terms on matters not related to prices. Destination clauses, for instance, prevented a buyer from reselling LNG cargoes until they were delivered to the buyer’s port.

In Asia, LNG prices were linked to the price of crude oil. When Japan began importing LNG, oil was the main fuel competing with natural gas in power generation, and consequently an oil-price linkage was adopted in LNG contracts. When other Asian buyers entered the market — South Korea (1986), Taiwan (1990), India (2004) and China (2006) — they too adopted this pricing approach. Oil-indexed pricing allowed buyers and sellers to access liquid oil futures markets to manage price risk through hedging.
For the first decades, LNG remained a small business. In 1971, six countries were importing LNG from three exporting countries. Even in 2000, there were just 11 importers and 12 exporters.

From around 2000, traditional business practices began to change. From around the turn of the millennium, the LNG business began to transition to being a global industry. The number of LNG buyers increased rapidly, facilitated by the advent of the FSRU in 2001, and growth in LNG trade accelerated (Figure 15.1). In 2017, 40 countries imported LNG from 19 exporters. As will be discussed in Section 3, FSRUs have allowed countries to begin importing LNG more quickly and at a lower cost than ever before.

Figure 15.1: LNG imports

The way LNG was traded also began to shift around 2000. The point-to-point business model started to fade and LNG ‘portfolio players’ emerged. These ‘portfolio players’ both produced LNG and/or purchased it from different regions, supplying buyers from their global portfolio, rather than from a specific LNG project.

From the mid–2000s, spot and short-term trade began to increase, as LNG from the Atlantic Basin was sold into Asia under trading arrangements other than long-term contracts. As Figure 15.2 shows, between 2005 and 2011, spot and short-term trade in Asia — defined as transactions under contracts of 4 years or less — increased nine-fold. By 2011, spot and short-term transactions accounted for 25 per cent of global LNG trade.

Figure 15.2: Spot and short-term LNG trade

Notes: Spot and short-term trade is defined as transactions under contracts of up to 4 years. Source: GIIGNL (2004–2017) Annual Report

Growing spot and short-term trade was driven by a combination of unexpected increases in Asian demand and a shortfall in supplies from some producers in the Pacific Basin. The unexpected increase in demand was in large part due to the Fukushima nuclear disaster in Japan in 2011, which resulted in Japan increasing LNG imports to fill the gap left by the closure of its fleet of nuclear power stations.

With the growth of spot and short-term markets in Asia, pricing arrangements in the region became more diverse. The price of spot LNG cargoes — where LNG is purchased for delivery within 4–12 weeks — was
based on the supply-demand dynamics for LNG, rather than on oil prices. Short-term contracts were often based on a hub price, such as Henry Hub in the United States or the National Balancing Point in Europe.

Meanwhile, non-price terms in contracts began to change. Recently, the Japanese Fair Trade Commission has said that new LNG contracts must not contain restrictions on the resale of cargoes, and called on sellers to revisit these practices in existing contracts. Box 15.1 discusses some of the efforts made by Asian buyers around LNG market reform.

**Box 15.1: LNG market reform in Asia**

Japan has been driving the agenda in terms of LNG market reform in Asia. In 2016, the Japanese Government released its *Strategy for LNG Market Development*. The Strategy’s main proposition was that ‘Japan should play a leading role in developing a flexible and liquid LNG market’, with Japan serving as an LNG trading hub. The Strategy outlined three main goals in pursuit of this agenda: (1) to eliminate destination restrictions ‘to the greatest extent possible’; (2) the ‘creation of a proper price discovery mechanism’ for LNG, noting that ‘the pricing of LNG to crude oil prices is no longer necessarily justifiable’; (3) the development of open and sufficient infrastructure. The Strategy envisaged an expansion of LNG spot trade in Asia.

One factor motivating Japan is that some Japanese buyers are likely to be over-contracted for LNG over the next few years. One of the ways these buyers can manage their contractual positions is by entering the market as LNG sellers, but destination clauses — which prevent cargoes from being diverted before they arrive to Japan — complicate this approach.

Other major buyers — namely China and South Korea — may also face over-contracted positions over next few years. In March 2017, Japan’s JERA — an equal joint venture of two major Japanese electric companies and the world’s largest LNG buyer — executed a memorandum of understanding (MOU) with other large buyers in South Korea and China. The purpose of the MOU is to provide a platform for cooperation to achieve a more flexible LNG market. The Indian Government has also argued that the removal of destination clauses and the oil-linked pricing approach would create a more flexible LNG market.

In short, major buyers in Asia are looking closely at new approaches to LNG trade, with implications for traditional business practices.

These trends have made LNG imports an option for Australia’s east coast

The option of importing LNG into Australia’s east coast gas market has been made possible by both the emergence of the FSRU business and changes in the way LNG is traded. While buyers may continue to need to sign long-term contracts to underpin the development of new LNG facilities and secure supply from these projects, buyers now also have access to a short-term market. This market offers a diverse set of contractual arrangements, with different pricing options and contractual lengths. While the benefits of portfolio players are sometimes contested, one view is that they have reduced the risk of supply disruptions from individual projects, and promoted the delivery of LNG to end-users from whichever source is the most economic.

**15.3 Australia’s east coast gas market and LNG import proposals**

Prices in the east coast gas market have risen in recent years

Australia has three gas markets that are not physically connected. The east coast gas market covers all states except Western Australia (which is covered by the western market) and the Northern Territory (northern market). The current east coast gas market can be thought of as consisting of two regions that are connected via pipeline — the North (i.e. Queensland) and the South (all other states). With the completion of the Northern Gas Pipeline (scheduled for the end of 2018), the Northern Territory will become part the east coast gas market.

Prices in the east coast gas market have risen over the past few years, as LNG exports from Queensland’s three LNG projects have ramped up. In the 2000s — before the decisions to build the three LNG projects were made — wholesale gas prices were around $3–4 a gigajoule. Between
mid–2016 and mid–2017, east coast prices escalated, at times climbing above international prices. Figure 15.3 shows how domestic wholesale spot prices at Wallumbilla (a Queensland gas hub) have risen over the past few years, spiking above international LNG prices at times during 2016–17. In February 2017, for example, the price of gas at Wallumbilla averaged $13 a gigajoule, while LNG spot prices in North Asia averaged around $9 a gigajoule.

By the end of 2017, east coast gas prices had moderated, but remained well above historical prices of $3–4 a gigajoule. At the end of 2017, most offers for gas supply during 2018 and 2019 were in the $8–10 a gigajoule range.

**Figure 15.3: East coast exports, and LNG and domestic spot prices**

Price rises in the past few years have been most pronounced in the southern part of the east coast gas market. Before LNG exports began in 2015, the southern gas market was supplied by the Cooper Basin. As LNG facilities ramped up production, some gas from the Cooper Basin was redirected for export, leading to a deterioration in competition in the southern market. This was particularly problematic for southern consumers, given that a large share of southern production was in the hands of a single supplier: the Esso-BHP Gippsland Basin Joint Venture (GBJV).

State government policies have constrained the development of new gas supply in the southern market. Victoria has a permanent ban on unconventional gas production and a moratorium on onshore conventional gas development until mid–2020. The New South Wales Government imposes heavy regulatory restrictions on unconventional gas development. These include additional review processes for Coal Seam Gas (CSG) projects on agricultural land that has been identified as highly productive, and exclusion zones on CSG development around existing and future residential areas.

**LNG imports have become an option worth considering**

A simple account of international trade would suggest that countries do not usually import and export the same product. If a country can produce a good for less than the world price, then it will export that good. That country will then meet its domestic requirements from its own production because this should be cheaper than importing the good at the world price.

There are a number of factors that have made LNG imports into the southern part of Australia’s east coast gas market worth considering. First, there is no single world price for LNG, and different pricing arrangements may mean that it is possible to export LNG at a higher price than the price for which LNG can be imported. The LNG projects on Australia’s east coast have long-term contracts with buyers in Asia, where LNG prices are linked to the price of Japan Customs-cleared Crude (JCC) oil. In contrast, prices in LNG spot and short-term markets usually depend on supply and demand for LNG. Where short-term contracts are oil-linked, these contract...
prices are currently being signed at a discount to the oil-linked LNG prices on Queensland LNG contracts. This may mean that LNG could be imported into the southern gas market on a spot or short-term basis at a lower price than Queensland LNG is being sold on long-term oil-linked contracts.

On one view, LNG spot and short-term prices will decline over the next few years and remain low for some time. However, it is worth noting that LNG spot prices remain elevated at present, and faster than expected demand growth, especially in Asia, might mean that a period of overcapacity in LNG markets is short-lived. An increasingly popular view is that LNG markets will tighten in the early 2020s, rather than the mid–2020s as previously expected.

Another factor encouraging proponents of Australian LNG import terminals is a potential mismatch between supply and demand in the southern gas market. The ACCC expects gas production in the southern states (excluding production in the Cooper Basin) to fall short of southern gas demand by 25 per cent during 2018. The shortfall is, in large part, a result of declining output from older fields in the Bass Strait, which will not be offset by production from new fields (which contain higher impurity gas that requires additional processing). The southern states will need to rely on both gas from the Cooper Basin, and also from Queensland, to meet gas demand in 2018.

The southern states are likely to require ‘imports’ from the Cooper Basin, and potentially Queensland, for some time to come. Under the Neutral Scenario in the Australian Energy Market Operator’s (AEMO) 2018 Gas Statement of Opportunities (GSOO) report, production from gas fields in the southern States, including the Cooper Basin, is mostly sufficient to meet southern demand. However, if Proved and Probable (2P) reserves and contingent resources in the South are not developed by the early 2020s, a greater volume of pipeline imports from Queensland would be required. AEMO’s March 2018 Victorian Gas Planning Report (VGPR) highlighted the risk that production in the Bass Strait could fall if new fields are not developed as expected. The VGPR noted Victorian gas production is expected to fall from 435 petajoules in 2017 to 187 petajoules in 2022 if only current gas production developments or those that are currently committed in Victoria go ahead. A decline in offshore Victorian production would likely mean the South would require additional pipeline imports from Queensland.

According to the ACCC’s account of price formation in the east coast market, a production shortfall in the South means that southern producers can charge a price that approaches the southern ‘buyer’s alternative’ — the price of gas in Queensland plus the costs of transporting gas from the north to the south. The potential reliance of the southern gas market on northern production has opened up the possibility of LNG imports competing with pipeline imports from the North.

There are a number of reasons why LNG imports might be competitive with pipeline imports from the North. First, the cost of production in Queensland is relatively high. The vast majority of the gas produced in Queensland is CSG. CSG production requires drilling hundreds of new wells per year — something that conventional gas production does not require — which adds to the cost of extraction. Gas in many other parts of the world — be it US shale gas or conventional gas in Qatar or off Australia’s North West coast — has lower production costs. The ACCC estimates that the current cost of gas production from Queensland CSG fields is $5–6 a gigajoule (US$4–5 per MMbtu) at the wellhead. Contingent gas resources, likely needed to satisfy demand from the early 2020s, have higher production costs. AEMO estimates put the cost of production for contingent CSG resources in Queensland in the $6–9 a gigajoule range (US$5–7 per MMbtu).

Second, transporting gas via pipeline from Queensland to the southern market is relatively costly. The ACCC estimates that piping gas from the Wallumbilla gas hub in Queensland to the southern market costs $1.85–$2.45 a gigajoule, depending on the final destination. In contrast, it costs about $1.50 a gigajoule to transport gas from Wallumbilla to Japan (about $1 a gigajoule for liquefaction and $0.50 a gigajoule for shipping). There
There are also contractual and capacity limitations on pipelines that may limit the amount of gas that can flow from Queensland to the southern gas market.

**There are two main types of LNG import terminals**

There are two basic types of LNG import facilities: onshore land-based terminals and FSRUs. An FSRU is an LNG storage ship that has an onboard regasification plant capable of transforming LNG back into a gaseous state and then supplying it directly into the gas network. FSRUs can be new builds or converted LNG tankers.

FSRUs have lower capital costs, faster installation times and greater commercial flexibility compared to conventional onshore terminals. The cost of a new FSRU or an FSRU conversion is typically 50–60 per cent of the cost of an onshore gas terminal. FSRUs can also be put in place more quickly. A new build FSRU takes 2–3 years and a tanker conversion takes 18–24 months, whereas offshore import terminals take 3–5 years to construct. The other great advantage of FSRUs, however, is that they can also be leased, further reducing project costs and lead times. In the early days of the FSRU business, charter terms were generally 10 years, but charter terms as short as 5 years have been reported recently.

FSRUs typically have an import capacity of anywhere between 100 petajoules and 325 petajoules per annum.

**There are four proposals for an LNG import terminal**

There are four proposals for an LNG import terminal in Australia’s east coast gas market (Table 15.1). All four proposals would involve importing LNG into the southern gas market and are awaiting a final investment decision (FID).

Australian Industrial Energy (AIE) — a joint venture between Andrew Forrest’s Squadron Energy, Japan’s Marubeni Corporation, and Japan’s JERA — is considering an LNG import terminal at Port Kembla in New South Wales. The site is located near the existing New South Wales pipeline network and gas could also be piped to Victoria via the Eastern Gas Pipeline.

AIE has flagged imports of up to 100 petajoules a year via an FSRU. An FID is targeted for the second half of 2018, with construction to begin in 2019, and first gas to be delivered to customers by early 2020. AIE expects the capital cost of the import terminal to be between $200–300 million. AIE is also investigating the construction of a new 750 megawatt gas-fired power plant as part of the second stage of the project.

Secondly, AGL, an Australian energy retailer, is undertaking a feasibility study into an LNG import terminal at Crib Point, on Western Port Bay in Victoria. The site has an existing oil import jetty, at which an FSRU could be moored. AGL has engaged APA to investigate the construction of a 55–60 kilometre pipeline — with capacity of around 1 petajoule a day — from Crib Point to the existing Victorian gas pipeline network. A potential tie-in point with APA’s Longford-Dandenong Pipeline at Pakenham has been identified.

<table>
<thead>
<tr>
<th>Project proponent</th>
<th>Location</th>
<th>Proposed start date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Industrial Energy</td>
<td>Port Kembla, NSW</td>
<td>2020</td>
</tr>
<tr>
<td>AGL</td>
<td>Crib Point, VIC</td>
<td>2020/2021</td>
</tr>
<tr>
<td>ExxonMobil</td>
<td>Longford*, VIC</td>
<td>2022</td>
</tr>
<tr>
<td>Integrated Global Partners</td>
<td>Pelican Point, SA</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Notes: *Longford has been reported as a potential site for ExxonMobil’s LNG import terminal, although this has not been confirmed by the company. Source: Company websites (2018), Australian Financial Review (2018), The Australian (2018), APA (2018), The Sydney Morning Herald (2018). AGL’s LNG import terminal, with capacity of around 100 petajoules a year, would start operations in 2020 or 2021. AGL has estimated the costs of LNG import terminal infrastructure at around $250 million. This does not
account for the annual leasing and operating costs of an FSRU. AGL expects to make an FID in financial year 2018–19.

Thirdly, ExxonMobil is considering building a Victorian LNG import plant, which could take advantage of existing gas infrastructure at the Longford gas plant. Imports would start around 2022 if the project, which is in the early stages of assessment, is approved.

A fourth proposal is the Outer Harbour project led by Melbourne-based management consultancy Integrated Global Partners. Mitsubishi has reportedly supported the project by financing a feasibility study. The project would see an FSRU moored at a new wharf to be built at Pelican Point near Adelaide.

15.4 Key issues around LNG imports
The commercial viability of LNG imports depends on several factors
The following section discusses a number of issues surrounding LNG imports. The section begins with a discussion of the different purchasing arrangements that could underpin LNG imports. It then examines two issues affecting the price for which imported gas might be delivered to customers, and thus the commercial viability of LNG imports. The first of these is the cost of the LNG itself, which in turn is affected by factors such as the cost of delivering US LNG to Asia, European hub prices and oil prices. The second is regasification costs, which depend on the capital costs of the project, the leasing costs of the FSRU and the volume of LNG imported.

A variety of purchasing arrangements could underpin LNG imports
There are a variety of contractual arrangements that could underpin LNG imports into Australia’s east coast gas market. LNG imports could also be purchased on a spot basis. However, the lack of a liquid LNG futures market in Asia means market participants would be unable to eliminate the risk of higher than expected spot prices.

LNG imports could also be purchased on short-term contracts, which are commonly less than 4 years. AIE has stated contracts could be slightly longer, at 5–7 years.

Contracts for LNG imports could be linked to oil prices. Alternatively, LNG imports could also be linked to another reference price, such as the Henry Hub price in the United States. The advantage of oil-linked and Henry Hub pricing is that LNG project proponents would have access to large futures markets, which would allow market participants to lock in LNG prices.

The cost of US LNG could be critical to LNG import proposals
The main cost of importing LNG is the price of the LNG itself. The price of imported LNG will depend on the interaction of both demand-side and supply-side factors in spot and short-term contract markets in Asia. Australian LNG import prices are expected to be broadly comparable to those paid by Asian consumers.

A key supply-side factor encouraging the proponents of LNG import terminals on Australia’s east coast is the expansion in global LNG export capacity that is underway. This expansion in global liquefaction capacity, led by the United States, could usher in a period of low LNG spot and short-term prices, although the sustainability of low prices is a key question.

With the United States emerging as a major source of new supply, the cost of delivering US LNG to Asia could have an impact on prices in the region. While pricing arrangements vary across US LNG contracts, the rule of thumb is that the cost of US LNG can be broken into four components: the Henry Hub gas price, a 15 per cent surcharge on the Henry Hub price to cover the cost of liquefaction and pipeline costs from Henry Hub to liquefaction plants, a fixed capacity charge (also known as a ‘tolling fee’) that covers the capital costs of the liquefaction plant, and transport costs from the US to Asia.

Tables 15.2 and 15.3 (on the next page) provide illustrative calculations for the cost of delivering US LNG to Asia via the Panama Canal — the lowest cost shipping route to Asia from LNG plants on the US Gulf Coast. Henry Hub prices are currently around US$3.0/MMbtu ($3.80 a gigajoule) and shipping costs are around US$1.90/MMbtu ($2.40 a gigajoule).
Table 15.2: Illustrative cost of delivering US LNG to Asia, US$/MMbtu

<table>
<thead>
<tr>
<th>Component</th>
<th>Low</th>
<th>Mid</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Henry Hub gas</td>
<td>2.5</td>
<td>3.0</td>
<td>3.5</td>
</tr>
<tr>
<td>15% surcharge</td>
<td>0.4</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Transport to Asia</td>
<td>1.2</td>
<td>1.7</td>
<td>2.2</td>
</tr>
<tr>
<td>Variable cost</td>
<td>4.1</td>
<td>5.2</td>
<td>6.3</td>
</tr>
<tr>
<td>Fixed capacity fee</td>
<td>2.3</td>
<td>2.9</td>
<td>3.5</td>
</tr>
<tr>
<td>Full cost</td>
<td>6.3</td>
<td>8.0</td>
<td>9.8</td>
</tr>
</tbody>
</table>

Table 15.3: Illustrative cost of delivering US LNG to Asia, A$/GJ

<table>
<thead>
<tr>
<th>Component</th>
<th>Low</th>
<th>Mid</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Henry Hub gas</td>
<td>3.2</td>
<td>3.8</td>
<td>4.4</td>
</tr>
<tr>
<td>15% surcharge</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Transport to Asia</td>
<td>1.5</td>
<td>2.1</td>
<td>2.8</td>
</tr>
<tr>
<td>Variable cost</td>
<td>5.1</td>
<td>6.5</td>
<td>7.9</td>
</tr>
<tr>
<td>Fixed capacity fee</td>
<td>2.8</td>
<td>3.6</td>
<td>4.4</td>
</tr>
<tr>
<td>Full cost</td>
<td>8.0</td>
<td>10.1</td>
<td>12.3</td>
</tr>
</tbody>
</table>

Notes: An exchange rate of A$1.00 = US$0.75 has been used. Transport costs are for return shipping from the US Gulf Coast to Tokyo via the Panama Canal. The low case represents the lowest average monthly shipping cost since October 2016 (first available data), while the high case is the highest average monthly cost on record. Historical data suggests an alternative shipping route would add US$0.30–US$0.80 to the cost of shipping. Fixed capacity charges reportedly range from US$2.25/MMbtu to US$3.50/MMbtu.

One question for Australian buyers looking to sign up for short-term contracts with US exporters is the cost of the fixed capacity fee in a new contract. Table 15.3 suggests a fixed capacity fee comparable to that paid by Asian buyers (in the contracts that underwrote US LNG projects) would be an additional $2.80–$4.40 a gigajoule. However, given US exporters have already recouped their capital costs via the fixed capacity fee in their contracts with Asian buyers, US exporters may be willing to reduce fixed capacity charges in new contracts.

Figure 15.4 shows how the cost components of US LNG have changed since October 2016. Henry Hub prices are expected to remain around US$3.0/MMbtu over the next few years.

The capacity of the Panama Canal (the fastest route from the US’ east coast terminals to Asia) to accommodate growing LNG shipments could potentially limit growth in US exports to the region. Research from the Oxford Institute for Energy Studies suggests that the Panama Canal, which has a capacity of 28 million tonnes per annum, could become a bottleneck in the early 2020s.

Figure 15.4: Cost components of US LNG exports

Source: Bloomberg (2018); Argus (2018); Bordoff and Losz (2016)

European hub and oil prices could also influence LNG import costs

There are other factors influencing Asian LNG spot and short-term prices, especially if overcapacity in world LNG markets does not emerge. Over the past few years, Asian LNG spot and short-term prices have been broadly correlated with European hub prices. LNG producers in the...
Atlantic Basin have the option of selling cargoes into Europe, which has plentiful gas storage capacity and can act as the ‘destination of last resort’. This has meant Asian buyers have needed to pay European hub prices plus the additional costs of transporting gas to Asia, in order to secure Atlantic Basin cargoes.

Figure 15.5 shows that North East Asian LNG spot prices have tracked closely with prices at Europe’s National Balancing Point. Between 2012 (earliest data available) and 2014, the differential between European hub and Asian spot prices widened. The 2011 Fukushima event, which saw the shutdown of Japan’s nuclear fleet and a concurrent surge in demand for LNG in Asia, pushed up LNG prices in Asia relative to prices in other parts of the world; a phenomenon which became known as the “Asian premium”.

As LNG markets became better supplied from 2014, the differential between European hub and Asian LNG spot prices has narrowed, with the exception of a number of price spikes during the northern winter, when Asian LNG demand has surged.

There has also been a historical relationship between LNG spot prices and oil-linked contract prices, as Figure 15.6 shows. Since April 2012, the monthly differential has not typically exceeded US$5/MMbtu, averaging just US$2.0/MMbtu. Both demand and supply side factors explain this correlation. LNG buyers have some flexibility on long-term oil-linked contracts, allowing them to increase/decrease long-term contract purchases depending on the relative attractiveness of the LNG spot market. Higher contract prices increase demand for LNG spot cargoes, pushing up spot prices. Low contract prices, on the other hand, make contracted volumes more attractive, pushing down demand for spot cargoes and thus spot prices. There is also some substitution between oil and gas in end-use sectors, which may contribute to price convergence.

Notes: DES stands for Delivered Ex Ship. DES LNG includes the cost of shipping and insurance.

Source: Argus (2018); Bloomberg (2018)
Supply-side factors also help to explain the historical relationship between LNG spot and oil-linked contract prices. Oil and gas are co-produced, meaning that increased production for one commodity sees production of the other rise too. The extent to which LNG spot and short-term prices might break away from oil-linked contract prices as LNG supply capacity grows over the next few years remains to be seen.

Regasification costs will also be important
Aside from the cost of the LNG itself, regasification — converting LNG back into gas — is the other major cost associated with importing the liquid fuel. Regasification costs depend on both the capital costs of the LNG import terminal and the leasing and operating costs of the FSRU. Regasification costs per unit largely depend on the volume of gas imported through the FSRU, i.e. on the level of throughput. The larger the volume of LNG imported, the lower regasification costs are on a per unit basis.

Table 15.4 and Figure 15.7 provide an illustrative example of the costs per gigajoule of regasification for an FSRU importing up to 100 petajoules per annum. Variable costs cover only the costs of leasing and operating the FSRU, while full costs include the capital costs of the import terminal. The costs of leasing and operating an FSRU are usually US$47–75 million a year (or $63–100 million at an AUD–USD $0.75 exchange rate) — and this range has been used to inform the low, mid and high cases. The capital costs have been assumed to be $250 million.

Based on this calculation, variable regasification costs would be $0.80–$1.30 if 75 petajoules of LNG were imported per year. If capital costs were spread over five years, that would add around $0.70 cents a gigajoule. This would bring the overall costs of regasification of an LNG import terminal importing 75 petajoules of gas for five years, to $1.50–$2.00 a gigajoule. If an FSRU was to operate for longer than five years, the capital costs would be reduced.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>0.6</td>
<td>0.8</td>
<td>1.0</td>
</tr>
<tr>
<td>75</td>
<td>0.8</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>50</td>
<td>1.3</td>
<td>1.6</td>
<td>2.0</td>
</tr>
<tr>
<td>Full costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>1.1</td>
<td>1.3</td>
<td>1.5</td>
</tr>
<tr>
<td>75</td>
<td>1.5</td>
<td>1.8</td>
<td>2.0</td>
</tr>
<tr>
<td>50</td>
<td>2.3</td>
<td>2.6</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Figure 15.7: Illustrative regasification costs per gigajoule as a function of throughput

Notes: Full costs include the leasing and operating costs of the FSRU, and the capital costs of the LNG import terminal. Variable costs cover only the leasing and operating costs of the FSRU. The calculation is based on: FSRU leasing and operating costs of $63 million, $81 million and $100 million per annum in the low, mid and high cases, respectively; capital costs of $250 million, LNG being imported for a period of five years.
Source: Department of Industry, Innovation and Science (2018)
Lowering regasification costs will require demand aggregation

‘Demand aggregation’ — bringing together a number of buyers willing to purchase imported LNG — will be critical to achieving a high capacity utilisation for an LNG import terminal, and thus to underpinning its commercial viability. Despite only a small-scale FSRU being proposed on the east coast, it is unlikely that a single end-user would purchase sufficient amounts of gas to underwrite an LNG import terminal. The capacity of a small-scale FSRU is around 100 petajoules per annum.

Small industrial customers in the east coast gas market consume just 0.1–1 petajoules per annum. Large industrial customers are those who consume over 1 petajoule of gas per annum. The annual gas consumption of Incitec Pivot, a fertiliser and explosives manufacturer (and one of the largest industrial gas customers on the east coast), is 31–33 petajoules. Customers purchasing imported gas will also have to balance contracts with LNG import project proponents with their existing gas supply portfolio.

An LNG import terminal with capacity of 100 petajoules per annum would service a significant share of east coast domestic gas demand. One hundred petajoules of gas equals 16 per cent of total domestic gas consumption on the east coast in 2017 (629 petajoules) and 21 per cent of southern gas consumption in 2017 (474 petajoules).

There are a number of possible customers for east coast LNG imports. Industrials are one group of potential customers. The industrial sector is the largest gas consuming sector in the east coast gas market, accounting for slightly less than half of total domestic consumption. Large industrial customers require long-term supply agreements to lend stability to their business operations, and seem a likely candidate for LNG imports.

A second group of customers is in the residential and commercial sector. An energy retailer would need to agree to purchase LNG if imported gas is to be consumed in this sector.

The third set of customers are gas-power generators (GPGs). Whether many GPG operators will be willing to sign up to contracts to underpin LNG imports remains to be seen.

As gas prices have risen over the past few years, many GPGs have switched to a peaking strategy in the National Electricity Market (NEM); a strategy which involves only generating when electricity prices are high, rather than trying to compete for intermediate demand. GPG operators who adopt a peaking role may only require gas at particular times and in small quantities. For many GPGs, contracts for gas supply for several years may not be compatible with their peaking strategy in the NEM.

AGL has an existing residential and industrial customer base, as well as gas-power generation assets. In 2017–18, AGL’s gas sales totalled 231 petajoules. There is also gas storage at the Iona facility in Victoria, with capacity of 26 petajoules, where imported gas could potentially be stored during periods of low consumption.

AIE’s proposal potentially involves building a 750 megawatt combined cycle gas-fired power station. Such a power station, operating at an 80 per cent load factor, and with an efficiency of 50–55 per cent, would require 40–43 petajoules of gas a year. A new gas-fired power station would help to underwrite the demand required to make LNG imports economic, but
whether a new gas-fired power plant is commercially viable is contingent on developments in the NEM.

An additional challenge in sustaining a high and steady level of throughput at an FSRU is the seasonal nature of gas demand, especially in the southern market. Gas demand in southern Australia is highly cyclical, with low demand in summer and high demand in winter. Current gas demand in southern markets across all sectors ranges between 600–900 terajoules per day in summer to 1200–1500 terajoules per day during winter. Having an FSRU off-line for half of the year is unlikely to be economic.

The timing of seasonal demand in Australia could be an advantage

A final issue to consider is seasonality in LNG spot prices. Asian LNG spot prices have spiked over the past two winters, as shown in Figure 15.9. The most recent spike was, in large part, driven by a sharp rise in China’s LNG imports. Australia’s peak domestic demand period is during the northern hemisphere summer. This could be an advantage from the perspective of importing LNG, allowing spot LNG imports during periods of lower prices.

Figure 15.9: North East Asian spot price and China’s LNG imports

![North East Asian spot price and China’s LNG imports](image)

Source: Argus (2018)

15.5 Conclusion

The fact that Australia may one day both export and import LNG from Australia’s east coast seems paradoxical. However, while there are challenges to LNG imports into Australia’s east coast gas market, there are also reasons to think that proposals for an import terminal may go ahead. The potential for a mismatch between demand and supply in the southern gas market, the high cost of Queensland gas and transportation costs from north to south, and a subdued outlook for Asian LNG prices appears to have made the LNG import option worth considering.

If LNG imports are economically viable, they would have important implications for Australia’s east coast gas market. The southern market could well face a situation in coming years where southern producers are able to charge a price that approaches the so-called southern ‘buyer’s alternative’ — the price of gas in Queensland plus the costs of transporting gas from north to south. LNG imports can be viewed as expanding the options for buyers in the southern gas market, and potentially lowering the southern ‘buyer’s alternative’. In this way, the price of LNG imports may act to cap the price of gas in the southern gas market. The overall impact on southern gas prices will depend on the price at which LNG imports can be delivered to southern consumers. This price will, in turn, be shaped by developments in Asian LNG spot and short-term markets.
Figure 16.1: Contribution to GDP


Figure 16.2: Principal markets for Australia’s resources and energy exports, 2017–18 dollars

Source: ABS (2018) International Trade in Goods and Services, 5368.0

Figure 16.3: Principal markets for Australia’s resources exports, 2017–18 dollars

Source: ABS (2018) International Trade in Goods and Services, 5368.0

Figure 16.4: Principal markets for Australia’s energy exports, 2017–18 dollars

Source: ABS (2018) International Trade in Goods and Services, 5368.0
Figure 16.5: Principal markets for Australia’s total exports, 2017–18 dollars

Source: ABS (2018) International Trade in Goods and Services, 5368.0

Figure 16.6: Principal markets for Australia’s total imports, 2017–18 dollars

Source: ABS (2018) International Trade in Goods and Services, 5368.0

Figure 16.7: Proportion of goods and services exports by sector


Figure 16.8: Proportion of merchandise exports by sector

### Table 16.1: Principal markets for Australia’s thermal coal exports, 2017–18 dollars

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>$ 8,503</td>
<td>8,210</td>
<td>7,471</td>
<td>7,102</td>
<td>8,404</td>
</tr>
<tr>
<td>South Korea</td>
<td>$ 3,183</td>
<td>3,698</td>
<td>2,880</td>
<td>1,798</td>
<td>3,579</td>
</tr>
<tr>
<td>China</td>
<td>$ 2,974</td>
<td>2,953</td>
<td>2,809</td>
<td>2,618</td>
<td>2,617</td>
</tr>
<tr>
<td>Taiwan</td>
<td>$ 1,830</td>
<td>1,768</td>
<td>1,860</td>
<td>1,636</td>
<td>2,306</td>
</tr>
<tr>
<td>Malaysia</td>
<td>$ 298</td>
<td>369</td>
<td>614</td>
<td>510</td>
<td>657</td>
</tr>
<tr>
<td>Thailand</td>
<td>$ 260</td>
<td>308</td>
<td>287</td>
<td>326</td>
<td>297</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 17,817</strong></td>
<td><strong>17,881</strong></td>
<td><strong>16,910</strong></td>
<td><strong>15,312</strong></td>
<td><strong>19,291</strong></td>
</tr>
</tbody>
</table>

Source: ABS (2018) International Trade in Goods and Services, 5368.0

### Table 16.2: Principal markets for Australia’s metallurgical coal exports, 2017–18 dollars

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>$ 5,043</td>
<td>5,149</td>
<td>5,278</td>
<td>4,787</td>
<td>8,541</td>
</tr>
<tr>
<td>Japan</td>
<td>$ 6,548</td>
<td>5,887</td>
<td>4,855</td>
<td>4,527</td>
<td>7,082</td>
</tr>
<tr>
<td>China</td>
<td>$ 5,063</td>
<td>6,269</td>
<td>5,024</td>
<td>4,022</td>
<td>7,811</td>
</tr>
<tr>
<td>South Korea</td>
<td>$ 2,671</td>
<td>2,631</td>
<td>2,505</td>
<td>2,167</td>
<td>3,765</td>
</tr>
<tr>
<td>Taiwan</td>
<td>$ 1,269</td>
<td>1,246</td>
<td>1,200</td>
<td>1,009</td>
<td>1,859</td>
</tr>
<tr>
<td>Netherlands</td>
<td>$ 1,069</td>
<td>1,074</td>
<td>876</td>
<td>950</td>
<td>1,925</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 24,665</strong></td>
<td><strong>24,891</strong></td>
<td><strong>22,955</strong></td>
<td><strong>20,542</strong></td>
<td><strong>36,062</strong></td>
</tr>
</tbody>
</table>

Source: ABS (2018) International Trade in Goods and Services, 5368.0
### Table 16.3: Principal markets for Australia’s crude oil and refinery feedstocks exports, 2017–18 dollars

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>$m</td>
<td>2,439</td>
<td>2,114</td>
<td>1,914</td>
<td>654</td>
</tr>
<tr>
<td>Indonesia</td>
<td>$m</td>
<td>330</td>
<td>331</td>
<td>35</td>
<td>368</td>
</tr>
<tr>
<td>China</td>
<td>$m</td>
<td>2,166</td>
<td>5</td>
<td>28</td>
<td>732</td>
</tr>
<tr>
<td>Thailand</td>
<td>$m</td>
<td>897</td>
<td>1,748</td>
<td>1,327</td>
<td>721</td>
</tr>
<tr>
<td>South Korea</td>
<td>$m</td>
<td>1,701</td>
<td>681</td>
<td>1</td>
<td>466</td>
</tr>
<tr>
<td>Malaysia</td>
<td>$m</td>
<td>879</td>
<td>314</td>
<td>4</td>
<td>150</td>
</tr>
<tr>
<td>Total</td>
<td>$m</td>
<td>11,485</td>
<td>11,897</td>
<td>9,109</td>
<td>5,651</td>
</tr>
</tbody>
</table>

Source: ABS (2018) International Trade in Goods and Services, 5368.0

### Table 16.4: Principal markets for Australia’s LNG exports, 2017–18 dollars

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>$m</td>
<td>14,055</td>
<td>16,115</td>
<td>15,065</td>
<td>10,932</td>
</tr>
<tr>
<td>China</td>
<td>$m</td>
<td>656</td>
<td>682</td>
<td>1,376</td>
<td>3,051</td>
</tr>
<tr>
<td>South Korea</td>
<td>$m</td>
<td>691</td>
<td>469</td>
<td>1,001</td>
<td>1,742</td>
</tr>
<tr>
<td>India</td>
<td>$m</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>523</td>
</tr>
<tr>
<td>Chinese Taipei</td>
<td>$m</td>
<td>287</td>
<td>186</td>
<td>42</td>
<td>166</td>
</tr>
<tr>
<td>Malaysia</td>
<td>$m</td>
<td>0</td>
<td>0</td>
<td>117</td>
<td>195</td>
</tr>
<tr>
<td>Total</td>
<td>$m</td>
<td>15,690</td>
<td>17,452</td>
<td>17,779</td>
<td>17,206</td>
</tr>
</tbody>
</table>

Notes: ABS data for LNG exports by destination in 2016–17 and total LNG exports. Australia’s LNG exports by destination before 2016–17 are estimates based on International Trade Centre data.
Table 16.5: Principal markets for Australia’s iron ore exports, 2017–18 dollars

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>$m</td>
<td>46,107</td>
<td>61,043</td>
<td>44,307</td>
<td>40,250</td>
<td>52,597</td>
</tr>
<tr>
<td>Japan</td>
<td>$m</td>
<td>9,472</td>
<td>10,344</td>
<td>7,047</td>
<td>4,860</td>
<td>5,498</td>
</tr>
<tr>
<td>South Korea</td>
<td>$m</td>
<td>5,417</td>
<td>6,527</td>
<td>4,259</td>
<td>3,169</td>
<td>3,988</td>
</tr>
<tr>
<td>Taiwan</td>
<td>$m</td>
<td>1,646</td>
<td>1,830</td>
<td>1,365</td>
<td>1,060</td>
<td>1,461</td>
</tr>
<tr>
<td>Indonesia</td>
<td>$m</td>
<td>61</td>
<td>44</td>
<td>29</td>
<td>56</td>
<td>44</td>
</tr>
<tr>
<td>India</td>
<td>$m</td>
<td>52</td>
<td>44</td>
<td>115</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$m</td>
<td><strong>62,749</strong></td>
<td><strong>79,926</strong></td>
<td><strong>57,373</strong></td>
<td><strong>49,616</strong></td>
<td><strong>63,906</strong></td>
</tr>
</tbody>
</table>

Source: ABS (2018) International Trade in Goods and Services, 5368.0

Table 16.6: Principal markets for Australia’s aluminium exports, 2017–18 dollars

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>South Korea</td>
<td>$m</td>
<td>745</td>
<td>729</td>
<td>808</td>
<td>1,158</td>
<td>756</td>
</tr>
<tr>
<td>Japan</td>
<td>$m</td>
<td>1,104</td>
<td>1,193</td>
<td>1,533</td>
<td>723</td>
<td>951</td>
</tr>
<tr>
<td>Taiwan</td>
<td>$m</td>
<td>501</td>
<td>475</td>
<td>514</td>
<td>309</td>
<td>211</td>
</tr>
<tr>
<td>Thailand</td>
<td>$m</td>
<td>410</td>
<td>333</td>
<td>306</td>
<td>283</td>
<td>319</td>
</tr>
<tr>
<td>China</td>
<td>$m</td>
<td>164</td>
<td>249</td>
<td>53</td>
<td>97</td>
<td>52</td>
</tr>
<tr>
<td>Indonesia</td>
<td>$m</td>
<td>273</td>
<td>209</td>
<td>144</td>
<td>98</td>
<td>155</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$m</td>
<td><strong>3,602</strong></td>
<td><strong>3,724</strong></td>
<td><strong>4,023</strong></td>
<td><strong>3,364</strong></td>
<td><strong>3,232</strong></td>
</tr>
</tbody>
</table>

Source: ABS (2018) International Trade in Goods and Services, 5368.0
### Table 16.7: Principal markets for Australia’s copper exports, 2017–18 dollars

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>$m</td>
<td>3,338</td>
<td>4,216</td>
<td>3,836</td>
<td>3,723</td>
<td>2,753</td>
</tr>
<tr>
<td>Japan</td>
<td>$m</td>
<td>1,775</td>
<td>1,739</td>
<td>2,094</td>
<td>1,482</td>
<td>1,384</td>
</tr>
<tr>
<td>Malaysia</td>
<td>$m</td>
<td>744</td>
<td>654</td>
<td>554</td>
<td>641</td>
<td>877</td>
</tr>
<tr>
<td>India</td>
<td>$m</td>
<td>1,220</td>
<td>1,012</td>
<td>845</td>
<td>532</td>
<td>697</td>
</tr>
<tr>
<td>South Korea</td>
<td>$m</td>
<td>482</td>
<td>625</td>
<td>384</td>
<td>509</td>
<td>455</td>
</tr>
<tr>
<td>Philippines</td>
<td>$m</td>
<td>155</td>
<td>305</td>
<td>264</td>
<td>228</td>
<td>405</td>
</tr>
<tr>
<td>Total</td>
<td>$m</td>
<td>8,843</td>
<td>9,319</td>
<td>8,912</td>
<td>8,419</td>
<td>7,724</td>
</tr>
</tbody>
</table>

Source: ABS (2018) International Trade in Goods and Services, 5368.0

### Table 16.8: Principal markets for Australia’s gold exports, 2017–18 dollars

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>$m</td>
<td>6,580</td>
<td>8,653</td>
<td>7,318</td>
<td>6,795</td>
<td>2,367</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>$m</td>
<td>2,876</td>
<td>685</td>
<td>613</td>
<td>4,088</td>
<td>3,993</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>$m</td>
<td>121</td>
<td>162</td>
<td>199</td>
<td>2,620</td>
<td>9,809</td>
</tr>
<tr>
<td>Singapore</td>
<td>$m</td>
<td>1,039</td>
<td>2,433</td>
<td>3,277</td>
<td>1,241</td>
<td>308</td>
</tr>
<tr>
<td>Thailand</td>
<td>$m</td>
<td>1,397</td>
<td>476</td>
<td>944</td>
<td>263</td>
<td>543</td>
</tr>
<tr>
<td>Switzerland</td>
<td>$m</td>
<td>315</td>
<td>369</td>
<td>16</td>
<td>90</td>
<td>230</td>
</tr>
<tr>
<td>Total</td>
<td>$m</td>
<td>16,553</td>
<td>13,926</td>
<td>13,731</td>
<td>16,283</td>
<td>18,384</td>
</tr>
</tbody>
</table>

Source: ABS (2018) International Trade in Goods and Services, 5368.0
A.1 Exchange rates
In this report, the AUD/USD exchange rate (Australian dollar relative to the US dollar) is based on the median of economic forecasters at the time that the report is prepared. The source is the Bloomberg survey of economic forecasters.

World commodity prices are typically denominated in US dollars, and exchange rate movements can have a significant effect on the actual outcomes of commodity prices and export earnings. A change in the value of the US dollar against other floating international currencies can influence movements in world resources and energy prices. A change in the Australian dollar against the US dollar will impact on export earnings for domestic commodity exporters and producers. There is substantial uncertainty surrounding any exchange rate forecast, with changes to exchange rates influenced by changes in financial market sentiment, sometimes resulting in strong volatility.

A.2 Conversion to real dollars
Nominal values and prices are converted to real dollars using on the Australian and US consumer price indexes (CPI). The Australian and US CPI forecasts are based on the median of economic forecasters at the time that the report was prepared. The source is the Bloomberg survey of economic forecasters.

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUD/USD exchange rate</td>
<td>0.77</td>
<td>0.77</td>
<td>0.80</td>
<td>0.77</td>
</tr>
</tbody>
</table>

Inflation rate

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>97.7</td>
<td>100.0</td>
<td>102.2</td>
<td>104.1</td>
</tr>
<tr>
<td>Australia</td>
<td>98.1</td>
<td>100.0</td>
<td>102.4</td>
<td>104.8</td>
</tr>
</tbody>
</table>

Notes: The inflation rate for Australia is used to covert Australian export values to real 2017–18 dollars.
The inflation rate for the United States is used to convert commodity prices denominated in USD to real 2018 dollars.
A.3 Time horizons

It is important to distinguish between different time horizons, as factors affecting production, consumption and prices in the short-term differ from factors affecting these components in the medium to long-term. Forecasts also become increasingly imprecise over longer time horizons, due to increased risk and uncertainty. For these reasons, the OCE uses different terminology to distinguish between short-term forecasts and medium to long-term projections, as outlined in Table A2.

Table A2: OCE terminology for time horizons

<table>
<thead>
<tr>
<th>Outlook period</th>
<th>Years</th>
<th>Terminology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current period</td>
<td>Current (Incomplete data or subject to revision)</td>
<td>Estimate</td>
</tr>
<tr>
<td>Short-term</td>
<td>1 to 2 years</td>
<td>Forecast</td>
</tr>
<tr>
<td>Medium-term</td>
<td>3 to 5 years</td>
<td>Projection</td>
</tr>
</tbody>
</table>

Source: Department of Industry, Innovation and Science (2018)

A.4 Commodity classifications

The Office of the Chief Economist (OCE) defines exports for each commodity by a selected set of 8-digit Australian Harmonised Export Commodity Classification (AHECC) codes. Where possible, the choice of AHECC codes is based on alignment with international trade data, to ensure that direct comparisons can be made. For example, groupings for various commodities are aligned with classifications used by the International Energy Agency, World Steel Association, International Nickel Study Group, International Lead and Zinc Study Group, International Copper Study Group and World Bureau of Metal Statistics.

In this report, benchmark prices and Australian production and exports are forecast for 21 commodities. As shown in Table A3, fourteen of these commodities are featured in a chapter of Resources and Energy Quarterly, while forecasts are produced for another seven commodities that are not published. Australia also exports other resources and energy commodities. These other commodities, defined as ‘other resources’ and ‘other energy’, are forecast as a group.

Table A3: Resources and energy commodities groupings and definitions

<table>
<thead>
<tr>
<th>Resources (non-energy)</th>
<th>Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource commodities are non-energy minerals and semi-manufactured products produced from non-energy minerals</td>
<td>Energy commodities are minerals and petroleum products that are typically used for power generation</td>
</tr>
<tr>
<td>Australian Harmonised Export Commodity Classification (AHECC) chapters 25 (part); 26 (part); 28 (part); 31 (part); 73 (part); 74; 75; 76; 78; 79; 80; 81</td>
<td>27 (part)</td>
</tr>
<tr>
<td>Commodities featured in Resources and Energy Quarterly Alumimum; alumina; bauxite; copper; gold; iron ore; crude steel; nickel; zinc</td>
<td>Crude oil and petroleum products; LNG; metallurgical coal; thermal coal; uranium</td>
</tr>
<tr>
<td>Commodities not featured in Resources and Energy Quarterly, but data is available Diamonds; lead; manganese; mineral sands; salt; silver; tin</td>
<td></td>
</tr>
</tbody>
</table>

Notes: The AHECC chapter is the first two digits of the trade code. Groupings are made at the 8-digit level.
Source: Department of Industry, Innovation and Science (2018)
Commodity analysts and contact details

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Analyst</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel and iron ore</td>
<td>Joseph Moloney</td>
<td><a href="mailto:joseph.moloney@industry.gov.au">joseph.moloney@industry.gov.au</a></td>
</tr>
<tr>
<td>Metallurgical and thermal coal</td>
<td>Monica Philalay</td>
<td><a href="mailto:monica.philalay@industry.gov.au">monica.philalay@industry.gov.au</a></td>
</tr>
<tr>
<td>Gas</td>
<td>Nikolai Drahos</td>
<td><a href="mailto:nikolai.drahos@industry.gov.au">nikolai.drahos@industry.gov.au</a></td>
</tr>
<tr>
<td>Oil</td>
<td>Kate Martin</td>
<td><a href="mailto:kate.martin@industry.gov.au">kate.martin@industry.gov.au</a></td>
</tr>
<tr>
<td>Uranium</td>
<td>Mark Gibbons</td>
<td><a href="mailto:mark.gibbons@industry.gov.au">mark.gibbons@industry.gov.au</a></td>
</tr>
<tr>
<td>Gold</td>
<td>Thuong Nguyen</td>
<td><a href="mailto:thuong.nguyen@industry.gov.au">thuong.nguyen@industry.gov.au</a></td>
</tr>
<tr>
<td>Aluminium, alumina and bauxite</td>
<td>Andrea Bath</td>
<td><a href="mailto:andrea.bath@industry.gov.au">andrea.bath@industry.gov.au</a></td>
</tr>
<tr>
<td>Copper</td>
<td>Mark Gibbons</td>
<td><a href="mailto:mark.gibbons@industry.gov.au">mark.gibbons@industry.gov.au</a></td>
</tr>
<tr>
<td>Nickel</td>
<td>Mark Gibbons</td>
<td><a href="mailto:mark.gibbons@industry.gov.au">mark.gibbons@industry.gov.au</a></td>
</tr>
<tr>
<td>Zinc</td>
<td>Mark Gibbons</td>
<td><a href="mailto:mark.gibbons@industry.gov.au">mark.gibbons@industry.gov.au</a></td>
</tr>
</tbody>
</table>

The Australian mining boom: a tale of three phases

<table>
<thead>
<tr>
<th>Year</th>
<th>Prices</th>
<th>Investment</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>46</td>
<td>20</td>
<td>55</td>
</tr>
<tr>
<td>2004</td>
<td>53</td>
<td>23</td>
<td>53</td>
</tr>
<tr>
<td>2005</td>
<td>69</td>
<td>29</td>
<td>57</td>
</tr>
<tr>
<td>2006</td>
<td>88</td>
<td>35</td>
<td>57</td>
</tr>
<tr>
<td>2007</td>
<td>88</td>
<td>51</td>
<td>61</td>
</tr>
<tr>
<td>2008</td>
<td>120</td>
<td>69</td>
<td>64</td>
</tr>
<tr>
<td>2009</td>
<td>103</td>
<td>96</td>
<td>66</td>
</tr>
<tr>
<td>2010</td>
<td>119</td>
<td>121</td>
<td>71</td>
</tr>
<tr>
<td>2011</td>
<td>138</td>
<td>202</td>
<td>71</td>
</tr>
<tr>
<td>2012</td>
<td>117</td>
<td>265</td>
<td>76</td>
</tr>
<tr>
<td>2013</td>
<td>115</td>
<td>254</td>
<td>83</td>
</tr>
<tr>
<td>2014</td>
<td>102</td>
<td>228</td>
<td>94</td>
</tr>
<tr>
<td>2015</td>
<td>85</td>
<td>223</td>
<td>98</td>
</tr>
<tr>
<td>2016</td>
<td>83</td>
<td>195</td>
<td>105</td>
</tr>
<tr>
<td>2017</td>
<td>101</td>
<td>122</td>
<td>106</td>
</tr>
<tr>
<td>2018</td>
<td>106</td>
<td>44</td>
<td>116</td>
</tr>
<tr>
<td>2019</td>
<td>94</td>
<td>41</td>
<td>121</td>
</tr>
<tr>
<td>2020</td>
<td>93</td>
<td>42</td>
<td>123</td>
</tr>
<tr>
<td>2021</td>
<td>95</td>
<td>35</td>
<td>123</td>
</tr>
<tr>
<td>2022</td>
<td>99</td>
<td>42</td>
<td>123</td>
</tr>
<tr>
<td>2023</td>
<td>102</td>
<td>35</td>
<td>121</td>
</tr>
</tbody>
</table>

Notes: Chart data originally published on page 4 of the Resources and Energy Quarterly March 2018. Price and Production are indices based on Australia’s export values and volumes. Investment refers to A$ billions of committed major resource and energy projects. Source: Department of Industry, Innovation and Science (2018)