Oil
Resources and Energy Quarterly March 2018

Top five countries for Australia’s crude oil and refined product imports, 2016–17 (billion litres)

1. Malaysia 10.237
2. South Korea 9.310
3. Singapore 8.994
4. Japan 4.974
5. UAE 3.421

Note: excludes natural gas imports

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

<table>
<thead>
<tr>
<th></th>
<th>Highest price</th>
<th>2018 average</th>
<th>Lowest price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$117</td>
<td>$66</td>
<td>$26</td>
</tr>
<tr>
<td>Date</td>
<td>6/09/2013</td>
<td>19/01/2016</td>
<td></td>
</tr>
</tbody>
</table>

Australia’s refinery production

- Automotive gasoline: 44%
- Diesel: 35%
- Aviation turbine fuel: 14%
- LPG: 3%
- Fuel oil: 2%
- Other: 1%
8.1 Summary

- Australia’s crude oil and condensate exports are forecast to increase from $5.6 billion in 2016–17 to $9.3 billion in 2022–23 in real terms, driven by higher export volumes and higher oil prices.
- Over the outlook period, declining crude oil output will be offset by higher condensate output, related to the new LNG projects coming online.
- World oil prices are projected to increase modestly over the outlook period. Higher US production and lower consumption growth is expected to limit price increases.

8.2 Prices

Oil prices reach three year highs

In January, the Brent spot price reached US$70 a barrel, its highest level since 2014, before moving lower towards the end of the quarter. Oil prices have been on the rise over the past two years, after bottoming out at US$30 a barrel in early 2015. Price gains have been driven by the OPEC Production Agreement, expanding consumption and geopolitical tensions. In 2017, Brent crude averaged US$54 a barrel, 22 per cent higher than 2016, and West Texas Intermediate (WTI) averaged US$51 a barrel, 17 per cent higher than 2016.

Over the outlook period, oil prices are forecast to increase, at a constrained pace. Lower production from OPEC and the other agreement partners — including Russia — is expected to keep world production constrained in the short term, despite increasing US production. With a more balanced world market, prices will also be buoyed by healthy economic conditions in growing consumer markets.

Towards the end of the outlook period, it is expected OPEC production will return to the market and increases in US production will subside. Higher capital costs and low exploration may weigh on future capacity investments. World oil prices are expected to increase, as consumption expands, however at a lower rate, due to available world supply. In 2023, average prices are projected to be US$60 a barrel for Brent and US$56 a barrel for WTI (in 2018 dollar terms).
8.3 World oil consumption

In 2017, world oil consumption expanded by 1.6 per cent, reaching 97.8 million barrels a day. Consumption growth continued to be concentrated in non-OECD markets, particularly in China and India, which showed growth of 5.1 per cent and 2.6 per cent respectively. Generally improved economic conditions in other countries facilitated healthy consumption growth in 2017.

Changing consumption patterns and moderating consumption growth

Over the outlook period, world consumption is expected to increase in line with the positive outlook for world economic conditions and growing consumer markets. In 2023, world consumption is projected to be 104.7 million barrels a day, increasing at an average annual rate of 1.1 per cent. By 2023, China and India are expected to consume an additional 1.2 and 1.1 million barrels a day of oil products, respectively.

While world consumption is set to increase, the rate of consumption growth will be slower than over the past few years. China is expected to continue to account for around 13 per cent of world consumption, as its consumption grows at around 2.6 per cent year. For all major consumption markets, including China, changing consumer preferences and government policies to decarbonise transport are expected to weigh on consumption growth over the outlook period.

In China, measures have been taken to restrict car ownership and promote lower vehicle usage, coupled with government support for electric vehicles and the electrification of bus and light truck fleets. In 2017, 2.7 per cent of all new cars sold in China were electric vehicles, and electric vehicles now make up around 0.7 per cent of China’s car population.

The most significant growth area of oil consumption is expected to be in petrochemical feedstocks, which account for around 20 per cent of total consumption. World consumption of LPG, ethane and naptha is forecast to increase by 2.3 per cent a year to 2030.
8.4 World oil production

Flat global production contributed to a rebalancing in 2017

In 2017, world oil production was 97.4 million barrels a day, unchanged from 2016 levels. Constrained OPEC production offset increases in US and Canadian production. The 2017 Production Agreement between OPEC members and Russia aimed to reduce excess supply in the world market, by reducing combined production by 1.8 million barrels a day. The agreement was initially introduced for six months, before being extended to the end of 2017. Actual total production was cut by more than the agreed level, primarily driven by Saudi Arabia and Venezuela; compliance reached 129 per cent at the end of the year.

Short-term production outlook: US to reach record high production levels

World production is forecast to reach 99.5 million barrels a day in 2018, 2.1 per cent higher than in 2017. The OPEC Production Agreement has been extended until the end of 2018. Record forecast production from the US and new production from Brazil, Canada, Mexico and Norway is expected to outweigh any production restraint exhibited by OPEC.

After strong drilling activity in 2017, sharp increases in US production are expected over the next two years, resulting in record export volumes. Operating economics have improved with industry learning and knowledge. Shale wells have high production rates, although lower operating lifetimes than conventional oil fields.

Low-cost production from the Permian is expected to raise US production to 14.7 million barrels a day in 2018, 11.5 per cent higher than 2017. Under current forecasts, the US is expected to become the highest producer in the world in 2018, exceeding Saudi Arabia’s production of around 12.3 million barrels a day and Russia’s 11.3 million barrels a day.
**OPEC production outlook — continuing to coordinate**

In 2017, combined OPEC production was 39.2 million barrels a day, 0.9 per cent lower than the previous year. With strong compliance to the agreement and positive oil market movements in 2017, it is expected that production will be little changed in 2018. Volatile production from a number of OPEC producers poses risks to the outlook. Venezuela’s oil production decreased significantly in 2017 to reach 30-year lows. Difficult economic conditions and operational constraints with labour and refinery inputs make significant production recovery unlikely. Output from Nigeria and Libya, who are excluded from the OPEC agreement, have not reached production targets due to militant attacks on oil infrastructure.

**Production may return to OPEC-led market dynamics**

Towards the end of the outlook period, it is expected that OPEC and agreement partners will seek to maintain balance in world markets; a coordinated transition away from the OPEC Production Agreement or an ongoing arrangement is likely to be established. US shale productivity is expected to decrease, as ‘sweet spots’ are exploited. World production is projected to increase at an average rate of 1.7 per cent a year to 2023, reaching 106.7 million barrels a day.

**8.5 Australia**

**Positive export outlook**

The real value of Australia’s petroleum exports is projected to increase over the outlook period; in 2022–23, crude oil and condensate export earnings are projected to reach $9.3 billion, up from $5.6 billion in 2016–17.

Export earnings growth is expected to be primarily driven by higher export volumes, which are forecast to reach record levels over the outlook period. Higher condensate exports, co-produced at the new LNG facilities, are expected to contribute to export volumes growing by an average 10.8 per cent a year over the outlook period. In 2022–23, export volumes are projected to reach 311 thousand barrels a day, up from 221 thousand barrels a day in 2016–17.

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**Figure 8.7: Australia’s export volumes and values**

![Graph showing export volumes and values from 2002-2018 to 2022-2023](source: Australian Bureau of Statistics (2018), Department of Industry Innovation and Science (2018))

**Declining crude oil production balanced by higher condensate production**

Australia’s petroleum production is expected to increase over the outlook period, as declining oil field production is outweighed by increased condensate production. Total production is projected to increase from 283 thousand barrels a day in 2016–17, to 372 thousand barrels a day in 2022–23. Within this, crude oil production is projected to decrease at an average annual rate of 4.7 per cent over the outlook period, reaching a projected production rate of 109 thousand barrels a day in 2022–23. The Greater Enfield facility, with an operating capacity of 40 thousand barrels a day, is scheduled to come online mid-2019, extending the life of Woodside’s Enfield project.

Significant increases in condensate production in the first few years of the outlook period are expected, as the Wheatstone, Icthys and Prelude LNG projects come into full operation. Inpex’s Icthys project in the Bonaparte basin is expected to become the biggest producing petroleum field in Australia with peak capacity of 100 thousand barrels a day of condensate.
Continued declines in exploration expenditure and quiet project horizon

Oil and gas exploration expenditure decreased at an annual rate of 26.9 per cent in the December 2017 quarter, to $245 million. Low average oil prices and a difficult operating environment have contributed to the reduction in exploration activity. Future investment is focused on brownfields expansion and backfilling declining production fields.

**Figure 8.8: Australia’s petroleum production**

Unleaded petrol and diesel form the largest portion of Australia’s refinery output, at 79 per cent of total production. Jet fuel and LPG, as well as specialty products like bitumen and chemical feedstocks, are also produced domestically.

Australia’s refineries typically produce around 40-45 per cent of the refined products that are consumed in Australia, with the remainder primarily imported from South Korea, Singapore and Japan and Malaysia.

**Table 8.1: Australia’s refinery capacity**

<table>
<thead>
<tr>
<th>Refinery, company</th>
<th>Location</th>
<th>Start-up</th>
<th>Capacity ML/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kwinana, BP</td>
<td>Kwinana, WA</td>
<td>1955</td>
<td>8650</td>
</tr>
<tr>
<td>Geelong, Viva Energy</td>
<td>Geelong, VIC</td>
<td>1954</td>
<td>7470</td>
</tr>
<tr>
<td>Lytton, Caltex</td>
<td>Brisbane, QLD</td>
<td>1949</td>
<td>6500</td>
</tr>
<tr>
<td>Altona, Mobil</td>
<td>Altona, VIC</td>
<td>1949</td>
<td>5222</td>
</tr>
</tbody>
</table>

Source: Company websites, Australian Institute of Petroleum (2018)

Refinery production has recently increased, as refinery investment, debottlenecking programs and technical overhauls were undertaken at all major facilities over the last four years. To optimise production and improve capacity at a petroleum refinery, ‘turnaround maintenance’ is undertaken around every 4-6 years. Refineries have also invested in production facilities to cater to growing consumer markets, and to increase storage capacity and supply chain flexibility.

**Box 8.1: Australia’s petroleum refineries**

There are four major petroleum refineries in Australia, with an average age of 65 years. Australia’s refineries have been extensively upgraded since start-up, in order to modernise production and meet higher fuel standards. However, Australia’s refineries are relatively small by world standards, with the largest having a capacity of 8.650 million litres per year, compared to the four largest Asian refineries, which each produce between 30,000 and 70,000 million litres per year.

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Table 8.2: Oil outlook

<table>
<thead>
<tr>
<th>World</th>
<th>Unit</th>
<th>2017 s</th>
<th>2018 f</th>
<th>2019 f</th>
<th>2020 z</th>
<th>2021 z</th>
<th>2022 z</th>
<th>2023 z</th>
<th>CAGR r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production a</td>
<td>mb/d</td>
<td>97.4</td>
<td>99.5</td>
<td>101.7</td>
<td>103.8</td>
<td>105.0</td>
<td>106.0</td>
<td>106.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Consumption a</td>
<td>mb/d</td>
<td>97.8</td>
<td>99.2</td>
<td>100.5</td>
<td>101.5</td>
<td>102.6</td>
<td>103.7</td>
<td>104.7</td>
<td>1.4</td>
</tr>
</tbody>
</table>

WTI crude oil price

| Nominal | US$/bbl | 50.5 | 59.2 | 59.4 | 61.6 | 61.7 | 61.2 | 61.9 | 4.2 |
| Real b | US$/bbl | 51.7 | 59.2 | 58.1 | 59.2 | 58.2 | 56.6 | 56.2 | 1.7 |

Brent crude oil price

| Nominal | US$/bbl | 54.0 | 63.4 | 63.7 | 65.9 | 66.0 | 65.5 | 66.2 | 4.2 |
| Real b | US$/bbl | 55.3 | 63.4 | 62.3 | 63.3 | 62.2 | 60.6 | 60.1 | 1.7 |

Australia

|-------|---------|-----------|-----------|-----------|-----------|-----------|-----------|--------|
| Crude and condensate
| Production a | kb/d | 283 | 296 | 364 | 413 | 406 | 385 | 372 | 4.7 |
| Export volume a | kb/d | 221 | 229 | 301 | 345 | 339 | 321 | 311 | 6.3 |
| Nominal value | A$m | 5,476 | 6,731 | 8,759 | 10,332 | 10,383 | 9,769 | 10,515 | 9.3 |
| Real value g | A$m | 5,586 | 6,731 | 8,558 | 9,863 | 9,677 | 8,886 | 9,333 | 6.8 |
| Imports a | kb/d | 351 | 377 | 368 | 363 | 358 | 342 | 350 | -1.5 |
| LPG production ac | kb/d | 52 | 54 | 109 | 102 | 71 | 67 | 65 | 3.8 |
| Refined products
| Refinery production a | kb/d | 429 | 447 | 440 | 440 | 434 | 415 | 420 | -1.2 |
| Export volume ad | kb/d | 18 | 13 | 9 | 9 | 9 | 9 | 9 | -7.2 |
| Import volume a | kb/d | 616 | 652 | 721 | 734 | 732 | 757 | 756 | 3.0 |
| Consumption | A$m | 1,004 | 1,047 | 1,070 | 1,086 | 1,103 | 1,119 | 1,125 | 1.5 |

Notes: 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 Excludes LPG; e Domestic sales of marketable products; f Forecast; g In 2017–18 financial year Australian dollars; z Projection. A barrel of oil equals 158.987 litres