Gas

Resources and Energy Quarterly September 2017

LNG is natural gas cooled to

–162°C

2nd

largest LNG exporter in the world

52 **million tonnes** of LNG exported in 2016–17

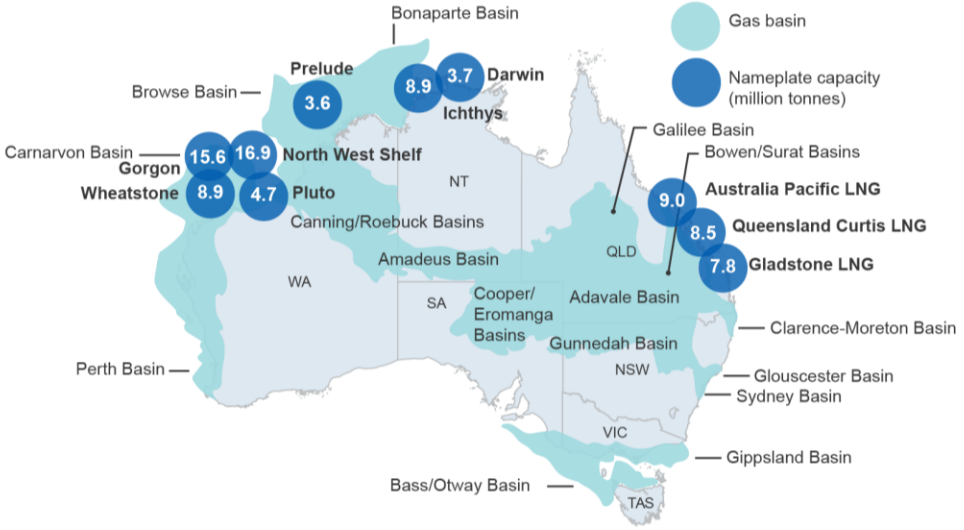
42%

rise from 2015–16

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

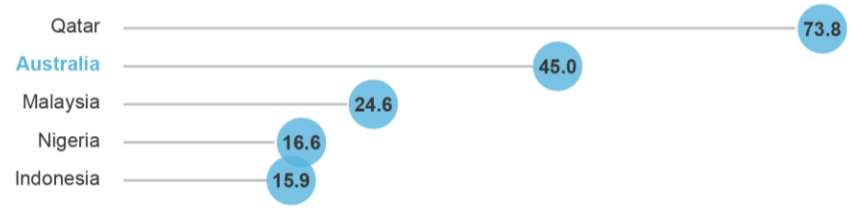
Most Australian LNG is sold on oil-linked contracts

Australia's LNG projects and gas basins

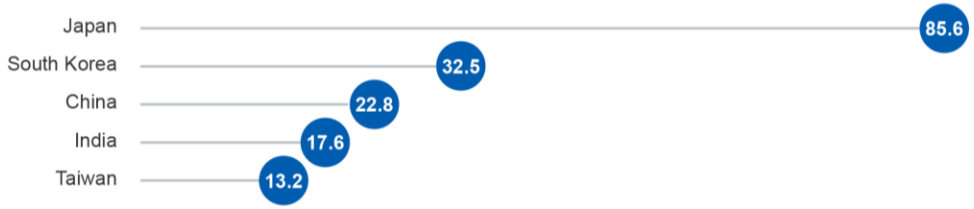


Largest LNG exporters and importers, 2016

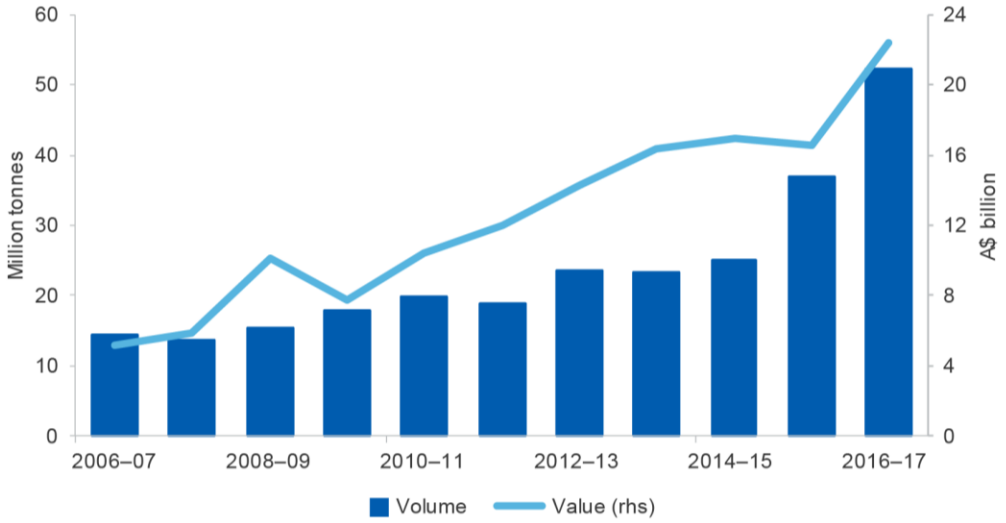
Largest exporters (million tonnes)



Largest importers (million tonnes)



Australia's LNG exports



Summary

- The value of Australia's LNG exports is forecast to increase from $22 billion in 2016–17 to $35 billion in 2018–19, driven by higher export volumes and, to a lesser extent, higher prices.
- The completion of the final three Australian LNG projects under construction will underpin strong growth in export volumes and bring total export capacity to 88 million tonnes. LNG is forecast to overtake metallurgical coal as Australia's second largest resource and energy export in 2018–19.
- LNG contract prices — under which most Australian LNG is sold — are forecast to increase in line with oil prices.
- The outlook for LNG export earnings is not without risks. Australia faces increasing competition in export markets. Oil prices are also a key sensitivity.

Prices

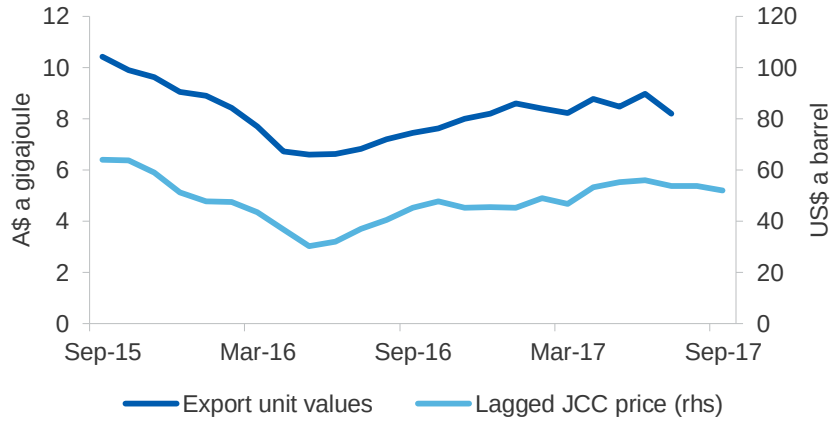
Oil price movements to drive Australian LNG prices

The latest available data shows that the average price of Australian LNG (FOB) declined from an 18-month high of $9 a gigajoule in June to $8.2 a gigajoule in July — or around US$6.8 per million British thermal units (MMbtu). The decline was driven by a fall in oil prices in April 2017, with the majority of Australian LNG sold on long-term contracts linked to the price of Japan Customs-cleared Crude (JCC) oil by a time lag of three months.

LNG spot prices in Asia have risen in recent months, bringing them more closely in line with long-term oil-linked contract prices. As Figure 7.2 shows, LNG spot prices (Delivered Ex Ship) averaged an estimated $8.2 a gigajoule in September (US$6.9 per MMbtu) while an indicative price for LNG on a long-term oil-linked contract (Delivered Ex Ship) was around $9.2 a gigajoule.

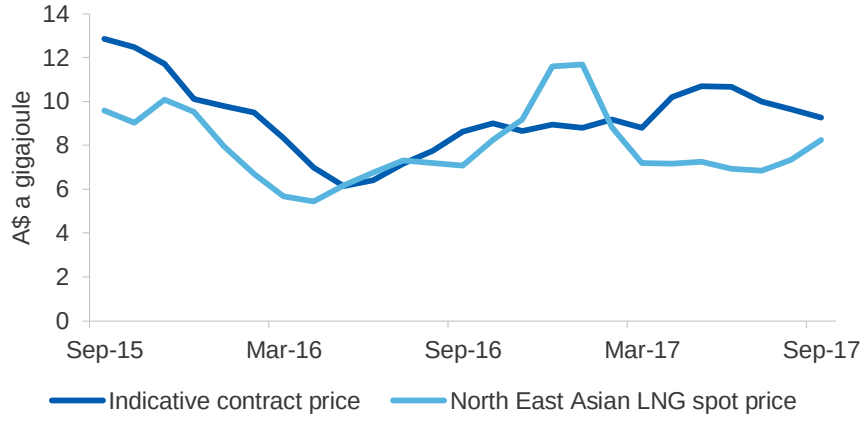
The average price of Australian LNG (FOB) is forecast to increase to average $9.1 a gigajoule in 2018–19, largely driven by higher prices on oil-linked contracts. The JCC oil price is forecast to average US$55 a barrel in 2018–19, up from an average US$50 a barrel in 2016–17.

Figure 7.1: Recent movement in export unit values, monthly



Notes: the JCC price is lagged three months.
Source: ABS (2017); Bloomberg (2017)

Figure 7.2: LNG contract price versus spot price, monthly



Notes: the contract price shown here is indicative only and is estimated as 14 per cent of the three month JCC price plus shipping. Des stands for Delivered Ex Ship.
Source: Argus (2017); Bloomberg (2017)

However, low spot prices will play some role in constraining the average export price realised, particularly if Australian exporters increase their share of sales at spot prices. Asian LNG spot prices (Delivered Ex Ship) are forecast to fall to an average $6.4 a gigajoule in 2019 (around US$5.2 per MMbtu), as additions to global supply capacity outstrip growth in LNG demand.

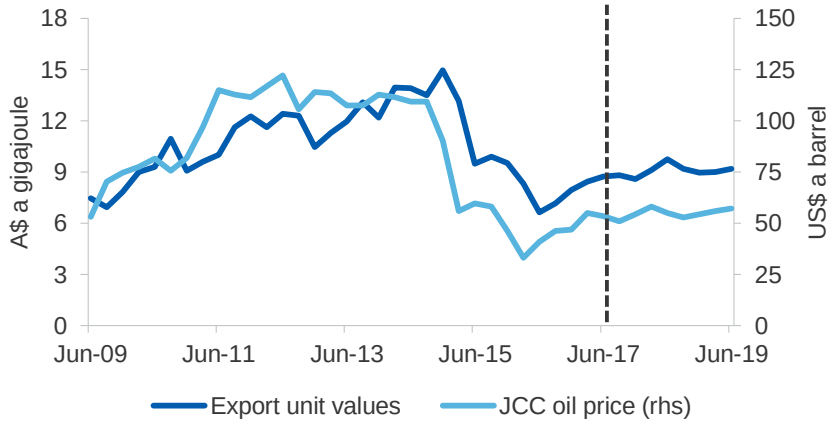
The forecast divergence between oil-linked contract prices and LNG spot prices is expected to encourage buyers to turn to the short-term contract or spot market, reducing purchases on long-term contracts to minimum 'take-or-pay' levels. A widening in the difference between spot and contract prices may also encourage buyers to seek changes to their contractual arrangements with sellers. In September, it was reported that India's Petronet LNG had negotiated a more favourable oil-linked pricing formula with ExxonMobil for LNG supplies from the Gorgon project.

World trade

Although growth in global gas demand is forecast to remain modest, it is expected to drive a major expansion in the relatively small LNG market. World LNG trade is forecast to increase at an average annual rate of 9.3 per cent a year, reaching 327 million tonnes in 2019. Emerging Asia — led by China — and Europe are expected to drive demand growth. Prospects for growth in the imports of the world's two largest consumers — Japan and South Korea — are more limited.

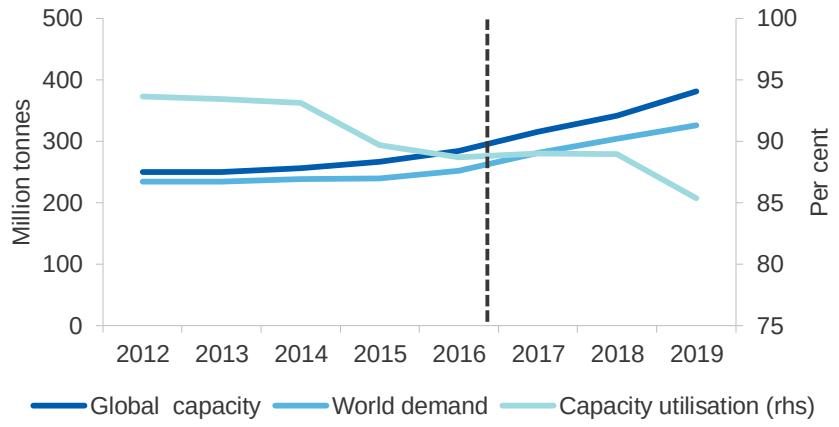
While LNG demand is forecast to grow rapidly over the next few years, it is expected to be outpaced by growth in supply capacity. Consequently, the average capacity utilisation of LNG plants is expected to fall.

Figure 7.3: Export unit value and JCC oil price forecasts



Source: ABS (2017); Bloomberg (2017)

Figure 7.4: Global liquefaction capacity and LNG demand



Notes: liquefaction capacity is nameplate less allowance for downtime and maintenance.
Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

World imports

The imports of the world's largest LNG buyer are set to decline

Japan's LNG imports increased by 5.5 per cent year-on-year in the first seven months of 2017, with gas demand supported by a hot summer and increased consumption in the industrial sector. Despite this, Japan's LNG imports are forecast to increase by only 3.1 per cent in 2017 to 88 million tonnes. By 2019, Japan's LNG imports are forecast to decline to 84 million tonnes.

Overall energy demand in Japan remains subdued. At the same time, LNG is expected to face increasing competition from other fuel sources in the power sector, which accounts for two-thirds of Japan's gas consumption.

The recent restart of idle nuclear power generation capacity — which competes with gas-fired power — is expected to weigh on LNG imports from mid-2017. Japanese utility Kansai Electric Power reactivated two reactors in the June quarter. Five of Japan's fleet of 42 reactors (combined capacity 4.4 gigawatts) are now operational.

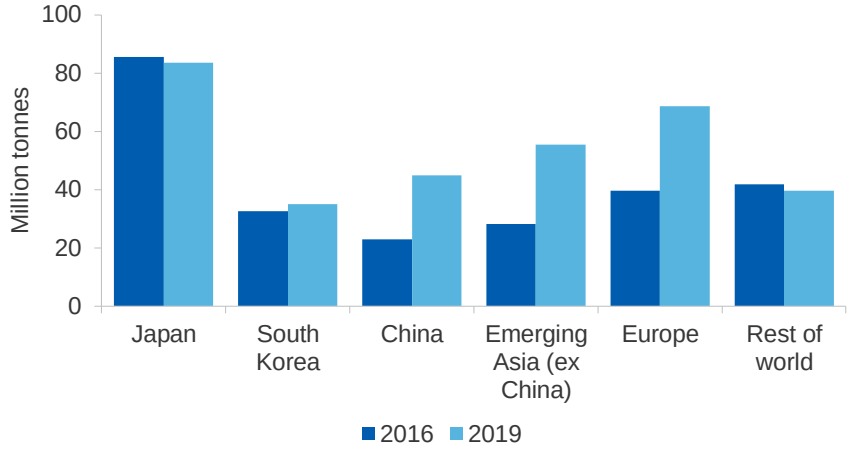
Further reactor restarts are possible within the outlook period. Four more reactors — with capacity totalling 4.7 gigawatts — have received approval from Japan's Nuclear Regulation Authority to restart. However, the timing and scale of nuclear restarts remains a key uncertainty affecting the outlook.

LNG also faces increasing competition in power generation from renewable energy. The Japanese Government's energy think-tank, the Institute of Energy Economics (IEEJ), expects renewable energy generation to increase at an average annual rate of 7.7 per cent between Japanese fiscal years (April to March) 2016–17 and 2018–19.

Recent announcements in South Korea could support LNG imports

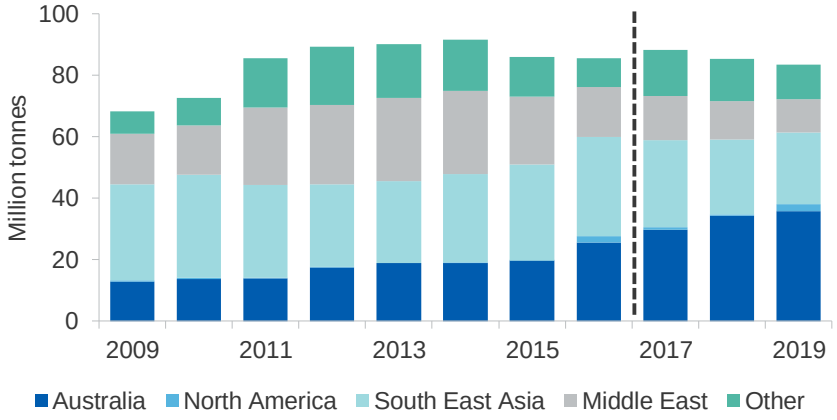
South Korea's LNG imports increased by 18 per cent year-on-year in the first seven months of 2017. With a number of nuclear reactors offline and nuclear-power generation down, gas-fired generation increased. South Korea's LNG imports are forecast to increase by 10 per cent in 2017 to 33 million tonnes, with the return of nuclear capacity weighing on LNG imports in the second half of 2017.

Figure 7.5: LNG import forecasts



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

Figure 7.6: Japan's LNG imports



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

In 2018 and 2019, South Korea's LNG imports are forecast to be broadly steady. While gas use in the industrial sector is expected to decline, several announcements by the recently elected South Korean government could lead to a modest increase in the use of LNG in power generation.

From 2018, operations at six old coal-fired power stations will be suspended between March and June each year to reduce air pollution. There are also plans to close two coal-fired power stations before the end of 2017, with a further eight closures expected before mid-2022. South Korea's government will also raise its coal consumption tax by as much as 22 per cent from the start of 2018, increasing the cost-competitiveness of gas.

The South Korean government also has plans to reduce reliance on nuclear energy, given public concern about the safety of the technology. The government has paused the construction of two nuclear power stations, pending a review, and also intends to close the aged Wolsong 1 nuclear reactor, although a timeline for this has not been specified.

If gas-fired generation replaces reduced coal-fired and nuclear power capacity, increased LNG imports will be required.

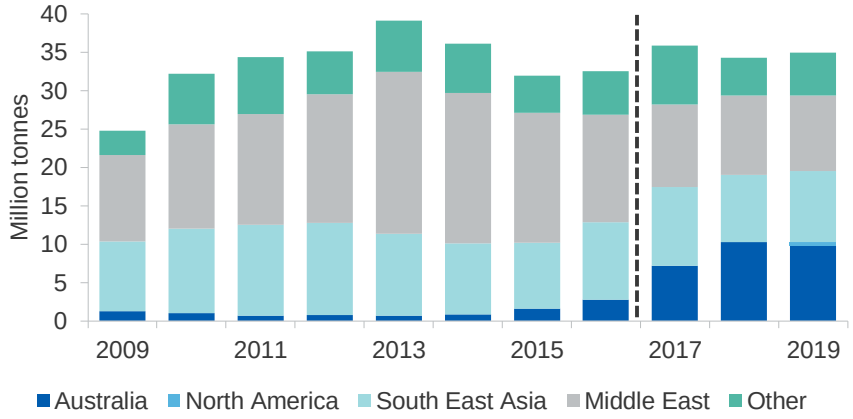
Emerging Asia, led by China, to drive growth in LNG demand

China's LNG imports increased by 60 per cent year-on-year in the first seven months of 2017. Natural gas consumption rose strongly, recording a seasonal record in each month of the year. Pipeline imports and domestic production also increased alongside LNG imports.

A combination of strong economic growth and energy policy targets are expected to support increased consumption. The Chinese government is aiming to increase the share of gas in the energy mix from 5.3 per cent in 2015 to 10 per cent by 2020, with the stated objectives of reducing air pollution and lowering carbon emissions.

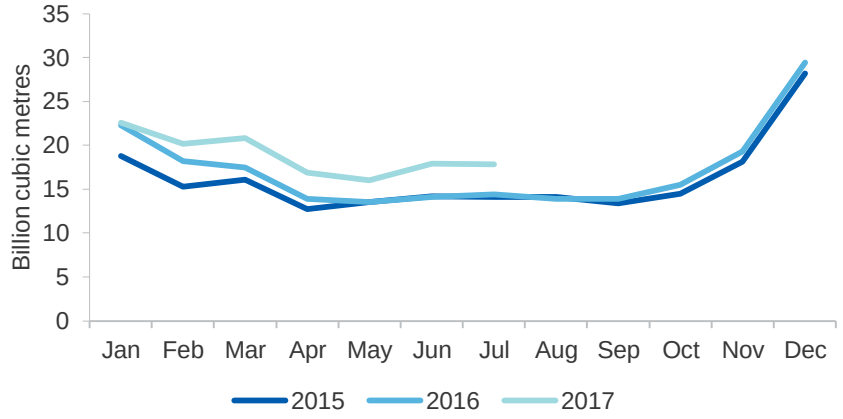
LNG is expected to play an important role in servicing rising gas demand. China's LNG imports are forecast to virtually double from 23 million tonnes in 2016 to 45 million tonnes in 2019. China has agreed to large contracts for LNG imports, starting over the next few years.

Figure 7.7: South Korea's LNG imports



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

Figure 7.8: Natural gas consumption in China



Notes: Apparent natural gas consumption.
Source: Bloomberg (2017)

In addition, low LNG prices — especially on the spot market — should assist the cost competiveness of LNG vis-à-vis domestic production and pipeline gas imports.

Other emerging Asian economies are expected to make a large contribution to growth in global LNG imports. Growth will be underpinned by low LNG spot and short-term contract prices, and the availability of floating storage and regasification unit (FSRU) technology, which allows small volumes of LNG to be received more cheaply.

India, for example, is aiming to increase the share of gas in the energy mix from about 6 per cent to around 15 per cent, although a timeline for this remains unclear. With no pipeline import infrastructure, a combination of domestic production and LNG imports are expected to be required to meet growing demand.

Europe's LNG imports are expected to increase

European LNG imports are forecast to increase from 40 million tonnes in 2016 to 69 million tonnes in 2019. Rising gas consumption, falling domestic production, and a desire to diversify away from Russian pipeline supply are all expected to support LNG imports.

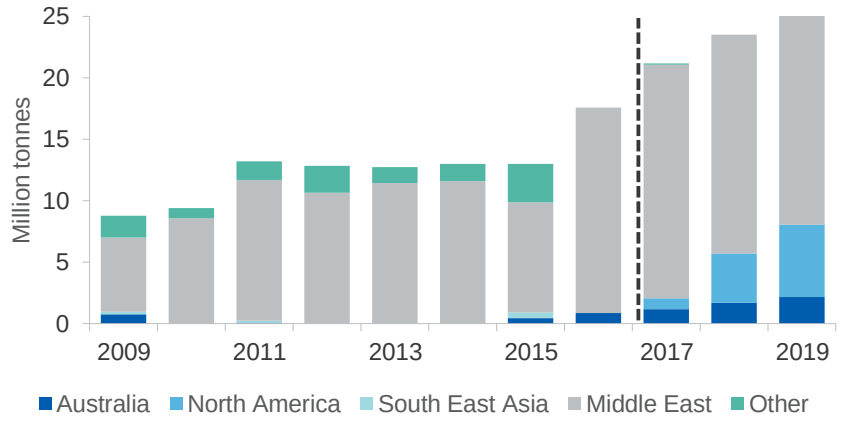
Europe is not a major destination for Australia's LNG exports. However, if LNG demand in Europe does not grow as strongly as projected, Qatari and US LNG may be displaced, potentially then bringing increased competition to the Asia-Pacific market.

World supply

Global supply capacity to rise

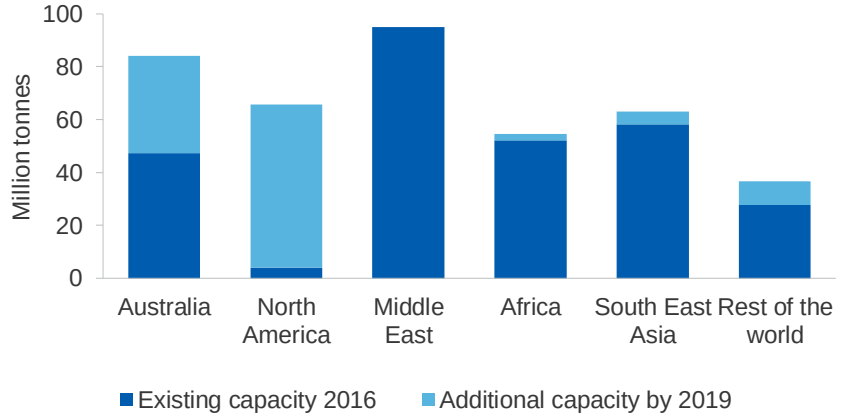
The next few years are expected to see a major expansion in global supply capacity. Around half of all new liquefaction capacity will come from the United States. By 2019, all five LNG projects currently under construction in the United States are expected to have started production, bringing nameplate capacity to around 64 million tonnes. However, US exports are only forecast to rise to around 37 million tonnes in 2019, with all of these projects scheduled for completion late in the outlook period.

Figure 7.9: India's LNG imports



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

Figure 7.10: Global LNG supply capacity



Notes: liquefaction capacity is nameplate less allowance for downtime and maintenance.
Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

With the US expected to be a major source of new supply, it is possible that the cost of delivering US gas to Asia could cap LNG spot prices in the region. The cost of US LNG will be determined by the price for which US LNG exporters can purchase domestic gas for export, plus the cost of liquefaction and transportation.

If current prices persist, and if tolling fees (fixed charges paid by LNG buyers that cover the capital costs of US LNG plants) are treated as a sunk cost, US LNG could potentially reach Asian markets for around US$5 per MMbtu ($6.3 a gigajoule). Henry Hub spot prices — the reference price for US domestic gas — remain about US$3 per MMbtu mark (around $3.8 a gigajoule). Liquefaction and transportation costs from the US Gulf Coast are thought to be about US$2 per MMbtu ($2.5 a gigajoule) at present, although estimates for transport costs vary.

Qatar's exports are forecast to remain largely unchanged

Qatar is the world's largest LNG exporter. In 2016, Qatar exported 74 million tonnes of LNG. Qatar's LNG projects have the lowest short-run marginal production costs in the world, and Qatar's exports are forecast to be broadly stable over the outlook period at 74 million tonnes.

To date, Qatar's LNG exports have been largely unaffected by recent tensions with its Middle Eastern neighbours. Qatar's decision in April to lift the moratorium on new gas development at its North Field, and potentially expand its LNG production capacity, is not expected to affect its LNG exports within the two-year outlook period.

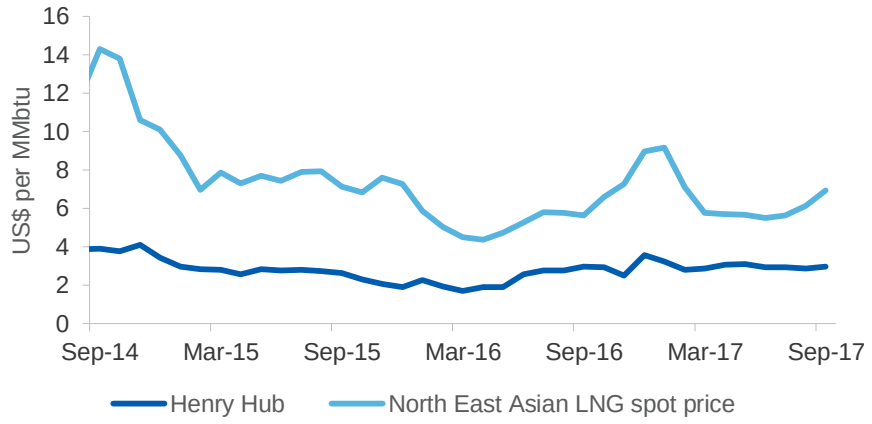
Australia

LNG export earnings to increase, driven by higher export volumes

Australia's LNG export earnings totalled $22 billion in 2016–17. The value of Australia's LNG exports is forecast to increase to $35 billion in 2018–19. Rising export values will be underpinned by higher export volumes and, to a lesser extent, higher prices.

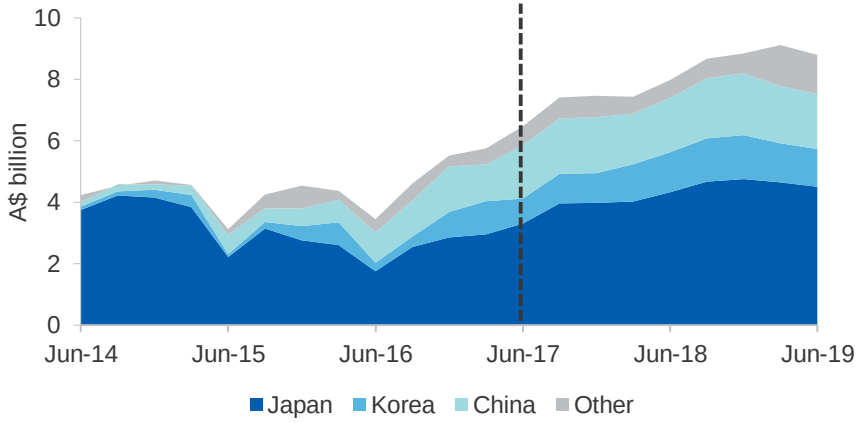
Australia's LNG export volumes are forecast to reach 74 million tonnes in 2018–19, up from an 52 million tonnes in 2016–17. Higher export volumes will be underpinned by higher production at Gorgon, as well as the completion of the three remaining LNG projects under construction — Wheatstone, Icthys and Prelude. These three projects will add around 21 million tonnes to Australia's LNG export capacity, bringing total

Figure 7.11: US Henry Hub price and Asian spot prices



Source: Argus Media (2017); Bloomberg (2017)

Figure 7.12: Quarterly value of Australian LNG exports



Source: Argus Media (2017); Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

nameplate capacity to around 88 million tonnes.

Woodside's Wheatstone project is likely to be the first of the three projects completed, with train 2 due online between March and May 2018. First LNG at Inpex's Icthys project is expected in the March quarter 2018, with some reports indicating that train 2 could commence operations a few months later. The Prelude Floating LNG project is likely to be the last of Australia's recent wave of seven LNG projects to be completed, with Shell indicating Prelude will be completed between May and August 2018.

Increased exports to Japan, South Korea and China are expected to drive the increase. While prospects for growth in the imports of Japan and South Korea are limited, Australian producers are expected to capture an increasing share of both country's imports.

The forecast for export values has been revised down

Forecast export values have been revised down by around $1.8 billion in 2017–18 and $3.3 billion in 2018–19 from the June 2017 *Resources and Energy Quarterly*. Downward revisions reflect a more subdued outlook for oil prices.

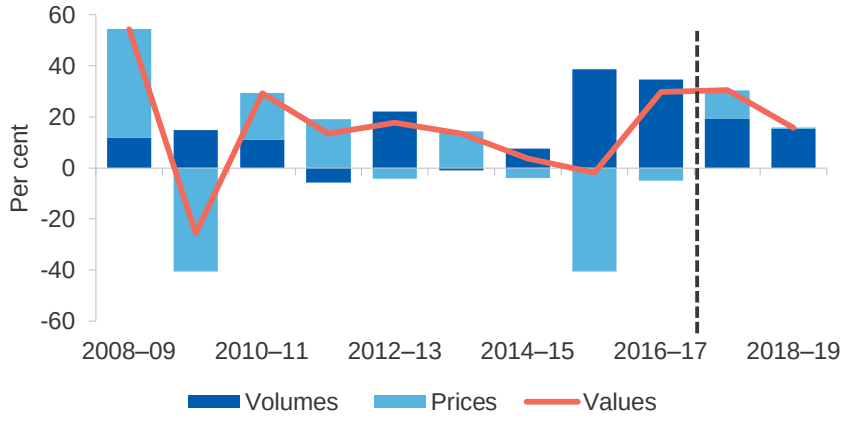
A number of uncertainties remain

Oil prices remain a key sensitivity to the outlook for LNG export earnings. If the JCC oil price forecast was reduced by US$5 a barrel, projected LNG export earnings would fall by $2.7 billion in 2018–19.

Some uncertainty also surrounds the outlook for export volumes. Competition in global LNG markets is set to intensify over the next few years, and the average capacity utilisation of Australian LNG plants is expected to edge down (as shown in Figure 7.14).

The extent of the decline will depend on the cost competitiveness of Australian LNG projects and the amount of flexibility in Australian LNG contracts. LNG contracts often include clauses which allow buyers to reduce purchases to minimum 'take-or-pay' levels. It is possible buyers may utilise these provisions if oil-linked contract prices remain higher than spot prices, or if they become over-contracted for LNG.

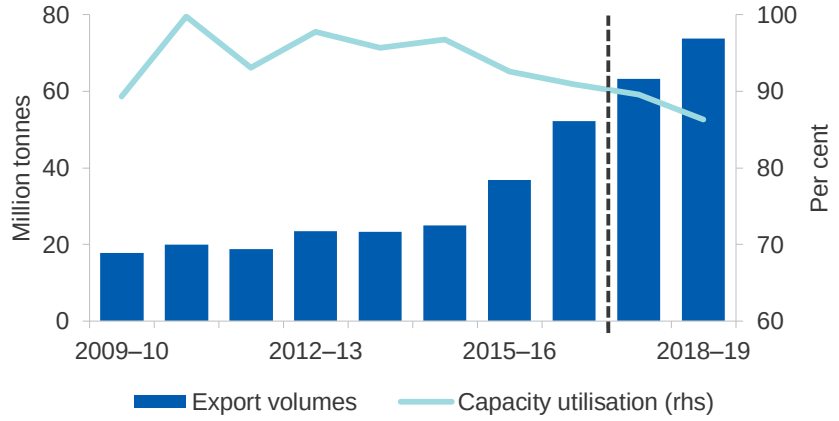
Figure 7.13: Annual growth in Australia's LNG export values, contributions from prices and export volumes



Notes: Log change is used to approximate percentage change. The approximation becomes less accurate the larger the percentage change.

Source: ABS (2017); Department of Industry, Innovation and Science (2017)

Figure 7.14: Australia's LNG exports and capacity utilisation



Source: Nexant World Gas Model (2017); Department of Industry, Innovation and Science (2017)

Table 7.1: Gas outlook

World	Unit	2016	2017 f	2018 f	2019 f	Annual percentage change 2017 f	2018 f	2019 f
JCC oil price a								
– nominal	US$/bbl	41.9	53.4	55.1	57.0	27.6	3.1	3.4
– real h	US$/bbl	42.7	53.4	53.9	54.6	25.1	1.0	1.2
Gas production t	Bcm	3,596.9	3,669.3	3,748.0	3,789.9	2.0	2.1	1.1
Gas consumption t	Bcm	3,595.7	3,670.1	3,750.9	3,794.0	2.1	2.2	1.1
LNG trade d	Mt	250.2	292.9	305.8	326.8	17.1	4.4	6.9
Australia	**Unit**	**2015–16**	**2016–17**	**2017–18 f**	**2018–19 f**	**2016–17**	**2017–18 f**	**2018–19 f**
Production b	Bcm	88.2	105.2	123.1	137.6	19.3	17.0	11.8
– Eastern market	Bcm	43.4	54.3	57.1	55.3	25.1	5.0	-3.1
– Western market	Bcm	43.8	49.6	64.1	71.9	13.0	29.3	12.2
– Northern market c	Bcm	0.9	1.3	2.0	10.4	44.3	47.2	431.1
LNG export volume d	Mt	36.9	52.2	63.3	73.8	41.6	21.3	16.6
– nominal value	A$m	16,576	22,332	30,255	35,397	34.7	35.5	17.0
– real value e	A$m	17,225	22,818	30,255	34,572	32.5	32.6	14.3
LNG export unit value g								
– nominal value	A$/GJ	8.5	8.1	9.1	9.1	-4.9	11.7	0.3
– real value e	A$/GJ	8.9	8.3	9.1	8.9	-6.5	9.3	-2.0
– nominal value	US$/MMBtu	6.6	6.5	7.4	7.4	-1.5	14.0	0.3
– real value e	US$/MMBtu	6.8	6.6	7.4	7.2	-3.1	11.6	-2.0

*Notes: **a** JCC stands for Japan Customs-cleared Crude; **b** 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; **c** 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; **d** 1 million tonnes of LNG is equivalent to approximately 1.36 billion cubic metres of gas; **e** In 2017–18 Australian dollars; **f** Forecast;**g** 1 MMBtu is equivalent to 1.055 GJ; **h** In 2017 US dollars; **s** Estimate; **t** 2016 is an estimate.*

Source: ABS (2017) International Trade in Goods and Services, Australia, Cat. No. 5368.0; Department of Industry, Innovation and Science (2017); Company reports; Nexant World Gas Model (2017)