

Gas

Resources and Energy Quarterly December 2018

LNG is natural gas cooled to **-162°C**



largest LNG exporter in the world

Australia exported **62 million tonnes** of LNG in 2017-18



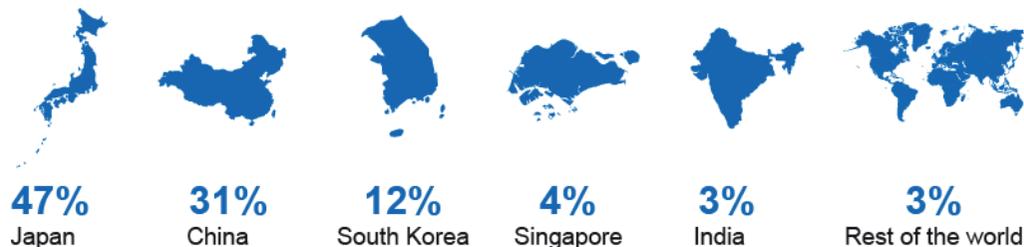
18% rise from 2016-17 export volumes



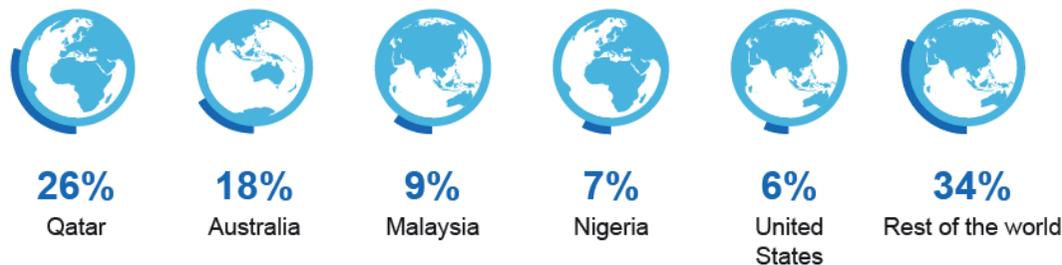
Combined nameplate capacity of Australia's 10 LNG projects is **88 million tonnes per annum**

Most Australian LNG is sold on oil-linked contracts

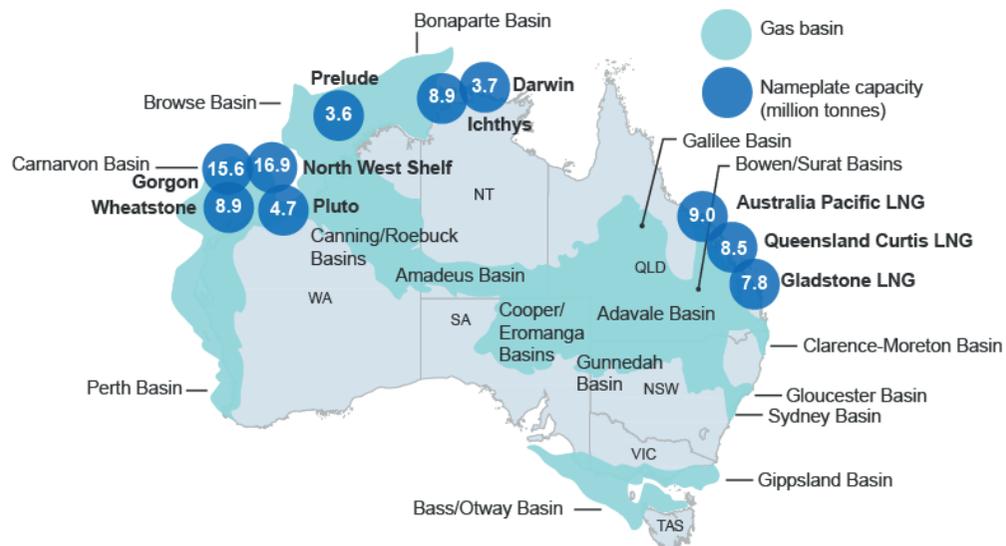
Australia's LNG export earnings by destination, 2017-18



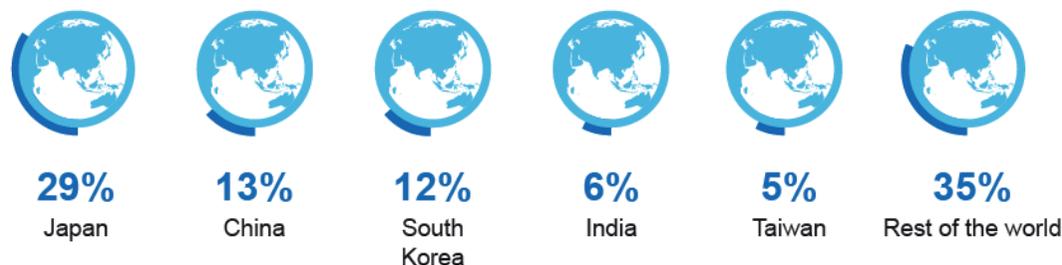
Share of world LNG exports in 2017



Australia's LNG projects and gas basins



Share of world LNG imports in 2017



7.1 Summary

- The value of Australia's LNG exports is forecast to increase from \$31 billion in 2017–18 to \$50 billion in 2018–19, driven by higher export volumes and higher prices, and remain near this level in 2019–20.
- Australia's LNG exports are forecast to increase from 62 million tonnes in 2017–18 to 78 million tonnes in 2019–20, driven by the ramp up of the final two LNG projects in Australia's recent wave of LNG investment.
- LNG contract prices — at which most Australian LNG is sold — are forecast to rise in 2018–19 before easing slightly in 2019–20.
- LNG spot prices are expected to decline, as additions to global supply capacity outstrip growth in LNG demand and as oil prices ease.

7.2 Prices

LNG contract prices in Asia are forecast to moderate

Most LNG in Asia is sold on long-term contracts, sometimes in excess of 20 years, where the price of LNG is linked to the price of oil. Oil-linked contract prices have been rising steadily since early 2016 (Figure 7.1) when oil prices reached a low of around US\$30 a barrel.

Tracking oil prices, LNG contract prices in Asia are forecast to decline modestly from current highs, but remain well above levels seen over the past few years. The Japan Customs-cleared Crude (JCC) oil price, to which LNG contract prices in Asia are often linked, is forecast to average US\$72 a barrel in 2020, down slightly on current levels of US\$76 a barrel, but up from an average of US\$54 a barrel in 2017.

LNG spot prices are also expected to decline

LNG spot prices in Asia have also been on the rise since early 2016, spiking during the previous two northern hemisphere winters and remaining elevated over the remainder of 2018 (Figure 7.1). Rising oil prices have likely contributed to higher LNG spot prices. Buyers have some flexibility in the volumes of LNG they purchase on long-term oil-linked contracts, and higher oil prices increase the relative attractiveness of spot cargoes, pushing up spot prices.

Figure 7.1: LNG spot and oil-linked contract prices in Asia, DES



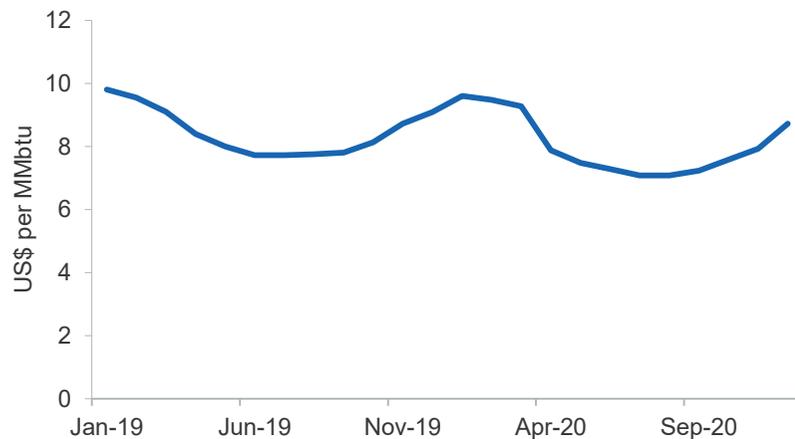
Notes: DES (Delivered Ex Ship) prices include shipping and insurance. The Argus North East Asian spot price is shown. The indicative LNG contract price in US\$ per MMBtu is given as 14 per cent of the JCC oil price in US\$ per barrel plus the cost of shipping.

Source: Argus (2018); Bloomberg (2018)

LNG spot prices in Asia are expected to decline in 2019 and 2020, as additions to global supply capacity outstrip growth in LNG demand, and as oil prices ease. The Asian LNG futures curve suggests a modest tapering in LNG spot prices over 2019 and 2020 (Figure 7.2). The futures curve also suggests that seasonality in LNG spot prices will continue. In Asia, gas storage — which moderates the impact of seasonal demand spikes on prices — is limited.

The Asian LNG futures curve points to relatively stable LNG spot prices over this northern hemisphere winter. The 2017–18 winter price spike was due to a rapid increase in Chinese LNG imports, driven by surging gas demand and an unexpected shortfall in China's pipeline gas imports from Central Asia. China has subsequently put in place measures to meet winter gas demand, such as boosting gas storage, and may not experience the same shortfall in pipeline gas imports from Central Asia this year. A more mild winter than last is also anticipated in North East Asia, which should help to ease demand pressures.

Figure 7.2: Asian LNG futures price, monthly, DES



Notes: The New York Mercantile Exchange Platts Japan/Korea Marker futures curve.
Source: Bloomberg (2018)

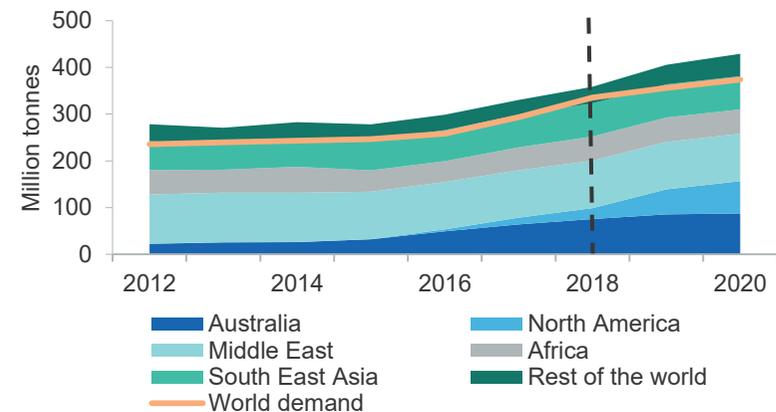
7.3 World trade

After a period of relatively low growth between 2011 and 2015, world LNG trade has expanded rapidly in the past few years. Strong growth is expected to continue: imports are projected to rise from 290 million tonnes in 2017 to around 367 million tonnes in 2020. Europe and emerging Asia — led by China — are expected to drive demand growth.

Nevertheless, the expansion in global LNG supply capacity is expected to outpace growth in LNG demand over the next few years (Figure 7.3). From early next decade, the LNG market is expected to begin rebalancing, as demand growth absorbs the available capacity.

LNG markets have been expected to enter a period of overcapacity for some time, but stronger than expected demand growth coupled with delays in project completions have delayed its arrival and reduced its anticipated severity (see Box 7.1 in the September 2018 *Resources and Energy Quarterly*).

Figure 7.3: Global supply capacity by country and world LNG demand



Notes: Nameplate capacity (the maximum annual production capacity of an LNG plant).
Source: Department of Industry, Innovation and Science (2018); Nexant (2018)

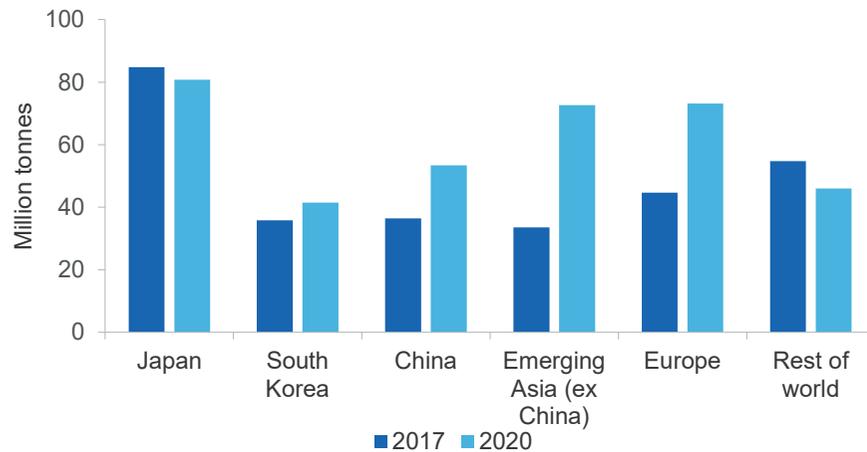
7.4 World imports

Nuclear restarts to reduce Japan's LNG imports

Japan sources almost all its gas using LNG imports, and has been the world's leading buyer of LNG since the 1970s. Japan's LNG imports are projected to fall from 85 million tonnes in 2017 to 81 million tonnes in 2020 (Figure 7.4), with the restart of several nuclear reactors over the past year reducing gas demand, and further restarts possible. Japan's LNG imports declined by 0.6 per cent in the first nine months of 2018, compared with the same period last year.

At the time of writing, nine of Japan's fleet of 42 nuclear reactors had gained approval to restart. Eight of these reactors were in operation, with Takahama No. 3 offline for regular maintenance. Japan's Institute of Energy Economics expects two more reactors to restart by March 2020, but there could be as many as five. Eighteen reactors have applications for restart with the Nuclear Regulation Authority — the administrative body charged with ensuring the safety of nuclear plants. However, nuclear energy in Japan continues to face public opposition and legal challenges. There remain significant risks of delays and slippages in nuclear restarts.

Figure 7.4: LNG import forecasts



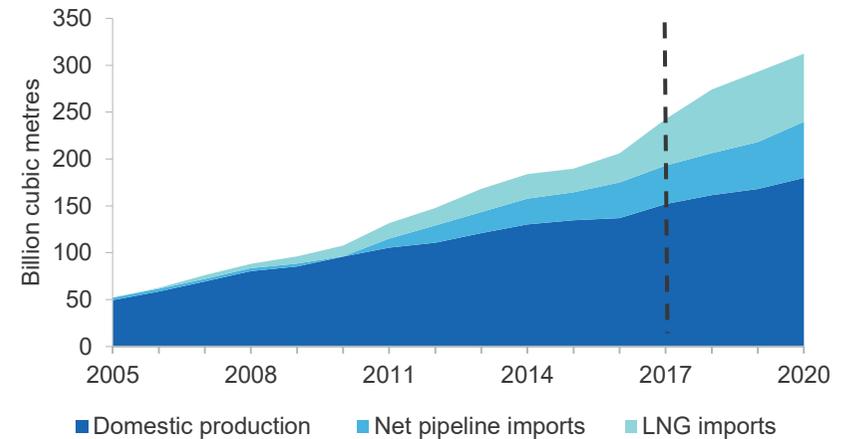
Source: Department of Industry, Innovation and Science (2018); Nexant (2018)

China to be the largest contributor to growth in LNG demand

China edged past South Korea to become the second largest LNG buyer in the world in 2017, with its imports reaching over 36 million tonnes (50 billion cubic metres). Gas consumption rose strongly, with China putting in place policies to address air pollution by encouraging gas use in place of coal. Strong growth continued into 2018, with LNG imports up 46 per cent year-on-year in the first nine months of 2018 at 37 million tonnes.

The Chinese government is aiming to raise the share of gas in the energy mix from 7 per cent in 2017 to a target range of 8.3–10 per cent in 2020. LNG is likely to play a major role in servicing rising Chinese gas demand. By 2020, China’s LNG imports are forecast to reach 53 million tonnes (73 billion cubic metres). Where in the Government’s 2020 target range China’s gas consumption reaches could have a major impact on LNG markets. China’s target of lifting the share of gas in the energy mix implies gas consumption of 305–365 billion cubic metres. This difference of fifty billion cubic metres of gas is equivalent to around 37 million tonnes of LNG — as much LNG as China imported during 2017.

Figure 7.5: China’s gas consumption by source



Source: Bloomberg (2018)

Other factors affecting China’s LNG demand over the outlook period will be the extent of competition from domestic gas production and pipeline gas imports. China is expected to begin importing Russian gas via the Power of Siberia pipeline from late 2019. Imports are expected to be about 5 billion cubic metres in the first year of operation, reaching 38 billion cubic metres in the sixth year. China is reportedly targeting natural gas production of 200 billion cubic metres in 2020, up from around 150 billion cubic metres in 2017. But China faces challenges in lifting domestic output and is expected to fall short of this target: it has difficult geology and gas resources are located in densely populated or heavily cultivated areas.

Modest growth projected for South Korea’s imports

South Korea was the world’s third largest LNG buyer last year, and its imports were up 22 per cent year-on-year in the first nine months of 2018. South Korea’s imports are forecast to increase from just under 36 million tonnes in 2017 to 41 million tonnes in 2020. South Korea’s long-term plan is to increase the share of gas in the energy mix from 15 per cent in 2016 to around 19 per cent by 2030. From 1 April 2019, South Korea will lower taxes on LNG imports and again raise taxes on thermal coal imports.

Other emerging Asian economies and Europe to also drive demand

Other economies in emerging Asia are expected to make a large contribution to growth in global LNG imports during the outlook period, including India, Pakistan, Bangladesh, Indonesia, Thailand and Singapore. In India, LNG imports are forecast to increase from 18 million tonnes in 2017 to 33 million tonnes in 2020, with India's domestic gas production not expected to keep pace with growing demand. There are several LNG import terminals under construction on India's east coast and the Government is aiming to lift gas' share of the energy mix to 15 per cent by 2030 from 5 per cent at present.

Europe is another major driver of increasing LNG demand, despite relatively flat growth in gas consumption. LNG imports are being driven by long-term declines in indigenous gas production, particularly in the United Kingdom and the Netherlands. However, LNG imports will also need to compete with pipeline gas supply from Russia. A key uncertainty is the fate of the controversial Nord Stream II gas pipeline. The pipeline, which connects Russian gas fields to the EU pipeline network at Germany's Baltic coast, is scheduled to be completed in 2019 but is opposed by the United States and has divided political opinion in Europe.

7.5 World exports

A major expansion of world LNG supply capacity is underway

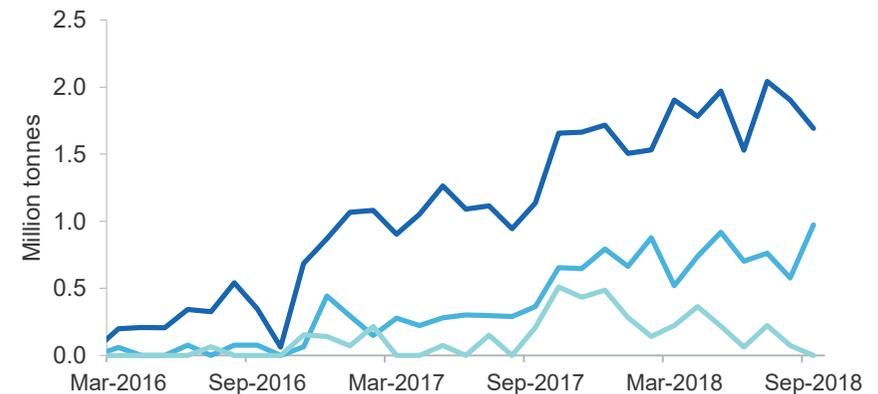
The next few years are expected to see a major expansion in global LNG supply capacity, driven primarily by the US, though some ramp-up is also expected in Australia and Russia.

Around two-thirds of the increase in supply capacity between 2018 and 2020 will come from the United States. The nameplate capacity of US LNG projects is on track to triple to around 70 million tonnes, with all six plants expected to be operational by the end of 2019. This expansion in LNG infrastructure is expected to make the US the third largest LNG exporter in the world, behind Australia (where nameplate capacity will soon reach 88 million tonnes) and Qatar (where nameplate capacity is expected to remain at 77 million tonnes for the next few years).

LNG trade has recently been caught up in trade tensions between China and the US. On 24 September, China imposed a 10 per cent tariff on imports of LNG from the US as part of its response to tariffs on US\$200 billion of imports of Chinese goods announced by the US Administration. In the 12 months to September 2018, the US exported 3 million tonnes of LNG to China (Figure 8.6) — equivalent to 6 per cent of China's LNG imports, and around 14 per cent of US LNG exports.

Data is not yet available for the period following the implementation of the tariffs, but early signs are that they have encouraged a reorganisation of trade flows, with China looking to bring in more LNG from other sources, and US LNG exports being directed to other markets. Cheniere Energy, the largest LNG exporter in the United States, has reportedly swapped cargoes that were to be sold to PetroChina with non-US origin volumes.

Figure 7.6: US LNG exports, monthly

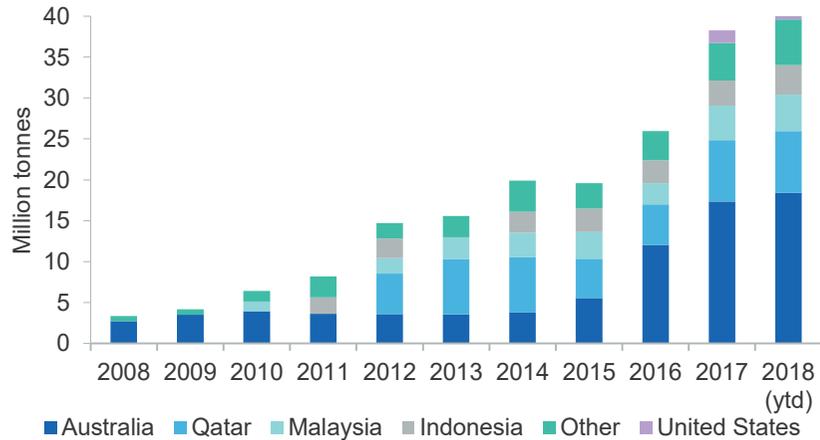


Source: EIA (2018)

The way in which trade flows reorganise will become clearer as data is made available for LNG trade over the northern hemisphere winter. US LNG exports to China (and Asia more broadly) were likely low in the September quarter due to seasonal rather than just geopolitical factors (Figure 7.6). However, over the northern hemisphere winter, US LNG exports to China would normally be expected to increase and act as a flexible source of supply to meet peak demand.

A longer-term risk is that escalating trade tensions discourage or delay final investment decisions (FIDs) for a second wave of US LNG projects. A long-term supply deal between US exporter Cheniere Energy and China National Petroleum (for 1.2 million tonnes of LNG per year) supported an FID in May 2018 for a third 4.5 million tonne train at Cheniere’s Corpus Christi LNG project.

Figure 7.7: China’s LNG imports



Notes: Data for 2018 is for January to October 2018.

Source: Bloomberg (2018)

Russia’s LNG exports are expected to increase over the next few years, as the country’s second LNG project, Yamal LNG, ramps up production. The commencement of operations at the third 5.5 million tonne train at Yamal will bring the nameplate capacity of Russian LNG facilities to 27 million tonnes. As average temperatures increase in the Arctic, the northern sea route appears to be emerging as a transport corridor between Russia and Asia. The Yamal project shipped a cargo of LNG to China via the northern sea route in November — reportedly the first ever shipment at this time of year, when the winter conditions normally inhibit transit. New capacity additions are also expected in Australia (discussed below).

Qatar’s LNG exports are projected to remain largely unchanged

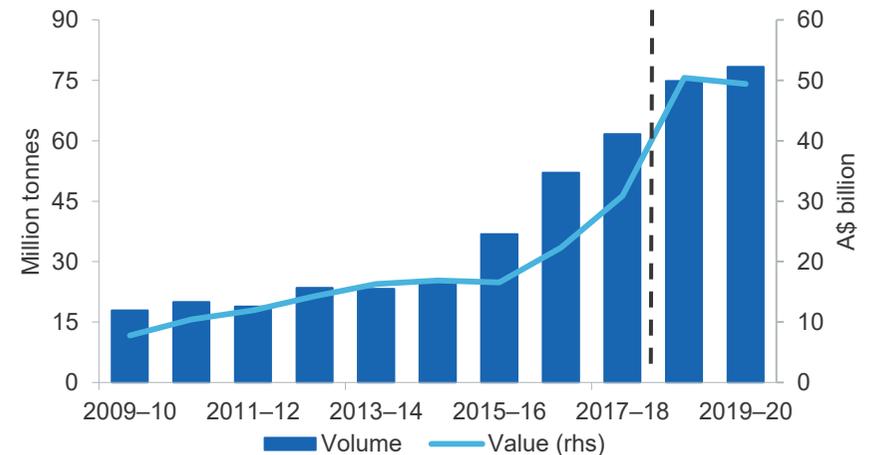
Qatar exported 75 million tonnes of LNG in 2017, making it the world’s largest exporter of the liquefied fuel. Since 2011, Qatar’s exports have ranged from 72–77 million tonnes a year, and they are expected to remain in this range over the outlook period. Qatar’s plans to increase LNG production capacity by 43 per cent to 110 million tonnes is not expected to flow through to increases in its exports until 2024.

7.6 Australia

Higher prices and export volumes to boost LNG export earnings

Australia’s LNG export earnings are forecast to increase from \$31 billion in 2017–18 to \$50 billion in 2018–19, and then remain near this level in 2019–20. The lagged effect of the recent spike in oil prices is expected to flow through to higher prices for Australian LNG in 2018–19, before prices ease in 2019–20. Increasing export volumes are expected to drive Australia’s LNG export earnings higher over the next two years. Australia’s LNG exports are forecast to reach 78 million tonnes in 2019–20, up from 62 million tonnes in 2017–18 (Figure 7.8).

Figure 7.8: Australia’s LNG export earnings and volumes

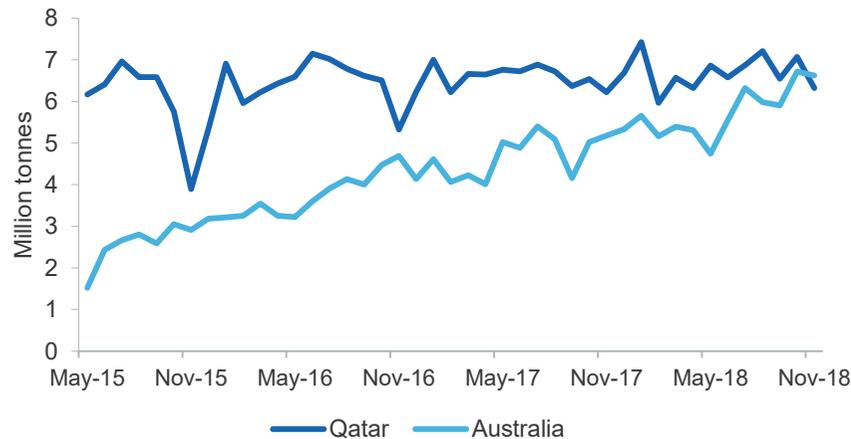


Source: ABS (2018); Department of Industry, Innovation and Science (2018)

Higher export volumes will be driven by the Wheatstone, Ichthys and Prelude LNG projects. Production at Wheatstone will be substantially higher in 2018–19 than in 2017–18, with the project having ramped up to near full capacity last quarter. Ichthys shipped its first LNG cargo in October, and train 2 is expected online in 2019. Shell has indicated that the Prelude project will begin LNG production before the end of 2018, although this had not occurred at the time of writing.

On current projections, Australia will edge past Qatar as the world’s largest LNG exporter (on an annual basis) in 2019 when exports reach 77 million tonnes, and extend its lead slightly further in 2020. Monthly shipping data suggests that Australia exported slightly more LNG than Qatar for the first time in November this year (Figure 7.9). However, given the narrow difference between the projected exports of the two nations, Australia overtaking Qatar is not a certainty.

Figure 7.9: Qatar and Australia’s monthly LNG exports



Source: Bloomberg (2018)

Australia is only expected to be the largest LNG exporter in world for a few years. By the mid-2020s, Australia seems likely to be overtaken by both Qatar, which has plans to lift export capacity to 110 million tonnes, and the

United States, where low-cost shale gas production could underpin the development of new LNG export projects.

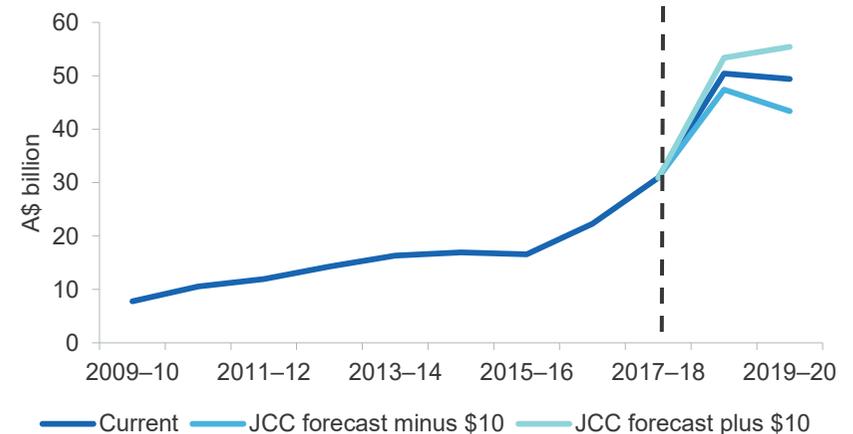
LNG export earnings have been revised up

Forecast LNG export earnings have been revised up by \$2.0 billion in 2018–19 and \$1.6 billion in 2019–20 since the September *Resources and Energy Quarterly*. The upwards revision reflects a weaker outlook for the Australian dollar and minor changes to production forecasts for a number of LNG projects.

Oil prices remain a key sensitivity

Oil prices have been volatile over the past few months, climbing over US\$80 a barrel before falling to under US\$60 a barrel. Future oil prices are a key sensitivity for LNG export earnings (Figure 7.10). The JCC is expected to be in the low US\$70 a barrel range over the outlook period. If the JCC oil price forecast was reduced by US\$10 a barrel, projected LNG export earnings would be \$3 billion lower in 2018–19 at \$47 billion and \$6 billion lower at \$43 billion in 2019–20.

Figure 7.10: LNG export earnings and the oil price sensitivity



Notes: JCC stands for Japan Customs-cleared Crude.

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

Box 7.1: The long-term outlook for natural gas

Natural gas is the fastest growing fossil fuel in all three of the International Energy Agency's (IEA) scenarios for the future of world energy. Under all three scenarios, gas comes to account for a greater share of the energy mix than coal. In the Sustainable Development Scenario — where energy demand is constrained and coal and oil consumption falls — gas consumption grows modestly, and gas becomes the dominant fuel in the global energy mix.

Under all three scenarios, gas demand is driven by emerging Asia. In the Sustainable Development Scenario — which sees the target of the Paris Agreement achieved — gas consumption in the Asia-Pacific is largely the same as in the New Policies Scenario (Figure 7.11). This suggests gas could act as a transition fuel in the Asia-Pacific, substituting for coal in power generation and making headway in other sectors. However, gas demand falls in other regions in the Sustainable Development Scenario, such as North America and Europe.

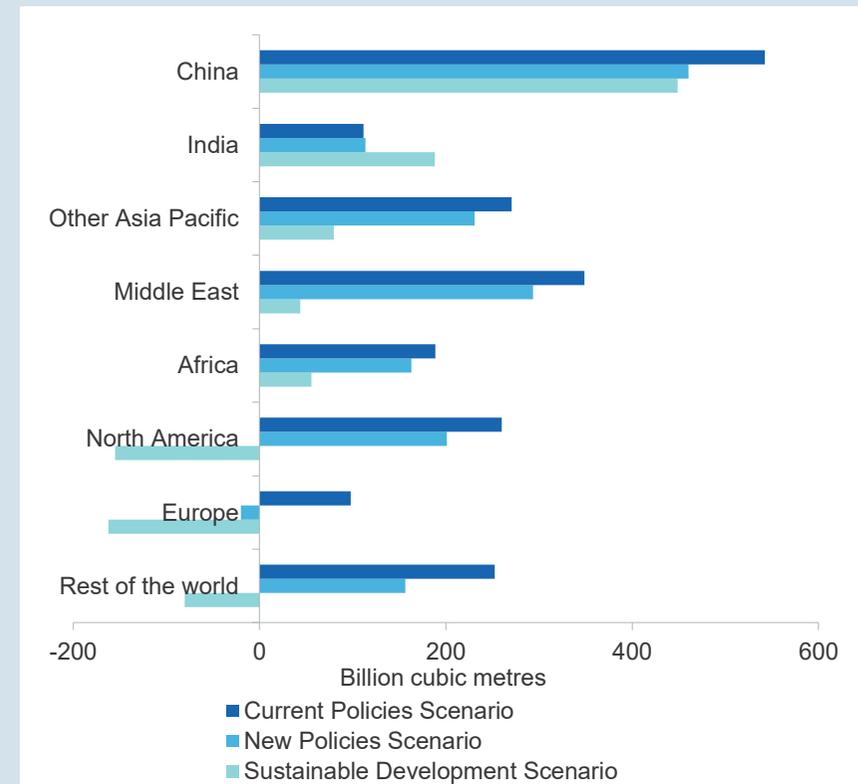
In the New Policies Scenario, China's gas consumption triples over the next two decades. Gas shifts from 7 per cent of China's energy mix in 2017 to 14 per cent in 2040. China's LNG imports more than quadruple from 36 million tonnes in 2017 to 151 million tonnes in 2040. By the mid-2020s, China has overtaken Japan as the world's largest LNG importer. India's gas demand also triples in this scenario, albeit off a low base. Gas' share of the energy mix rises from 5 per cent to 8 per cent by 2040, but falls short of the Government's target of 15 per cent. LNG imports increase from 18 million tonnes in 2017 to 63 million tonnes in 2040.

New LNG supply will come from the ramp up of existing projects in the US, and from Qatar's plans to expand its export capacity (see 'World exports' in this Chapter). Australia's LNG exports increase from 57 million tonnes in 2017 to 107 million tonnes in 2040 under the New Policies Scenario. East Africa looks set to commence new export projects, and Argentina may be drawn into the LNG market as it develops its unconventional gas resources.

The delivery of Russia's Yamal project on time and on budget encourages the development of gas resources in the Arctic.

However, challenges to the outlook for gas remain. Gas needs to deliver reliability and affordability while meeting economic and environmental objectives if policymakers are to commit to the infrastructure needed for the fuel. Signs of supply insecurity or price volatility could push gas to the margin and see Asia pursue coal and renewables instead.

Figure 7.11: Change in gas demand by IEA scenario, 2017 to 2040



Notes: The CPS considers the impact of policies and measures that are firmly enshrined in legislation as of mid-2018. The NPS incorporates current policies and also the likely effects of announced policies, including official targets. The SDS entails a pathway consistent with the goals of universal access to modern energy by 2030; emissions reduction in line with the Paris Agreement; and improving air quality.

Source: IEA (2018)

Table 7.1: Gas outlook

	Unit	2017	2018 ^f	2019 ^f	2020 ^f	Annual percentage change		
						2018 ^f	2019 ^f	2020 ^f
World								
JCC oil price ^a								
– nominal	US\$/bbl	54.1	71.8	73.0	71.5	32.8	1.7	–2.1
– real ^h	US\$/bbl	55.4	71.8	71.4	69.1	29.6	–0.5	–3.2
Gas production	Bcm	3,726.5	3,847.9	3,885.3	3,948.6	3.3	1.0	1.6
Gas consumption	Bcm	3,739.8	3,834.5	3,889.2	3,942.2	2.5	1.4	1.4
LNG trade	Mt ^d	289.9	329.1	349.6	367.4	13.5	6.2	5.1
	Unit	2016–17	2017–18	2018–19 ^f	2019–20 ^f	2017–18 ^f	2018–19 ^f	2019–20 ^f
Australia								
Production ^b	Bcm	105.3	120.3	137.5	142.3	14.2	14.3	3.5
– Eastern market	Bcm	54.3	55.0	55.0	53.1	1.3	0.0	–3.4
– Western market	Bcm	49.6	63.8	76.6	77.0	28.7	19.9	0.6
– Northern market ^c	Bcm	1.3	1.4	5.9	12.1	5.5	319.5	105.1
LNG export volume ^d	Mt	52.1	61.7	74.9	78.3	18.4	21.4	4.6
– nominal value	A\$m	22,308	30,907	50,411	49,403	38.5	63.1	–2.0
– real value ^e	A\$m	23,261	31,617	50,411	48,233	35.9	59.4	–4.3
LNG export unit value ^g								
– nominal value	A\$/GJ	8.1	9.5	12.7	11.9	17.1	34.4	–6.3
– real value ^e	A\$/GJ	8.5	9.7	12.7	11.7	14.8	31.3	–8.5
– nominal value	US\$/MMBtu	6.5	7.8	9.8	9.6	20.3	26.2	–2.2
– real value ^e	US\$/MMBtu	6.7	7.9	9.8	9.4	18.0	23.3	–4.5

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 2018–19 Australian dollars; **f** Forecast; **g** 1 MMBtu is equivalent to 1.055 GJ; **h** In 2018 US dollars; **s** Estimate.

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