Gas

Resources and Energy Quarterly September 2019

LNG is natural gas cooled to

–162°C

Australia exported

75 million tonnes

of LNG in 2018–19

21%

rise from 2017–18 export volumes

2nd

largest LNG exporter in the world in 2018

Combined nameplate capacity of Australia's 10 LNG projects is

88 million tonnes per annum

Most Australian LNG is sold at oil-linked contract prices

Australia's LNG export earnings by destination, 2018–19

47%	31%	12%	4%	3%	4%
Japan	China	South Korea	Singapore	India	Rest of the world

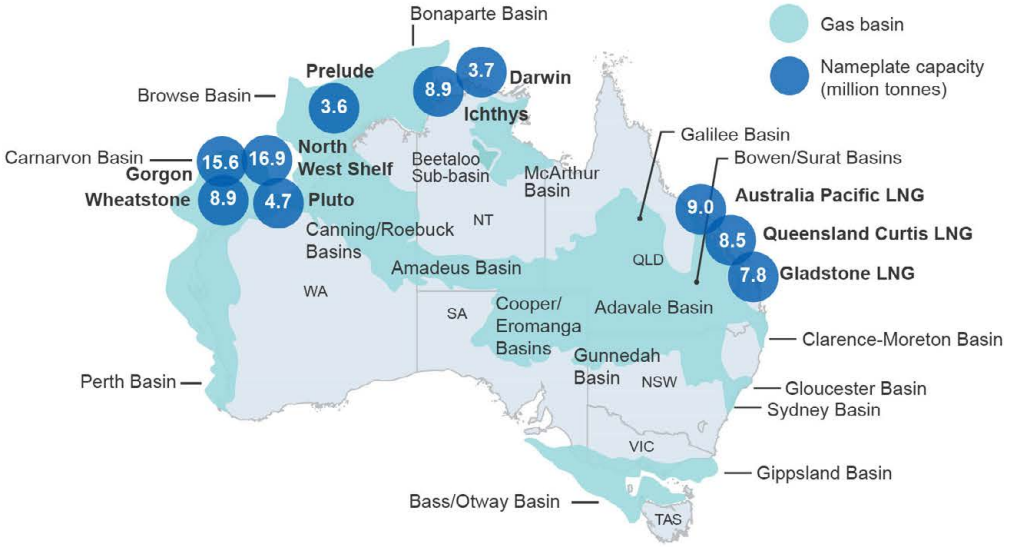
Share of world LNG exports in 2018

25%	21%	7%	7%	6%	34%
Qatar	Australia	Malaysia	United States	Nigeria	Rest of the world

Share of world LNG imports in 2018

26%	16%	13%	7%	5%	32%
Japan	China	South Korea	India	Taiwan	Rest of the world

Australia's LNG projects and gas basins



7.1 Summary

- Australia exported $50 billion of LNG in 2018–19. Export earnings are forecast to lift to $52 billion in 2019–20, driven by growing export volumes, before falling back to $49 billion, as prices ease.
- Australia's LNG export volumes are forecast to increase from 75 million tonnes in 2018–19 to 81 million tonnes in 2020–21, as the last two projects in Australia's recent wave of LNG investment ramp up output.
- Australian LNG export prices are forecast to decline slightly in 2019–20 and 2020–21, due to an appreciating exchange rate and easing oil-linked contract prices (at which most Australian LNG is sold).

LNG prices in Asia continue to diverge

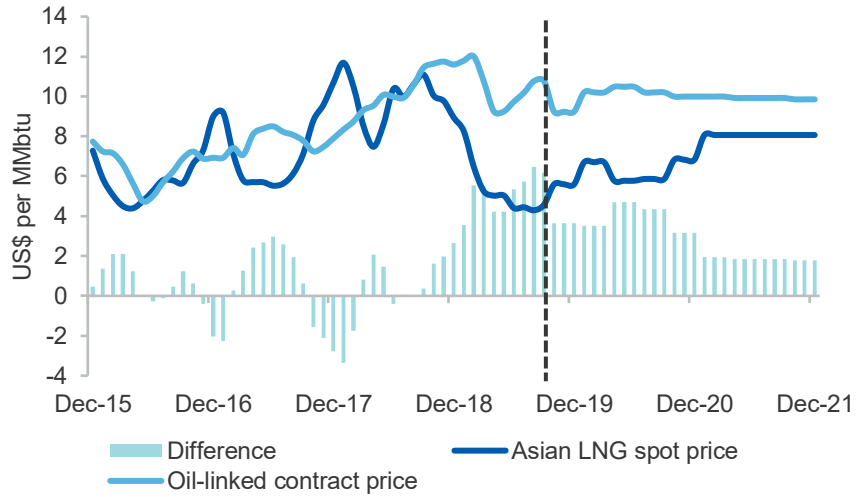
Gas pricing arrangements vary from region to region. In Asia, 70 per cent of LNG traded in 2018 was sold on long-term contracts, where the price of LNG is linked to the price of oil by a time lag of several months. The majority of the remaining 30 per cent was sold on the spot market (at least 70 per cent and probably far more) or by short-term contract.

LNG spot prices in Asia have continued to diverge from long-term oil-linked contract prices over the past few months, as shown in Figure 7.1. In August, LNG spot prices were at their lowest level on record, averaging US$4.30 per million British thermal units (MMbtu), or A$6.00 a gigajoule, while an indicative oil-linked contract price was around US$10.80/MMbtu (A$15.10/GJ).

The fall in spot prices has been driven by a combination of growing supply capacity and weak demand from major consumers in Asia. On the supply side, the ramp up of new capacity in the US, Australia and Russia has added to downward pressure on prices. Meanwhile, growth in China's LNG purchases has slowed, and the imports of Japan and South Korea — the world's largest and third largest LNG buyers respectively — have declined. The weak demand response to low LNG spot prices is partly because large North East Asian customers purchase the bulk of their LNG on long-term contracts, where prices are set by oil prices (commonly the Japan Customs-cleared crude price, also known as the JCC).

In contrast to LNG spot prices, long-term oil-linked contract prices have increased in recent months. While there is no single oil-linked contract price in Asia — but rather a patchwork of different contractual pricing arrangements agreed at different points in time — indicative figures suggest that the differential between spot and long-term contract prices is at its widest level on record (Figure 7.1).

Figure 7.1: LNG prices, monthly



Notes: The Argus Northeast Asian spot price is shown. LNG prices are DES (Delivered Ex Ship). DES prices include shipping and insurance. The long-term oil-linked contract price is indicative only, and is estimated at 14 per cent of the 3-month lagged Japan Customs-cleared crude oil price plus shipping.

Source: Argus (2019); Bloomberg (2019)

A key question is what the implications of this decoupling between long-term contract and spot prices might be, especially if decoupling endures for a sustained period. Buyers are reportedly reducing purchases on long-term contracts as their contractual flexibility permits (exercising so-called 'downward tolerance'), and increasing purchases of spot cargoes.

Buyers are also pushing to have contract prices lowered during the price reviews that are built into long-term supply agreements. Japanese utility Osaka Gas is in arbitration with Exxon Mobil's PNG LNG project after the

parties failed to settle on a price during price review negotiations. In the longer term, low spot prices relative to oil-linked prices may encourage buyers to push for shorter, more flexible contracts and gas-based pricing (as opposed to oil-linked pricing). Figure 7.2 shows how spot and short-term LNG trade has grown since the early 2000s.

Figure 7.2: Global LNG trade

Source: GIIGNL (2019)

The differential between LNG spot and long-term prices to narrow

LNG spot prices, which are driven by supply-demand fundamentals (as opposed to oil-linked contract prices), are expected to recover from their current record low levels over the period to 2021. In 2019 and 2020, the recovery is expected to be modest, as additions to world supply capacity either outpace or keep pace with demand growth (Figure 7.3). LNG spot prices are forecast to average US$5.40/MMbtu (A$7.30/GJ) in 2019 and US$6.30/MMbtu (A$8.30/GJ) in 2020.

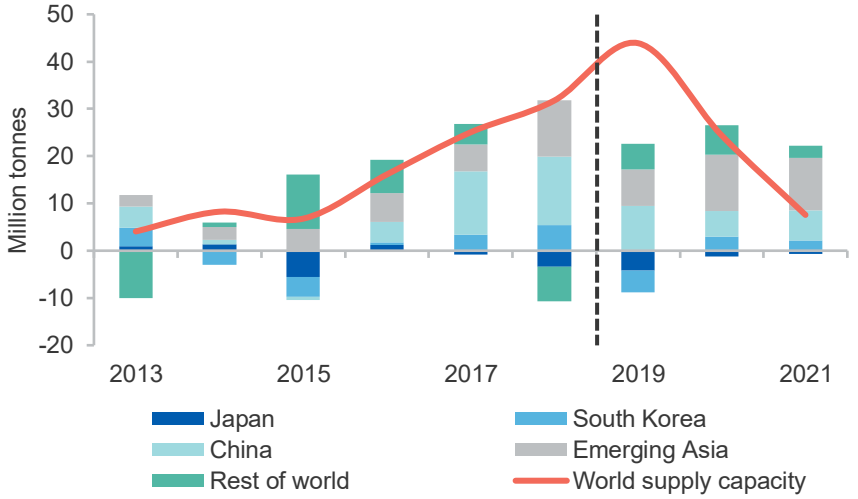
In 2021, the pace of the recovery is expected to accelerate. LNG spot prices are forecast to recover to US$8.10/MMbtu (A$10.30/GJ). Supply growth looks likely to slow dramatically in the early 2020s, as the ramp up of new capacity in the US, Australia and Russia draws to a close. Demand is consequently expected to begin closing the gap on global production capacity in 2021.

Meanwhile, LNG contract prices in Asia are forecast to gradually decline over the outlook period to 2021, tracking the fall in oil prices (see chapter 8 *Oil*) with a lag. In short, the differential between oil-linked contract prices and LNG spot prices is expected to narrow over the outlook period.

7.2 World trade

LNG trade has grown rapidly over the past few years, driven by surging demand in Asia and the ramp up of new projects commissioned between 2009 and 2015. In 2018, LNG trade totalled 309 million tonnes, up 7 per cent from 288 million tonnes in 2017. In 2019 and 2020, the continued expansion in global LNG supply capacity is expected to either outpace or keep pace with growth in LNG demand, before capacity growth slows dramatically in 2021. From 2021, the LNG market is expected to begin rebalancing, as demand growth absorbs the available capacity (Figure 7.3).

Figure 7.3: Annual change in LNG demand and world supply capacity



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

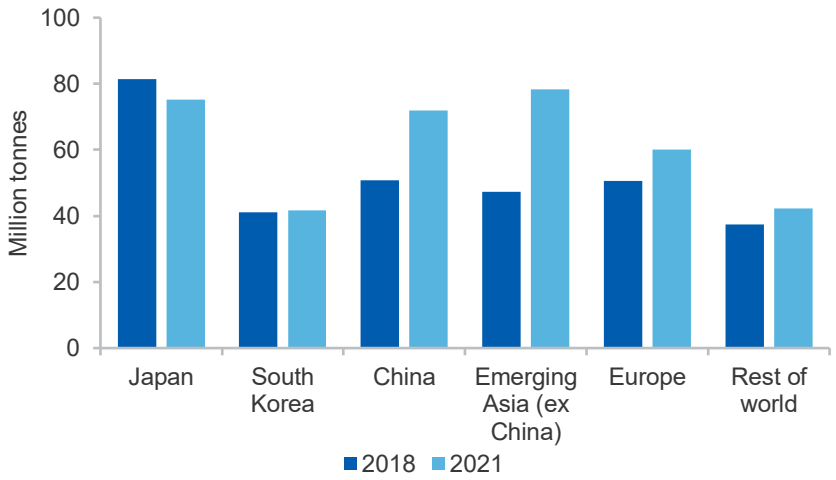
7.3 World imports

Nuclear restarts to reduce Japan's LNG imports

Japan is the world's leading LNG buyer, importing 81 million tonnes of LNG in 2018. However, Japan's LNG imports fell by 9 per cent year-on-year in the first eight months of 2019, due to a relatively mild winter at the start of the year and increased nuclear power generation.

Japan's LNG imports are forecast to fall by 6 million tonnes over the outlook period to 75 million tonnes in 2021 (Figure 7.4). Overall energy demand in Japan is expected to decline slightly. At the same time, LNG is expected to face increasing competition in the electricity generation sector from both nuclear and renewable power generation. At the time of writing, nine of Japan's 42 nuclear reactors had gained approval to restart and seven were in operation. Further nuclear restarts appear likely over the next five years. Eighteen reactors have applications to restart with the Nuclear Regulation Authority, and at least three reactors are likely to restart before the end 2021.

Figure 7.4: LNG import forecasts



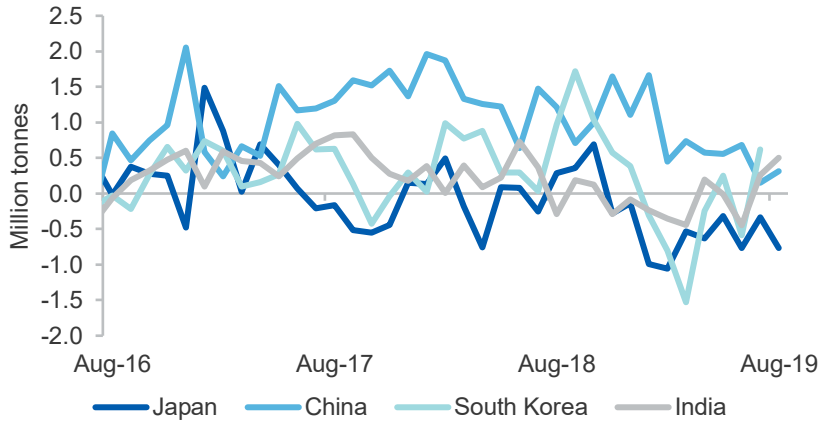
Source: Department of Industry, Innovation and Science (2019); Nexant (2019)

However, several possible eventualities are complicating the outlook for nuclear energy in Japan, and could see Japan import more LNG than what is forecast. In April, Japan's Nuclear Regulation Authority stated that it would order the shutdown of any nuclear reactors that have not met deadlines to implement counterterrorism measures. A number of reactors are at risk of missing these deadlines over the outlook period (to 2021). In addition, ongoing public opposition to nuclear energy in Japan could delay the restart of more nuclear power reactors.

China to shape future developments in global LNG markets

China was the second largest LNG buyer in the world in 2018, importing 51 million tonnes of LNG (69 billion cubic metres). China's LNG imports continued to increase rapidly in the first eight months of 2019, up 15 per cent on the same period a year earlier. However, import growth has slowed considerably in recent months, as shown in Figure 7.5.

Figure 7.5: Year-on-year change in LNG imports



Source: Bloomberg (2019); Argus (2019)

Strong growth in China's gas consumption is expected to continue over the outlook period, driven by China's efforts to reduce air pollution and 'turn China's skies blue again'. China is aiming to raise the share of gas in the overall energy mix from 7.0 percent in 2017 to a target range of 8.3–10

per cent in 2020, and to 15 per cent in 2030. In 2021, China's gas consumption is forecast to reach 364 billion cubic metres, up from around 280 billion cubic metres in 2018.

LNG is expected to play a major role in servicing rising Chinese gas demand: China's LNG imports are forecast to reach 72 million tonnes (98 billion cubic metres) in 2021. While both domestic production and pipeline imports are forecast to grow, they are not expected to keep pace with rising domestic demand.

China is targeting domestic gas production of 207 billion cubic metres in 2020, up 30 per cent from around 160 billion cubic metres in 2018. However, China faces difficulties in lifting domestic output, including challenging geology, and could fall short of its 2020 production target.

China's pipeline gas imports are also expected to increase over the next few years. Both the Central Asia–China Gas Pipeline expansion and the Power of Siberia pipeline from Russia to northern-eastern China are scheduled for completion in late 2019. The impact of China's decision to increase tariffs on US LNG from 10 per cent to 25 per cent from 1 June 2019 is discussed in Section 7.5.

South Korea's imports increased rapidly last year

South Korea was the world's third largest buyer of LNG in 2018, with LNG imports reaching an all-time high of 41 million tonnes. The rise was due to a sharp fall in nuclear power generation, with reactors offline for both regular maintenance and unexpected downtime. South Korea's LNG imports fell by 10 per cent in the first seven months of 2019, with demand constrained by a mild winter earlier in the year and the return of nuclear generation capacity to operation. The return of nuclear generation capacity is expected to drive a short-term fall in South Korea's imports to 37 million tonnes in 2019.

After 2019, LNG imports are expected to increase again, reaching 42 million tonnes in 2021. South Korea's long-term plan is to shift its energy mix towards renewables and gas, and away from nuclear and coal. Against this backdrop, South Korea lowered taxes on LNG imports and raised taxes on thermal coal imports on 1 April 2019, and plans to close several more aging coal-fired power stations before 2022.

LNG demand to increase amongst other emerging Asian economies

Several other emerging Asian economies are expected to contribute to rising LNG demand over the outlook period. India's LNG imports are forecast to increase from 21 million tonnes in 2018 to 28 million tonnes in 2021. India is aiming to lift gas' share of the energy mix from the current 5 per cent to 15 per cent by 2030. While India's domestic gas production is forecast to grow, it is not expected to keep pace with demand. India has considerable gas resources, but the commercial potential of these resources is uncertain.

There is also significant scope for increased LNG demand in other emerging Asian economies, such as Pakistan, Bangladesh, Indonesia, Malaysia and Thailand. Pakistan is already a significant LNG buyer, with imports reaching 10 million tonnes in 2018, after the country experienced a domestic gas shortage. While individually these countries are relatively small importers of LNG, collectively they are expected make a substantial contribution to rising global LNG demand.

Europe expected to increase LNG imports

Europe has absorbed much of the increase in LNG production over 2019. For producers, Europe acts as the 'destination of last resort' in LNG markets, given it has plentiful gas storage capacity. Europe's LNG imports are forecast to climb from 51 million tonnes in 2018 to 60 million tonnes in 2021. While European gas consumption is expected to remain relatively flat, rising LNG imports are expected to be driven by declining gas production. Gas production in Europe has been declining since 2000, mainly due to resource depletion in the North Sea and efforts to reduce seismic activity at the Groningen gas field in the Netherlands.

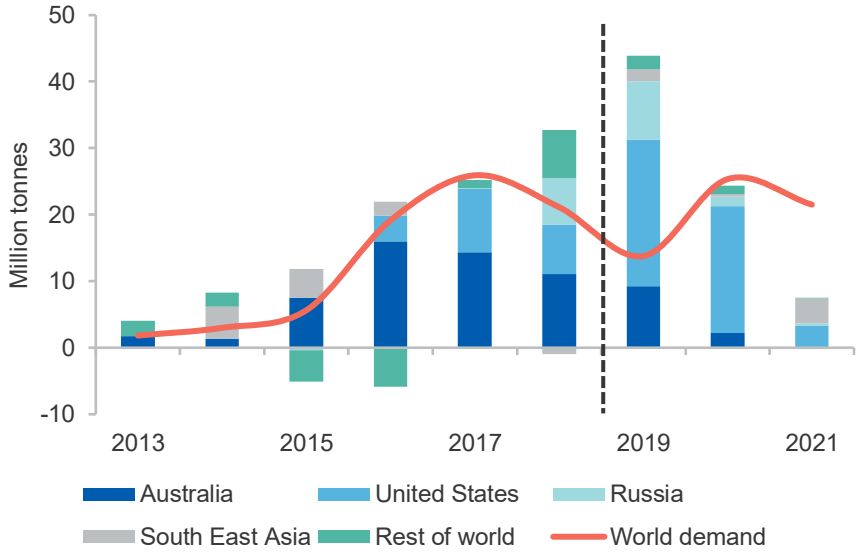
LNG is expected to face increasing competition from pipeline gas, with the controversial Nord Stream II gas pipeline scheduled for completion in 2019. With a capacity of 55 billion cubic metres per annum (equivalent to around 40 million tonnes of LNG), Nord Stream II connects Russian gas fields to the EU pipeline network at Germany's Baltic coast.

7.4 World exports

A major expansion in global LNG production capacity is underway

The expansion in global LNG supply capacity seen over the past few years still has some way to run. World supply capacity is expected to increase rapidly in 2019 and 2020 (Figure 7.6), driven primarily by the US, and supported by the continued ramp-up in Australia (see the next section). This growing supply capacity is expected to temper increases in LNG spot prices in Asia over this period.

Figure 7.6: Change in global nameplate capacity and LNG demand



Notes: Nameplate capacity is the maximum annual production capacity of an LNG plant.
Source: Department of Industry, Innovation and Science (2019); Nexant (2019)

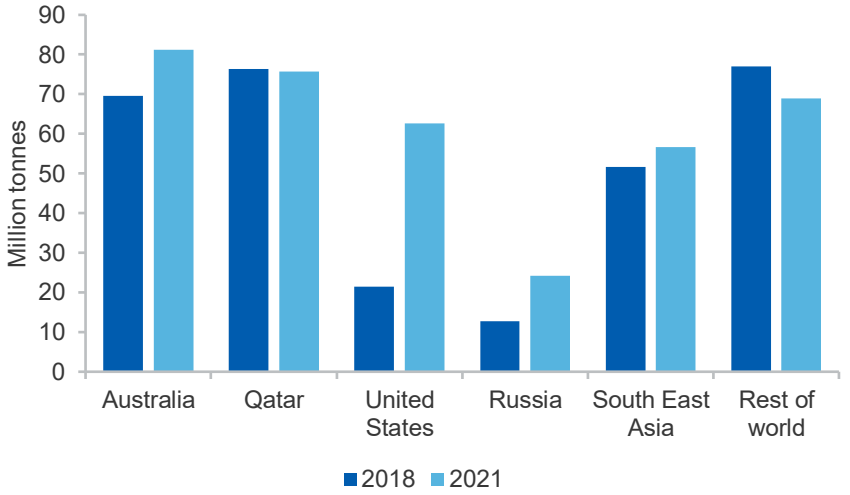
The combined nameplate capacity of US LNG projects is on track to reach around 70 million tonnes per annum (mtpa) in 2020. All six US plants are expected to be operational by the end of 2019, and production will continue to ramp up in 2020. This expansion in LNG infrastructure is expected to make the US the world's third largest LNG exporter, behind Australia (where nameplate capacity will soon reach 88 mtpa) and Qatar (where nameplate capacity is expected to remain at 77 mtpa for the next few years). Russia's LNG export capacity stands at 27 mtpa, following the completion of Yamal LNG — the country's second LNG project after Sakhalin.

In 2021, growth in global supply capacity is expected to drop to its lowest level since 2013, with the only additions to capacity likely to be from new trains at existing projects in the US and Indonesia (Figure 7.6).

Qatar's LNG exports are projected to remain largely unchanged

Qatar was the world's largest LNG exporter in 2018, exporting 76 million tonnes of the liquefied fuel. According to International Energy Agency (IEA) data, Qatar's exports have ranged from 72–77 million tonnes a year since 2011, although other sources put the peak of Qatar's LNG exports at around 80 million tonnes.

Figure 7.7: LNG export forecasts



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

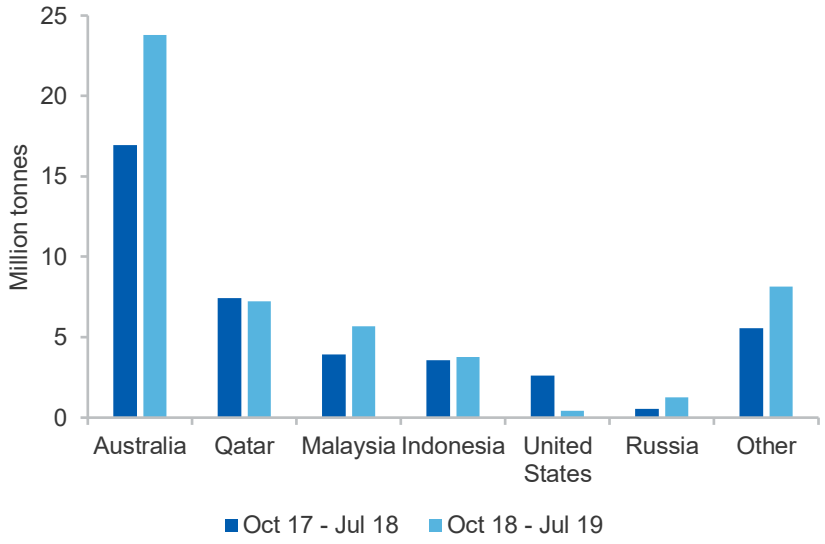
Qatar's LNG exports were unchanged year-on-year over the first eight months of 2019. Qatar's LNG exports are forecast to remain at around 76 million tonnes through to 2021 (Figure 7.7). Beyond the outlook period of this report, Qatar has plans to increase LNG production capacity by 43 per cent to 110 million tonnes in 2024.

Box 7.1 discusses Qatar's LNG exports in more detail, and whether the country will be surpassed as the world's largest LNG exporter by Australia.

LNG has been caught up in US-China trade tensions

LNG trade has recently been caught up in trade tensions between China and the US. On 13 May, China announced that it would increase tariffs on LNG imports from the US from 10 per cent to 25 per cent, effective from 1 June 2019, as part of its response to the US raising tariffs on US$200 billion of Chinese goods.

Figure 7.8: China's LNG imports by source before and after the imposition of tariffs on US LNG in September 2018



Source: Bloomberg

To date, the 10 per cent tariff — which commenced on 24 September 2018 — has encouraged a reorganisation of trade flows; China has purchased more LNG from other sources, while US LNG exports have been directed to other markets. The effect of tariffs on short-term LNG prices appears to have been minimal, or has been swamped by other factors, such as rapidly increasing supply capacity in LNG markets.

Australia has accounted for the majority of the increase in China's imports since China imposed tariffs on US LNG in September 2018 (Figure 7.8). However, it is difficult to attribute this increase directly to the effect of tariffs, given China's rapidly growing LNG demand and the ramp up of new Australian projects (such as Wheatstone and Ichthys) over the same period.

The impact of China lifting tariffs on imports of US LNG to 25 per cent from June 2019 will become clearer in coming months, as data for the second half of 2019 becomes available. It is possible that trade flows will continue to reorganise around increased tariffs, with few apparent effects on the total market. However, tariffs may also mean that China has to bring in more LNG from higher cost, non-US sources. If non US-origin LNG is more costly for China to import, then tariffs could potentially have the effect of reducing China's LNG purchases.

A longer-term risk is that escalating trade tensions discourage or delay final investment decisions (FIDs) for a second wave of US LNG projects. Some US LNG developers are reportedly holding off on FIDs, with US-China trade tensions one consideration. Trade tensions may also deter China — which is expected to become the world's largest LNG buyer in the early 2020s — from investing in new US LNG projects. However, China could take more US LNG in the event that trade tensions are resolved.

7.5 Australia

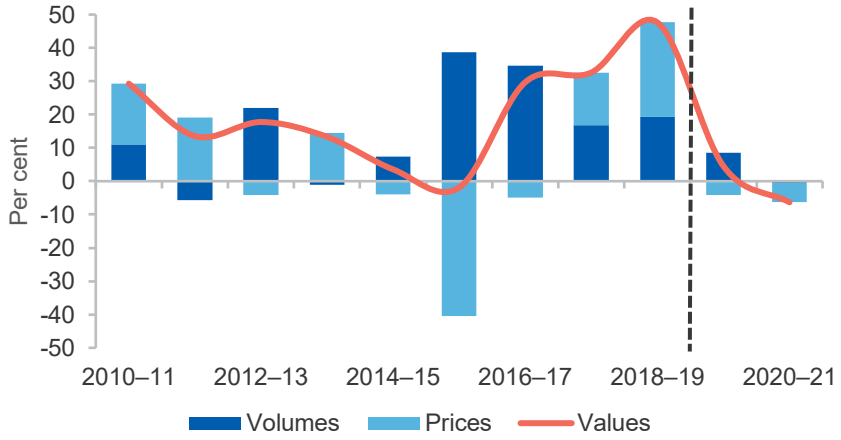
Australia's LNG exports are surging

Australia exported $50 billion of LNG in 2018–19, up from $31 billion in 2017–18. Higher export earnings have been driven by the recovery in oil prices (relative to 2017–18), and the ramp up of LNG exports, particularly from the Wheatstone and Ichthys LNG projects. Australia and Qatar have continued to jostle for the title of the world's largest LNG exporter over the course of 2019 (see Box 7.1).

Australia's LNG export earnings to remain broadly stable

The value of Australia's LNG exports is forecast to increase to $52 billion in 2019–20, driven by the ramp up in export volumes from Prelude and Ichthys (Figure 7.9 and 7.10). Shell shipped the first LNG cargo from its Prelude project on 11 June, and production is expected to ramp up during 2019–20. Production at the Ichthys project was around 80 per cent of nameplate capacity during the June quarter.

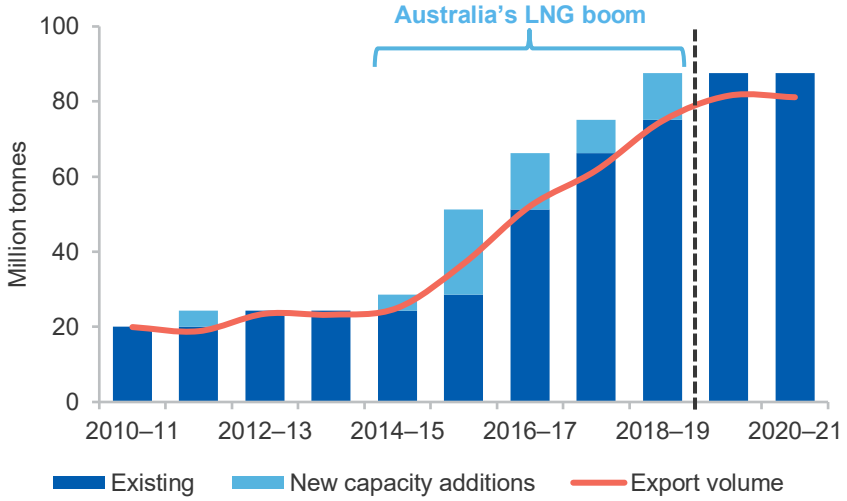
Figure 7.9: Growth in Australia's LNG export earnings, contributions from volumes and prices



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

In 2020–21, the value of Australia's LNG exports is expected to fall back to $49 billion, as oil-linked contract prices (at which most Australian LNG is sold) edge down and the exchange rate appreciates. LNG export volumes are expected to remain broadly stable in 2020–21 (Figure 7.10). Tapering production at Darwin LNG is expected to weigh on export volumes towards the end of the outlook period. ConocoPhillips confirmed in June that it expected the Darwin LNG plant to shut down for 1-2 years, starting between 2021 and 2023, when gas from the Bayu-Undan field is exhausted.

Figure 7.10: Australia's LNG exports and export capacity



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

Export earnings have been revised down

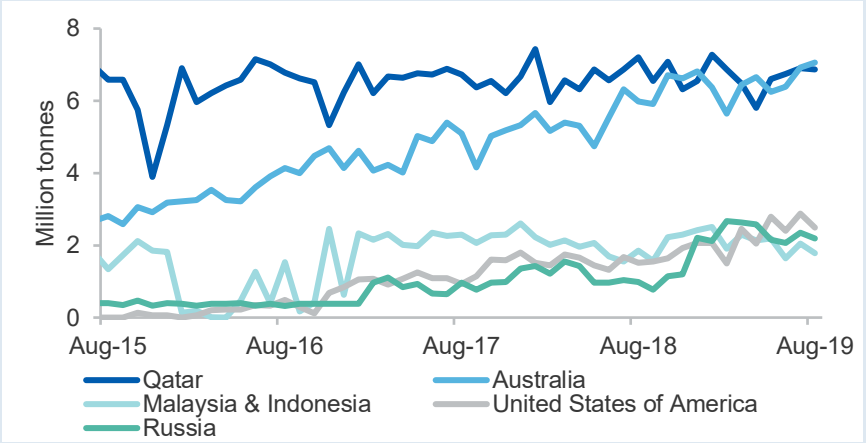
The forecast for Australian LNG export earnings has been revised down from the June 2019 *Resources and Energy Quarterly*, by $1.5 billion in 2019–20 and $1.6 billion in 2020–21. Lower forecast export earnings reflect a lower oil price forecast (see chapter 8 *Oil*), partly offset by a weaker exchange rate outlook.

Box 7.1: The title of the world's largest LNG exporter

Australia and Qatar continue to jostle for the title of the world's largest LNG exporter. In 2018, Qatar's exports of 76 million tonnes comfortably outstripped Australia's 70 million tonnes, although Australia did export more LNG at the end of 2018 before Qatar subsequently regained the lead (Figure 7.11). In the first eight months of 2019, Australia had exported 52 million tonnes of LNG, compared to Qatar's 54 million tonnes.

Australia is forecast to edge past Qatar as the world's largest LNG exporter (on an annual basis) in 2019, shipping 78 million tonnes of LNG (compared to an anticipated 76 million tonnes in Qatar). Australia is then forecast to extend its lead further in 2020, as exports climb to 81 million tonnes and Qatar's output remains steady (Figure 7.13). However, the narrow difference between the projected exports of the two nations means that Australia overtaking Qatar is far from certain, especially in 2019.

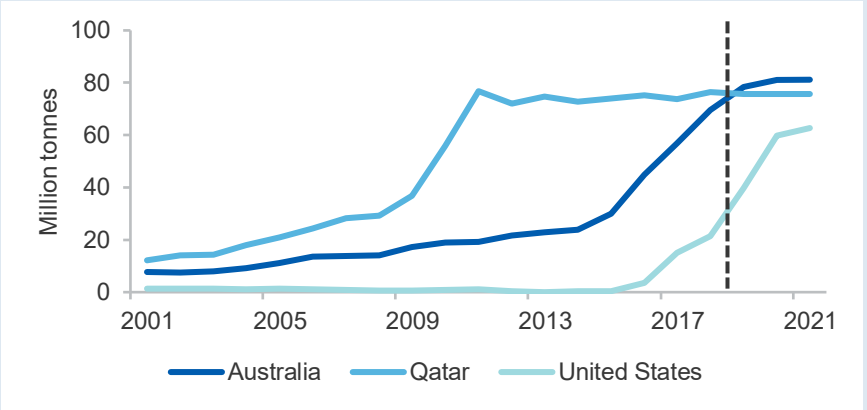
Figure 7.11: Monthly LNG exports of key producers



Source: Bloomberg (2019)

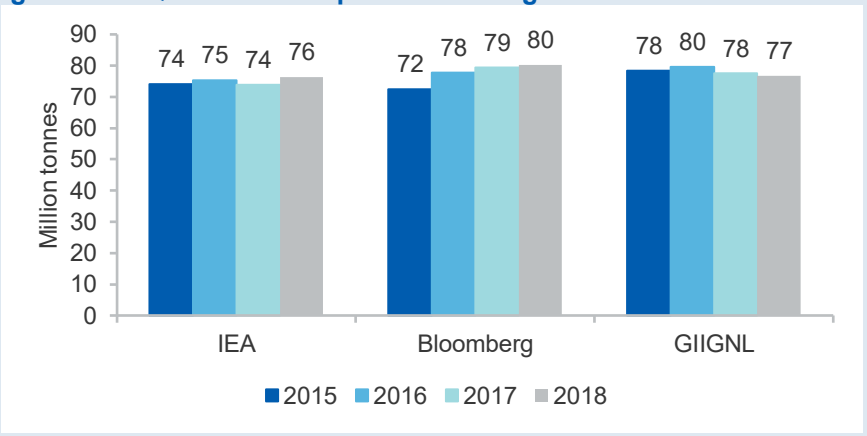
The tussle for the title of the world's largest LNG exporter is further complicated by a lack of clarity around the precise level of Qatar's LNG exports. IEA data (used in this report) puts Qatar's exports at 76 million tonnes in 2018, while data from the International Group of Liquefied Natural Gas Importers (GIIGNL) has exports at 77 million tonnes, and shipping data suggests Qatar exported 80 million tonnes. It is possible that Australia may overtake Qatar in 2019 according to IEA or GIIGNL data, but not according to another data source. Whatever the case, during the mid-2020s, Australia is expected to be surpassed as the world's largest LNG exporter by both Qatar and the US.

Figure 7.12: LNG export projections for Australia, Qatar and the US



Source: Nexant (2019); IEA (2019); Department of Industry, Innovation and Science (2019)

Figure 7.13: Qatar's LNG exports according to different data sources



Source: IEA (2019); Bloomberg (2019); GIIGNL (2019)

Table 7.1: World gas outlook

	Unit	2018	2019[f]	2020[f]	2021[f]	Annual percentage change 2019[f]	2020[f]	2021[f]
JCC oil price[a]								
– nominal	US$/bbl	72.9	66.6	68.8	66.8	-8.7	3.3	-2.9
– real[h]	US$/bbl	74.5	66.6	67.2	63.9	-10.7	0.9	-5.0
Asian LNG spot price[bg]								
– nominal	US$/MMbtu	9.8	5.4	6.3	8.1	-45.1	17.0	28.2
– real[h]	US$/MMbtu	10.0	5.4	6.1	7.7	-46.3	14.4	25.5
LNG trade	Mt[c]	308.7	322.5	347.8	369.3	4.5	7.9	6.2
Gas production	Bcm	3,800.8	3,884.3	3,955.5	4,016.3	2.2	1.8	1.5
Gas consumption	Bcm	3,814.9	3,894.0	3,966.1	4,045.9	2.1	1.9	2.0

Notes: **a** JCC stands for Japan Customs-cleared Crude; **b** Historical data is the North Asia SLInG weekly spot price; **c** 1 million tonnes of LNG is equivalent to approximately 1.36 billion cubic metres (bcm) of gas; **f** Forecast; **g** 1 MMBtu is equivalent to 1.055 GJ; **h** In 2019 US dollars; **s** estimate.

Source: ABS (2019) International Trade in Goods and Services, Australia, 5368.0; Department of Industry, Innovation and Science (2019); Company reports; Nexant World Gas Model (2019)

Table 7.2: Australian gas outlook

	Unit	2017–18	2018–19	2019–20[f]	2020–21[f]	Annual percentage change 2018–19	2019–20[f]	2020–21[f]
Production[d]	Bcm	120.3	145.2	151.7	154.6	20.7	4.5	1.9
– Eastern market	Bcm	55.0	55.3	54.9	54.6	0.5	-0.8	-0.5
– Western market	Bcm	63.8	82.3	82.8	85.9	28.9	0.7	3.7
– Northern market[k]	Bcm	1.4	7.6	14.0	14.2	439.3	84.4	1.2
LNG export volume	Mt[c]	61.7	74.9	81.6	81.2	21.3	9.0	-0.5
– nominal value	A$m	30,907	49,768	52,076	48,881	61.0	4.6	-6.1
– real value[e]	A$m	32,170	50,963	52,076	47,707	58.4	2.2	-8.4
LNG export unit value[g]								
– nominal value	A$/GJ	9.5	12.6	12.1	11.4	32.7	-4.0	-5.7
– real value[e]	A$/GJ	9.9	12.9	12.1	11.1	30.6	-6.2	-7.9
– nominal value	US$/MMBtu	7.8	9.5	8.9	8.9	22.4	-6.4	-0.2
– real value[e]	US$/MMBtu	8.1	9.7	8.9	8.7	20.5	-8.6	-2.6

Notes: **c** 1 million tonnes of LNG is equivalent to approximately 1.36 billion cubic metres (bcm) of gas; **d** 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; **e** In 2019–20 Australian dollars; **f** Forecast; **g** 1 MMBtu is equivalent to 1.055 GJ; **h** In 2019 US dollars; **k** 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; **s** estimate.

Source: ABS (2019) International Trade in Goods and Services, Australia, 5368.0; Department of Industry, Innovation and Science (2019); Company reports; Nexant World Gas Model (2019)