Gas

Resources and Energy Quarterly June 2019

LNG is natural gas cooled to

–162°C

Australia exported

70 million tonnes of LNG in 2018

22% rise from 2017 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

44%	33%	12%	4%	3%	4%
Japan	China	South Korea	Taiwan	Singapore	Rest of the world

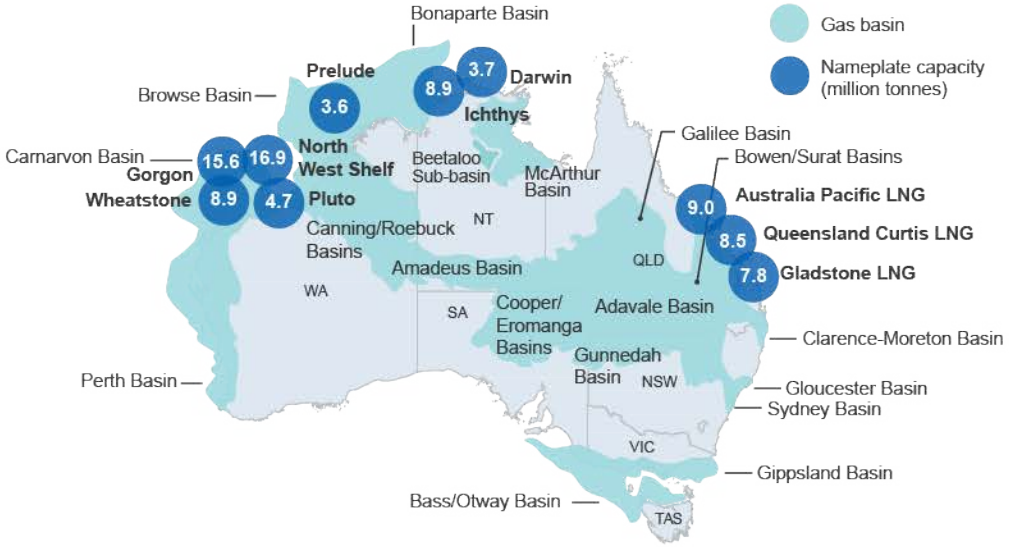
Share of world LNG exports in 2018

25%	22%	8%	6%	6%	33%
Qatar	Australia	Malaysia	Nigeria	United States	Rest of the world

Share of world LNG imports in 2018

26%	17%	12%	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 an estimated $50 billion of LNG in 2018–19. Export earnings are forecast to lift to $54 billion in 2019–20, driven by growing export volumes, before falling back to $50 billion, as prices ease.
- Australia's LNG export volumes are forecast to increase from an estimated 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 remain stable in 2019–20 and then decline in 2020–21, due to an appreciating exchange rate and easing LNG contract prices (at which most Australian LNG is sold). LNG spot prices are forecast to remain low, as additions to global capacity outstrip increases in world demand.

7.2 Prices

LNG contract prices in Asia have fallen sharply over the past few months

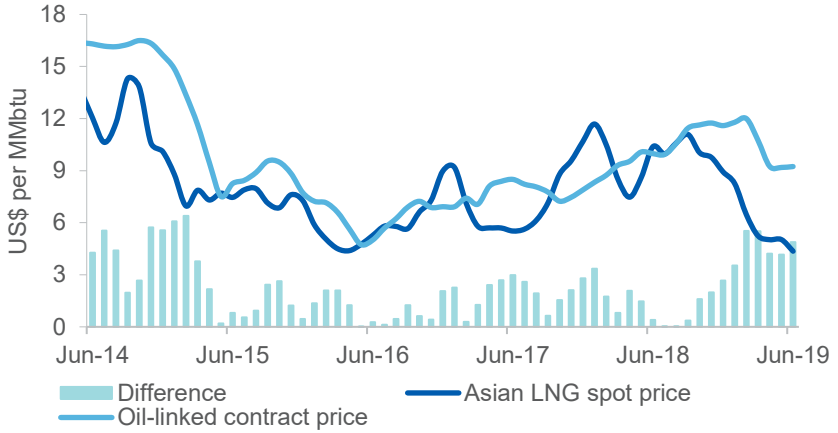
Gas pricing arrangements vary from region to region. Most LNG in Asia is sold on long-term contracts — sometimes in excess of 20 years — where the price of LNG is linked to the price of oil (by a time lag of several months). Figure 7.1 shows how oil-linked contract prices have fallen sharply over the past few months, due to the lagged effect of the oil price collapse in January and February 2019.

LNG spot prices to remain low

LNG spot prices have declined dramatically since late 2018, even falling through the 2018–19 northern hemisphere winter — a time of the year at which prices would usually spike, due to strong seasonal demand. The price fall has been driven by the ramp up of new capacity in the US, Australia and Russia combined with declining imports in Japan and South Korea — the world's largest and third largest LNG buyers.

The recent fall in LNG spot prices means that they have now diverged substantially from long-term oil-linked contract prices, as shown in Figure 7.1. A key question is what the implications of this decoupling might be, especially if decoupling endures for a sustained period. Previous periods of low spot prices have encouraged buyers to push for shorter, more flexible contracts and gas-based pricing, and away from traditional oil-linked pricing arrangements.

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. The difference between the two LNG prices is in absolute terms.

Source: Argus (2019); Bloomberg (2019)

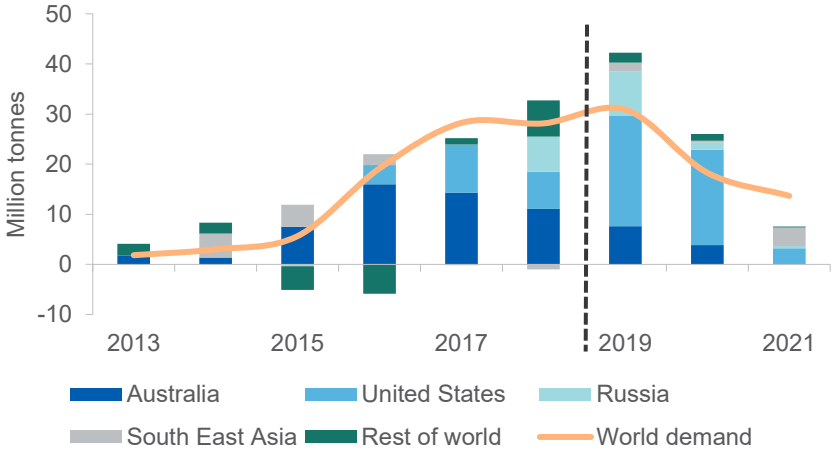
In 2019 and 2020, additions to global supply capacity are expected to outstrip growth in LNG demand. Consequently, Asian LNG spot prices are forecast to remain low, averaging US$5.70 per million British thermal units (MMbtu) in 2019 (A$7.60 a gigajoule) and US$6.80/MMbtu (A$8.80/GJ) in 2020 — well down on the 2018 average of US$9.80/MMbtu (A$12.40/GJ).

In 2021, LNG spot prices are expected to recover to US$8.40/MMbtu (A$10.70/GJ). Supply growth looks likely to slow dramatically in the early 2020s, and demand is consequently expected to begin closing the gap on global production capacity. Future movements in Asian spot prices could affect domestic gas prices in Australia's eastern gas market (Box 7.1).

7.3 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 an estimated 318 million tonnes, up 10 per cent from 290 million tonnes in 2017. In 2019 and 2020, the continued expansion in global LNG supply capacity is expected to outpace growth in LNG demand, before capacity growth slows dramatically in 2021 (Figure 7.2). From 2021, the LNG market is expected to begin rebalancing, as demand growth absorbs the available capacity.

Figure 7.2: Change in global nameplate capacity and LNG demand



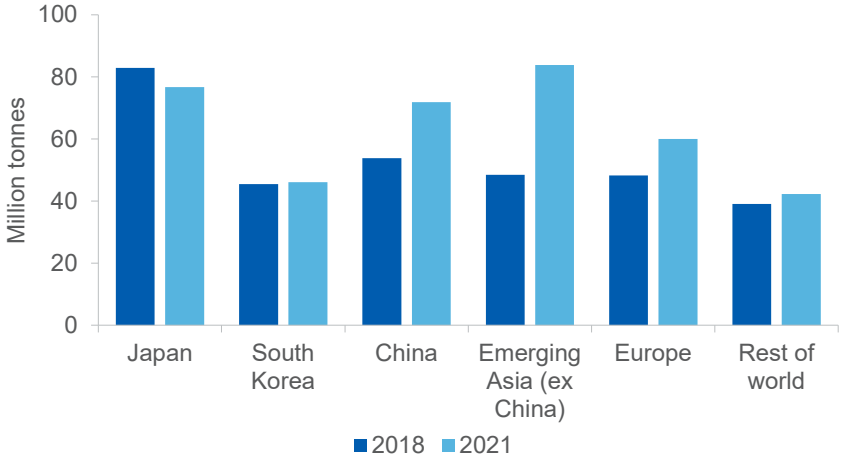
Notes: Nameplate capacity is the maximum annual production capacity of an LNG plant.
Source: Department of Industry, Innovation and Science (2019); Nexant (2019)

7.4 World imports

Nuclear restarts to reduce Japan's LNG imports

Japan is the world's leading LNG buyer, importing 83 million tonnes of LNG in 2018. However, Japan's LNG imports fell by 10 per cent year-on-year in the first five months of 2019, due to a relatively mild winter and the restart of nuclear power reactors over the past year. Japan's LNG imports are forecast to fall to 77 million tonnes in 2021 (Figure 7.3). 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.

Figure 7.3: LNG import forecasts



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

The restart of several reactors over 2018 is expected to reduce Japan's annual LNG imports from 2019 onwards. At the time of writing, 9 of Japan's 42 nuclear reactors had gained approval to restart and were in operation. Further nuclear restarts appear likely over the next 5 years. Eighteen reactors have applications to restart with the Nuclear Regulation Authority, and at least 3 reactors are likely to restart before end 2021.

However, several eventualities complicate the outlook for nuclear energy in Japan, and could see Japan import more LNG than 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. Up to nine reactors, including five that are operational, 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 54 million tonnes of LNG (73 billion cubic metres). China's LNG imports continued to increase rapidly in the first five months of 2019, up 19 per cent on the same period a year earlier, on the back of surging gas demand. Strong demand also made room for increased pipeline gas imports and domestic gas production.

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 (Figure 7.4).

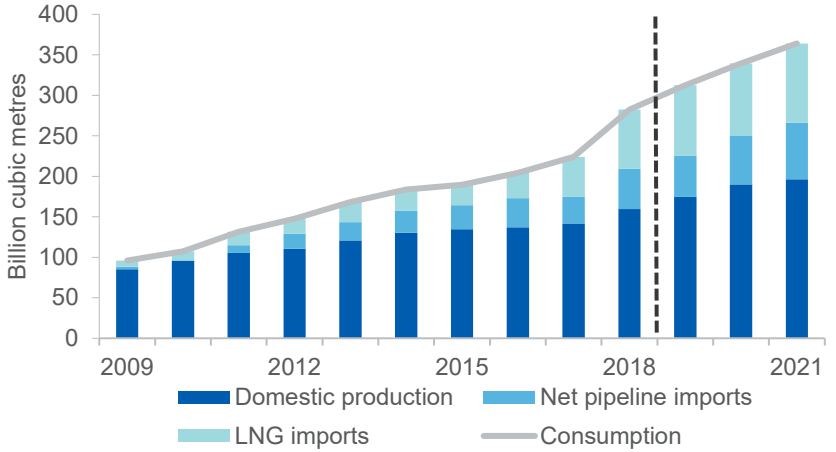
LNG is expected to play a major role in servicing rising Chinese gas demand: China's LNG imports are forecast to reach 72 million tonnes (98 billion cubic metres) in 2021. While both domestic production and pipeline imports are forecast to grow, they are not expected to keep pace with rising domestic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

China is targeting domestic gas production of 207 billion cubic metres in 2020, up 30 per cent from around 159 billion cubic metres in 2018. However, China faces challenges in lifting domestic output, including difficult 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. There are plans to expand the capacity of the Central Asia–China Gas Pipeline system from 55 billion cubic metres to 65 billion cubic metres by the end of 2019. The Power of Siberia pipeline from Russia to northern-eastern China is also scheduled for completion at the end of 2019. China is expected to import around 5 billion cubic metres of gas from Russia in the first full year of the pipeline's operation in 2020, but it will take until around 2025 for the imports to reach the pipeline's full capacity of 38 billion cubic metres.

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.

Figure 7.4: China's gas consumption by source



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

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 45 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 15 per cent in the first four months of 2019, with demand constrained by a mild winter 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 41 million tonnes in 2019.

After 2019, LNG imports are expected to begin increasing again, reaching 46 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 plans to close several more aging coal-fired power stations before 2022, and lowered taxes on LNG imports and raised taxes on thermal coal imports on 1 April 2019.

LNG demand to increase amongst other emerging Asian economies

Several other emerging Asian economies are expected to contribute to rising LNG demand. India's LNG imports are forecast to increase from 22 million tonnes in 2018 to 33 million tonnes in 2021. India is aiming to lift gas' share of the energy mix to 15 per cent by 2030 from the current 5 per cent. 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 remains 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 an estimated 8 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 to increase demand in the short term, before LNG imports decline

Europe's LNG imports are forecast to climb from an estimated 48 million tonnes in 2018 to 60 million tonnes in 2021. With European gas consumption expected to remain relatively flat, 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.

7.5 World exports

A major expansion in global LNG production capacity is underway

The major 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, driven primarily by the US, and supported by a continued ramp-up in Australia (see section 7.6) and Russia. This growing supply capacity is expected to temper increases in LNG spot prices in Asia over this period.

The combined nameplate capacity of US LNG projects is on track to triple to 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).

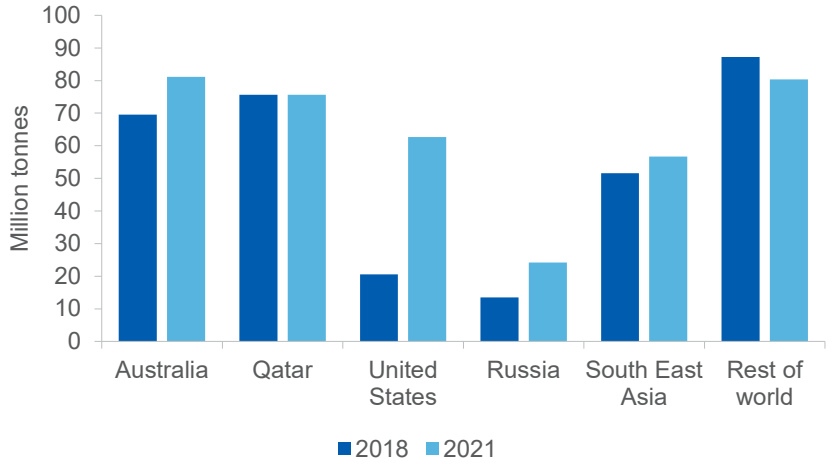
Russia's LNG export capacity is expected to reach 27 mtpa by the end of 2019. Yamal LNG — the country's second LNG project after Sakhalin — is currently in the process of ramping up production from its third train.

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.

Qatar's LNG exports are projected to remain largely unchanged

Qatar was the world's largest LNG exporter in 2018, exporting an estimated 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. Qatar's LNG exports are forecast to remain around 76 million tonnes through to 2021. Qatar has plans to increase LNG production capacity by 43 per cent to 110 million tonnes in 2024, but the expansion is not due to be completed until after the end of the outlook period for this report.

Figure 7.5: LNG export forecasts



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

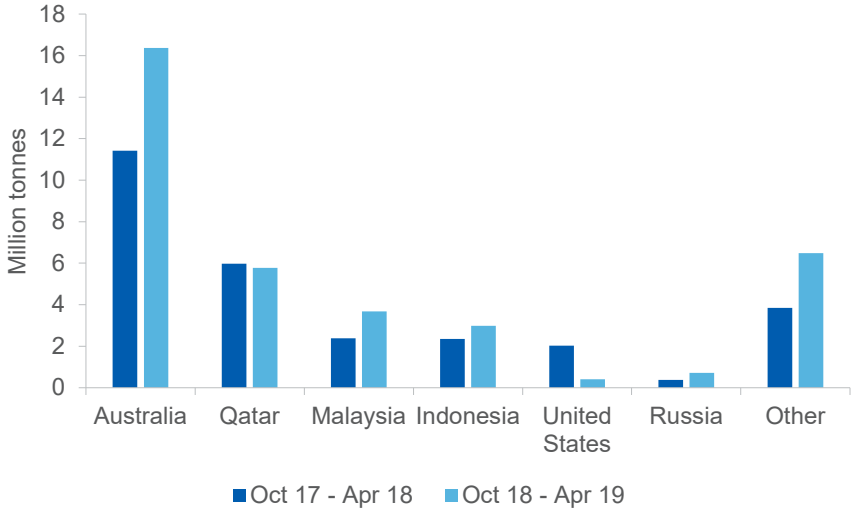
LNG has been caught up in US-China trade tensions

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 US LNG imports 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.

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 (Figures 7.6 and 7.7). 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 7.6). 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. Other countries, such as Malaysia and Indonesia, have also increased LNG exports to China since September 2018.

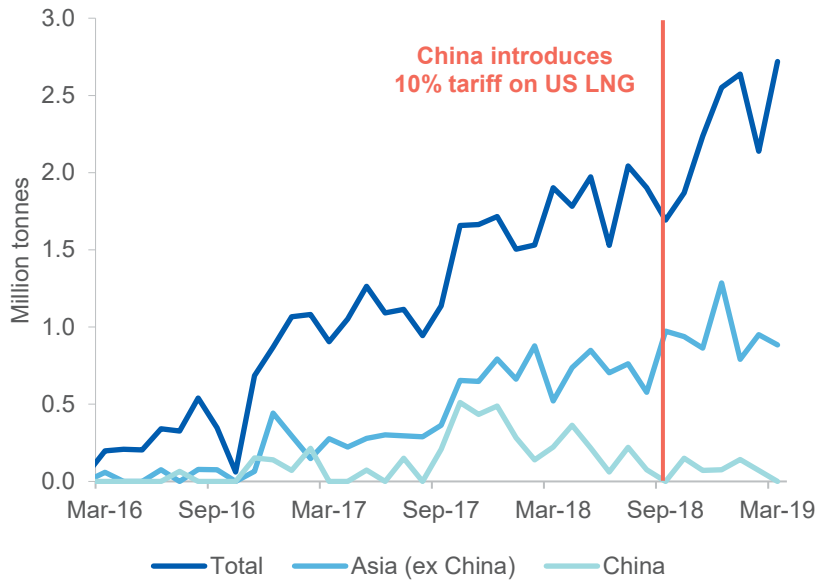
Figure 7.6: Year-on-year change in China's LNG imports since the imposition of tariffs on US LNG in September 2018



Source: Bloomberg

The impact of China lifting tariffs on US LNG to 25 per cent from June 2019 will become clearer in coming months, as data for the second half of 2019 comes in. It is possible that trade flows continue to reorganise around increased tariffs, with few apparent effects on the market. However, it may also become increasingly costly for China to bring in more LNG from non-US sources. Chinese LNG requirements are growing rapidly and the ramp up in low cost US LNG would have been a natural source of new supply for China. 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.

Figure 7.7: US LNG exports by destination, monthly



Source: Energy Information Administration (2019)

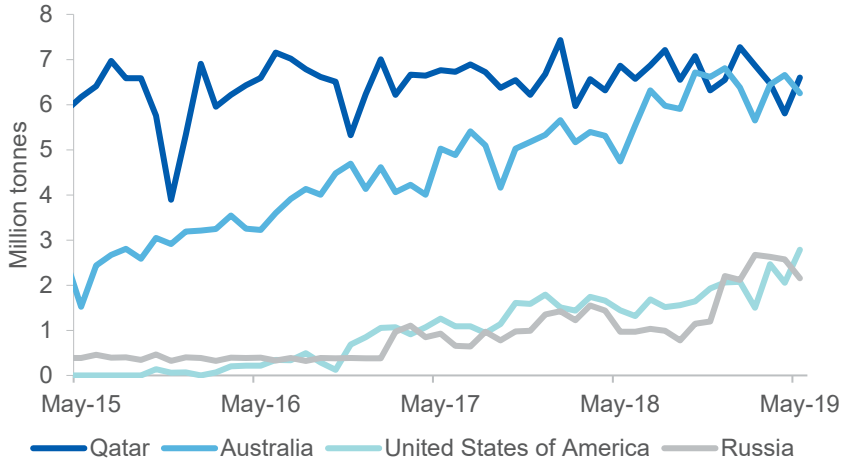
A longer-term risk is that escalating trade tensions discourage or delay final investment decisions (FIDs) for a second wave of US LNG projects. Given China is set to become the world's largest LNG buyer in the early 2020s, China will be looking for new sources of supply over the next few years, and trade tensions may deter Chinese buyers from investing in new US LNG projects. US exporter Cheniere Energy and Chinese buyer Sinopec have reportedly held off signing a 20-year supply deal for 2 million tonnes of LNG per year (starting in 2023) due to trade tensions. However, the possibility remains that China could commit to taking more US LNG in the event that trade tensions are resolved.

7.6 Australia

Australia's LNG exports are surging

Australia exported an estimated $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 continued to jostle for the title of the world's largest LNG exporter over the first five months of 2019. Australia took the lead in April as Qatar's exports dipped due to maintenance (Figure 7.8), before Qatar edged back past Australia in May.

Figure 7.8: Monthly LNG exports of key producers

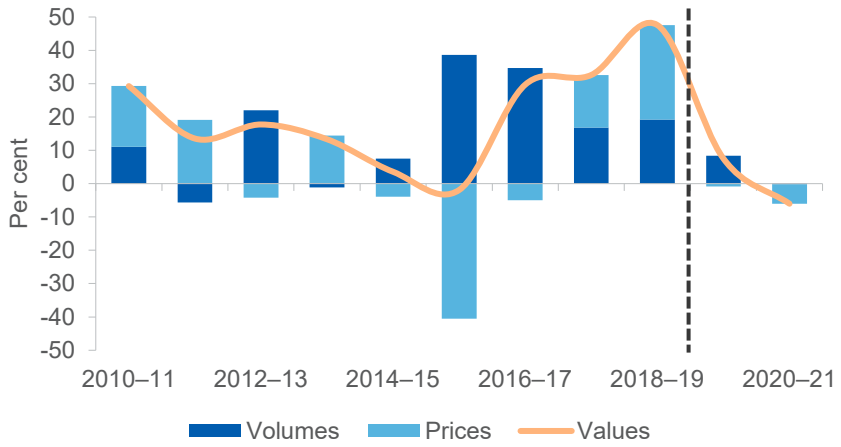


Source: Bloomberg (2019)

Australia's LNG export earnings to remain broadly stable

The value of Australia's LNG exports is forecast to increase to $54 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. Train 2 at Ichthys is expected to come online during 2019.

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)

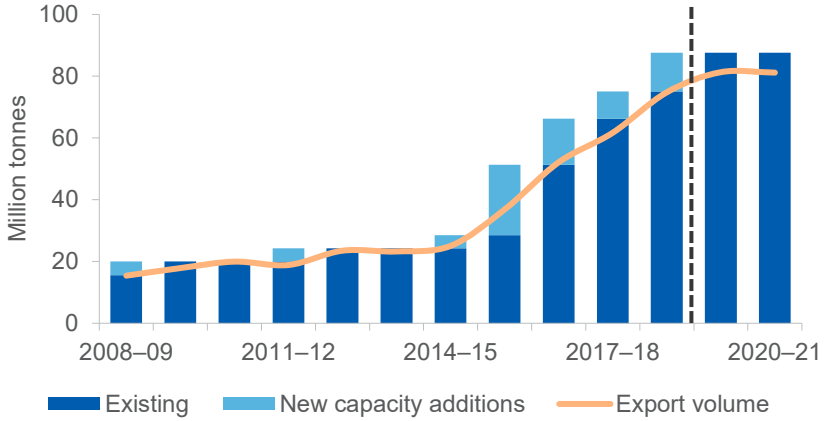
In 2020–21, the value of Australia's LNG exports is expected to fall back to $50 billion, as oil-linked contract prices (at which most Australian LNG is sold) edge down and the exchange rate appreciates. LNG export volumes are expected to remain broadly stable in 2020–21 (Figure 7.9).

Australia could be the world's largest LNG exporter for the next few years

Australia is forecast to edge past Qatar as the world's largest LNG exporter (on an annual basis) when exports reach 78 million tonnes in 2019, and extend its lead in 2020 as exports climb to 81 million tonnes. However, the narrow difference between the projected exports of the two nations means that Australia overtaking Qatar is not a certainty. Indeed, that margin is likely to be particularly narrow in 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 75-76 million tonnes per annum over the past two years, while data from the International Group of Liquefied Natural Gas Importers (GIIGNL) has exports at 77-78 million tonnes during this time, and shipping data suggests Qatar exported 79-80 million tonnes of LNG over the same period. During the mid-2020s, Australia is expected to be surpassed as the world's largest LNG exporter by both Qatar and the US, as new projects in both countries come online.

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 up

The forecast for Australian LNG export earnings has been revised up from the March 2019 *Resources and Energy Quarterly*. Export earnings are now expected to be $1.1 billion higher in 2019–20, reflecting an upwards revision to the oil price forecast (see the *oil* chapter) and a downward revision to the AUD/USD exchange rate assumption.

An upward revision to prices has offset the impact of a downward revision to export volumes. 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. While falling output at Darwin LNG was factored into the outlook for the March *Resources and Energy Quarterly*, production is now expected to decline at a faster rate.

Box 7.1: LNG price forecasting and Australia's eastern gas market

Movements in LNG spot prices in Asia have proven difficult to predict over the past few years. LNG spot prices rose over 2017 and 2018, during a time when many forecasters expected LNG markets to enter a period of deep overcapacity. Recently, just as discussion was turning to the potential for a supply crunch, spot prices fell sharply to near record lows.

In June 2019, the Oxford Institute for Energy Studies (OIES) published a paper *LNG spot price forecasting and the futures curve* that examined the accuracy of using the Asian LNG futures price — the current price of LNG for delivery at a specified future date — to forecast the Asian LNG spot price. The research compares the accuracy of futures prices against a 'naïve' or 'no change' forecast — a literature benchmark for testing forecasting methodologies — under which future spot prices are forecast to be equal to the most recent spot price.

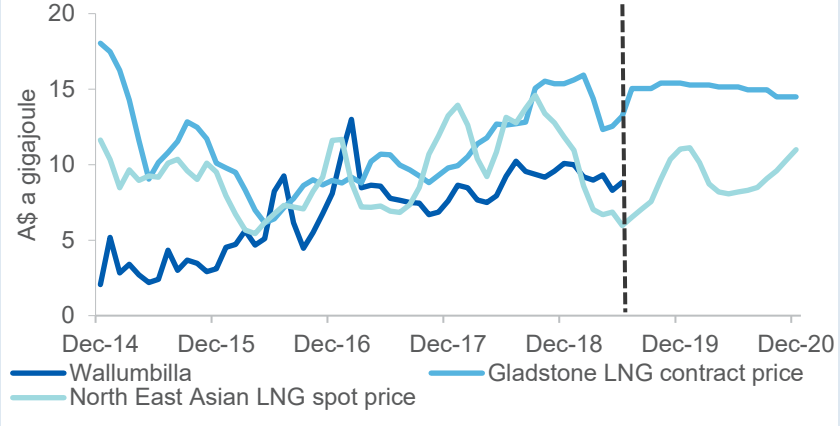
The OIES finds that the Asian LNG futures price has displayed some predictive power relative to a naïve forecast for time horizons of around five months or less. For time horizons of six months or more, a naïve forecast outperforms a futures-based approach. According to the OIES, the predictive power of the futures curve may deteriorate due to declining liquidity (i.e. trading activity) in Asian LNG futures markets, which prevents the futures market from accurately reflecting participants' expectations of spot prices in the future. Alternatively, a growing risk premium — the return that investors require to take the offsetting position in a futures contract — may increasingly bias a futures-based forecast.

Following the start of LNG exports from Queensland in 2015, domestic gas prices in Australia's eastern gas market have become linked with LNG prices in Asia (Figure 7.11). According to the Australian Competition and Consumer Commission (ACCC), netbacks from Asian LNG spot prices — the spot price minus the costs of shipping and liquefaction — play an important role in shaping domestic gas prices, although they are not the only influence. In 2018, the ACCC began publishing an LNG spot price netback series to improve price transparency in the eastern gas market and assist buyers in gas supply negotiations. However, it is worth noting that the precise relationship between domestic gas prices, LNG spot prices and oil-linked LNG contract prices (at which most Queensland LNG is sold) remains unclear (see the *gas* chapter from the December 2017 *Resources and Energy Quarterly*).

Figure 7.11 shows a domestic gas price — the price of gas at Wallumbilla (a gas trading hub in Queensland) — and LNG spot and oil-linked contract prices, and forecasts for LNG prices based on the Asian LNG futures curve and OCE oil price forecasts. In June 2019, prices at Wallumbilla were above Asian LNG spot prices, but below oil-linked contract prices.

Moving forward, the futures curve and OCE oil price forecasts suggest the divergence between LNG spot and oil-linked prices will continue. The question now is whether domestic gas prices fall towards LNG spot prices or rally towards oil-linked contract prices. Whatever the case, movements in domestic gas prices will have implications for industrial users, residential gas bills and electricity prices in Australia.

Figure 7.11: LNG prices and Australian domestic gas prices



Notes: LNG prices are Delivered Ex Ship (i.e. include the cost of shipping and insurance). The price of LNG sold on Gladstone oil-linked contracts is estimated at 14 per cent of the 3-month lagged JCC oil price plus shipping.

Source: Argus (2019); Australian Energy Market Operator (2019); Bloomberg (2019)

Table 7.1: Gas outlook

	Unit	2018	2019[f]	2020[f]	2021[f]	Annual percentage change 2019[f]	2020[f]	2021[f]
World								
JCC oil price[a]								
– nominal	US$/bbl	72.9	70.0	72.4	70.5	-4.0	3.3	-2.6
– real[h]	US$/bbl	74.6	70.0	70.7	67.4	-6.1	1.0	-4.7
Gas production	Bcm	3 813.5	3 920.3	3 981.8	4 032.0	2.8	1.6	1.3
Gas consumption	Bcm	3 827.6	3 929.9	3 992.4	4 061.6	2.7	1.6	1.7
LNG trade	Mt[d]	318.0	348.9	367.2	380.8	9.7	5.2	3.7
	Unit	**2017–18**	**2018–19[s]**	**2019–20[f]**	**2020–21[f]**	**2018–19[f]**	**2019–20[f]**	**2020–21[f]**
Australia								
Production[b]	Bcm	120.3	139.9	145.0	144.9	16.3	3.7	-0.1
– Eastern market	Bcm	55.3	55.3	55.5	54.9	0.1	0.3	-1.0
– Western market	Bcm	63.8	82.1	81.0	81.0	28.7	-1.4	0.0
– Northern market[c]	Bcm	1.2	2.4	8.6	9.1	112.1	250.6	5.5
LNG export volume[d]	Mt	61.7	74.8	81.3	81.2	21.2	8.7	-0.2
– nominal value	A$m	30,907	49,738	53,623	50,488	60.9	7.8	-5.8
– real value[e]	A$m	31,523	49,738	52,366	48,120	57.8	5.3	-8.1
LNG export unit value[g]								
– nominal value	A$/GJ	9.5	12.6	12.5	11.8	32.8	-0.8	-5.7
– real value[e]	A$/GJ	9.7	12.6	12.2	11.2	30.2	-3.2	-8.0
– nominal value	US$/MMBtu	7.8	9.6	9.5	9.3	23.3	-1.2	-2.1
– real value[e]	US$/MMBtu	7.9	9.6	9.2	8.8	20.9	-3.5	-4.4

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 (bcm) of gas; **e** In 2018–19 Australian dollars; **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)