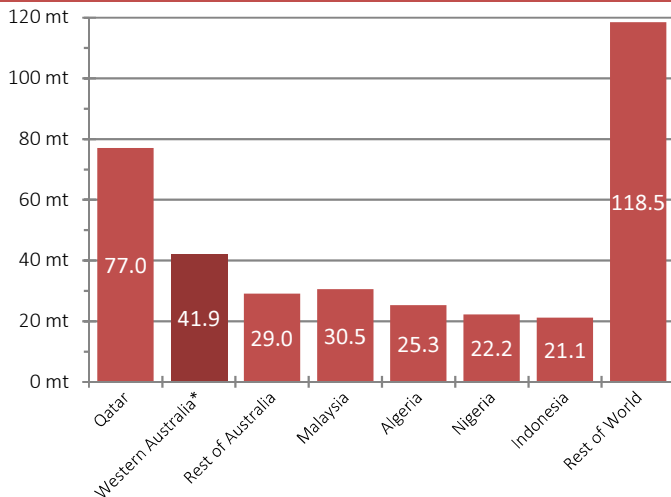




- Western Australia has an established and reliable liquefied natural gas (LNG) export industry. The State’s first LNG project, the North West Shelf, will celebrate 30 years of LNG exports in 2019.
- Western Australian LNG projects are located close to Asia, the region with the largest consumption of LNG.
- As foundation investment partners and customers, Japanese utility companies helped establish Western Australia’s LNG industry. Japan remains the destination for most of Western Australia’s LNG exports.
- In 2006, Western Australia became the first jurisdiction in the world to export LNG to China via the North West Shelf’s sales contract with Guangdong Dapeng LNG. Western Australian LNG projects also have long-term contracts signed with customers in South Korea and India.
- High gas prices in the 2000s prompted major investment in Western Australia’s LNG industry. Western Australia currently has four operating LNG export projects: the North West Shelf, Pluto, Gorgon and Wheatstone. When the Prelude floating LNG project begins exports in 2019, the State’s total LNG export capacity will be close to 50 million tonnes per annum (mtpa).

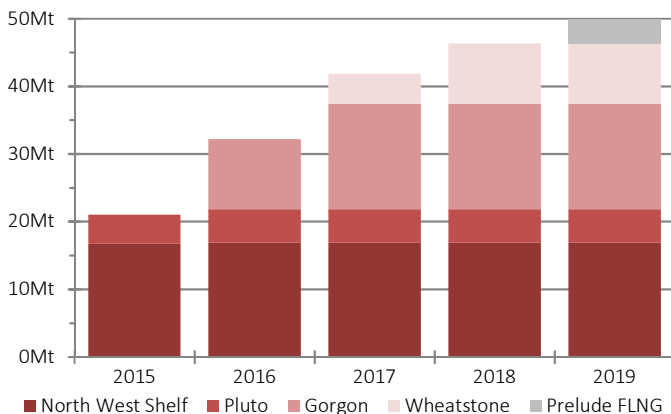
Global LNG export capacity: 2017



Source: International Group of LNG Importers (GIIGNL); WA Department of Jobs, Tourism, Science and Innovation (JTSI) estimates (based on public company announcements).

- The International Group of LNG Importers estimates that at the end of 2017, global LNG export capacity was 365 mtpa.
- Australia’s capacity at the end of 2017 was 70.9 mtpa, which included the:
 - North West Shelf, Pluto, Gorgon and Wheatstone (train 1) projects in Western Australia (totalling 41.9 mtpa);
 - Darwin project in the Northern Territory (3.7 mtpa); and
 - Queensland Curtis, Gladstone and Australia Pacific projects in Queensland (25.3 mtpa).
- The second train at Wheatstone began production in June 2018 while Ichthys began exports in October 2018. The Prelude floating LNG project is scheduled to begin exports in early 2019.
- Australia’s total LNG production capacity will then be 88 mtpa, the largest of any country.

Western Australia’s LNG export capacity



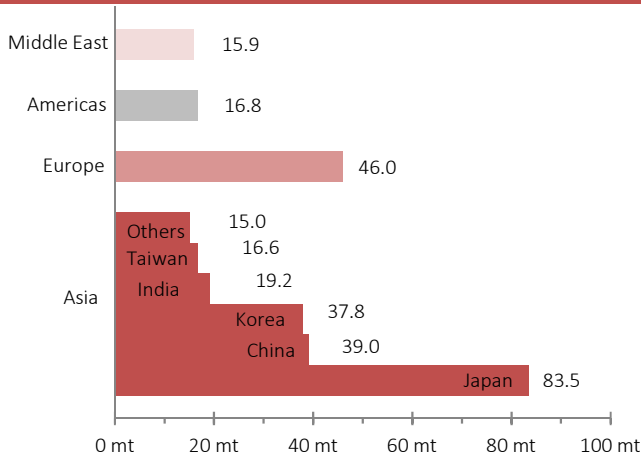
Note – Additions to LNG export capacity reflect the start-up of LNG trains during a particular year; however not all the export capacity of a new LNG train may be available in the same year.

Source: JTSI estimates based on public company announcements.

- The North West Shelf project originally comprised two trains in 1989. A third, fourth and fifth train were developed in 1992, 2004 and 2008, raising total capacity to 16.9 mtpa.
- The Pluto project (single 4.9 mtpa train) began exporting in May 2012.
- The Gorgon project (15.6 mtpa, three trains) began exports from its first train in March 2016 and production from its second and third trains in October 2016 and March 2017.
- The Wheatstone project (8.9 mtpa, two trains) commenced production from its first train in October 2017 and second train in June 2018.
- The remaining LNG development in Western Australia is the Prelude floating LNG project (3.6 mtpa).
- When development of Prelude is complete and exports begin, Western Australia’s total LNG export capacity will be 49.9 mtpa.



Regional LNG imports: 2017



Source: International Group of LNG Importers (GIIGNL).

- In 2017, global LNG trade was 289.8 million tonnes, with the five largest importers – Japan, South Korea, China, India and Taiwan – located in Asia. There are also emerging LNG markets in Pakistan and Southeast Asia.
- Asia accounted for 73 per cent (211.2 million tonnes) of global LNG imports in 2017.
 - Japan and South Korea together accounted for 42 per cent of LNG imports in 2017.
 - China and India together accounted for 20 per cent of LNG imports in 2017, with this proportion expected to grow as both countries increase their gas demand.
- Europe (16 per cent), the Americas (6 per cent) and the Middle East (5 per cent) made up the balance of global LNG imports.

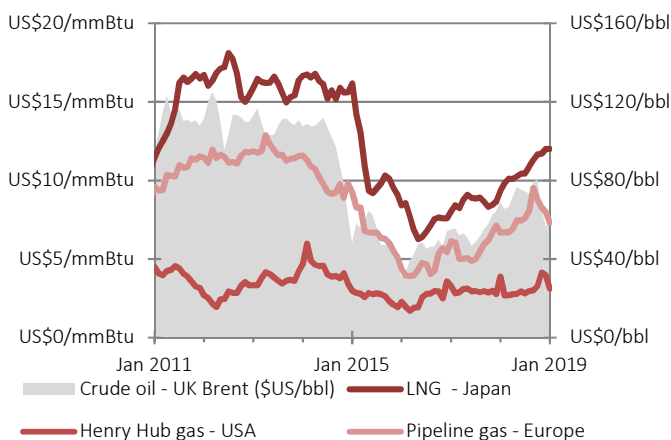
LNG transport: international shipping duration (days)

From:	To: Japan (Tokyo)	China (Shanghai)	Korea (Incheon)	Taiwan (Yung-an)	India (Gujarat)
Australia (West coast)	8	7	8	6	9
Australia (East coast)	8	9	9	8	14
Qatar	14	12	13	11	2
USA (Gulf coast)	20	22	21	22	21
South East Asia (Singapore)	6	5	6	4	6
Russia (Sakhalin)	2	3	3	4	12
Nigeria	23	22	23	20	15

Note – days shipping is based on a vessel at maximum speeds of 19.5 knots.
Source: Shiptscene; International Group of LNG Importers (GIIGNL).

- Western Australia’s LNG projects are located relatively close to the world’s biggest LNG importers in Asia, comparing favourably to the shipping distances from Qatar (with the exception of India).
- The shipping distance from Western Australia’s LNG projects to Japan is around 3,400 nautical miles or about 8 days travel, with similar shipping durations to South Korea, China, Taiwan and India.
- The expansion of the Panama Canal, completed in late-June 2016, means that most LNG tankers can now pass through, providing a shorter trade route for LNG exports from the USA to Asian customers. However, shipping to Asian customers from the US Gulf Coast still takes more than twice the time of shipping from Western Australia.

Regional LNG/pipeline gas prices

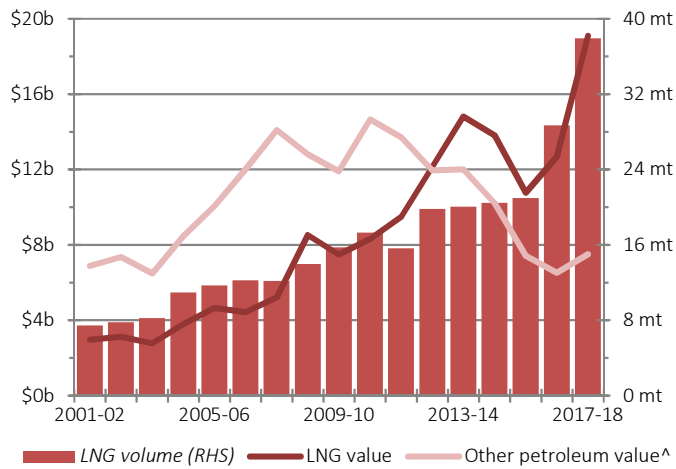


mmBtu = millions of British thermal units bbl = barrel
Source: World Bank

- LNG sales in Asia are made mostly through long-term contracts. According to the International Group of LNG importers, 21 per cent of Asia’s LNG imports in 2017 were through spot and short-term contracts, with the remaining 79 per cent through long-term contracts.
- Most long-term LNG contracts for supply to Asia have prices linked to the oil price, so LNG prices in Asia generally move with the oil price (with a timing lag of a few months).
- This differs from gas prices in the USA, which respond to the regional gas market. In the past, this has led to a large gap between Asian LNG prices and USA gas prices: higher oil prices led to higher LNG prices in Asia, while gas prices fell in the USA as more shale gas supply was brought to market. The large fall in the oil price in late 2014 reduced this gap.
- The average price of Japan’s LNG imports in January 2019 was US\$12.0 per mmBtu, up 28 per cent on January 2018.
- The average price of Japan’s LNG imports in 2018 was US\$10.7 per mmBtu, up 24 per cent on 2017.



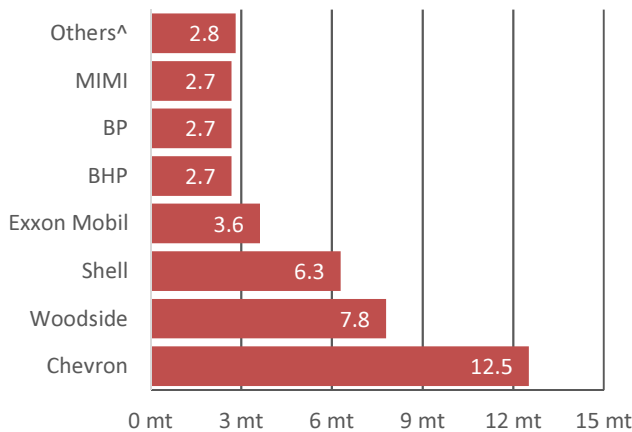
Western Australia's LNG sales (volume and value)



^ Other petroleum sales include Condensate, Crude Oil, LPG and domestic natural gas.
Source: WA Department of Mines, Industry Regulation and Safety.

- The volume of Western Australia's LNG sales rose 32 per cent to 37.9 million tonnes in 2017-18. The increase in volume was mainly due to the ramp-up in production from the Gorgon and Wheatstone LNG projects during the financial year.
- The value of Western Australia's LNG sales rose 50 per cent to \$19.1 billion in 2017-18.
- LNG accounted for 17 per cent of Western Australia's total commodity sales (\$115.0 billion) in 2017-18, up from a share of 12 per cent in 2016-17.
- LNG accounted for 72 per cent of Western Australia's total petroleum sales (\$26.6 billion) in 2017-18, up from a share of 66 per cent in 2016-17.

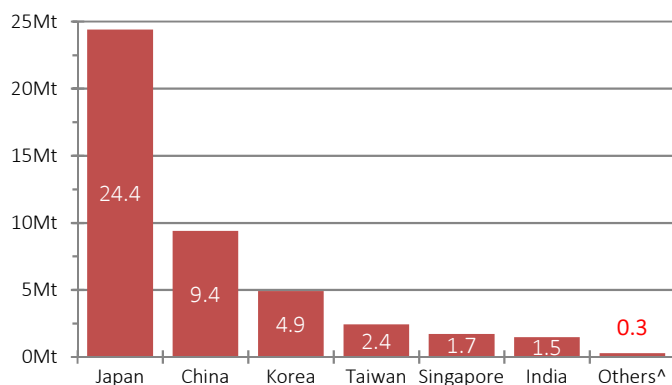
WA's LNG production by company: 12 months to Sep 2018



^ Includes CNOOC, Tokyo Gas, Kansai Electric, Osaka Gas, Jera, Kufpec, PE Wheatstone and Kyushu Electric.
Source: EnergyQuest EnergyQuarterly.

- Chevron accounted for 30 per cent of Western Australia's LNG production in the year to September 2018. Chevron has a one sixth share of the North West Shelf project and is the operator and largest stakeholder in the Gorgon and Wheatstone projects. Chevron's share of Western Australia's LNG production has increased as production from Gorgon and Wheatstone has ramped up.
- Woodside accounted for 19 per cent of Western Australia's LNG production in the year to September 2018. Woodside has a one sixth share of the North West Shelf project and a 90 per cent share of the Pluto project.
- Shell accounted for 15 per cent of Western Australia's LNG production in the year to September 2018. Shell has a one sixth share of the North West Shelf project and a 25 per cent share of the Gorgon project. Shell is also the operator and largest stakeholder of the Prelude floating LNG project and its share of Western Australia's LNG production will increase when this project begins exports.

WA's LNG sales by destination: 12 months to January 2019



^ Others include sales to United Arab Emirate and Pakistan.
Source: EnergyQuest LNG Report

- Japan was Western Australia's first LNG customer in 1989 and it remains the State's largest customer.
- In the twelve months to January 2019, Western Australia exported 44.6 million tonnes of LNG. Of this total:
 - Japan accounted for 55 per cent;
 - China accounted for 21 per cent;
 - South Korea accounted for 11 per cent;
 - Taiwan accounted for 5 per cent;
 - Singapore accounted for 4 per cent;
 - India accounted for 3 per cent.
- Japan is likely to remain Western Australia's largest LNG customer, however new contracts with buyers in China, South Korea and India and growing portfolio sales will diversify the State's LNG markets.



WA LNG PROJECT LIST (including associated infrastructure and developments) – as at 26 February 2019

Project	Stakeholders	Capex (A\$b)	Capacity (mtpa)*	Start-up	Other Project Information
North West Shelf <i>Trains 1-5</i>	Woodside (16.67%) BHP (16.67%) BP (16.67%) Chevron (16.67%) MIMI (16.67%) Shell (16.67%)	34.0	16.9	1989	Trains 1 and 2 began in 1989. Train 3 began in 1992. Train 4 began in 2004. Train 5 began in 2008.
Pluto <i>Train 1</i>	Woodside (90%) Tokyo Gas (5%) Kansai Electric (5%)	15.0	4.9	2012	Pluto exported its first LNG cargo in May 2012. Xena 1 field commenced production in June 2015. Woodside plans to backfill and expand the Pluto LNG facilities with additional gas sourced from the Scarborough fields. Woodside entered FEED for Pluto Train 2 in December 2018. FID is targeted for 2020, and start up 2024.
North Rankin <i>Redevelopment</i>	see North West Shelf	5.0	n/a	2013	North Rankin Platform B will recover about 5 trillion cubic feet of gas from the North Rankin and Perseus fields.
Greater Western Flank (Phase 1) <i>Development</i>	see North West Shelf	2.5	n/a	Dec 2015	Phase 1 will recover 1.1 trillion cubic feet of gas to maintain North West Shelf output, via subsea tie-back to the existing Goodwyn A platform. Target fields in Phase 1 include Goodwyn GH and Tidepole.
Gorgon <i>Trains 1-3</i>	Chevron (47.3%) ExxonMobil (25%) Shell (25%) Osaka Gas (1.25%) Tokyo Gas (1%) JERA (0.417%)	55.0	15.6	Mar 2016	Gorgon exported its first LNG cargo in March 2016. Train 2 began production in October 2016. Train 3 began production in March 2017. Chevron is considering increasing Gorgon capacity by debottlenecking existing trains.
Julimar-Brunello <i>Development</i>	Woodside (65%) KUFPEC (35%)	1.4	n/a	Oct 2016	The Julimar and Brunello fields will feed 2.1 trillion cubic feet of gas to the Wheatstone LNG project. Phase two of the project to tie-back the Julimar field to the existing Brunello subsea infrastructure has progressed FEED activities in 2019, with FID targeted for 2019.
Persephone <i>Development</i>	see North West Shelf	0.9	n/a	Jul 2017	The Persephone Development will maintain Karratha Gas Plant output via subsea tie-back to the existing North Rankin complex.
Wheatstone <i>Train 1 & 2</i>	Chevron (64.14%) KUFPEC (13.4%) Woodside (13%) PE Wheatstone (8%) Kyushu Electric (1.46%)	40.0 [^]	8.9	Oct 2017	Train 1 commenced LNG production in October 2017. Train 2 commenced LNG production in June 2018.
Ichthys <i>Train 1 & 2</i>	Inpex (66.245%) Total (26%) CPC (2.625%) Tokyo Gas (1.575%) Osaka Gas (1.2%) Kansai Electric (1.2%) JERA (0.735%) Toho Gas (0.42%)	27.2 [^]	n/a	Oct 2018	Ichthys exported its first LNG cargo in October 2018. The project has two LNG trains at Darwin with a total capacity of 8.9 mtpa. All LNG production from Ichthys is attributed to the Northern Territory. Western Australia's share of the project's total capital expenditure is around 50 per cent.
Greater Western Flank (Phase 2) <i>Development</i>	see North West Shelf	2.8	n/a	Oct 2018	Phase 2 will recover 1.6 trillion cubic feet of gas to maintain North West Shelf output, via subsea tie-back to the Goodwyn A platform. Target fields in Phase 2 include Dockrell, Kreast, Lady Nora, Pemberton and Sculptor-Rankin.
Prelude <i>FLNG vessel</i>	Shell (67.5%) Inpex (17.5%) KOGAS (10%) CPC (5%)	18.0 [^]	3.6	Mar quarter 2019	The floating LNG vessel started production in late December 2018, with exports scheduled to begin in the first quarter of 2019. In addition to LNG, Prelude will produce 1.3 mtpa of condensate and 0.4 mtpa of LPG. The vessel will operate at the Prelude gas field for 25 years.
Gorgon Stage 2	see Gorgon	5.1	n/a	2022	In April 2018, Chevron announced investment in the second stage of the Gorgon project, which will help maintain supply to the project for the next 30 years. Drilling is expected to start in 2019.

Capex = capital expenditure; mtpa = million tonnes per annum (export capacity addition); FEED = front-end engineering and design; FID = final investment decision; FLNG = Floating LNG; n/a = not applicable.

Notes: * Capacity refers to the production capacity of LNG facilities in Western Australia.

[^] JTSI estimate of capital expenditure in Australian dollar terms, taking into account the profile of capital expenditure and movements in the exchange rate across the construction period. For Ichthys, the estimate is the capital expenditure in Western Australia.

Sources: Deloitte Access Economics 'Investment Monitor', EnergyQuest 'Energy Quarterly', project proponent websites, reports, presentations and media.



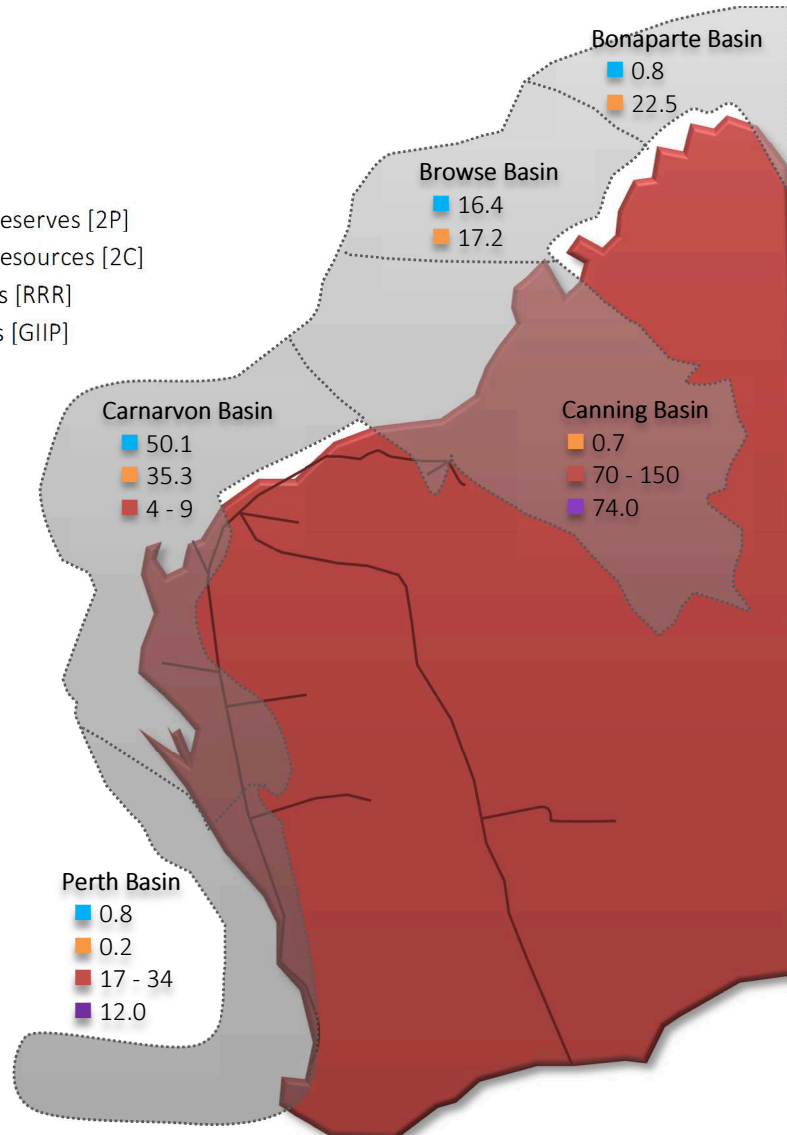
Western Australia's natural gas reserves and resources

- Western Australia's current and committed LNG projects source gas from offshore in the Carnarvon and Browse basins.
- The State's domestic gas needs are supplied through production facilities located in the Carnarvon and Perth basins.
- The State also has onshore shale and tight gas resources in the Canning, Carnarvon and Perth basins.

Map of WA's gas reserves and resources (trillion cubic feet) – as at September 2018

LEGEND

- Gas pipeline
- ⋯ Gas basin
- Conventional gas reserves [2P]
- Conventional gas resources [2C]
- Shale gas resources [RRR]
- Tight gas resources [GIIP]



Reserves are categorised by probability or likelihood of recovery
2P = reserves that are proved (90%) + probable (50%).

Contingent resources are known and recoverable, however are considered sub-economic at this point in time
2C = contingent resources.

Resources can be assessed against the geologic and technical likelihood of success plus the amount that is technically able to be produced now
RRR = DMIRS's current, best estimates of risked, recoverable resources.

GIIP = Gas-initially-in-place, referring to the estimated total amount of gas contained within the basin, including volumes that are deemed sub-economic, and which may never be recovered

Reserves and resources for the Bonaparte Basin show the net entitlement to Australia.

Note – map is indicative only. For more information on reserves and resources classification, see the Society of Petroleum Engineers' *Petroleum Resources Management System*.

Sources: EnergyQuest EnergyQuarterly; and WA Department of Mines, Industry Regulation and Safety.