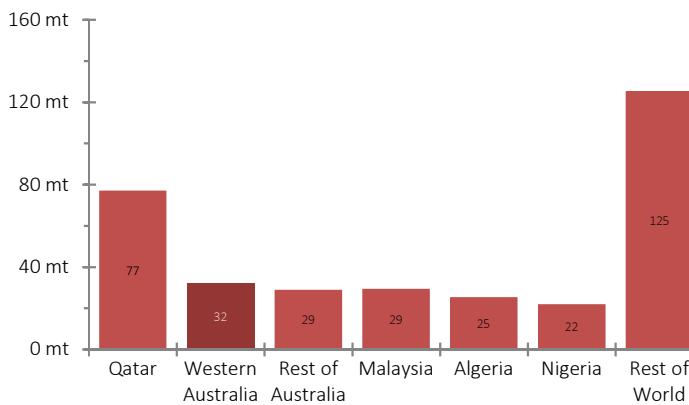




- Western Australia has an established and reliable liquefied natural gas (LNG) export industry, with the State’s first LNG project – the North West Shelf – celebrating 25 years of LNG exports in 2014.
- Western Australian LNG projects are located close to Asia, the region with the largest consumption 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. 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 three operating LNG export projects: the North West Shelf, Pluto and Gorgon. By 2018, the State will have five operating LNG export projects with a total capacity of close to 50 million tonnes per annum (mtpa).
- Perth hosted the 18<sup>th</sup> International Conference and Exhibition on LNG (LNG18) in April 2016.

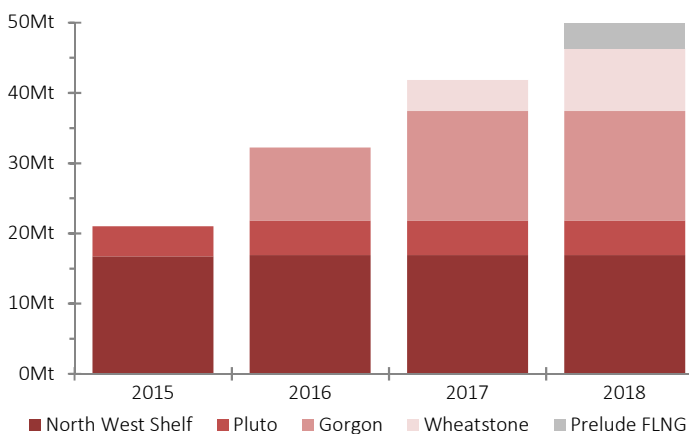
**Global LNG export capacity: 2016**



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

- The International Group of LNG Importers estimates that at the end of 2016, global LNG export capacity was 340 mtpa.
- Australia’s capacity at the end of 2016 was 61.1 mtpa, which included the:
  - North West Shelf, Pluto and Gorgon (LNG trains 1 and 2) projects in Western Australia (totalling 32 mtpa);
  - Darwin project in the Northern Territory (3.7 mtpa); and
  - Queensland Curtis, Gladstone and Australia Pacific projects in Queensland (25.4 mtpa).
- If all projects currently under construction (Wheatstone, and Prelude in Western Australia and Ichthys in the Northern Territory) proceed as scheduled, Australia’s total capacity will be 88 mtpa by 2018. Australia will then have the largest LNG export capacity of any country, surpassing Qatar’s 77 mtpa.

**Western Australia’s LNG export capacity**



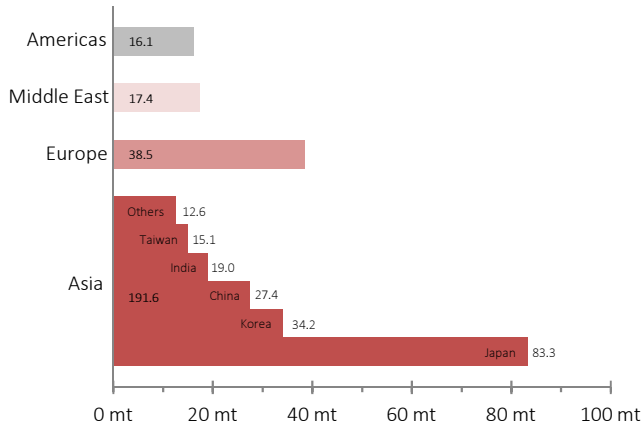
Note – Additions to LNG export capacity reflect the start-up of LNG trains during a particular year; however not all the export capacity of a new LNG train may be available in the same year.

Source: WA DJTSI estimates based on public company announcements.

- Western Australia’s North West Shelf’s foundation project had two trains and began exporting LNG in 1989. A third train was added in 1992, a fourth in 2004 and a fifth in 2008. The total capacity of these five trains is now 16.9 mtpa.
- The Pluto project began exporting LNG in May 2012. The project operates a single LNG train with 4.9 mtpa capacity.
- The Gorgon project began exports from its first LNG train in March 2016 and production from its second and third LNG trains in October 2016 and March 2017, respectively. The project has a total capacity of 15.6 mtpa.
- The two remaining Western Australian LNG projects under construction are:
  - Wheatstone, 8.9 mtpa capacity, two trains; and
  - Prelude, 3.6 mtpa capacity, one train on a floating vessel.
- By 2018, when construction of these projects is scheduled to be complete, the State’s total LNG export capacity will be 49.9 mtpa.



Regional LNG imports: 2016



Source: International Group of LNG Importers (GIIGNL).

- In 2016, global LNG trade was 263.6 million tonnes, with the five largest importers – Japan, South Korea, China, India and Taiwan – located in Asia.
- Asia accounted for 73 per cent of global LNG imports in 2016:
  - Japan and South Korea together accounted for 45 per cent of LNG imports in 2016.
  - China and India together accounted for 18 per cent of LNG imports in 2016, with this proportion expected to grow as both countries increase their gas demand.
- Europe (15 per cent), the Middle East (7 per cent) and the Americas (6 per cent) made up the balance of LNG imports.
- LNG demand in Europe in particular can be volatile depending on the price, availability of competing energy sources and weather conditions.

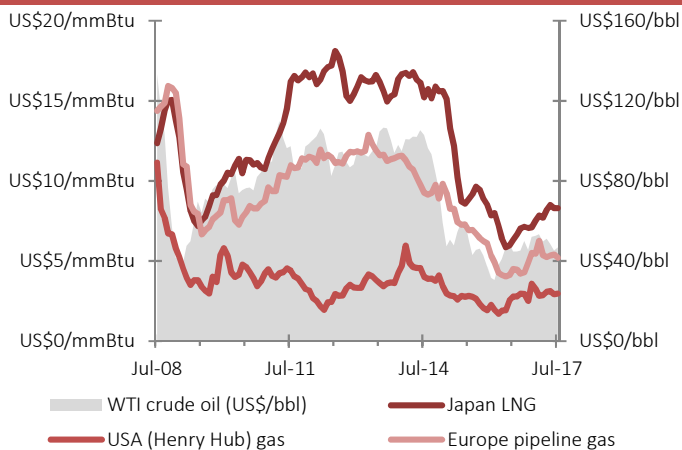
LNG transport: international shipping duration (days)

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: Shipperscene; 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 to Japan is 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 will still take more than twice the time of shipping from Western Australia.
- In January 2017, Evol LNG conducted Australia’s first commercial LNG bunkering operation, refuelling a Woodside supply vessel at King Bay Supply Base near Dampier. Woodside has announced plans to supply LNG as a shipping fuel for iron ore and other bulk cargoes to China.

Regional LNG/pipeline gas prices

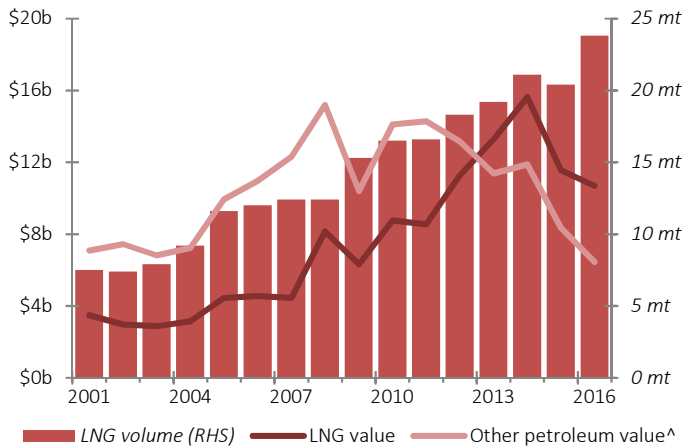


mmBtu = millions of British thermal units  
Source: World Bank.

- LNG sales in Asia are generally based on long-term contracts with prices linked to the price of Japanese oil imports.
- 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 recent years, this led to a large gap between the Japanese LNG import price and the Henry Hub gas price in the USA: higher oil prices led to higher LNG prices in Japan, while gas prices were falling in the USA as additional supply from shale gas was brought to market. The large fall in the oil price in late 2014 reduced the size of this gap.
- The average price of LNG to Japan in July 2017 was US\$8.3 per mmBtu, up 31 per cent on July 2016.
- The average price of LNG to Japan in 2016-17 was US\$7.5 per mmBtu, down 6 per cent on 2015-16.



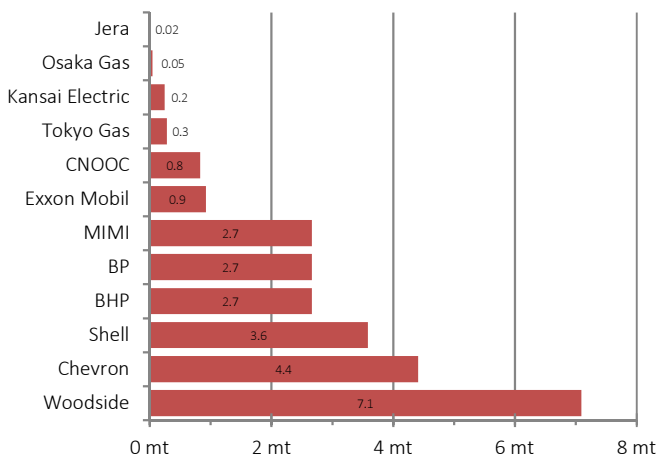
Western Australia's LNG sales (volume and value)



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 17 per cent to 23.8 million tonnes in 2016.
- The value of Western Australia's LNG sales fell 8 per cent to \$10.7 billion in 2016.
- The fall in the value was mainly due to the lower oil price, as most sales from Western Australia's LNG projects are determined by long-term contracts with prices linked to the oil price. According to the International Group of LNG Importers, 23 per cent of Australia's LNG exports in 2016 were through spot and short-term trade (contract duration of four years or less) with the remaining 77 per cent through long-term contracts.
- LNG accounted for 11 per cent of Western Australia's total commodity sales (\$93.3 billion) in 2016, down from a peak of 14 per cent in 2014.

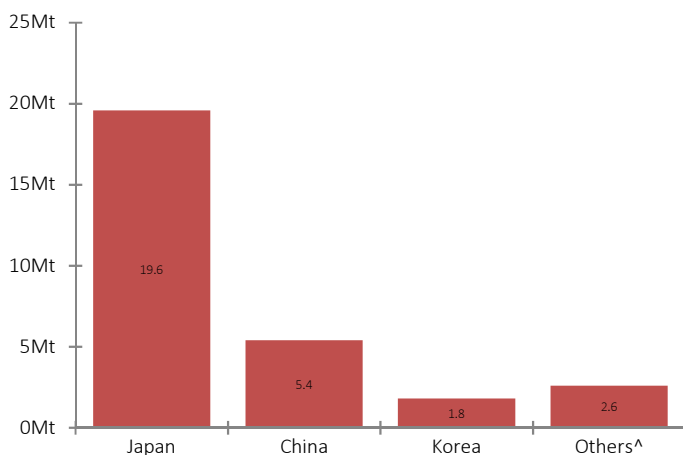
WA's LNG production by company: 12 months to March 2017



Source: EnergyQuest EnergyQuarterly.

- Woodside accounted for 28 per cent of Western Australia's LNG production in the twelve months to March 2017. Woodside has a one sixth share of the North West Shelf project and a 90 per cent share of the Pluto project.
- Chevron accounted for 17 per cent of Western Australia's LNG production in the twelve months to March 2017. Chevron is the operator and largest stakeholder in the Gorgon and Wheatstone projects and its share of Western Australia's LNG production will increase as these projects ramp-up production.
- As the global LNG market moves towards over-supply and more buyers in new markets emerge, LNG producers are shifting towards a 'portfolio' sales strategy in which companies sell their equity share of a project's production. Aggregating sales volumes from different LNG projects allows sellers to maximise spot and short-term market opportunities.

WA's LNG sales by destination: 12 months to July 2017



Others may include sales to: India, Taiwan, Thailand, Singapore, Kuwait, Malaysia and United Arab Emirates.  
Source: EnergyQuest LNG Report.

- In the twelve months to July 2017, Western Australia exported 29.4 million tonnes of LNG. Of Western Australia's total LNG sales in this period:
  - Japan accounted for 67 per cent;
  - China accounted for 18 per cent; and
  - South Korea accounted for 6 per cent.
- Japan was Western Australia's first LNG customer in 1989 and it remains the State's largest customer.
- Western Australia became the first exporter of LNG to China in 2006 through the North West Shelf's contract with Guangdong Dapeng LNG.
- Japan is expected to remain Western Australia's largest LNG customer, however new long-term contracts with buyers in China, South Korea and India and the growth of portfolio selling will make the distribution of the State's LNG exports more diverse.



WA LNG PROJECT LIST (including associated infrastructure) – as at 31 August 2017

Project	Stakeholders	Capex (A\$b)	Capacity (mtpa)	Start-up	Other Project Information
<b>North West Shelf</b> <i>Trains 1-5</i>	Woodside (16.67%) BHP (16.67%) BP (16.67%) Chevron (16.67%) MIMI (16.67%) Shell (16.67%)	27.0	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.
<b>Pluto</b> <i>Train 1</i>	Woodside (90%) Tokyo Gas (5%) Kansai Electric (5%)	15.0	4.9	2012	Xena 1 field commenced production in June 2015. Woodside is considering a mid-scale expansion of the Pluto LNG plant by either debottlenecking the existing plant or constructing a smaller LNG train.
<b>North Rankin</b> <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.
<b>Greater Western Flank (Phase 1)</b> <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.
<b>Gorgon</b> <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.
<b>Julimar-Brunello</b> <i>Development</i>	Woodside (65%) KUFPEC (35%)	1.4	n/a	Oct 2016	Woodside announced in October 2016 that it had completed construction and commissioning work. Commercial operation will commence once Wheatstone construction is complete. The Julimar and Brunello fields will feed 2.1 trillion cubic feet of gas to the Wheatstone LNG project.
<b>Wheatstone</b> <i>Train 1 &amp; 2</i>	Chevron (64.14%) KUFPEC (13.4%) Woodside (13%) PE Wheatstone (8%) Kyushu Electric (1.46%)	40.0 <sup>^</sup>	8.9	Sep 2017	Chevron expects first LNG export from Train 1 to occur in mid-2017, with first LNG from Train 2 following six to eight months later. Activities supporting the delivery of first LNG continue offshore and at the LNG plant site.
<b>Persephone</b> <i>Development</i>	see North West Shelf	1.2	n/a	Sep 2017	FID made in November 2014. The Persephone Development will maintain Karratha Gas Plant output via subsea tie-back to the existing North Rankin complex.
<b>Ichthys</b> <i>Train 1 &amp; 2</i>	Inpex (62.245%) Total (30%) CPC (2.625%) Tokyo Gas (1.575%) Osaka Gas (1.2%) Kansai Electric (1.2%) JERA (0.735%) Toho Gas (0.42%)	19.0 <sup>1</sup>	n/a <sup>2</sup>	Mar 2018	Inpex announced in April 2017 that first LNG production has been delayed from the third quarter of 2017 to the first quarter of 2018. <sup>1</sup> Western Australia has an estimated 50 per cent share of the project's total capital expenditure of A\$38.0 billion. <sup>2</sup> The project will have a capacity of 8.9 mtpa, all of which is attributed to the Northern Territory.
<b>Prelude</b> <i>FLNG vessel</i>	Shell (67.5%) Inpex (17.5%) KOGAS (10%) CPC (5%)	12.6	3.6	Apr - Aug 2018	The floating LNG vessel arrived at the Prelude gas field in the Browse Basin in July 2017. Start-up is expected between April and August 2018. 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.
<b>Greater Western Flank (Phase 2)</b> <i>Development</i>	see North West Shelf	2.8	n/a	Dec 2019	FEED commenced in December 2014 with FID made in December 2015. Phase 2 will recover 1.7 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 2 include Dockrell, Kreast, Lady Nora, Pemberton and Sculptor-Rankin.

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

Note: <sup>^</sup> DSD estimate of Wheatstone capital expenditure in Australian dollar terms, taking into account the profile of capital expenditure and movements in the exchange rate across the construction period.

Sources: Deloitte Access Economics 'Investment Monitor', EnergyQuest 'Energy Quarterly', WA Chamber of Commerce and Industry 'Resources and Energy Projects Service', project proponent websites, reports, presentations and media.



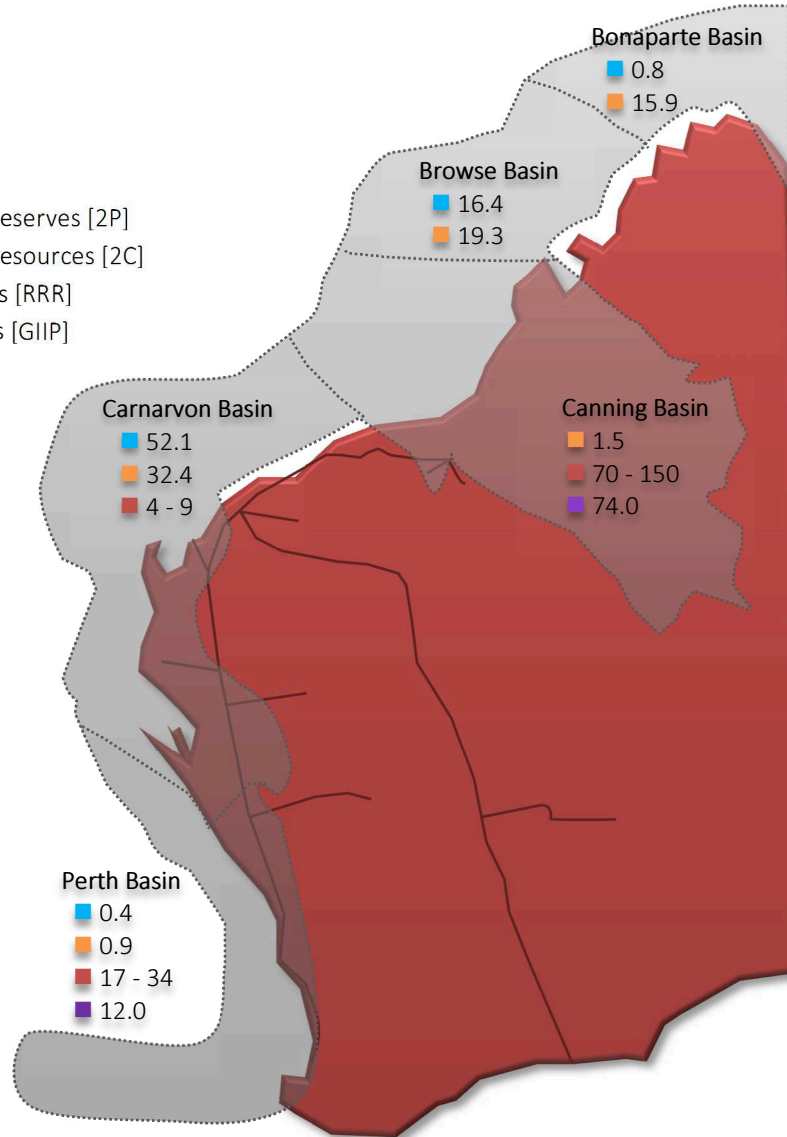
Western Australia's natural gas reserves and resources

- 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. While onshore drilling and exploration is occurring, it is in its early stages.

Map of WA's gas reserves and resources (trillion cubic feet) – as at May 2017

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 = DMP'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.