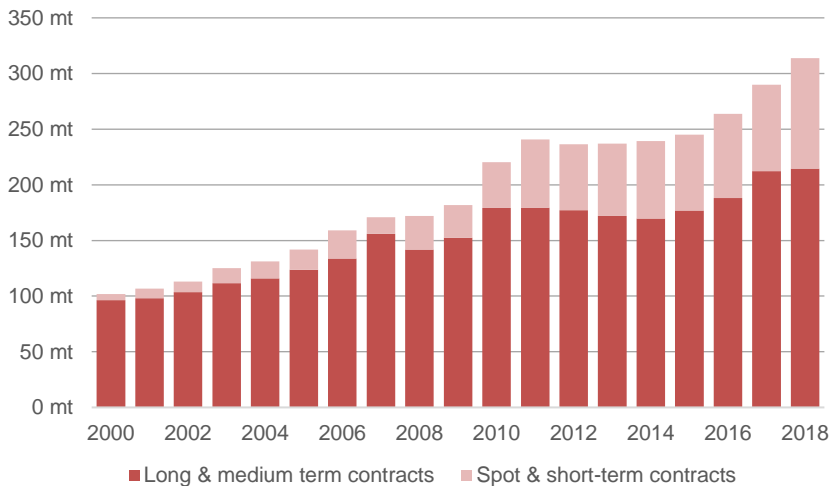




THE GLOBAL LIQUEFIED NATURAL GAS (LNG) MARKET

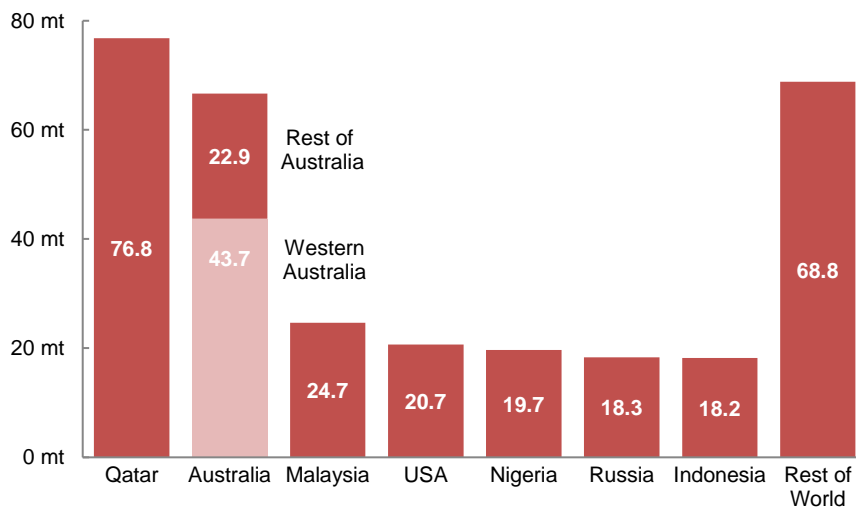
Global LNG trade



Source: International Group of LNG importers (GIIGNL)

- Global LNG trade in 2018 was 313.8 million tonnes, an 8.3 per cent (or 24 million tonne) increase from 2017.
- Since 2000, global LNG trade has grown at an average annual rate of 6.5 per cent.
- Most LNG trade is made through long and medium-term contracts (contracts with a duration of longer than four years). In 2018, long and medium-term contracts accounted for 68 per cent (214.5 million tonnes) of global LNG trade.
- The share of LNG trade made through spot and short-term contracts is growing, accounting for 32 per cent (99.8 million tonnes) of total LNG trade in 2018, the highest share on record.

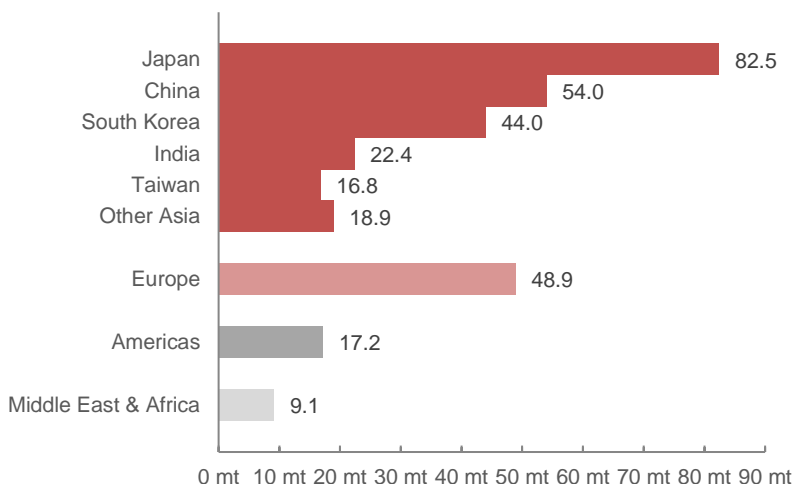
LNG exports: 2018



Source: International Group of LNG Importers (GIIGNL); WA Department of Jobs, Tourism, Science and Innovation (JTISI) estimates.

- Australia was the second largest LNG exporter in 2018, accounting for 21 per cent of global exports. Western Australia by itself accounted for 14 per cent of global exports and 66 per cent of Australia's exports in 2018.
- Qatar was the largest LNG exporter in 2018, accounting for 24 per cent of global exports. Qatar has been the world's largest LNG exporter since 2006.
- Malaysia was the third largest LNG exporter in 2018, accounting for 8 per cent of global exports.
- The USA accounted for 7 per cent of global LNG exports in 2018. The USA's share of global LNG exports will increase over the next few years as new projects become operational.

LNG imports: 2018



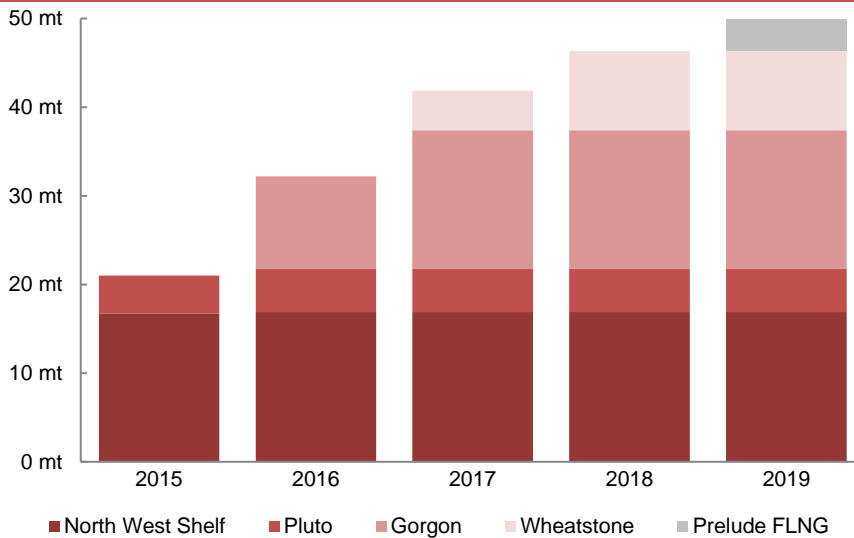
Source: International Group of LNG Importers (GIIGNL).

- Asia accounted for 76 per cent (238.6 million tonnes) of global LNG imports in 2018. The five largest LNG importers in 2018 – Japan, China, South Korea, India and Taiwan – are all in Asia.
- Europe (16 per cent), the Americas (5 per cent) and the Middle East and Africa (3 per cent) made up the balance of global LNG imports in 2018.
- Japan was the largest LNG importer in 2018 at 82.5 million tonnes. Japan's LNG imports peaked in 2014 at 89.2 million tonnes.
- China was the second largest LNG importer in 2018 at 54.0 million tonnes. China's LNG imports grew by 38 per cent in 2018.



WESTERN AUSTRALIA'S COMPETITIVENESS

Western Australia's LNG export capacity



Note – Additions to LNG export capacity reflect the start-up of LNG trains during a particular year.
Source: JTSI estimates based on public company announcements.

- Western Australia has an established and reliable LNG export industry. The State's first LNG project, the North West Shelf, marked 30 years of LNG exports in 2019.
- High gas prices in the 2000s prompted major investment in Western Australia's LNG industry. Western Australia currently has five operating LNG export projects: the North West Shelf, Pluto, Gorgon, Wheatstone and Prelude. The State's total LNG export capacity is 50 million tonnes a year.
- Western Australia's LNG projects are underpinned by large gas reserves, which provide LNG buyers with security of supply. Additional gas reserves in the Canarvon and Browse Basins are available to increase production in the future.

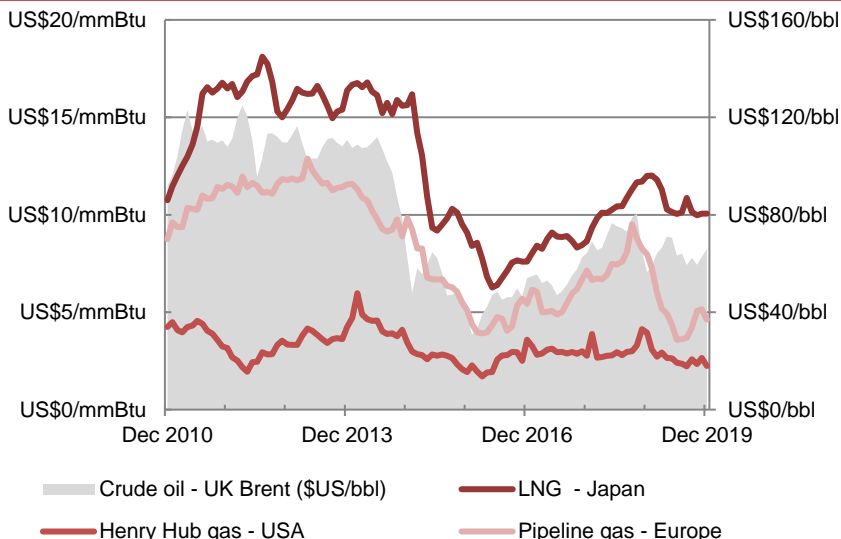
LNG transport: shipping duration (days)

From:	To: Japan (Tokyo)	China (Shanghai)	Korea (Incheon)	Taiwan (Yung-an)	India (Gujarat)
Western Australia	8	7	8	6	9
Queensland	8	9	9	8	14
Qatar	14	12	13	11	2
USA (Gulf coast)	20	22	21	22	21
SE 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: Shippscene; International Group of LNG Importers (GIIGNL).

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

LNG/pipeline gas prices



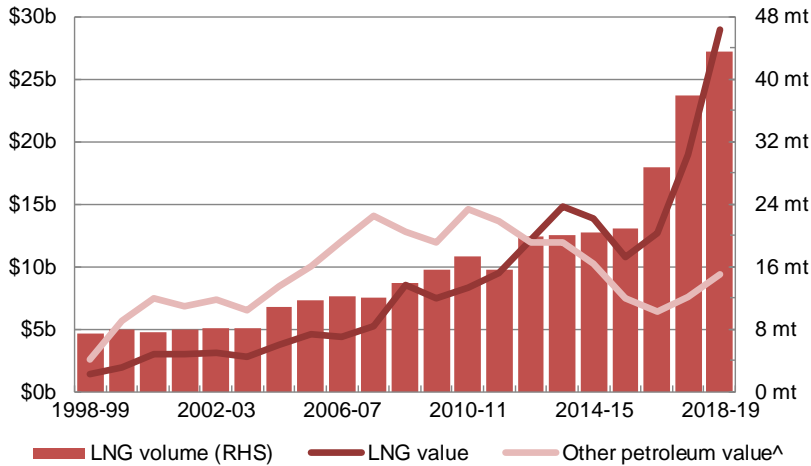
mmBtu = millions of British thermal units bbl = barrel
Source: World Bank

- Western Australia's LNG projects have low operating costs, giving them the capacity to maintain continuity of supply as prices vary.
- 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, and Europe which respond to the regional gas market.
- The average price of Japan's LNG imports in November 2019 was US\$10.1 per mmBtu, down 14 per cent on December 2018.
- The average price of Japan's LNG imports in 2018-19 was US\$11.1 per mmBtu, up 19 per cent on 2017-18.



WESTERN AUSTRALIA'S SUPPLY

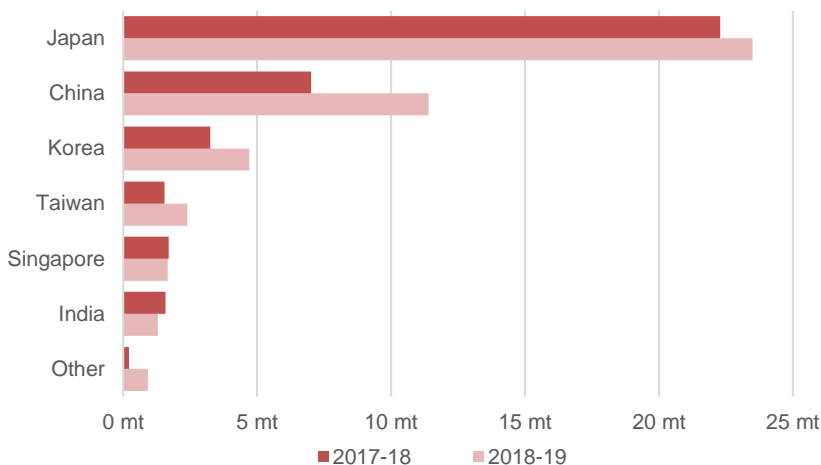
Western Australia's LNG sales



- The volume of Western Australia's LNG sales rose 15 per cent to 43.6 million tonnes in 2018-19.
- The value of Western Australia's LNG sales rose 53 per cent to \$29.0 billion in 2018-19.
- In 2018-19, LNG accounted for 20 per cent of the State's total minerals and petroleum sales (\$145.4 billion).
- Western Australia's LNG projects also produce condensate, liquefied petroleum gas (LPG) and natural gas for Western Australia's domestic market.
- The *WA Domestic Gas Policy* requires LNG exporters to make gas available to Western Australian consumers equivalent to 15 per cent of their LNG exports. In 2018-19, LNG exporters supplied over half Western Australia's domestic gas needs.

^ Other petroleum sales include condensate, crude oil, LPG and domestic natural gas.
Source: WA Department of Mines, Industry Regulation and Safety.

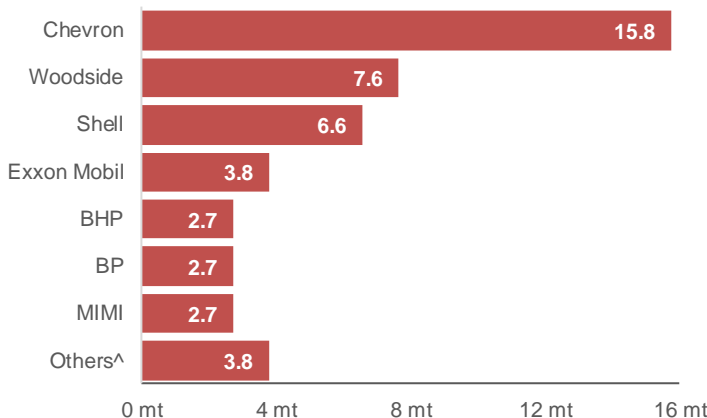
WA's LNG sales by destination



- Japan was Western Australia's first LNG customer in 1989 and remains the State's largest customer. Western Australia accounted for 30 per cent of Japan's LNG imports in 2018.
- 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 Australia accounted for 17 per cent of China's LNG imports in 2018.
- Of Western Australia's total LNG exports in 2018-19:
 - Japan accounted for 51 per cent
 - China accounted for 25 per cent
 - South Korea accounted for 10 per cent
 - Taiwan accounted for 5 per cent
 - Singapore accounted for 4 per cent
 - India accounted for 3 per cent.

^ Others include sales to Thailand, United Arab Emirates, Pakistan and Rest of Australia.
Source: EnergyQuest LNG Report

WA's LNG production by company: 2018-19



- In 2018-19, Chevron (34 per cent), Woodside (17 per cent) and Shell (14 per cent) accounted for the largest shares of Western Australia's LNG production by company.
- 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.
- Woodside has a one sixth share of the North West Shelf project and a 90 per cent share of the Pluto project and is the operator of these projects.
- Shell has a one sixth share of the North West Shelf project, a 25 per cent share of the Gorgon project and is the operator and largest stakeholder of the Prelude floating LNG project.

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



WA LNG PROJECT LIST (including associated infrastructure and developments) – as at December 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 recovers 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 recovers 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 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 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.
Persephone <i>Development</i>	see North West Shelf	1.1	n/a	Jul 2017	The Persephone Development maintains 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. Chevron is increasing Wheatstone capacity by debottlenecking existing trains.
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	The Ichthys gas field is located in the Browse Basin, offshore Western Australia. 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, although condensate is exported from a floating production, storage and offloading facility located offshore Western Australia. 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 recovers 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%)	19.6 [^]	3.6	Jun 2019	The floating LNG vessel exported its first LNG cargo in June 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 gas supply to the project for the next 30 years. Drilling started in May 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.



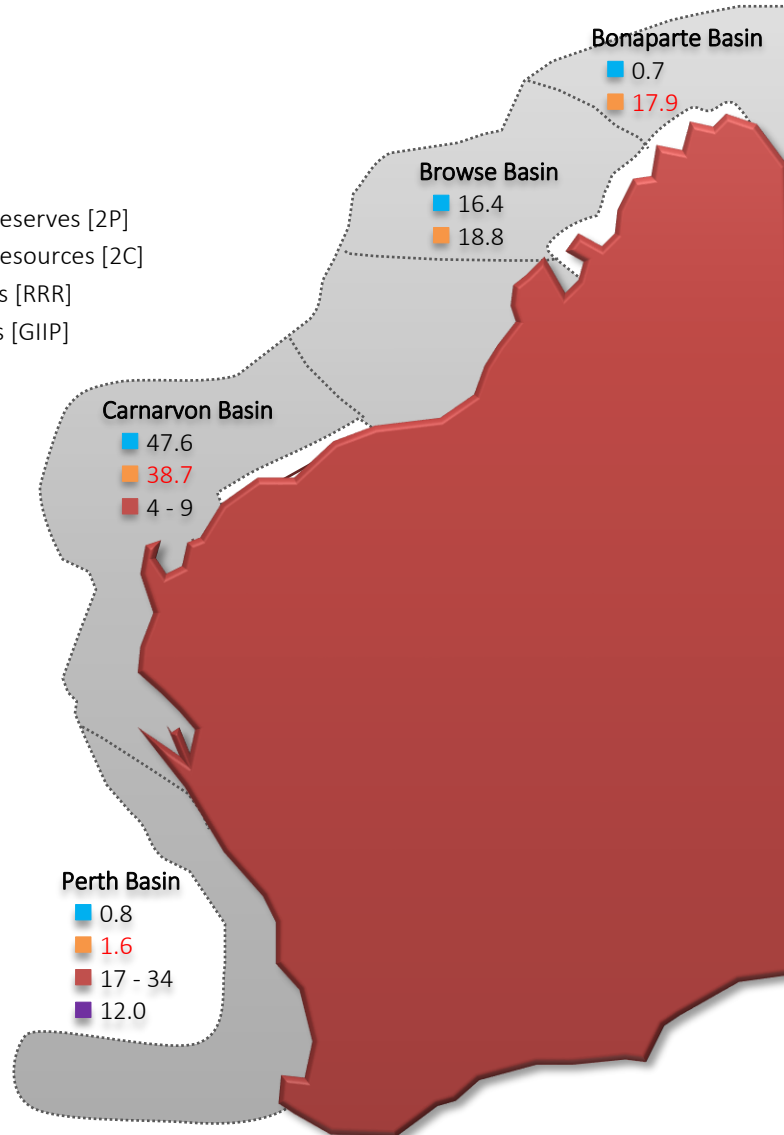
Western Australia's natural gas reserves and resources

- Western Australia's 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 December 2019

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*. For more details on infrastructure including gas pipelines and processing plants, see <https://www.itsi.wa.gov.au/docs/default-source/default-document-library/wa-major-resource-projects-map-2018.pdf>

Sources: EnergyQuest *EnergyQuarterly* (conventional gas reserves and resources); and WA Department of Mines, Industry Regulation and Safety (shale and tight gas resources).