

Volatile gas

Economics and gas in Western Australia

Already exposed to resource price volatility, WA will now allow fracking for unconventional gas. Despite recent increases in gas production, domestic prices are forecast to increase and gas still accounts for just 2% of state revenues and at best 1% of employment.

Report supported by Lock the Gate

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Summary

Western Australia's economy is heavily impacted by the resource sector. 22% of gross state production comes from resources, making it heavily exposed to the booms and busts of global resource markets.

The established gas industry in Western Australia comprises large-scale offshore gas fields focussed on export markets and a number of smaller onshore gas producers supplying domestic users.

Resource royalties and taxes for petroleum (oil and gas) generated \$576 million in revenue, or about 2% of total revenues, for the Western Australian government in 2016-17.

The domestic gas reservation policy (DGR policy) ensures that major gas exporters supply 15% of the gas they produce to the domestic market, currently around 4 TJ per day, with new reserve gas coming to the domestic market this year.

The DGR policy has insulated local gas users from global prices. Prices have fallen in recent years, with Western Australia's domestic gas now 31% cheaper than Australia's East Coast where no such policy exists. However, Australia's Energy Market Operator forecasts increasing prices and new supply. If new supply is high-cost unconventional gas it may set prices and see substantial price increases.

Major domestic gas users in Western Australia are grid-connected electricity generation (25%), mining (24%), mineral processing (28%—predominantly alumina), and industrial use (18%). Other businesses use just 4% and households just 2%.

The petroleum (oil and gas) industry is one of the smallest employers in Western Australia's resources sector with all gas related industries employing just over 11,400 people in 2016, just 1 percent of the state's employment.

Compared to the established offshore gas industry, onshore unconventional gas (in coal seams or shale formations) will be high cost. This means that royalties which apply to value-added prices will bring less revenue than existing low-cost offshore gas.

Most resource rich regions are diversifying their economies rather than investing in new high cost projects in established energy sectors. Including more gas in the economic mix simply ties Western Australia's economic fortunes more closely to global commodity cycles.

Introduction

Western Australia is a resource rich region with an outsized mining and resource sector comprising 22% of state production on average over the past decade.¹ This is far higher than Queensland, which generates 9% of gross state product from mining. Australia as a whole has only 7% of Gross Domestic Product (GDP) from natural resources, and even resource-rich Norway, for example, generates just 9% of GDP from their resources sector.²

Recent exploration activity has shown that unconventional onshore gas, in coal seams and shale formations, is likely to be widespread in Western Australia, particularly in the Perth and Canning Basins.

In September 2017 a state-wide moratorium on hydraulic fracture stimulation (fracking) for onshore unconventional gas was imposed and a scientific inquiry into fracking was established.³ Concerns about risks to the environment, health, agriculture and heritage motivated this policy. Because of this, no projects tapping these unconventional gas reserves exist, but many are likely to be proposed if the policy is changed and if global gas prices increase in coming years. The results of this inquiry led to the state's moratorium on fracking being lifted in November 2018.⁴

Because extracting depletable natural resources is a one-shot exercise, questions about the economic value that the community can derive from them are crucial. This report provides background on the WA gas industry, to assist stakeholders in understanding the impacts of future development of unconventional in WA.

In the Western Australian context, questions about the economic value of resource development must also consider the macroeconomic implications of further

¹ ABS. (2017). *5220.0 - Australian National Accounts: State Accounts, 2016-17*. Australian Bureau of Statistics. Table 6. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5220.02016-17?OpenDocument>

² World Bank. (2018). *Total natural resource rents (% of GDP)*. World Bank Open Data. <https://data.worldbank.org/indicator/NY.GDP.TOTL.RT.ZS?locations=EC-AU-NOT>
World Bank staff estimates based on sources and methods described in "The Changing Wealth of Nations 2018: Building a Sustainable Future".

³ Government of Western Australia. (2017). *Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia 2017*. <https://frackinginquiry.wa.gov.au>

⁴ Newell (2018) Mark McGowan lifts moratorium on WA fracking, <https://thewest.com.au/business/energy/mark-mcgowan-lifts-moratorium-on-wa-fracking-ng-b881033600z>

concentrating the productive base in the resource and energy sectors. Because of the risks and economic fluctuations that come from high resource dependency in an economy, the World Bank has recently been helping many resource-rich nations to foster more diversity in their economic capacity.⁵

WA Treasury is aware of the risks and volatility that an outsized resource sector presents to its wider economy and community. In a recent submission to the Productivity Commission, Treasury wrote:

States with large mining activities may need to use the rents [of the mining sector] to offset the risks for the community associated with regional and State-wide economic volatility that is consequent upon the dependence on mining, including the finiteness of resources.⁶

If Western Australia was a country, World Bank advice would be to diversify rather than double-down on resources. Despite acknowledging the same problems, Australian Treasuries seem reluctant to give the same advice.

LOCATION

The domestic gas industry in WA began in the early 1970s with the establishment of the Dongara production facility, approximately 320kms north of Perth, and the Parmelia pipeline to Perth (location shown in Figure 1).⁷ Since that time, additional gas projects in the Perth Basin were developed to supply gas for commercial, industrial and residential users in the south-west, such as Xyris and Red Gully. In recent years many of these established projects have reached the end of their life, while further discoveries have seen some new reserves begin development in the region.⁸

In terms of total production capacity, Western Australia's gas industry is now dominated by offshore export-focussed facilities in the North West Shelf (NWS) located off the coast near Karratha in the state's north-west (see Figure 1, Inset A). As well as producing liquified natural gas (LNG) shipped to export markets, these gas

⁵ Fruman, C. (2017). *Economic diversification: A priority for action, now more than ever*. World Bank. Private Sector Development Blog. <http://blogs.worldbank.org/psd/economic-diversification-priority-action-now-more-ever>

⁶ Government of Western Australia. (2017) *Western Australia's Submission to the Productivity Commission's Inquiry into Horizontal Fiscal Equalisation*. P41. http://www.pc.gov.au/__data/assets/pdf_file/0008/218564/sub015-horizontal-fiscal-equalisation.pdf

⁷ Mitsui. (2018). *History of oil and gas in the Perth Basin*. Mitsui E&P. <https://mitsuiepmidwest.com.au/who-we-are/history-oil-gas-perth-basin/>

⁸ Diss, K. (2016). *AWE approves Perth basin gas field development*. ABC News. 5 Jan 2016. <http://www.abc.net.au/news/2016-01-05/awe-approves-perth-basin-gas-field/7068546>

facilities provide domestic gas due to legislated requirements for gas exporters to also supply domestic gas markets, known as the domestic gas reservation (DGR) policy.⁹

The offshore gas industry began in the 1980s with the development of the North West Shelf joint venture project.¹⁰ Domestic gas from this project was secured by long-term contracts with the State Energy Commission of Western Australia (SECWA), the government entity responsible for gas and electricity supply. The cost to WA taxpayers of this assistance to the gas industry was substantial, as WA Treasury has noted:

In 2010 net present value terms, the cost of Western Australia's assistance to the North West Shelf project (e.g. payment of subsidies to the State's power utility to help cover the losses it initially incurred under crucial 'take or pay' gas contracts) is estimated to be around \$8 billion.¹¹

Gas from the NWS is transported to domestic users in and around Perth through the Dampier-Bunbury pipeline, which was funded by SECWA and first operated in 1985. In addition, gas from the NWS is transmitted to inland mineral miners for local power generation through the Goldfields Gas Pipeline that was opened in 1996. This 1,378km pipeline connects NWS gas production and nearby production from Varanus Island (which supplies domestic gas exclusively)¹² to the Kalgoorlie to Kambalda Pipeline. Along the way it delivers gas for electricity generation at a number of mines, such as the Mount Keith Nickel Mine and BHP's Pilbara iron ore mines that use electricity from the Newman Power Station.¹³

⁹ Domgas Alliance. (2013). *WA Domestic Gas Market Outlook: 2013 – 2020*. February 2013. http://www.domgas.com.au/pdf/Alliance_reports/WA%20DOMESTIC%20GAS%20MARKET%20OUTLOOK-FINAL-Feb%202013.pdf

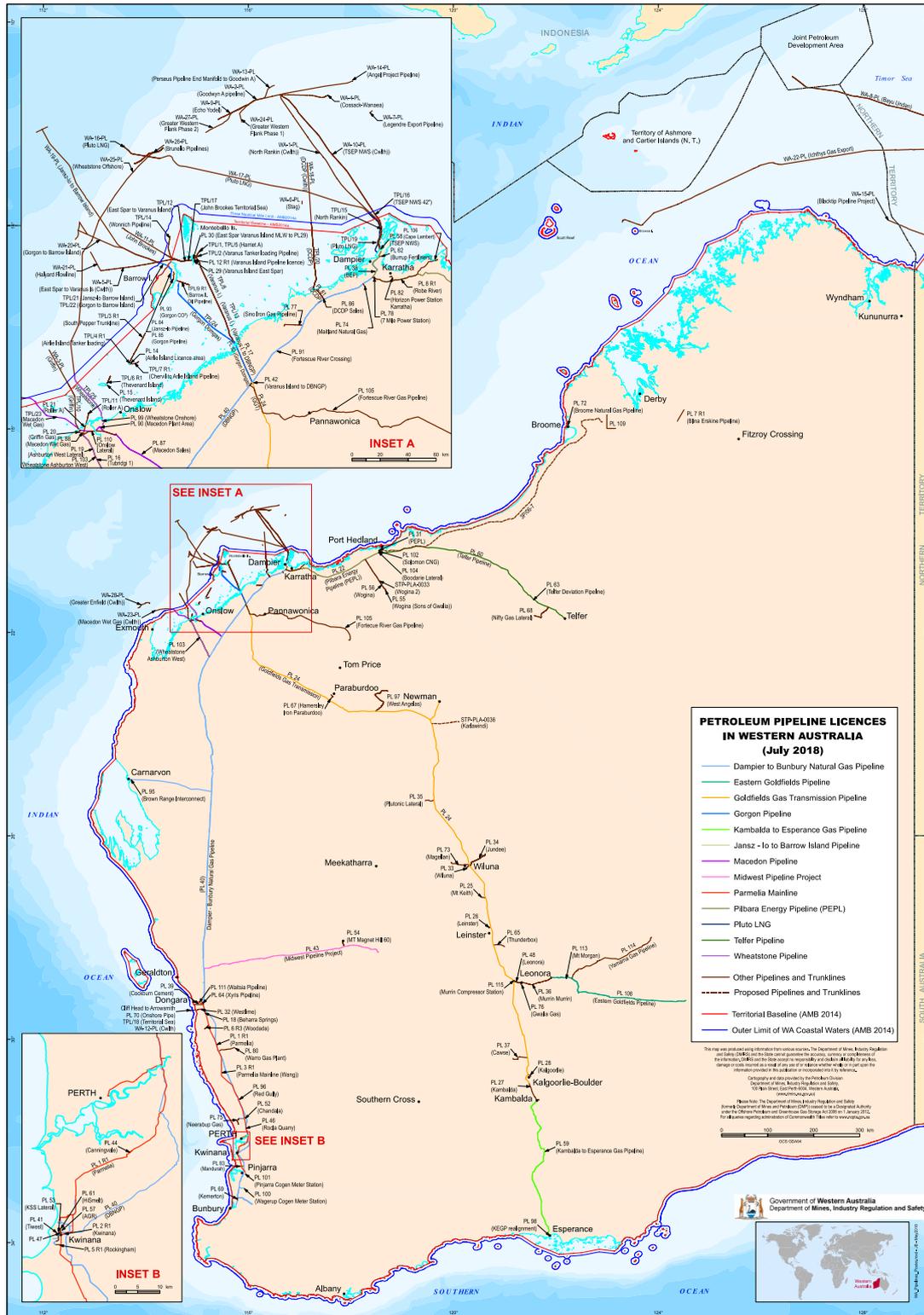
¹⁰ The Western Australian government underwrote the project and constructed the Dampier-Bunbury pipeline. Joint venture partners are: Woodside Energy Pty Ltd (the NWS project operator); BP Development Australia Pty Ltd; BHP Billiton Petroleum (North West Shelf) Pty Ltd; Chevron Australia Pty Ltd; CNOOC NWS Private Limited; Japan Australia LNG (MIMI) Pty Ltd; and Shell Development (Australia) Pty Ltd.

¹¹ WA Treasury. (2011) *GST Distribution Review: WA Submission*. P13. https://www.treasury.wa.gov.au/uploadedFiles/_Treasury/Publications/wa_submission_gst_distribution_review_october2011.pdf

¹² Quadrant Energy. (2017). *Varanus Island Facilities Factsheet*. <https://www.quadrantenergy.com.au/wp-content/uploads/2016/12/Varanus-Island-Facilities-Factsheet-January-2017.pdf>

¹³ APA. (2018). *Goldfields gas pipeline system*. <https://www.apa.com.au/globalassets/documents/info/schematic/ggp-schematic.pdf>

Figure 1: Map of Western Australia gas projects and pipelines

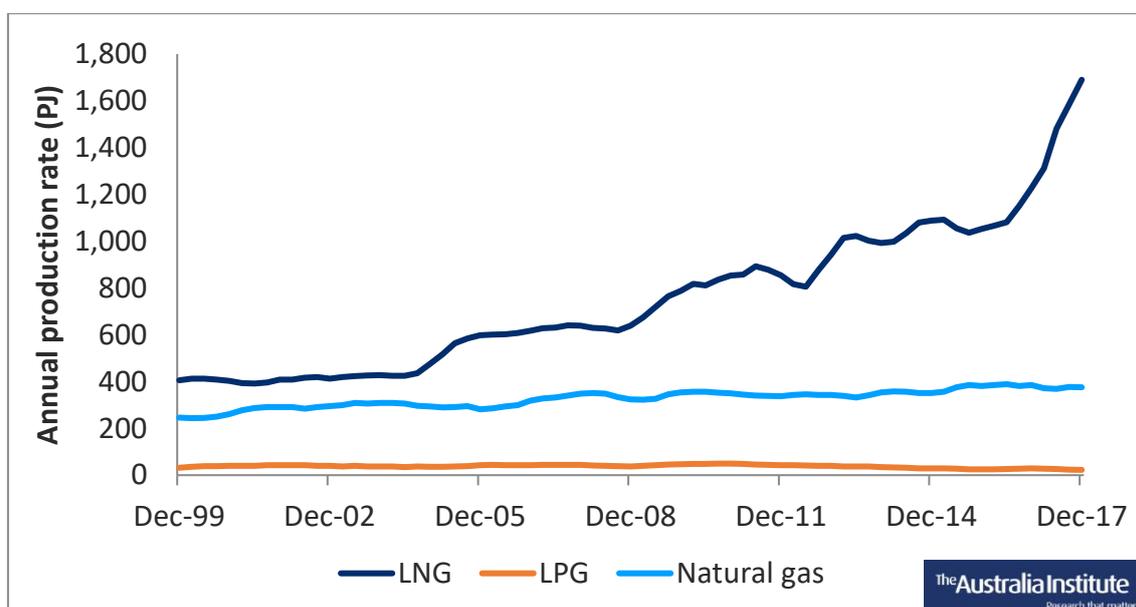


Source: DMIRS. (2017a). *Petroleum pipelines licences in Western Australia*. Department of Mines, Industry, Regulation and Safety.
<http://www.dmp.wa.gov.au/Documents/Petroleum/PD-SBD-GEO-103D.pdf>

PRODUCTION

Presently, gas production in Western Australia is characterised by high volumes of liquified natural gas (LNG) exports, and lower volumes of natural gas piped to WA consumers without liquefaction. There are also smaller quantities of liquified petroleum gas (LPG), consisting of butane or propane, as opposed to the methane of LNG, which is used domestically for such purposes as gas bottles and cars. The production of these gas products is shown in Figure 2 below:

Figure 2: WA gas production

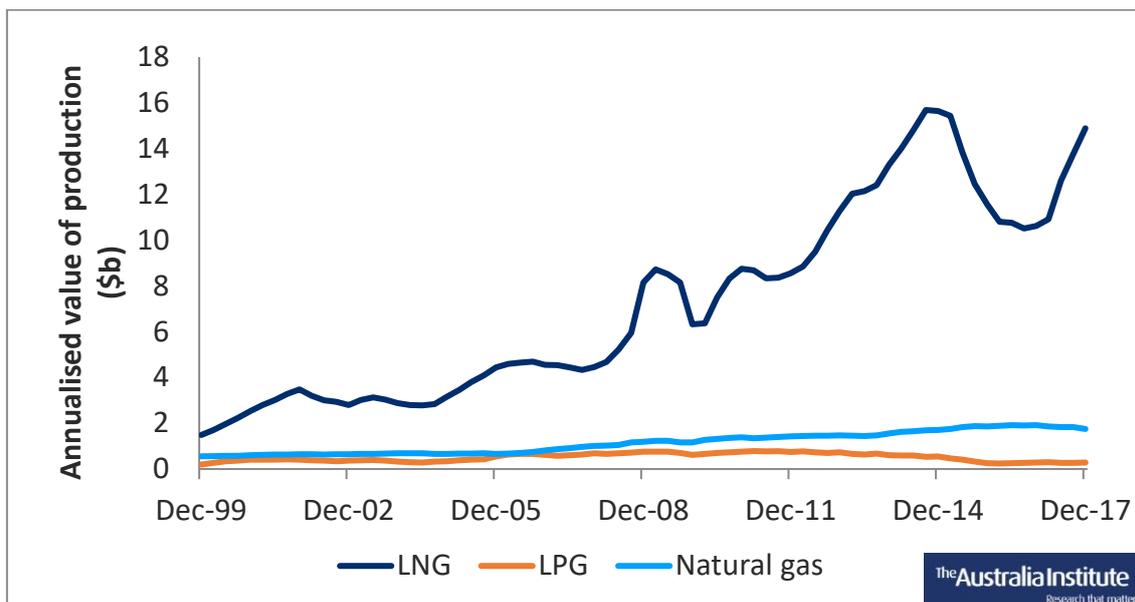


Source: DMIRS. (2017b). *Mineral and Petroleum Statistics Digest 2016-17*.
http://dmp.wa.gov.au/Documents/About-Us-Careers/AboutUs-StatisticsDigest_2016-17.pdf

Figure 2 shows that the vast majority of WA gas production is exported as LNG, a trend that will continue as large projects continue to ramp up capacity.

Total LNG production reached a record high in 2017 of 28.7 million tonnes, or around 1,700 PJ, however the value of this production was not a record, as global prices have fallen from the recent peaks (see Figure 3). Notably, the value of production of this LNG production has been extremely volatile during the past decade, increasing by 150% from 2008 to 2015, before decreasing 35% from 2014 to 2016, before increasing 40% since. As LNG is over 90% of the gas industry, further gas development is likely to tie the industry even closer to the global resource cycle that creates the volatile conditions in the overall Western Australian economy. This volatility can be seen in the value of WA gas production, particularly LNG, shown in Figure 3 below:

Figure 3: Value of WA gas production



Source: DMIRS. (2017b). *Mineral and Petroleum Statistics Digest 2016-17*.

EXPORTS

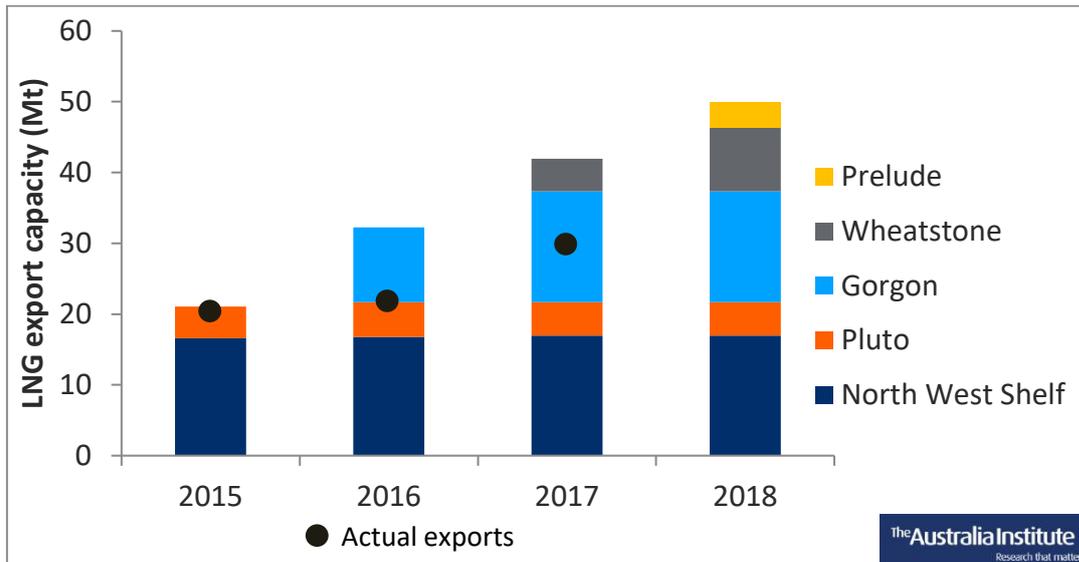
LNG is by far the leading gas product and gas export of WA, which comes predominantly from offshore gas wells which are compressed into liquid form for tanker shipment to export markets.

Western Australia currently has four operating LNG export projects: the North West Shelf, Pluto, Gorgon and Wheatstone. By the end of 2018, the State will have five operating LNG export projects with a total capacity of close to 50 million tonnes a year.¹⁴

The past four years have seen increased investment in export capacity from Gorgon and Wheatstone projects, as well as the recent arrival of the Shell's Prelude floating LNG facility (see Figure 4). Actual exports were close to the export capacity in 2015, but since then the softening of global gas prices coupled with the enormous increase in capacity has meant there presently appears to be excess export capacity. To recover the recent investment costs from export terminal investments, the incentive is for gas producers to increase supply of gas to export markets even in the face of low or declining prices (as long as the price exceeds their marginal cost).

¹⁴ JTSI. (2018). *WA Liquefied Natural Gas Industry Profile*. July 2018. Department of Jobs, Tourism, Science and Innovation. http://www.jtsi.wa.gov.au/docs/default-source/default-document-library/wa-lng-profile---july-2018.pdf?sfvrsn=ec93721c_2

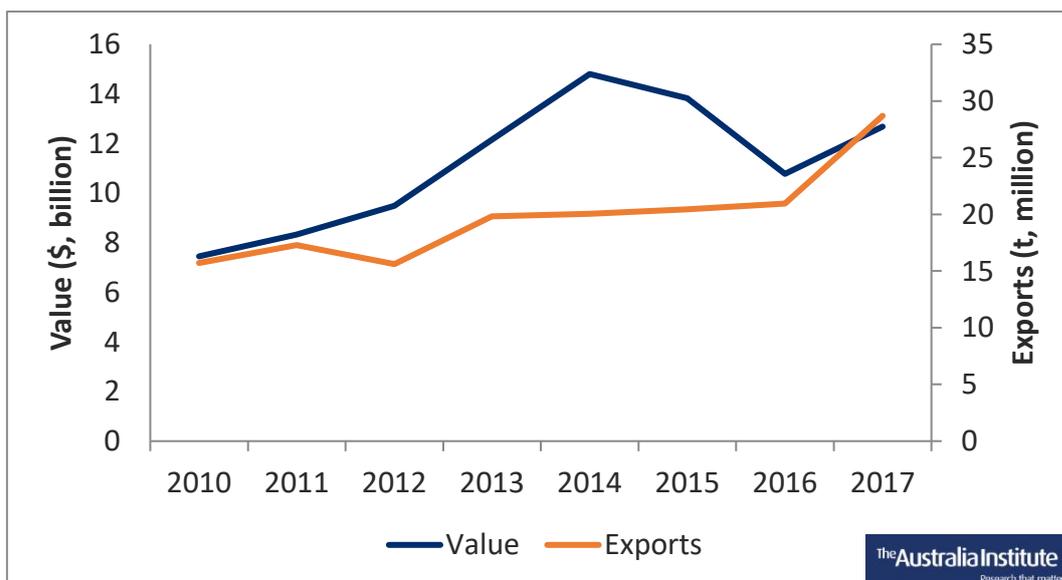
Figure 4: Western Australia LNG export capacity



Source: JTSI. (2018). *WA Liquefied Natural Gas Industry Profile*.

As shown in Figure 5, the total value of Western Australia’s LNG exports peaked in 2014 at around \$15 billion due to the temporary LNG price boom which saw global prices reach a peak of around USD 20 per million British Thermal Units (mmbtu) in Asian markets. Current prices in these markets are around USD 11.¹⁵ This period of high prices led to financial commitments towards new investment in export capacity which have since begun operating and have led to record high exports volumes.

Figure 5: Western Australia LNG exports



Source: DMIRS. (2017b).

¹⁵ Bluegold Research. (2018). *Global LNG Prices*. <https://bluegoldresearch.com/global-lng-prices>

DOMESTIC CONSUMPTION

Domestic gas in Western Australia is used for grid-connected electricity generation (25%), mining (24%), mineral processing (28%—predominantly alumina), industrial use (18%—ammonia, oil and gas processing, brickworks, cement manufacturers, and chemicals plants). Business users make up 4% of gas use.¹⁶

Residential users are about 2% of gas use, however they do contribute to peak demand in winter for home heating. This breakdown of domestic gas use has been relatively constant in recent years, as Table 1 shows. However, gas used in mining operations has grown 41% in the past four years, while gas used in electricity generation has fallen by 5%.

Table 1: Domestic gas use by industry (TJ/day)

Uses	2013	2014	2015	2016	2017
LNG	9	8	19	14	8
Mining	180	179	196	234	253
Industry	161	153	154	156	165
Grid-connected power generation	275	281	283	264	260
Mineral Processing	300	291	292	291	294
Other	60	61	61	63	63
Total	985	973	1005	1020	1043

Source: Marsden Jacob Associates. (2017).

Note: Data for 2017 calendar year extrapolated from 1 Jan to 28 Aug AEMO data. Excludes gas used in gas shipping which is estimated to be 20 TJ/day. Definitions: GPG – gas used in grid connected generators primarily used for power supply to residential and commercial customers in townships or cities; LNG – gas used by LNG projects in the construction phase of projects; Mining – includes iron ore, gold, lithium and nickel mines; Industry – includes ammonia, oil and gas processing (e.g. LPG, petroleum), brickworks, cement manufacturers, and chemicals plants; Mineral Processing – includes alumina refineries, nickel smelters and titanium oxide production.

Minerals processing and mining gas use is dominated by a handful of companies. In 2010 just five large companies accounted for 90% of gas use in Western Australia—

¹⁶ Marsden Jacob Associates. (2017). *The development of annual and peak gas demand forecasts for the Western Australian Gas Market*. Prepared for the Australian Energy Market Operator. https://www.aemo.com.au/-/media/Files/Gas/National_Planning_and_Forecasting/WA_GSOO/2017/MJA-Methodology-Report.pdf

Alcoa, Alinta Sales, BHP Billiton, Burrup Fertilisers and Verve Energy.¹⁷ These gas users typically enter long-term gas supply contracts lasting a decade or more to insulate themselves from short term price variation.

DOMESTIC SUPPLY AND GAS RESERVATION

Natural gas supply to the domestic gas market came from nine active projects in 2017, summarised in Table 2. Of this 1,659 TJ per day of total domestic gas capacity, 97% is from gas fields in the Carnarvon Basin in the state’s north-west—Devil Creek, Gorgon, Karratha Gas Plant (NWS project), Macedon, and Varanus Island (see Figure 1 Inset A).

The remaining projects—Beharra Springs, Dongara, Red Gully, and Xyris—are in the Perth Basin, and many are nearing the end of their life. Dongara, for example, is being decommissioned.

Table 2: Domestic gas production facility capacity and average utilisation WA

Facility	Nameplate capacity (TJ/day)	Peak production (TJ/day)	Average production (TJ/day) Q3,16-Q2,17	Average capacity utilisation FY 2016-17 (%)
Beharra Springs	19.6	16.3	13	66
Dongara	7	2	0.2	2
Devil Creek	220	147	99	45
Gorgon (Phase 1)	182	182	86	47
Karratha Gas Plant	630	605	411	65
Macedon	220	220	206	93
Red Gully	10	9	6	64
Varanus Island	360	274	205	57
Xyris	10	10	8	80
TOTAL	1,659	1,465	1,034	62

Source: AEMO. (2017). *Western Australia Gas Statement of Opportunities 2017*. Australian Energy Market Operator. <https://www.aemo.com.au/Media-Centre/2017-WA-Gas-Statement-of-Opportunities>

To ensure that domestic users benefit from exploitation of gas resources, the long-held policy position of the Western Australian government has been to maintain a domestic gas reservation (DGR) policy.

¹⁷ ACIL Tasman. (2010). *Gas prices in Western Australia*. Review of inputs to the WA Wholesale Energy Market. https://www.aemo.com.au/media/docs/default-source/rules/other-wem-consultation-docs/2010/acil_tasman_final_report_-_updated5eee.pdf?sfvrsn=2

Successive WA governments have maintained a domestic gas policy since helping underwrite the North West Shelf LNG project in 1979. The policy was formalised in 2006 and clarified in 2012.¹⁸

Current DGR policy is for natural gas equivalent to 15% of LNG production from each export project to be made available for domestic consumption. There are four agreements for domestic gas reservation agreements now in place, with two projects to soon begin supply, and two currently supplying gas—Barrow Island (Chevron’s Gorgon project) and North West Shelf (Woodside)—as shown in Table 3.

Table 3: Summary of current WA gas reservation agreements

Project (agreement date)	Reserves (TCF)	LNG export capacity (mtpa)	Domgas Obligation (PJ and years)	Indicative Supply (TJ/day)	Domgas supplied (PJ)
Gorgon (Chevron, 2003)	42.8	15.6	2,000 PJ (2016-37)	300	6
Pluto (Woodside, 2006)	3.1	4.7	450 PJ (2017-32)	110	0
Wheatstone (Chevron, 2011)	12	8.9	1,600 PJ (2018-39)	200	0
North West Shelf (Woodside, 2015)	10.2	16.9	660 PJ (2015-34)	90	6

Abbreviations: TCF = trillion cubic feet, mtpa = million tonnes per annum, mt = million tonnes PJ = petajoule & TJ = terajoule.¹⁹

Note: Pluto and Wheatstone domestic gas obligations are only recently commencing and data on actual supply is not yet available.

Rather than supply domestically, offsets can be proposed by gas exporters, which are considered on a case-by case basis. Offsets can meet reserve obligations

¹⁸ JTSI. (2018b). *WA Domestic Gas Policy*. Department of Jobs, Tourism, Science and Innovation. <http://www.jtsi.wa.gov.au/economic-development/economy/domestic-gas-policy>

¹⁹ Sources: JTSI. (2018c). *Western Australian LNG Project Domestic Gas Agreements*. Department of Jobs, Tourism, Science and Innovation. http://www.jtsi.wa.gov.au/docs/default-source/default-document-library/western-australian-lng-project-domestic-gas-agreements60eb0fa57ba2628e86e4ff0000981137.pdf?sfvrsn=de496d1c_6 and JTSI. (2017). *Western Australian Domestic Gas Policy. Implementation Update*. Department of Jobs, Tourism, Science and Innovation. http://www.jtsi.wa.gov.au/docs/default-source/default-document-library/update-on-the-implementation-of-the-domestic-gas-policy-0518.pdf?sfvrsn=8486d1c_6

by supplying gas or other energy from alternative sources, rather than supplying gas from their LNG projects. Offsets must provide a net addition to the state's domestic energy supply.²⁰

It is not clear the degree to which offsets could be supplied by unconventional gas or renewable energy. However, no domestic gas reserves are currently supplied by offsets.²¹

The net economic effect of Western Australia's reservation policy is to put a wedge between domestic prices and global prices, insulating domestic gas users from vagaries of global energy price cycles. This effect can be seen in comparison of east-coast and west-coast domestic gas prices in Figure 6 below.²²

²⁰ JTSI. (2018b).

²¹ JTSI. (2018d). *Implementation of Domestic Gas Policy*. Department of Jobs, Tourism, Science and Innovation <http://www.jtsi.wa.gov.au/economic-development/economy/domestic-gas-policy/implementation-of-domestic-gas-policy>

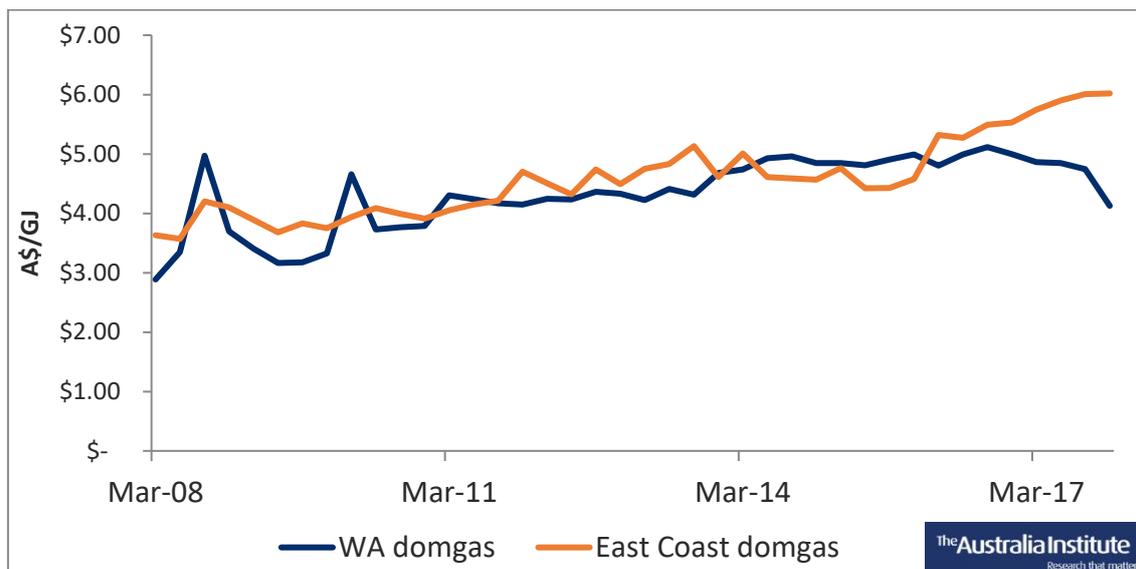
²² The price spike in 2008 was due to supply disruption from Varanus Island due to the rupture of a corroded pipeline and subsequent explosion. An inquiry report into this event is available from the Parliament of Australia.

https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Economics/Completed_inquiries/2008-10/wa_gas_08/report/index

The 2010 price spike appears to be due to attempted restriction of domestic gas from producers in a period of high international prices when renegotiating domestic supply contracts.

http://www.domgas.com.au/pdf/Other_reports/DomGas_Report_2010.pdf

Figure 6: East Coast and WA domestic wholesale gas prices



Source: DMIRS. (2018a). *Mineral and Petroleum commodity review 2017*. Major Commodities Resources File. <http://www.dmp.wa.gov.au/About-Us-Careers/Latest-Statistics-Release-4081.aspx>

Note: These are average prices paid which mostly come from legacy long-term contracts.

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Figure 6 reflects Queensland’s LNG export terminal at Curtis Island near Gladstone commencing operation in 2015, with the east-coast producers becoming connected to global markets. The gas price in east-coast domestic markets increased 36% since the opening of the LNG terminal because it allowed producers to sell to global markets where prices were higher. During this same period, the domestic wholesale price in Western Australia declined by 16%.

Domestic gas users currently benefit from lower energy costs from Western Australia’s reservation policy, whereas in Queensland the energy costs for major local gas users have increased substantially. For some types of industrial processing the energy costs are significant. For example, gas accounts for around a third of the cash costs of aluminium production.²³

²³ JTSI. (2015). *Mineral Royalty Rate Analysis Final Report 2015*. Department of State Development. Department of Mines and Petroleum. http://www.jtsi.wa.gov.au/docs/default-source/default-document-library/mineral-royalty-rate-analysis-final-report-0315.pdf?sfvrsn=76076e1c_6

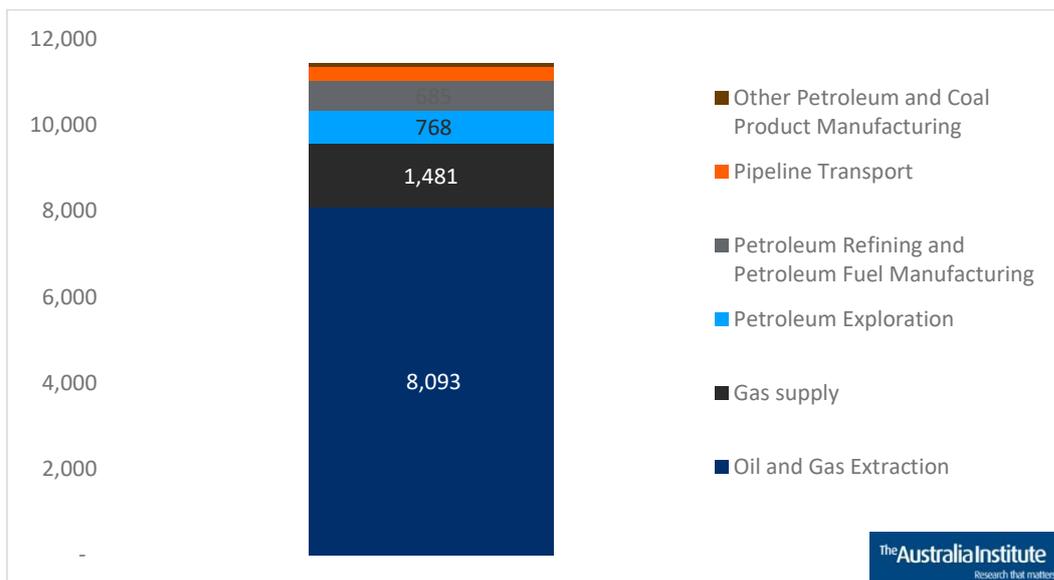
While WA currently enjoys lower gas prices than the troubled eastern market, similar issues could be coming to the state. Domestic supply is projected to decline to 2023. At that point AEMO forecasts that domestic prices will rise, “encouraging the development of further supply”.²⁴ However, if much of this supply comes from high-cost unconventional sources prices may not be forced down again. If high-cost fracked gas becomes the marginal supplier to the WA market, similar cost increases to the east coast could occur.

²⁴ AEMO (2017) Gas statement of opportunities for Western Australia, https://www.aemo.com.au/-/media/Files/Gas/National_Planning_and_Forecasting/WA_GSOO/2017/2017-WA-GSOO.pdf

Employment

Oil and gas industries are capital intensive and employ relatively few people. In WA, around 8,000 people work in oil and gas extraction and 1,481 in gas supply (which includes household gas provision), with another 2,000 working in related industries such as refining (including LNG liquefaction), exploration and pipelines, as shown in Figure 7 below:

Figure 7: WA employment in oil and gas related industries

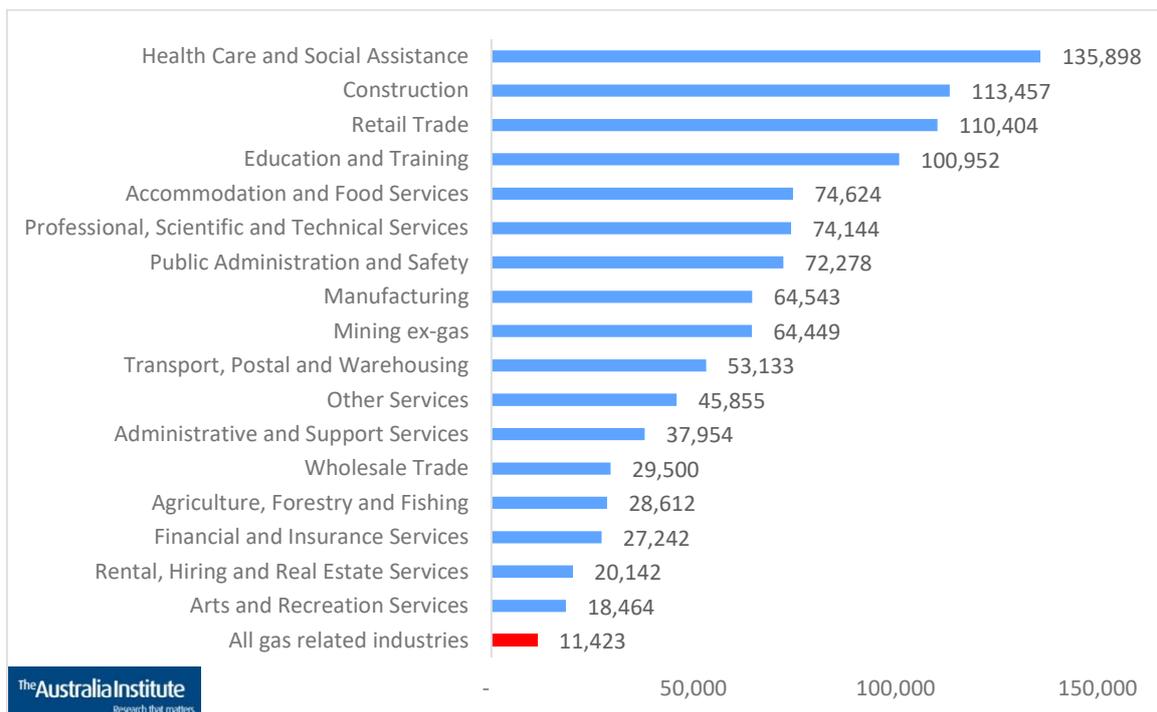


Source: ABS (2016) Census, accessed through TableBuilder

While WA has the most people of any state working in oil and gas industries,²⁵ the industry represents only one percent of WA's 1.1 million people employed. Even taking a broad definition of the gas industry including household distribution, exploration and unidentified other manufacturing, the industry employs fewer people than arts and recreation, as shown in Figure 8 below:

²⁵ Using the Census industry categories above the WA total is 11,423. Queensland comes in next with nearly 8,800, followed by Victoria (5,260), NSW (3,407), SA (2,840), NT (863), Tasmania (227 – 130 in supply) and ACT (97 - 58 in supply). Source: ABS (2016) Census.

Figure 8: WA employment by industry

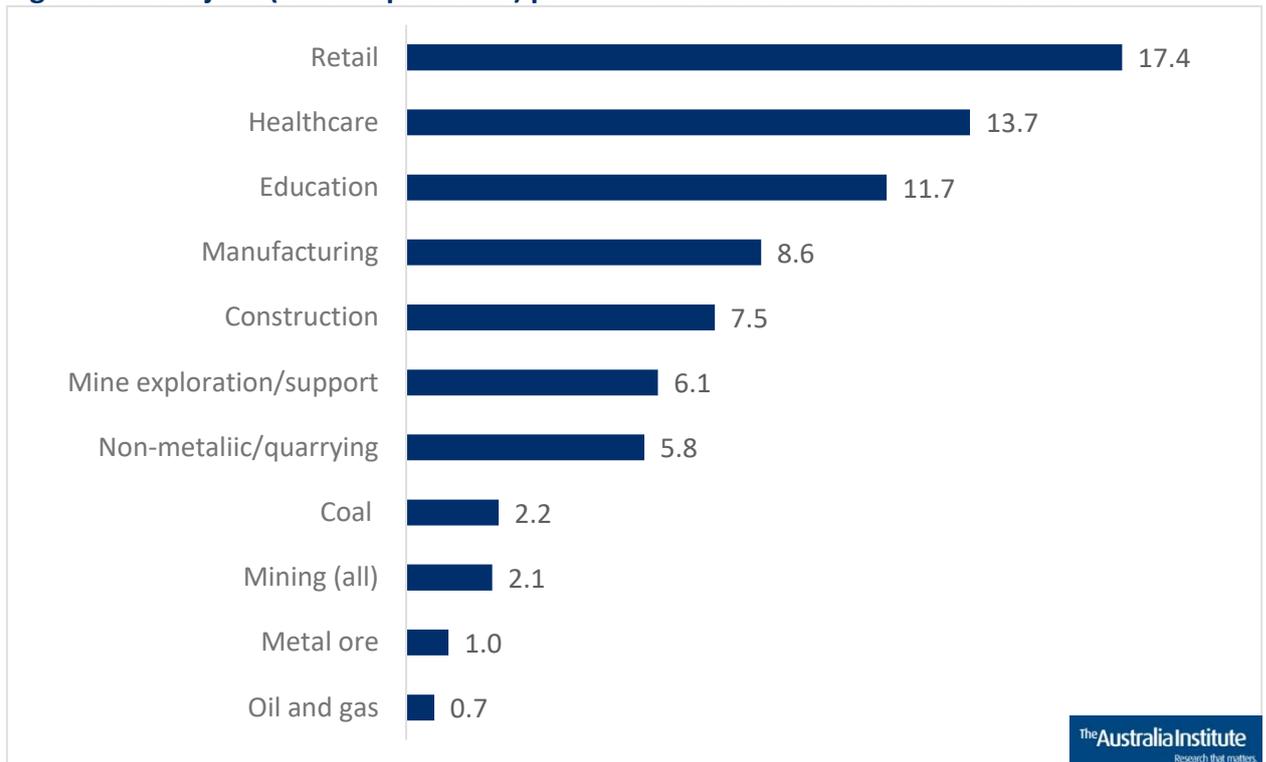


Source: ABS (2016) Census, accessed through TableBuilder

Even compared to other resource industries, the oil and gas industry employs very few people compared the value of the minerals extracted. In 2016 WA’s gas industry produced \$12.8 billion worth of gas and petroleum products, while employing at most 11,423 people in all gas-related industries. In other words \$1.1 million dollars worth of gas was sold for every job in the industry.²⁶ Taking into account the inputs of each industry, oil and gas extraction employs less people per dollar of value added than any other industry, including other parts of the resource sector. If employment growth is the policy goal, then investment in virtually any other industry is will deliver better results. Figure 9 below compares the average number of jobs per million dollars of value added:

²⁶ Sources: as for Figure 3: Value of WA gas production and Census as for Figure 7: WA employment in oil and gas related industries. 2016 is used as this was the census year. Note that the value of gas production increased by 20 percent in 2017. Assuming constant employment, this would have seen over \$5m of gas produced per job.

Figure 9: Total jobs (full and part-time) per million dollars of value add - Australia



Note: 2012-17 average For non resource sectors, 2011-2015 for resource sub-sectors.

Source: ABS (2018) 5204 Australian System of National Accounts, 2017-18 Table 5, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5204.02017-18?OpenDocumentABS> (Aug 2018) 6291.0.55.003 - Labour Force, Australia, Detailed, Quarterly, Table 4. <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.003Aug%202018?OpenDocument>; ABS (2016) Mining Operations Australia, www.abs.gov.au/ausstats/abs@.nsf/mf/8415.0

As shown in Figure 9, the construction sector creates 7.5 jobs per million dollars of value created (more than 11 times higher than oil and gas), while service sectors like education and healthcare employ between 10 and 20. A diverse economy needs to foster these sectors of the economy as well.

WA gas royalties and taxes

There are three systems used to collect revenue from petroleum extraction in Western Australia.

1. Wellhead royalties
2. Resource Rent Royalty (RRR)
3. Petroleum Resource Rent Tax (PRRT)

WELLHEAD ROYALTIES

Wellhead royalties are *ad valorem* royalties that apply at between 10% and 12% rates to the wellhead value, which is the net value of the gas passing a valuation point in the production line.²⁷

Onshore wellhead petroleum royalties are collected by the state government, while the federal government collects wellhead royalties for offshore projects, including the North West Shelf (NWS) – which generates almost all of the gas royalties for the state.

Amendments to the *Offshore Petroleum (Royalty) Act 2006* shifted administrative control for the royalty regime for offshore oil and gas from the Western Australian government to the federal government in 2009. Around 68% of revenues generated are returned to Western Australia in the form of NWS Grants.²⁸

Over 99% of oil and gas royalties in Western Australia come from the North West Shelf (NWS) petroleum projects. These projects are subject to both the Petroleum Resource Rent Tax (PRRT) and wellhead royalties.²⁹

²⁷ DMIRS. (2018c). *Petroleum Royalties*. Department of Mines, Industry, Regulation and Safety. <http://www.dmp.wa.gov.au/Petroleum/Royalties-1578.aspx>

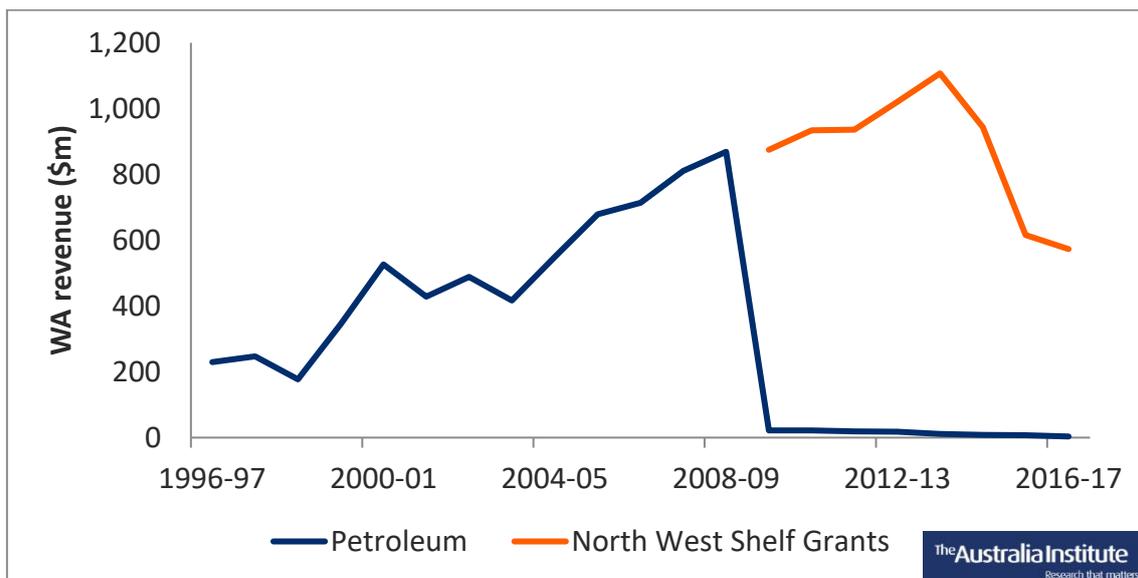
²⁸ ANAO. (2016). Collection of North West Shelf Royalty Revenue. Australian National Audit Office. <https://www.anao.gov.au/work/performance-audit/collection-north-west-shelf-royalty-revenue>

²⁹ Australian Government. (2017). *Petroleum Resource Rent Tax review: Final report*. <https://cdn.tspace.gov.au/uploads/sites/72/2017/04/PRRT.pdf>

The royalty rate for the North West shelf is set at between 10 per cent of the wellhead value for primary production licences and 11 and 12.5 per cent for secondary production licences³⁰

The Western Australian government has received these royalties from the federal government, which has administered them in the form of North West Shelf Grants since 2009 (see Figure 10).

Figure 10: Historical WA petroleum royalties



Source: DMIRS (2018) Economic indicators 2017-18

Primarily because of the recent global price declines, total NWS wellhead and PRRT royalties peaked in 2014 at \$1.1 billion and have since dropped 48% to be now at \$576 million, levels last seen in 2005, despite production of LNG nearly doubling since that time (however crude oil and other petroleum products is flat in terms of output).

While this may seem a substantial sum, it needs to be seen in the context of the WA state budget and its \$29.5 billion in annual revenue. Petroleum royalties and NW Shelf Grants are expected to make up just 2 percent of the state budget. Iron ore royalties, by contrast, are worth more than \$4 billion per year, 14 percent of the budget.³¹

³⁰ The Treasury. (2016). *Petroleum Resource Rent Tax Review. Issues Note*. 20 December 2016. Australian Government. https://static.treasury.gov.au/uploads/sites/1/2017/06/R2016-001_PRRT_dn.pdf

³¹ WA Treasury (2018) Budget papers, <https://www.ourstatebudget.wa.gov.au/budget-papers.html>

A recent audit found that the administration of NWS royalties had a number of loopholes.³² These include a lack of agreement about specific allowable deductions that reduce the wellhead value to which the royalty rate applies, though the amount of royalties in dispute from favourable accounting practices is a small fraction of the total.

RESOURCE RENT ROYALTY

While located near the North West Shelf, one specific onshore gas project—the Barrow Island project—pays a resource rent royalty (RRR) on gas produced under the petroleum lease 1H which covers the Barrow Island land area. This lease is currently owned by Chevron, which supplies gas domestically and for export.³³ Facilities located on the island are now expanded to accommodate processing for the newer offshore gas reserves in the Gorgon project.

A 25% share of RRR funds go to Western Australia, with the remaining 75% going to the federal government. The amount of royalties earned from this project are confidential.

PETROLEUM RESOURCE RENT TAX

In addition to the above royalty regimes, all petroleum projects in Australia, both onshore and offshore, have been subject to the federal Petroleum Resource Rents Tax (PRRT), a profits-based tax, since 2012. The PRRT applies at a 40 percent rate to a project's taxable profit, which is the revenue minus the project expenditure, but also allowing for allowances for exploration expenditure, and exploration expenditure transferred in from other related PRRT projects.

These extensive accounting deductions, as well as the generous starting asset cost base for established projects that were brought into the regime,³⁴ have made the tax

³² The Auditor-General. (2016). *Collection of North West Shelf Royalty Revenue*. ANAO Report No.28 2016–17 Performance Audit. Department of Industry, Innovation and Science.
https://www.anao.gov.au/sites/g/files/net4981/f/ANAO_Report_2016-2017_%2028.pdf

³³ DMIRS. (2018). *Petroleum and Geothermal Register. L1H Petroleum Lease*. Department of Mines, Industry, Regulation and Safety.
<https://pgr.dmp.wa.gov.au/PGR/Titles/DisplayTitle.aspx?d=8v2GY5i675KQN5238LDJko2laFx8F1phESxSa2HT3E%3d>

³⁴ Daley, J. et al. (2013). *Mineral Resources Rent Tax - will it work?* Grattan Institute.
https://grattan.edu.au/wp-content/uploads/2014/05/518_transcript_cities_melb_MRRT.pdf

less effective as a revenue source in recent years. Revenue declines led to a review of the PRRT in 2016 which highlighted the generosity of this system to the producers.³⁵ Indeed, total PRRT revenues in 2015 were around \$900 million, which almost the same as they were in 1992, despite the massive expansion of the gas industry over that period.³⁶

The recent high investment and exploration expenditure in the gas industry have created substantial deductions to the taxable profits of projects subject to the PRRT. Coupled with lower LNG prices, this means lower public revenues per unit of gas from new projects compared to older ones. This situation is widely acknowledged.

Western Australian Treasury documents last year suggested the giant new gas projects on the North-West Shelf, such as Chevron's \$US54 billion Gorgon LNG, might not pay PRRT for 20 to 30 years.³⁷

The general gas royalty situation was summarised as follows by the WA government:

Western Australia's revenue benefits from petroleum resource driven investment growth, particularly for LNG projects, is otherwise limited.³⁸

PETROLEUM ROYALTIES IN CONTEXT

In 2016-17, petroleum royalties were 2% of the \$27 billion total revenue of the WA government.³⁹ Royalties from other mineral resources were \$5.2 billion, or 19% of total revenues, with 90% of that royalty revenue coming from iron ore.

³⁵ The Treasury. (2017). *Review of the Petroleum Resource Rent Tax*. Australian Government. <https://treasury.gov.au/review/review-of-the-petroleum-resource-rent-tax/>

³⁶ Murray, C. (2017). *Review of the Petroleum Resource Rent Tax (PRRT)*. Submission by Dr Cameron K. Murray for Prosper Australia. https://static.treasury.gov.au/uploads/sites/1/2017/06/R2016-001_Propser-Australia.pdf

³⁷ Coorey, P. and A. Macdonald-Smith. (2017). *Petroleum resource rent tax to be tightened, existing projects exempted*. Australian Financial Review. 25 March 2017. <https://www.afr.com/news/petroleum-resource-rent-tax-to-be-tightened-existing-projects-exempted-20180324-h0xx7r>

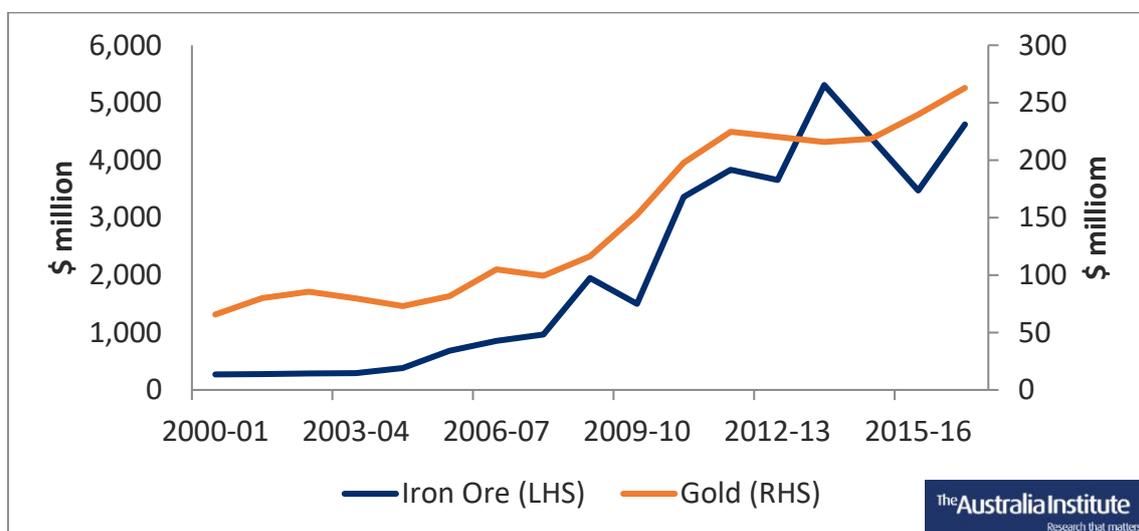
³⁸ Government of Western Australia. (2017). *Western Australia's submission to the review of the Petroleum Resource Rent Tax*. https://static.treasury.gov.au/uploads/sites/1/2017/06/R2016-001_Western-Australian-Government.pdf

³⁹ Treasury. (2017). *2016-17 Annual Report on State Finances*. Government of Western Australia. <http://static.treasury.wa.gov.au/2016-17-arsf/2016-17-arsf-report.pdf>

What is fascinating is that decline in petroleum royalties is unique in the context of Western Australia’s resource sector. Gold prices are down 30% from their 2012 peak, for example, but output and royalties are up (see Figure 11).

Similarly, iron ore prices halved between 2011 and 2017. Yet production increased 85%, pushing iron ore royalties up 20% since that time (though down 13% since their more recent 2014-15 peak) (see Figure 11). Despite iron ore royalties outperforming petroleum royalties, WA’s National Party (unsuccessfully) took a policy to the last state election to increase the public’s share of iron ore value by nearly \$3 billion per year. This suggests that the petroleum sector royalty regime is far from optimal.⁴⁰

Figure 11: Iron ore and gold royalties in WA



Source: DMIRS. (2018b). *Mineral and Petroleum commodity review 2017*. Economic Indicators Resources Data. <http://www.dmp.wa.gov.au/About-Us-Careers/Latest-Statistics-Release-4081.aspx>

In general, the royalty regime for oil and gas seems to be inferior to that of other mineral resources, meaning less value from these resources is shared with the public.

⁴⁰ Richardson, D. (2016). *The \$5 levy on iron ore in WA*. Briefing Paper. Nov 2016. The Australia Institute. <http://www.tai.org.au/sites/default/files/P310%20The%20%245%20levy%20on%20iron%20ore%20in%20WA%20FINAL.pdf>

Conclusions

As WA considers a future unconventional gas industry, it is important to understand the current state of the WA economy and existing gas industry. The WA economy is already heavily exposed to resource industries and the volatility that this brings. Relative to the size of the gas industry's recent expansion, little benefit has flowed to the state in terms of revenue or employment. Domestic gas prices and reservation policy may also come under pressure in the near future.

WA can learn from the experience of Queensland where a large unconventional gas industry exists and the Northern Territory, where another moratorium has just been overturned. The industry in both states has been strongly opposed by local communities.