The Australia Institute
Research that matters.

The economic impacts of unconventional gas in Western Australia

WA's moratorium on fracking has been overturned without consideration of economic impacts. Economic logic, and the lived experience of Queensland and the USA, shows the industry has an incentive to expand as much and as fast as possible. This has a negative impact on communities, provides few jobs, little revenue and could increase domestic gas prices.

Rod Campbell, Mark Ogge and Cameron Murray
November 2018

ABOUT THE AUSTRALIA INSTITUTE

The Australia Institute is an independent public policy think tank based in Canberra. It is funded by donations from philanthropic trusts and individuals and commissioned research. We barrack for ideas, not political parties or candidates. Since its launch in 1994, the Institute has carried out highly influential research on a broad range of economic, social and environmental issues.

OUR PHILOSOPHY

As we begin the 21st century, new dilemmas confront our society and our planet. Unprecedented levels of consumption co-exist with extreme poverty. Through new technology we are more connected than we have ever been, yet civic engagement is declining. Environmental neglect continues despite heightened ecological awareness. A better balance is urgently needed.

The Australia Institute's directors, staff and supporters represent a broad range of views and priorities. What unites us is a belief that through a combination of research and creativity we can promote new solutions and ways of thinking.

OUR PURPOSE – 'RESEARCH THAT MATTERS'

The Institute publishes research that contributes to a more just, sustainable and peaceful society. Our goal is to gather, interpret and communicate evidence in order to both diagnose the problems we face and propose new solutions to tackle them.

The Institute is wholly independent and not affiliated with any other organisation. Donations to its Research Fund are tax deductible for the donor. Anyone wishing to donate can do so via the website at https://www.tai.org.au or by calling the Institute on 02 6130 0530. Our secure and user-friendly website allows donors to make either one-off or regular monthly donations and we encourage everyone who can to donate in this way as it assists our research in the most significant manner.

Level 1, Endeavour House, 1 Franklin St
Canberra, ACT 2601
Tel: (02) 61300530
Email: mail@tai.org.au
Website: www.tai.org.au
ISSN: 1836-9014

Summary

Western Australia's fracking moratorium has been overturned with little consideration of the likely economic and social impacts of developing an unconventional gas industry. Despite industry claims that it is looking to develop "small regional gas projects", proponents are boasting to investors of "world-scale" resources.

The USA has similar quantities of unconventional gas to WA. Since the development of US resources began in 2007, the production rate has grown to a scale about ten times more than Western Australia's output of LNG from offshore wells in 2017. Queensland coal seam gas (CSG) production has grown to four times the size of domestic gas use in Western Australia, and the rate of extraction is still rising. While the commercial viability of WA shale projects is uncertain, incentives point in the direction of large-scale development.

For established rural and agricultural communities, the social changes that come from rapid unconventional gas development are not always positive. A survey funded by gas companies in 2014 found that communities in Queensland's Darling Downs had predominantly negative views about the effect of the CSG boom on their region. Only around 6% of respondents thought that the community was "Changing to something different, but better", while the majority of respondents said they were "Resisting", "Not coping", or "Only just coping".

Oil and gas industries are capital intensive and employ relatively few people. Taking a broad definition of the gas industry, WA's 11,400 gas industry workers represent just 1 percent of employment in the state. 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.

The Northern Territory Government's fracking inquiry commissioned economic research from regular gas industry consultants, ACIL Allen. ACIL estimated that gas extraction roughly equivalent to WA's current domestic supply would increase employment by just 524 jobs. They considered this a 'low to very low' probability outcome, with changes to employment between 80 and 200 more likely. Even if all jobs went to local people in WA's northern outback region, only a minor impact would be had on the regions 2,796 people unemployed.

Many of the region's unemployed are Indigenous. Indigenous people account for 3.7% of resource jobs industry wide. Based on this share of employment unconventional gas

in WA could be expected to create between three and 19 long-term jobs for Indigenous people.

Experience in Queensland suggests unconventional gas creates very few jobs in other industries. While construction and professional services do benefit, there was a loss of 1.8 agricultural jobs for every new gas job created.

Despite being a large producer and exporter of gas, petroleum royalties are a small part of WA State Government revenue. Petroleum royalties and related North West Shelf Grants make up just 2 percent of the $29.5 billion state budget. In Queensland, the reality of unconventional gas royalties has been radically different from the picture given by the gas industry when they sought approvals for their projects. ACIL estimates in the NT show that even a best-case large shale gas industry would be likely to generate revenue worth just 0.6 percent of WA state government revenue. This is roughly equal to the value of traffic fines in the WA budget.

Relative to conventional gas, shale gas is high cost to extract. On the East Coast, high cost coal seam gas entered the production mix in 2015 and drove up the average cost of gas by 72%. AEMO expects supply from domestic-only gas facilities to decline and total contracted domestic supply to fall from 2020 to 2023. At this point AEMO expects WA domestic gas prices to rise and encourage further supply. If this supply comes from high-cost unconventional sources, prices will remain high. Especially if domestic gas suppliers are able to exert market power. Santos has just completed the acquisition of a significant supplier to the WA market, Quadrant Energy. Santos has used its position in the east coast market to intentionally increase domestic prices there.

The social and economic impacts of unconventional gas can be considerable. Given WA's role as a large conventional gas exporter there is little benefit in developing unconventional gas in the state.

Introduction

Western Australia's moratorium on fracking has been overturned by the McGowan Government.[1] This decision was based largely on the findings of *the Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia* (the Inquiry). The Inquiry did not make detailed consideration of social or economic issues:

> The scope of this Inquiry, and the EP Act, does not extend to considerations of harm to social or economic values that do not arise directly or indirectly from degradation, pollution or loss of physical or biological values. Thus, the Inquiry does not broadly extend to the future of the oil and gas industry in Western Australia, to considerations of the comparative impacts of oil and gas versus other energy sources, or to the consequences of resource development more generally. Neither does the Inquiry consider any social or economic benefits that hydraulic fracture stimulation might bring to the community. [2]

Given the controversy around the social and economic impacts of unconventional gas development in Queensland, the Northern Territory and overseas, this omission means that decision makers have little guidance on some of the issues of most concern to the WA community. This report considers some of these key issues:

- Likely scale of unconventional gas in WA
- Community impacts
- Employment impacts
- Revenue impacts
- Price impacts for WA businesses and households.

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

[2] Independent Scientific Panel Inquiry into Hydraulic Fracture Stimulation in Western Australia (2018) *Final Report to the Western Australian Government*, p https://frackinginquiry.wa.gov.au/sites/default/files/final_report.pdf

Likely scale of a WA unconventional gas industry

Western Australia (WA) has extensive onshore unconventional gas resources, predominantly in the Canning and Perth Basins (**Error! Reference source not found.**) with 190,000 PJ to 300,000 PJ of estimated total resources.[3] This is substantially more than conventional gas resources and proved reserves of around 150,000 PJ.

Gas companies have explicitly noted that WA's unconventional gas could be exported through the North West Shelf hub, and that there is "substantial potential for export to global markets".[4] Buru Energy thinks big:

> Buru Energy has identified and appraised a world scale tight wet gas resource that potentially offers long term energy security to Western Australia, significant contribution to Australia's GDP and socio-economic and employment opportunities for people and businesses in the local and regional community.[5]

However, when the gas industry lobbies for favourable government planning and environmental approvals they present the opposite story — that unconventional gas development would be for "small regional gas projects".[6]

Hence, a key question surrounding the development of shale or tight gas in WA is likely scale of development that would both a) cover establishment costs and b) be the profitable future production path for gas producers.

Simple economic analysis suggests that for a fixed capital investment in non-renewable resource extraction it is optimal to maximise the production rate to maximise profits, as long as the price is relatively stable. This is true even if the revenue does not cover the costs, as maximum production rates also minimise losses.

---

[3] AEMO. (2017). *Gas Statement of Opportunities for Western Australia.* Australian Energy Market Operator Limited. p3. https://www.aemo.com.au/Media-Centre/2017-WA-Gas-Statement-of-Opportunities

[4] Thick, P. (2013). *Is this the future of domestic gas — Canning Basin?* New Standard Energy. http://www.aie.org.au/AIE/Documents/PER130723_Presentation_2.pdf

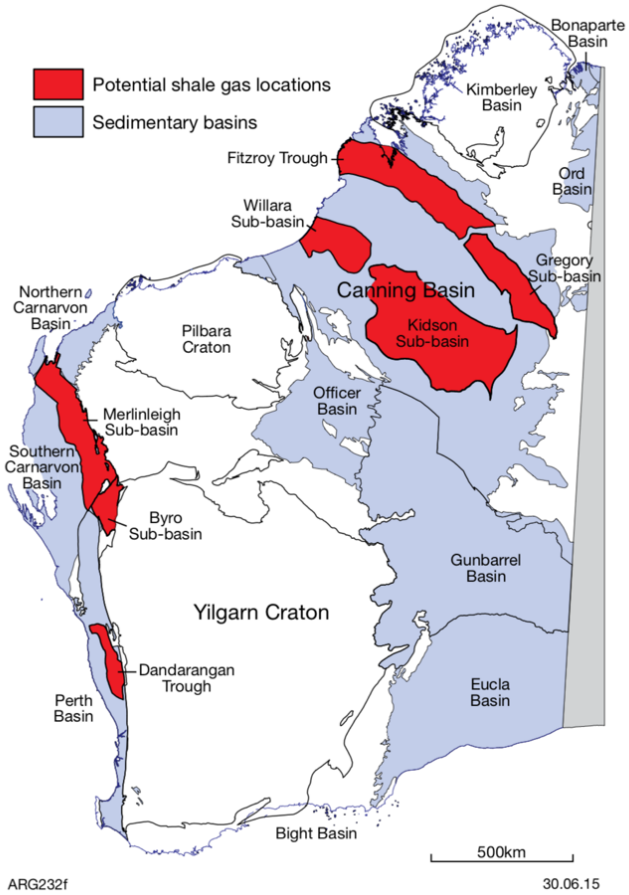
[5] Buru Energy (n.d.) *Gas*, https://www.buruenergy.com/canning-basin/gas/

[6] Doman, M. (2018). *Activism on gas projects is wasted energy*. APPEA. 19 September 2018. https://www.appea.com.au/2018/09/activism-on-gas-projects-is-wasted-energy/

The past decade's experience of shale gas development in the United States, and coal seam gas (CSG) in Queensland, are informative examples both of this economic motive in action, and of the likely scale of unconventional gas production in WA should this resource be developed.

With similar unconventional gas resources, United States shale gas production is ten times higher than WA's current offshore gas production. With much smaller CSG reserves, Queensland's gas production has grown to be nearly as high as WA's offshore gas production rate. Together these experiences suggest that if unconventional gas production is allowed to begin in WA the dominant economic incentive will be to scale quickly and supply export markets.

Figure 1: Location of potential onshore unconventional gas



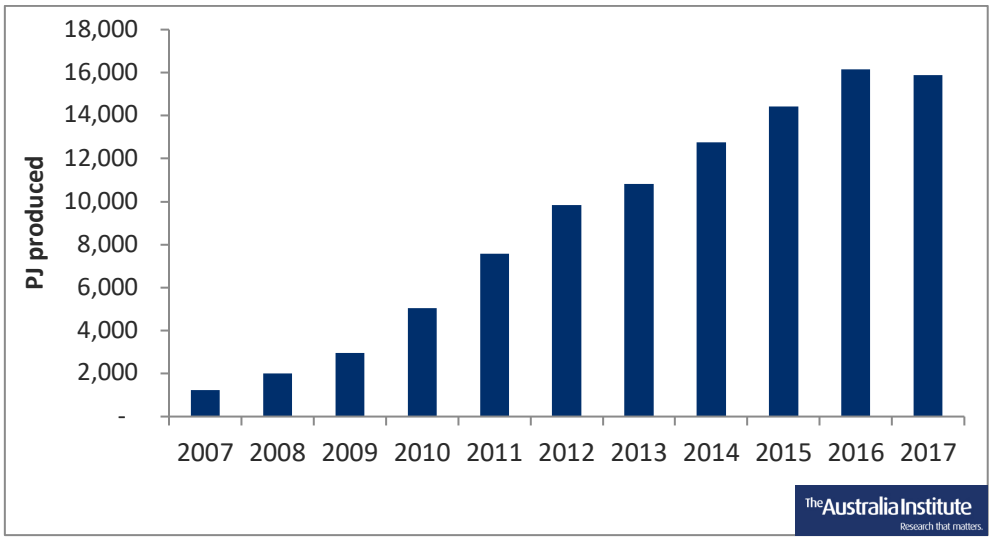
Source: Government of Western Australia. (2015). *Guide to the Regulatory Framework for Shale and Tight Gas in Western Australia - A Whole-of-Government Approach 2015 Edition*.

The United States experience

This basic economic reality is on display in the United States shale gas industry, where similarly large reserves have been developed over the past decade. The shale gas

industry there is as a whole is unprofitable, despite amazing growth in gas production (see Figure 2).[7] High upfront capital costs were incurred during a period of high prices to develop the industry with reasonable economies of scale. But even as gas prices have fallen, the optimal reaction has been to maximise gas output to minimise losses on capital invested. This is a clear example of the economics at play— once capital is committed, maximising output on that capital is economically optimal.

Figure 2: United States shale gas production



Source: U.S. Energy Information Administration. (2018). Natural Gas— Shale gas. https://www.eia.gov/dnav/ng/ng_enr_shalegas_dcu_NUS_a.htm

If future gas prices and regulatory settings change, a similar investment motive will be at play in Western Australia, and the United States experience can provide a good indicator of the likely scale production of unconventional gas development.

Proved reserves of shale gas in the United States are estimated to be over 200,000 PJ, or similar in scale to the natural endowment of tight gas in Western Australia.[8]

Since the development of these resources in the United States began in 2007, the production rate has grown to be around 17,000 PJ per year (see Figure 2). This production is about ten times more than Western Australia's output of LNG from offshore wells in 2017, or about 45 times more than domestic gas consumption in Western Australia.

[7] Cunningham, N. (2018). *Here's why the shale industry still isn't profitable.* Business Insider. 1 Feb 2018. https://www.businessinsider.com/shale-industry-not-profitable-irrational-production-2018-1/?r=AU&IR=T

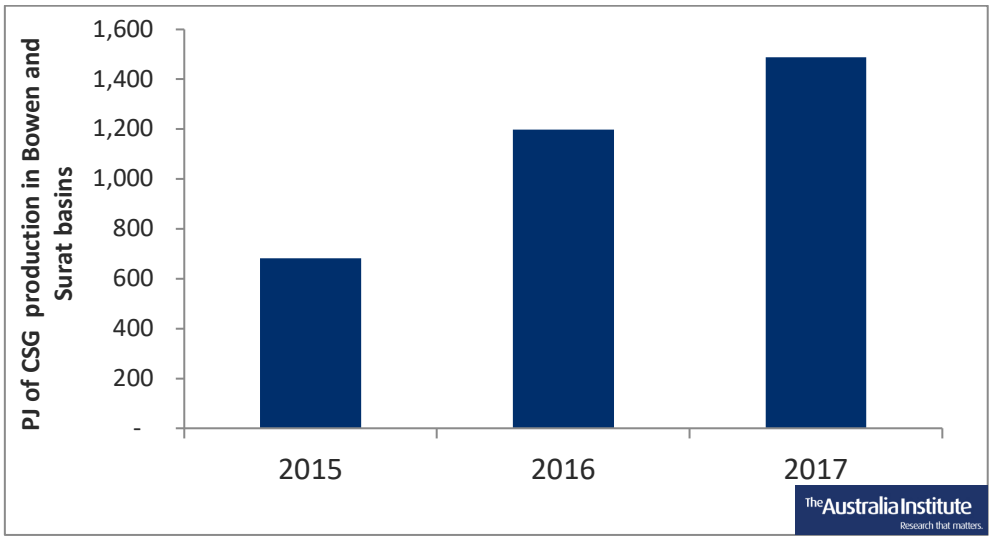
[8] U.S. Energy Information Administration. (2018). *Natural Gas— Shale gas*. https://www.eia.gov/dnav/ng/ng_enr_shalegas_dcu_NUS_a.htm

There is no reason to think that the Western Australian shale gas experience would be much different from the United States experience— the resources are similar in magnitude, the economic motives are the same, and the same influence of global gas companies on ensuring generous regulatory controls will be felt politically.

The Queensland coal seam gas experience

A similar development pattern happened in Queensland in the Surat and Bowen Basins. Coal seam gas (CSG) reserves of 37,000 PJ are now being extracted at a rate of 1,500 PJ per year (Figure 3) since these resources began development in the 2008-10 period. This production rate is four times larger than total domestic gas use in Western Australia, and the rate of extraction is still rising (as is it economically logical to do so).

Figure 3: Queensland coal seam gas production



Source: Queensland Government Data. (2018). *Petroleum and gas production and reserve statistics*. https://data.qld.gov.au/dataset/petroleum-gas-production-and-reserve-statistics

Regional domestic use

Given the scale of unconventional gas resources and the economic incentives involved in extraction, development of new shale gas only for small-scale regional mining and electricity needs appears uneconomic.

In fact, the new reserved domestic gas supplies from offshore projects such as Woodside's Pluto project, and Chevron's Wheatstone project, have seen a rush to establish larger domestic markets by replacing shipping and mining fuel in order to

absorb this gas supply.[9] A Woodside spokesperson said earlier this year that "For now the market has significant excess of supply and capacity".[10]

In short, there is considerable new gas coming to the Pilbara region from offshore gas in and around the North West Shelf (NWS). This gas is coming via established truck supply routes for the West Kimberley Power Project,[11] and will soon be coming via new truck supply routes to remote mining sites with gas from Woodside's Pluto project.

It is not clear small-scale development of new shale gas fields in the region would make economic sense in an era of cheap domestic supply and existing investments in local distribution.

The experience of unconventional gas development in the United States and Queensland demonstrates a scale of development that reflects underlying economic incentives. With enormous possible unconventional gas resources, the likely scale of development of these resources in WA, if driven by economic considerations, will be a similar order of magnitude to WA's current offshore gas production. All incentives point in the direction of large-scale development, and with this will come the influence of global gas companies on ensuring generous regulatory controls to allow it.

[9] Stevens, M. (2016). *How Woodside plans to build a domestic market for its LNG*. AFR. 4 Dec 2016. https://www.afr.com/business/energy/how-woodside-plans-to-build-a-domestic-market-for-its-lng-20161202-gt2vpo
Construction has begun on truck-loading facilities.

[10] The Australian Pipeliner. (2018). Woodside plans Pluto expansion. 30 January 2018. https://www.pipeliner.com.au/2018/01/30/woodside-plans-pluto-expansion/

[11] https://energydevelopments.com/casestudies/west-kimberley-power-project/

Community impacts

One way to assess the potential broader social and economic impacts from unconventional gas development is to look at the experience of Queensland, where coal seam gas (CSG) was rapidly developed in the 2012-15 period. Three main local effects from unconventional gas exploitation were noted: 1) conflict with agriculture; 2) community dissatisfaction; and 3) the boom and bust cycle.

The best research to date on the direct effect of CSG fields on agricultural output in Queensland's Surat Basin shows that agricultural revenues fell by 7% on average (in a study area of 11,500 Ha with 155 CSG wells).[12] This is necessary consideration when evaluating potential external costs of unconventional gas in the Perth basin wheatbelt, for example.

Additionally, studies of fracking in the Unites States have shown that the water use intensity necessary for fracking grows rapidly, with water use per well increasing 770% in the five years since 2011.[13] In general, there are agricultural conflicts with unconventional gas that are rarely acknowledged during early economic assessments, and which decrease the social value of exploiting the gas resources.[14]

For established rural and agricultural communities, the social changes that come from rapid unconventional gas development are not always desired. A survey funded by gas companies in 2014 showed that communities in Queensland's Darling Downs had predominantly negative views about the effect of the CSG boom on their region.[15] As shown in Figure 4 below, only around 6% thought that the community was "Changing to something different, but better", while the majority of respondents said they were "Resisting", "Not coping", or "Only just coping". Other results showed that most

[12] Marinoni, O., & Garcia, J. N. (2016). *A novel model to estimate the impact of Coal Seam Gas extraction on agro-economic returns*. Land Use Policy, 59, 351-365.

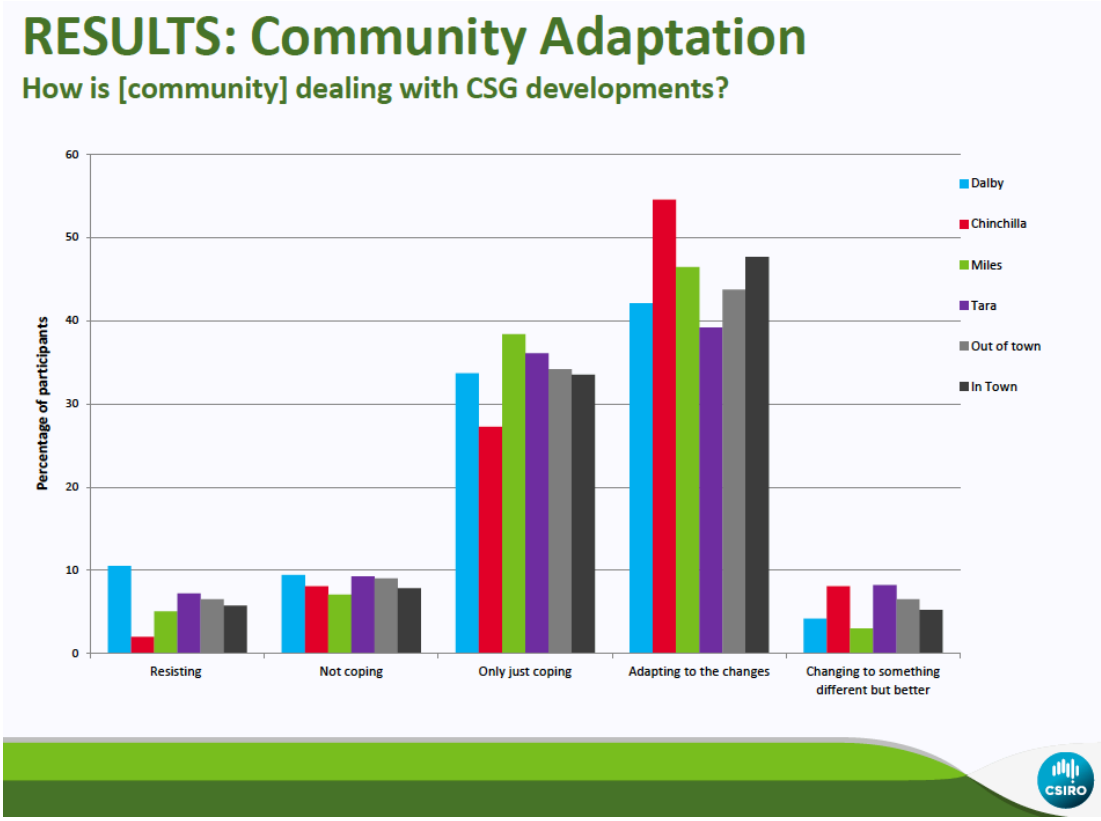
[13] Kondash et al. (2018). *The intensification of the water footprint of hydraulic fracturing*. Science Advances.

[14] Everingham, J. et. al. (2013*). Energy resources from the food bowl: an uneasy co-existence. Identifying and managing cumulative impacts of mining and agriculture.* Project report, CSRM, The University of Queensland. https://www.csrm.uq.edu.au/publications/energy-resources-from-the-food-bowl-an-uneasy-co-existence-identifying-and-managing-cumulative-impacts-of-mining-and-agriculture

[15] Walton, A.et. al. (2014). *CSIRO survey of community wellbeing and responding to change: Western Downs region in Queensland.* CSIRO Technical report: CSIRO, Australia. https://gisera.csiro.au/wp-content/uploads/2018/01/CSIRO-survey-of-Community-Wellbeing-and-responding-to-change-Western-Downs-region-in-Queensland.pdf

respondents said their attitude to coal seam gas was to “Tolerate” or “Accept” it, or with only 7% saying they “Embrace” it.

Figure 4: Results of GISERA community survey gasfleid region of Darling Downs QLD



Source: Walton, A.et. al. (2014). CSIRO survey of community wellbeing and responding to change: Western Downs region in Queensland. CSIRO Technical report: CSIRO, Australia.

Other surveys have shown that there is a general view that the boom and bust cycle has a negative impact on social cohesion and “neighbourliness” due to absentee investors of property, vacant and dilapidated housing during the bust, and rapid change in the population.[16]

Lastly, the boom and bust construction cycle of CSG wells and pipelines in Queensland was extremely disruptive, leading to a temporary quadrupling of local housing rents and prices and boost in local wages that made is difficult for established small local businesses that were not suppliers to the gas industry.[17]

[16] Centre for Coal Seam Gas. (2018). *Annual Report on Queensland's Gasfields Regions*. University of Queensland. https://boomtown-indicators.org/data-updates/western-downs

[17] Fleming, D., and Measham, T. (2015). *Local economic impacts of an unconventional energy boom: the coal seam gas industry in Australia.* Australian Journal of Agricultural and Resource Economics, 59(1),

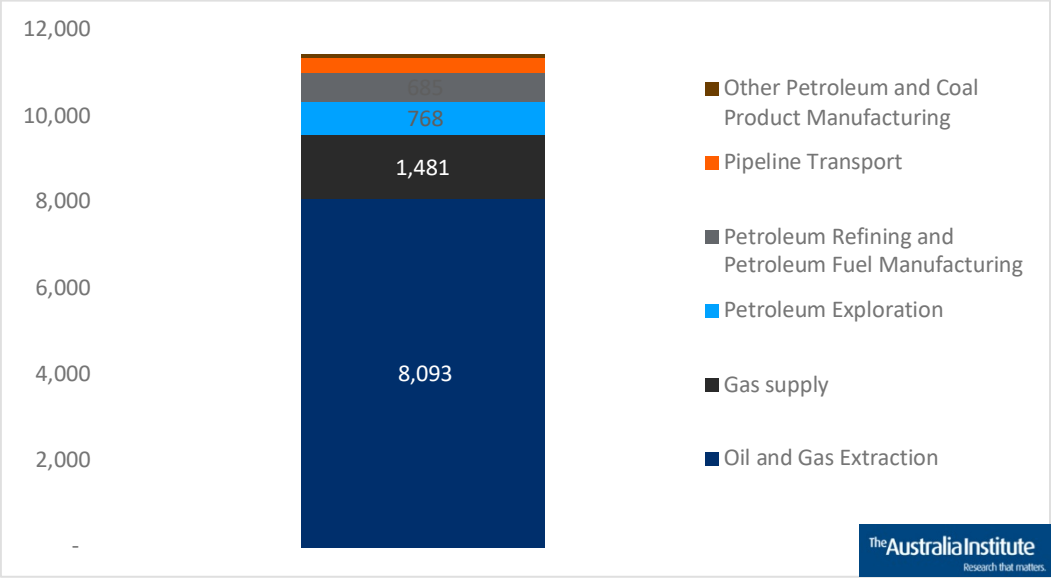
In Western Australia, further tying investment activity to the commodity price cycles is likely to accentuate similar cyclical effects that already happen but on a much larger state-wide scale.

78-94; Centre for Coal Seam Gas. (2018). *Annual Report on Queensland's Gasfields Regions*. University of Queensland. https://boomtown-indicators.org/data-updates/western-downs

Jobs

Oil and gas industries are capital intensive and employ relatively few people. In WA around 8,000 people work in oil and gas extraction, 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 5 below:

Figure 5: WA employment in oil and gas related industries

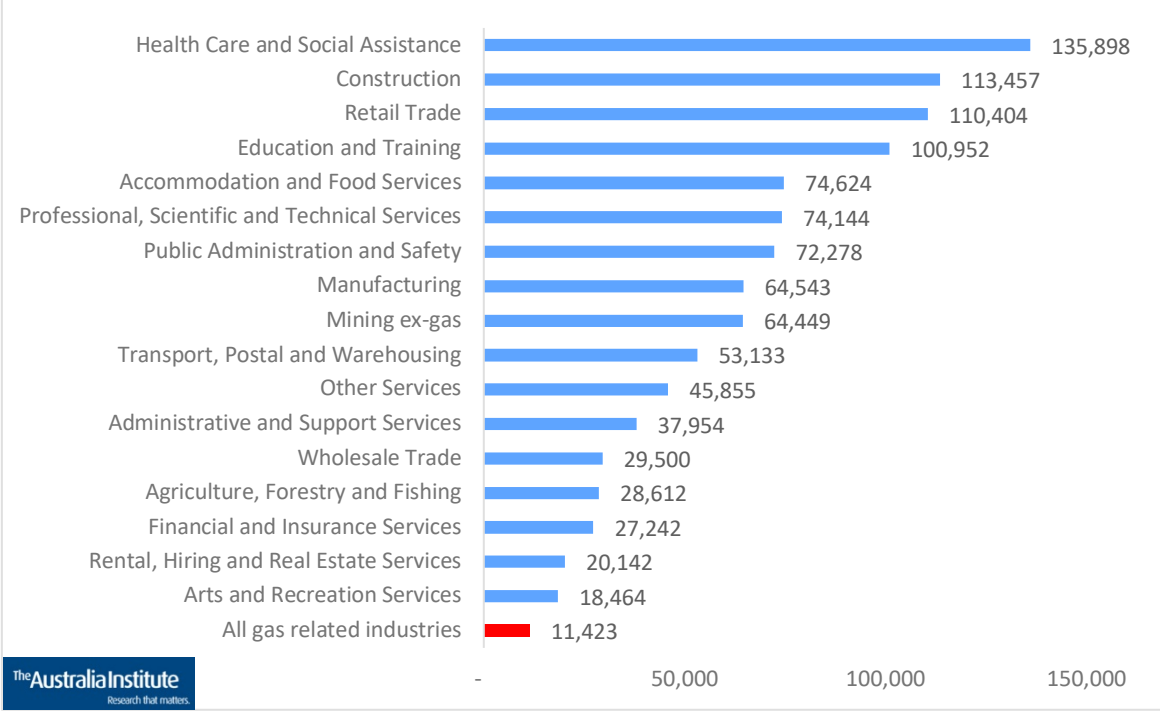


Source: ABS (2016) Census

While WA has the most people of any state working in oil and gas industries,[18] 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 6 below:

[18] 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 6: WA employment by industry

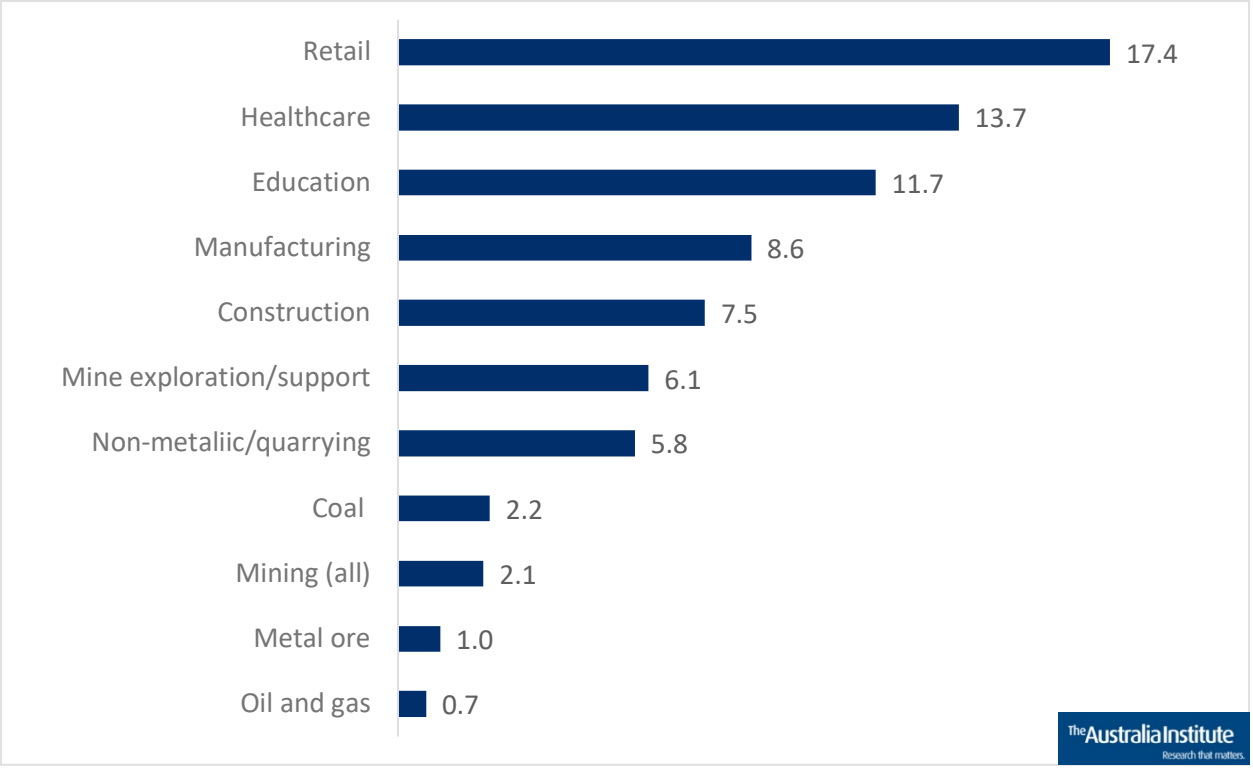


Source: ABS (2016) Census

Even compared to other natural resource extraction activities, 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 other words, $1.1 million dollars' worth of gas was sold for every job in the industry.[19] 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 7 below compares the average number of jobs per million dollars of value added:

[19] Sources: as for Figure 3: Value of WA gas production and Census as for Figure X: 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 7: 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, http://www.abs.gov.au/ausstats/abs@.nsf/mf/8415.0

As shown in Figure 7, 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.

Employment impact of a shale gas industry

The Northern Territory has just completed an inquiry into fracking, including economic assessment by consultants ACIL Allen, a consultancy that frequently works for the gas industry. Both WA and NT's unconventional gas reserves are in shale, as distinct from coal seams and of comparable resource size – up to 252,276 PJ in the NT and between

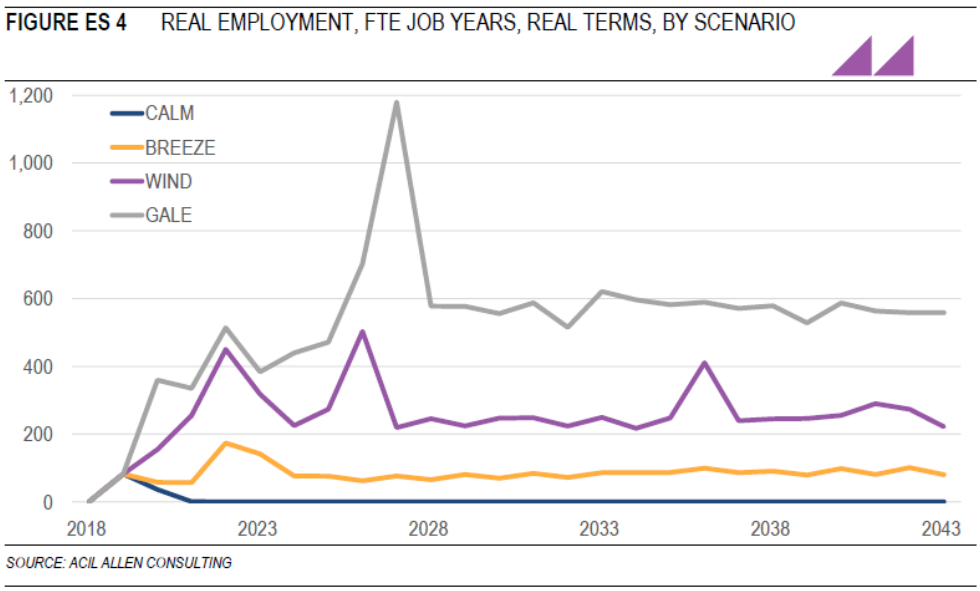
190,000 PJ and 300,000 PJ in WA.[20] ACIL's analysis makes it clear that there would be few additional jobs created by unconventional gas development.

Like WA, there is considerable uncertainty around the size of any potential unconventional gas industry in the NT. ACIL based their estimates around five different shale gas development scenarios:

- "Gale" – production of 1,000 TJ/day, similar to WA's recent domestic production. Considered low to very low probability.
- "Wind" – 400 TJ/day, similar to production of Karratha Gas Plant 2016-17. Considered moderate to low probability.
- "Breeze" – 100 TJ/day, similar to recent production at Devil Creek. Considered moderate to high probability.
- "Calm" – resource found not to be commercial without subsidy and no development takes place. Considered very high probability.

ACIL estimated the additional jobs in the NT economy in each year for these scenarios. Their results are reproduced in Figure 8 below:

Figure 8: Employment by year, NT unconventional gas development scenarios



[20] AEMO (2017) Gas Statement of Opportunities for Western Australia; ACIL Allen (2018) The economic impacts of a potential shale gas development in the Northern Territory, https://frackinginquiry.nt.gov.au/inquiry-reports/final-report

Source: ACIL Allen (2018) The economic impacts of a potential shale gas development in the Northern Territory, https://frackinginquiry.nt.gov.au/inquiry-reports/final-report

Figure 8 shows that the most likely outcome, 'calm' would lead to zero jobs, reflecting both the capital intensive nature of gas development and the financial uncertainty around unconventional gas in remote areas. At best ACIL estimated a spike in construction jobs in the late 2020s for one year, and the shale 'gale' bringing an average of 524 jobs. The most likely production scenario 'breeze' would see an average of 80 more jobs in the NT economy. The 'wind' scenario would see an average increase of 252 jobs.

To put this in context, there are 84,800 unemployed people in Western Australia.[21] The increase in employment estimated by ACIL would represent a fraction of one percent of the state's unemployment. In the ABS's Outback (North) region, where most WA fracking would occur, there were 2,796 people unemployed and looking for work at the time of the 2016 Census. Even if all new jobs went to local people, the most likely production scenario would employ 80 people, less than 3% of the people unemployed in Outback (North). This is of course highly unlikely given the fly-in-fly-out nature of the gas industry and the skills required. Many of these people are Indigenous, at particular disadvantage and most unlikely to secure employment in the unconventional gas industry.

Indigenous employment claims

A focus of discussion around unconventional gas in WA has been the potential for jobs for Indigenous people. Buru Energy claims on its website to have strong relationships with Traditional Owners and to have implemented:

- *Training of personnel in security, the operation of excavators, water carts, dump trucks, front-end loaders and bobcats.*
- *Employment of over 30 Traditional Owners during our recent exploratory frac program near Noonkanbah Station with over 13,500 hours of paid employment undertaken by community members during the three-month program.*[22]

Such initiatives are to be commended. The long-term record of the resource industry is less impressive, particularly once operations pass construction phase and the need for

[21] ABS (2018) *6202.0 - Labour Force, Australia, October 2018*, http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6202.0October%202018?OpenDocument

[22] Buru Energy (n.d.) *Traditional Owners*, https://www.buruenergy.com/corporate-responsibility/traditional-owners/

excavators, dump trucks, other equipment and people to guard them. The ABS estimates that 6,654 indigenous people work in all parts of the mining and resource industry, 3.7 percent of the 177,640 total. Far more Indigenous people work in Health care, public administration, education, construction, retail, and other service industries.[23] Separate statistics for the gas industry are not available.

Applying the industry's Indigenous employment share to the likely increase in employment in NT's production scenarios modelled by ACIL, sees:

- Breeze – 82 jobs total x 3.7% = 3 jobs
- Wind – 252 jobs total x 3.7% = 9 jobs
- Gale – 524 jobs total x 3.7% = 19 jobs

In summary, if a WA shale gas industry is economically viable, based on general Indigenous employment in Australia's resource industries, the most likely outcome is an increase in indigenous employment of between three and nine full time equivalent jobs (FTE). At best, with production that doubled WA's recent domestic production an estimated increase of 19 indigenous jobs would be expected.

Employment impacts on other industries

While the unconventional gas industry certainly employs some people, there are very few flow-on jobs outside the gas industry itself, and many of these jobs are come at the cost of displacement of jobs in other industries.

Most industries increase and decrease gradually over time, allowing other industries and the economy as a whole to adjust. However large gas and LNG projects ramp up quickly and require a large skilled workforce, goods and services for a short period of time. Because the economy has finite productive resources such as skilled labour, services and capital, a sudden surge in demand for these will drive up prices for other industries which can be very disruptive and cause a contraction in output and jobs in these industries, particularly manufacturing and agriculture.

Queensland has the only large unconventional gas industry operating in Australia. While there are geological differences between coal seam gas that is being extracted in Queensland and shale and tight gas in Western Australia, the infrastructure and employment requirements are similar. Both require a large number of wells drilled

[23] ABS (2016) Census and ABS (2017) Aboriginal and Torres Strait Islander Census: Industry, http://www.abs.gov.au/ausstats/abs@.nsf/MediaRealesesByCatalogue/142C08A784A1B5C0CA2581BF001EE22C?OpenDocument

over vast areas, both require fracking and have similar construction and operational workforce requirements.

As such much can be learned from the Queensland unconventional gas experiment about the likely social and economic impacts of unconventional gas development in Western Australia.

Detailed analysis of the flow-on employment impacts of in Queensland's gas fields has been undertaken by the Gas Industry Social and Environmental Research Alliance (GISERA).[24] As shown in Figure 9 below, the research found that there was virtually no flow on jobs to outside of the gas industry itself:

Figure 9: Coal seam gas employment spillover over different sectors

	Elasticity	Additional job for each new CSG job
Local goods sector		
Construction	0.832 (0.426) *	1.414
Professional services	0.704 (0.259) **	0.422
Retail trade	0.011 (0.140)	0.024
Accommodation and food services	0.375 (0.263)	0.471
Other services	−0.385 (0.247)	−0.890
Tradable goods sector		
Manufacturing	0.068 (0.199)	0.160
Agriculture	−0.314 (0.182) *	−1.790

Notes

* $P < 0.10$; ** $P < 0.05$. Elasticity values are two-stage least square estimations for coefficient β in equation (2). The number of CSG wells in an statistical local area is used as instrument for the log change of mining employment. Values are estimated using sample 3 ($n = 48$). F-stat first-stage = 10.74. Robust clustered standard errors at Local Government Area levels are in parentheses. Other services sector includes employment in the Australian Bureau of Statistics categories of rental agencies, transport and 'other services'.

Source: Fleming M and Measham T (2015a) Local economic impacts of an unconventional energy boom: the coal seam gas industry in Australia, The Australian Journal of Agricultural and Resource Economics.

[24] Fleming M and Measham T (2015a) Local economic impacts of an unconventional energy boom: the coal seam gas industry in Australia, The Australian Journal of Agricultural and Resource Economics, 59(1), pp. 78–94 https://onlinelibrary.wiley.com/doi/abs/10.1111/1467-8489.12043

Figure 9 shows that and that there was a loss of 1.8 agricultural jobs for every new gas job created. The sector that received the most significant amount of receive spillower jobs is construction, with 1.4 additional jobs for every new gas job.

However, these jobs are short term. As the Western Australian Department of Mines and Petroleum notes, in the Western Australian LNG industry as a whole, nine out of ten jobs disappear after the construction phase:

Generally, after the construction phase, only one in 10 LNG jobs is retained, compared with one in three iron ore jobs.[25]

The large fluctuations in construction employment also cause displacement of jobs in other sectors. Sometimes resource companies publish tables of modelling for the employment impacts of their projects in their economic impact assessments. One example is economic modelling by the Queensland unconventional gas company Arrow LNG. As shown in Figure X below, Arrow's modelling estimated that the development of this single project would displace 680 manufacturing jobs in Queensland as a whole including over 200 in the local Darling Downs region between 2019-20 to 2027-28, as well as a significant amount of agricultural jobs.[26]

Figure x: Arrow LNG modelling for Economic Assessment of Surat Gas Project.

Industry	Darling Downs		Queensland	
	2013-14 to 2018-19	2019-20 to 2027-28	2013-14 to 2018-19	2019-20 to 2027-28
Agriculture, forestry and fishing	-56	-52	-68	-66
Mining	180	431	209	494
Manufacturing	-112	-226	-457	-680
Electricity and water	-14	-19	-148	-130
Construction	315	160	334	197
Trade	53	81	36	59
Transport and storage	-9	-18	-34	-47
Business, finance and insurance services	88	39	299	242
Public administration, defence, health and education	-50	-47	-6	34
Recreation and other services	-11	-18	-5	-11
Ownership of dwellings	0	0	-1	-1
Total Change in Employment (FTEs)	**384**	**332**	**158**	**92**

Source: Prime Research (unpublished).

Source: AEC (2011) Economic Impact Assessment: Surat Gas Project, Table 5.2 p.50

[25] Government of Western Australia Department of Mines and Petroleum (2016) *Statistics Digest 2015-16*, http://www.dmp.wa.gov.au/Documents/About-Us-Careers/Stats_Digest_2015-16.pdf

[26] AEC (2011) Economic Impact Assessment: Surat Gas Project, Table 5.2 p.50, https://www.arrowenergy.com.au/__data/assets/pdf_file/0006/28734/Appendix20O20-20Economic20Impact20Assessment.pdf

Revenue from unconventional gas

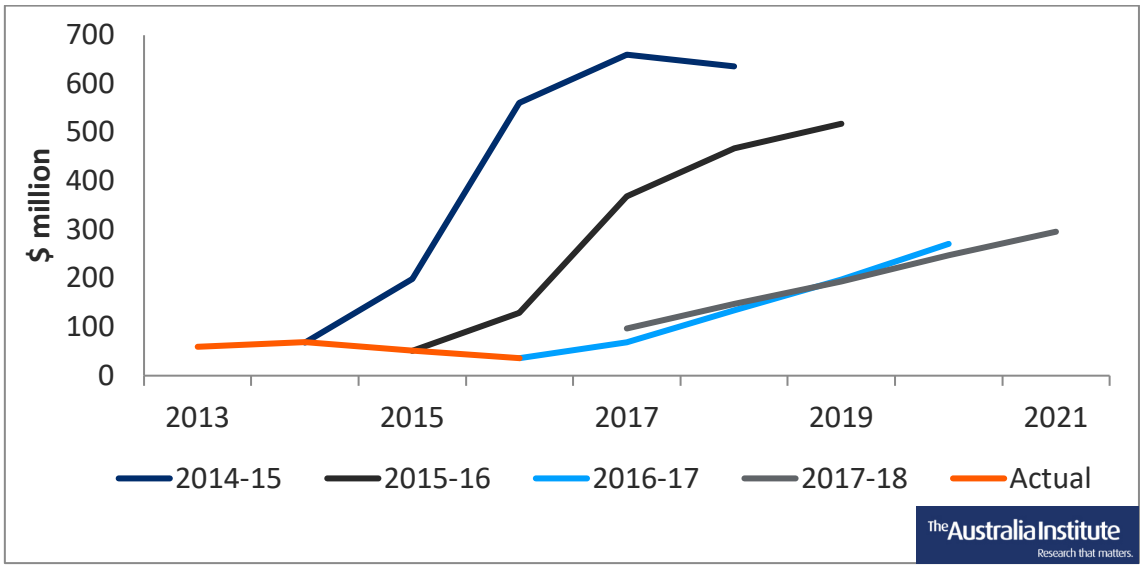
Despite being a large producer and exporter of gas, petroleum royalties are a small part of WA State Government revenue. Petroleum royalties and related North West Shelf Grants make up just 2 percent of the $29.5 billion state budget. Iron ore royalties by contrast are worth more than $4 billion per year, 14 percent of the budget.[27]

The relatively high cost of unconventional gas has two important implications. First, it means that projects are high risk and have a high chance of commercial failure during gas price fluctuations. Second, the high costs mean that profit-based royalty regimes and fixed-rate royalty regimes that apply to wellhead value-added measures, will generate little revenue for governments. Even royalties from conventional offshore gas in Western Australia have been falling due to new projects being higher cost ones, suggesting that onshore unconventional gas is unlikely to generate royalty windfalls.

In Queensland, the reality of unconventional gas royalties has been radically different from the picture given by the gas industry when they sought approvals for their projects. Figure 10 shows the ambitious forecasts of the Queensland government of royalty revenue based on gas industry information versus the ultimate reality. The promises were over ten times the reality in 2017.

[27] See Murray et al (2018) *Pipeline: Gas and the WA economy for more details*. Also see WA Treasury (2018) *Budget papers*, https://www.ourstatebudget.wa.gov.au/budget-papers.html

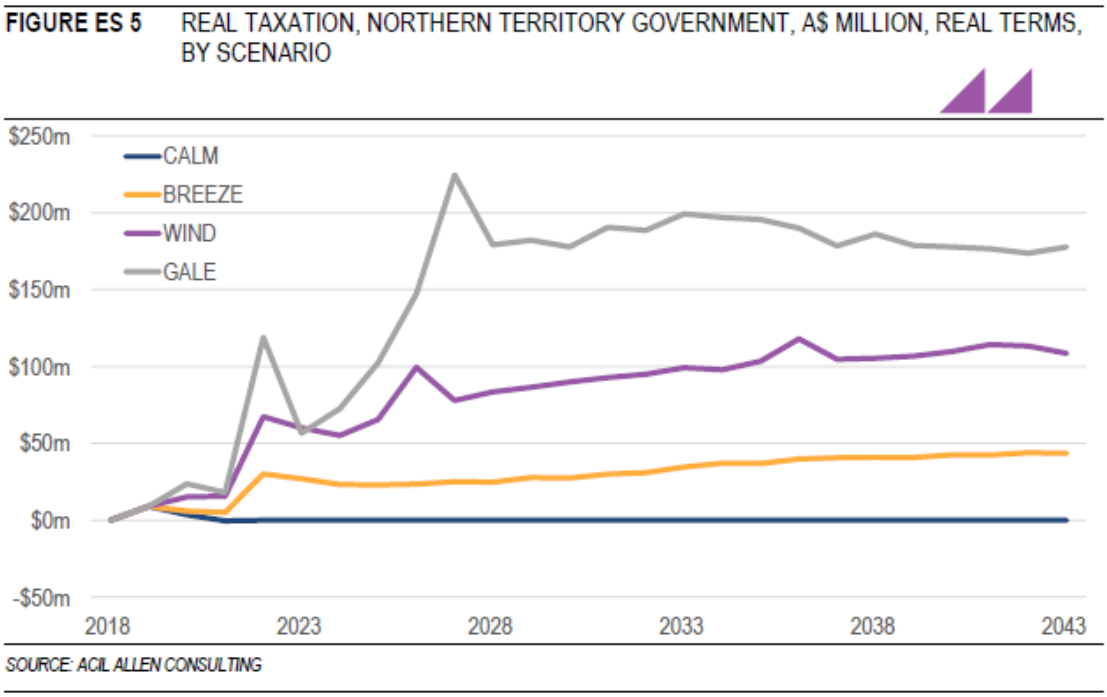
Figure 10: Queensland's forecast and actual budget royalties



Queensland Government. (2018). *Budget Papers* (and historical). https://budget.qld.gov.au

The economic consultants to the NT Fracking Inquiry came to a similar conclusion. In their best case scenario by the late 2020s a major shale gas industry would increase NT government revenue (before any GST adjustment by the commonwealth) by around $200 million, as shown in Figure 11 below:

Figure 11: Shale gas impact on budget revenue by year



Source: ACIL Allen (2018) The economic impacts of a potential shale gas development in the Northern Territory, https://frackinginquiry.nt.gov.au/inquiry-reports/final-report

In context, Figure 11 shows that even a best-case large shale gas industry would be likely to generate revenue worth just 0.6 percent of WA state government revenue. This is roughly equal to the value of traffic fines in the WA budget.[28]

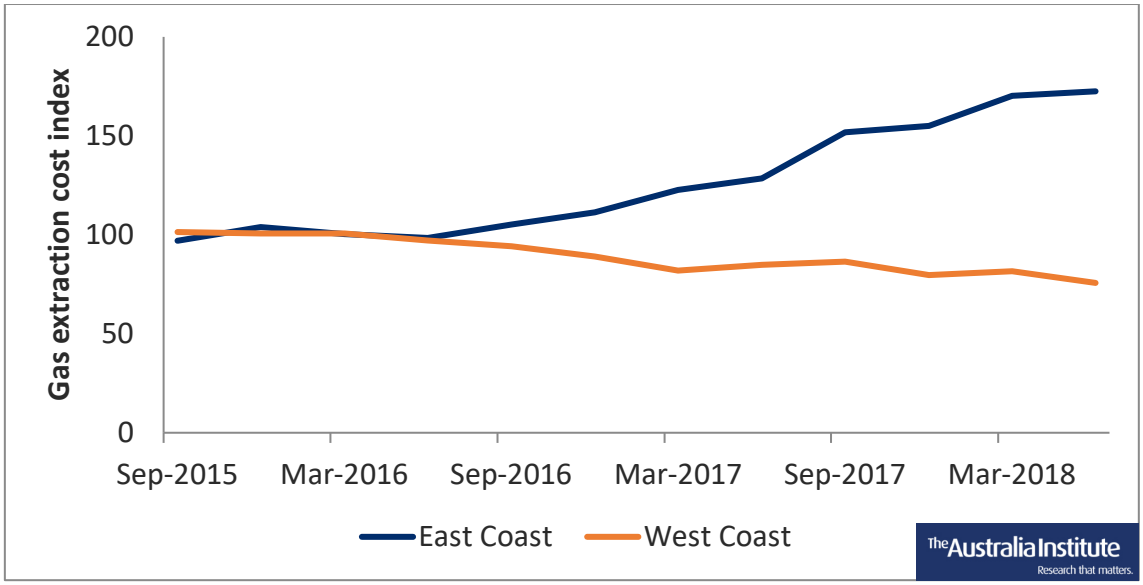
The more likely Breeze and Wind scenearios would see revenue increases limited mainly to less than $100m per year, a third of one percent of WA state revenue.

[28] WA Treasury (2018) Budget Papers, see p212, Table 2.1. https://www.ourstatebudget.wa.gov.au/2018-19/budget-papers/bp3/2018-19-wa-state-budget-bp3.pdf

Gas prices for WA businesses and households

One of the main features that differentiates onshore unconventional gas from established gas resources is its higher cost. On the East Coast, high cost coal seam gas entered the production mix in 2015 and drove up the average cost of gas production. As shown Figure 12, the effect has been to increase the average production cost of gas by 72%. At the same time in Western Australia, economies of scale from established and new large-scale offshore projects have reduced the cost by 18%. Compared to 2015 costs, East Coast gas now costs 230% more on average to produce than west coast gas.

Figure 12: Comparison of East and West Coast gas production costs



Source: ABS. (2018). *6427.0 - Producer Price Indexes, Australia, Jun 2018*. Table 36. Australia Bureau of Statistics.
http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6427.0Jun%202018?OpenDocument

The prohibitive cost profile of unconventional gas has been observed to be one of the main reasons that onshore unconventional gas projects had not been developed in Western Australia, despite a global trend towards such gas resources:

> Given the amount of conventional gas resources remaining, and the relatively high cost of developing unconventional gas, there has been no commercial production of unconventional gas in WA.[29]

In macroeconomic terms, devoting labour and capital resources to high-cost ways of producing goods that are already a major part of the economic base further reduces the diversity of Western Australia's economy and ties its fortunes even tighter to global commodity cycles. Most resource rich regions are using the revenues raised from their energy resource endowments to shift their economies into new industries.

Much of the reason east coast gas prices have risen in recent years has been linking the east coast market to the world market through LNG export terminals in Gladstone, Queensland. WA's domestic gas reservation policy has kept prices for WA users lower than the east coast despite large export facilities. However, AEMO expects supply from domestic-only gas facilities to decline and total contracted domestic supply to fall from 2020 to 2023. At this point AEMO expects WA domestic gas prices to rise and encourage further supply.[30]

If this supply comes from high-cost unconventional sources, prices will remain high. Especially if domestic gas suppliers are able to exert market power. Santos has just completed the acquisition of a significant supplier to the WA market, Quadrant Energy.[31] Santos has used its position in the east coast market to increase domestic prices there, as the company told analysts in 2014:

> Santos now argues that its aim in GLNG was always as much about raising the domestic gas price, and therefore re-rating large parts of the portfolio outside of GLNG, as it was about the project. Even if this was the case, with the shortage of gas being seen at QCLNG, and APLNG busy feeding itself, we wonder if GLNG was needed to see net back pricing domestically. What is more, with a ~0.8% drag on Australian GDP from every $2/GJ rise in the domestic gas price, this view certainly wouldn't have been terribly popular with politicians who approved the project.[32]

---

[29] AEMO. (2017). Gas statement of opportunities for Western Australia. p23. 3 https://www.aemo.com.au/-/media/Files/Gas/National_Planning_and_Forecasting/WA_GSOO/2017/2017-WA-GSOO.pdf

[30] AEMO (2017) p4.

[31] Santos (2018) Santos completes acquisition of Quadrant Energy, https://www.santos.com/media-centre/announcements/santos-completes-acquisition-of-quadrant-energy/

[32] Credit Suisse (2014) Santos: The seven year itch?, https://www.gabpg.org.au/wp-content/uploads/2014/06/Credit_suisse_report110314.pdf

While further analysis should be conducted around the likely impact on gas supply and price, high-cost gas supplied by companies with market power into a market with declining supply appears likely to increase prices.

Conclusions

Unconventional gas has typically failed to deliver the sustained local economic prosperity it promised where it has been established. It is unlikely the situation would be any different in Western Australia.

What makes Western Australia different from other areas is that it, a) already hosts a large, low-cost, established gas industry, and b) has a gas reservation policy that currently provides reliable local supply even when global prices would otherwise attract gas producers to export gas instead, and c) already has an economy heavily impacted by energy and mineral exports.

These factors mean that establishing new high cost energy sources, such as unconventional shale or coal seam gas, reduce the average cost advantage to the resource industry while at the same time binding Western Australia's economy more closely to global commodity price cycles.

The gains in terms of potential ongoing employment opportunities from developing unconventional gas as small as the petroleum sector in general is a small employer even compared to its value added, even in relation to other resource sectors.

Because unconventional gas will be higher cost gas the royalty revenues per unit of production will be lower than for offshore gas. Notably, gas is already a relatively low royalty earner in the resources sector compared to the value of the resource.

In all, Western Australia could improve its economic outlook and long-term stability by diversifying away from the resources sector to more labour-intensive sectors of the economy, rather than invest in high cost additional resource extraction activities.