

Economies of shale

Submission on the Draft Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory

The NT Fracking Inquiry's draft report omits and misinterprets key results from its own economic report. It ignores the "very high" probability of commercial failure and confuses jobs with job-years. More care needs to be taken around economic results in finalising and communicating the Inquiry's report.

Rod Campbell
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Introduction

The Australia Institute welcomes the opportunity to make a submission on the Draft Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (the Inquiry). This submission focuses on Chapter 13 Economic Impacts of the Draft Report and the report by ACIL Allen *The economic impacts of a potential shale gas development in the Northern Territory* (the ACIL report), commissioned by the Inquiry. A separate Australia Institute submission addresses the Draft Report's treatment of methane emissions.

The Australia Institute has been involved in earlier parts of the Inquiry, making a written submission, appearing at a Darwin public hearing and in consultation with ACIL. Overall, our view is that unconventional gas in the Territory is unlikely to provide significant economic benefit and comes with substantial risks. Our view is supported by the ACIL report which states that there is "very high probability" that an unconventional gas industry would "fail to commercialise" in the NT ("Shale Calm" scenario). It also states there is "very low" or "low" probability of their highest production scenario ("Shale Gale" scenario).

Even in the low-probability Gale Scenario, ACIL estimate direct and indirect employment in the NT would be only 524 full time equivalent jobs higher than their baseline case. This represents just half of one percent of employment in the NT. Similarly, ACIL estimates that the Gale Scenario would see an increase in Territory Government revenue of \$143.2 million per year, just 2% of budget revenue. The high or very high probability scenarios would increase Territory revenues by between zero and \$29.1 million per year, a fraction of one percent.

Despite this rare unanimity from economists that an unconventional gas industry in the NT would be low-probability and have little impact on employment or revenue, the Draft Report paints a very different picture. For example:

ACIL Allen's economic impact assessment modelling reports that lifting the moratorium on hydraulic fracturing in the NT will deliver tangible economic benefits in the form of increased income, output, employment and taxation revenue, and stronger population growth. (p327)

The Draft Report reaches this different conclusion because it omits and misrepresents key results of the ACIL report. In particular, the Draft Report makes no mention of ACIL's assessment of the probability of its different modelled scenarios. ACIL's report makes it clear that and should be a key point raised in the Inquiry's final report.

Other problems relate to the conflation of jobs with 'job years'. Much of the Draft Report's focus is on numbers of 'job years' that ACIL's modelled scenarios estimate, in particular the highest number of 13,611. The Draft Report fails to explain the difference between jobs and job years, omitting the latter term entirely.

The authors of the Draft Report are not alone in misunderstanding ACIL's results. Multiple media reports misreported the 13,611 'jobs' figure, giving the impression that an unconventional gas industry could be an employer 26 times greater than ACIL's best-case assessment. Astonishingly, the Inquiry's leader Justice Rachel Pepper claimed 32,000 jobs could be created in one media interview, misquoting another ACIL figure.

ACIL's presentation of some of their key results made these mistakes easy to make. For example, ACIL's executive summary also refers to 13,611 jobs, saving the 'job years' term for later in the report. Some of ACIL's population figures are 'person years' not people. Estimates of revenues and growth in present value form, which provide more conservative values, are scarcely referred to in their report.

While these issues may be a result of clumsy editing, readers of ACIL's report should note that the company consults regularly to the gas industry. While ACIL's economists have produced reasonable results, their editors have managed to produce a report that has been interpreted publicly in a way much more favourable to their usual list of clients.

In the politically charged atmosphere of gas policy the Inquiry's omissions and misinterpretations of ACIL's results make evidence-based policy even more difficult to achieve. Much more care needs to be taken around economic results in finalising and communicating the Inquiry's report.

Key changes recommended to draft report

ADDITION OF SCENARIO PROBABILITY MATRIX

The Draft Report does not reproduce or make any reference to the ACIL report’s assessment of the probability of each scenario occurring referred to as the “Development Scenario Probability Matrix”. In ACIL’s assessment, there is very high likelihood that shale gas development is not viable in the NT and low to very low probability of the large-scale “shale gale” scenario occurring:

Figure 1: ACIL Scenario Probability Matrix

FIGURE ES 7 ACIL ALLEN DEVELOPMENT SCENARIO PROBABILITY MATRIX

INDUSTRY DEVELOPMENT SCENARIO	Production Profile	Production Cost Regime	POLICY SCENARIO PROBABILITY MATRIX		
			PERMANENT MORATORIUM	PARTIAL LIFT	FULL LIFT
BASELINE	Nil Shale Production	N/A	CERTAIN	MODERATE	LOW
SHALE CALM	Exploration occurs Failure to commercialise	N/A	ZERO	VERY HIGH	VERY HIGH
SHALE BREEZE	Scenario 1 Target production: 36PJ per annum	High cost	ZERO	MODERATE	HIGH
SHALE WIND	Scenario 2 Target production: 150PJ per annum	Moderate cost	ZERO	LOW	MODERATE
SHALE GALE	Scenario 3 Target production: 365PJ per annum	Low cost	ZERO	VERY LOW	LOW

SOURCE: ACIL ALLEN CONSULTING

Source: ACIL (2017) The economic impacts of a potential shale gas development in the northern territory, page IX

ACIL’s probability matrix is very important in the context of their report. It states that the ‘Shale Calm’ scenario, where gas exploration occurs but does not lead to commercial gas development, is the most likely outcome. The only other outcome considered of ‘high’ likelihood is the ‘Shale Breeze’ scenario with a full lift of the moratorium. The ‘Shale Gale’ scenario, is the least likely to occur.

ACIL’s matrix is based on a qualitative assessment, but was not developed lightly. ACIL’s consultation included eight interviews with gas industry representatives (Table 1.1) and the matrix considers:

[The] outcomes of the financial modelling, the uncertainty regarding the size of the Northern Territory's commercial reserves, and the challenges associated with producing gas at a price which the market will accept. (p45)

ACIL's probability assessment echoes those of industry analysts who think it is unlikely unconventional gas development in the NT can be commercially viable given likely high costs of production and distance from markets.¹

Far too few economic reports make this important consideration, resulting in approval of projects that either do not proceed, or shut down intermittently, and not delivering the promised economic benefits. By including this part of the analysis, ACIL give decision makers a far better understanding of the likely consequences of their decisions. The report's consideration of the probability of each scenario is one of its key strengths and the entire economic discussion of gas in the NT should be seen in the context of it.

Despite the importance of the Scenario Probability Matrix and it appearing three times in the ACIL report (pages IX, 46 and 136), it is not reproduced in or even referred to by the Inquiry's Draft Report. The Draft Report repeats ACIL's paragraph from before the matrix on p45 almost word-for word, yet ignores the matrix and its implications completely.²

By ignoring ACIL's assessment of the probability of each scenario, the Draft Report misrepresents ACIL's analysis and results. For example:

ACIL Allen's economic impact assessment modelling reports that lifting the moratorium on hydraulic fracturing in the NT will deliver tangible economic

¹ See extensive discussion in Robertson (2016) Pipe Dream: A financial analysis of the Northern Gas Pipeline, <http://ieefa.org/wp-content/uploads/2016/05/Pipe-Dream-A-Financial-Analysis-of-the-NEGI-MAY-2016.pdf>, as well as media reports such as McDonald-Smith (2017) Origin Energy sizes up Beetaloo gas prize, <http://www.afr.com/business/energy/gas/origin-energy-sizes-up-beetaloo-gas-prize-20170718-gxdulh>; Chambers (2017) Origin sitting on Beetaloo shale gas bonanza, <http://www.theaustralian.com.au/business/mining-energy/origin-sitting-on-beetaloo-shale-gas-bonanza/news-story/b0df8be0415702284a6c5a8c23832285>

² ACIL's paragraph reads: *ACIL Allen notes that it has made a critical assumption that the shale gas developments modelled in this report are a "dry gas play". That is, the hydrocarbons produced in a development do not include higher value liquid hydrocarbons such as ethane, propane, butane or crude oil. A "liquids rich" shale gas play results in a very small increase in operating costs (associated with increased processing to separate the higher value hydrocarbons from the lower value hydrocarbons), and a very large increase in potential production revenue. (p45)*

The Draft Report reads: *all gas is 100% 'dry gas', with no higher value hydrocarbons, such as butane, ethane, propane or crude oil, targeted or available for extraction. A 'liquids rich' shale gas play results in a small increase in operating costs and a large increase in potential production revenue. The net effect of a liquids rich development is to significantly improve project economics. (p312)*

benefits in the form of increased income, output, employment and taxation revenue, and stronger population growth. (13.7 Conclusion, p327)

Additional taxation revenue will flow to the Government if the moratorium is lifted directly through increased royalty and payroll tax payments, and indirectly through additional goods and services tax (GST) revenue distributed back to the NT. (13.6.1 Increased Government Revenue, p321)

ACIL Allen estimates that the direct and indirect employment impact of the industry will be an average 82 FTE (Breeze), 252 FTE (Wind) and 524 FTE (Gale) per annum, with much of this employment likely to occur in regional areas where development activities would occur. (13.6.2 Managing an increased demand for labour, p323)

These statements are false. ACIL's report clearly states that lifting the fracking moratorium **might** deliver tangible benefits, additional taxation revenue or jobs, but that there is "very high" probability that the industry is not viable and these benefits do not occur. These paragraphs should be re-written to reflect ACIL's assessment of development probabilities. The Probability Matrix should be reproduced in section Section 13.3.3 *Information Challenge* (p310-311), where ACIL's financial model that informs the matrix is first discussed. Reference to the probability matrix should also be included in:

- 13.2 *Key issues* (p304)
- 13.3.4.3 *Project cash flow modelling* (p313), including reference to the most likely 'Shale Calm' scenario.
- 13.4.2 *Calm scenario* (p317)
- 13.4.3 *Breeze scenario* (p317)
- 13.4.4 *Wind scenario* (p318)
- 13.4.5 *Gale scenario* (p318)

A shortcoming of ACIL's report is a lack of consideration of the costs to communities of the 'Shale Calm' scenario. ACIL's model assumes that as production is not viable in this scenario, there is no benefit and no cost. In the real world, companies with exploration or production rights do not disappear just because a project is unviable. Doing so would result in total loss of market value of the project and significant write downs for companies, which often carry these projects on their accounts at high values.

If proponents of unviable projects disappeared, there would be no controversy over Queensland's Adani mine proposal. Instead, project proponents like Adani in Queensland, or Santos's gas project at Narrabri, continue to advocate for their project as it is in their direct financial interests to do so. They pursue government subsidies,

relaxed environmental conditions and continue to promote projects in the media and to communities. In the case of the NT, the most likely ‘Shale Calm’ scenario would still impose costs on communities advocating to protect water resources. Communities will need to continue to engage with planning processes and other forms of advocacy that take time and resources. These costs are avoided by maintaining the moratorium.

NO CONSIDERATION OF PRESENT VALUES

A related point to the omission of the probability matrix is the Draft Report’s failure to discuss any of the present value estimates from ACIL’s report.

Most economic and financial analysis presents streams revenues and costs into the future as a ‘present value’. As the term suggests, this estimates what future costs and benefits are worth at the present. This is partly because future costs and benefits are uncertain – they may not materialise. Partly due to uncertainty, most people would prefer to receive a payment of \$100 now rather than in ten years’ time.

Uncertainty and people’s preference to have money earlier (and defer costs to later) is why economists and financial analysts ‘discount’ future revenues and costs. ACIL discount all their estimates for the different modelled scenarios in Tables 8.1, 9.1, 10.1 and 11.1. An extract of Table 9.1 is shown below:

Figure 2: Extract from ACIL Table 9.1 highlighting present value estimates

	Total	Average	NPV (7 per cent)
Real income			
Northern Territory	\$937.2m	\$36.0m	\$380.1m
Rest of Australia	\$3,339.9m	\$128.5m	\$1,099.0m
Total Australia	\$4,277.2m	\$164.5m	\$1,479.1m

Source: ACIL (2017) The economic impacts of a potential shale gas development in the Northern Territory, page 105.

From an economic perspective these are the more useful figures than the estimates of “Total” impact because they take into account uncertainty and some estimate of people’s time preferences. ACIL do not often refer to these figures in their report, probably because they refer repeatedly to the probability matrix that emphasises the low uncertainty of many of the results occurring.

The Draft Report should be amended to either refer mainly to present value figures, or to emphasise the probability matrix discussion around the likelihood of each scenario.

MISREPRESENTATION OF EMPLOYMENT AND POPULATION INCREASE ESTIMATES

ACIL's report supports The Australia Institute's long-held view that the unconventional gas industry would not employ many people in the Northern Territory. The high probability 'Shale Calm' scenario would see an average increase of just 5 full time equivalent (FTE) jobs (Table 8.1, p93), while in relation to the other scenarios:

ACIL Allen estimates that the direct and indirect employment impact of the industry will be an average 82 FTE (Breeze), 252 FTE (Wind) and 524 FTE (Gale) per annum...(Draft Report p323)

Context is important. The latest Australian Bureau of Statistics estimate of employment in the Northern Territory is 136,500 people employed, 108,100 of which are full time. Even the low-probability 'Shale Gale' scenario would change NT employment by less than half of one percent.

It is important to understand exactly what is estimated in the ACIL report. The figures above are ACIL's estimate of the average number of additional full time equivalent jobs in the Northern Territory under each scenario over the 25 year modelled period. ACIL estimate there would be more additional jobs in some years, such as during construction, and less in others, such as during exploration. These estimates of each year average out to the numbers above.

Confusingly, the ACIL report also estimates numbers of 'job years', or the sum of all years of additional employment that each scenario would result in:

This additional economic activity will generate employment opportunities for Territorians, with an estimated 2,154 FTE job years (BREEZE), to 6,559 FTE job years (WIND) to 13,611 FTE job years (GALE) generated by the various development scenarios over the forecast period over and above the existing employment growth ACIL Allen has forecast in its base case (Figure 12.3). This equates to between 82 FTEs, 252 FTEs, and 524 FTEs of net employment growth in each year on average. While modest overall, this represents the capital intensive nature of the shale gas industry, and is also a function of ACIL Allen's conservative treatment of employment growth in its modelling activities (see Section 6). (ACIL report p134)

More confusingly still, this paragraph also appears in the Executive Summary of the ACIL report, but with the term 'job years' edited out:

This additional economic activity will generate employment opportunities for Territorians, with an estimated 2,154 FTE jobs (BREEZE), to 6,559 FTE jobs (WIND) to 13,611 FTE jobs (GALE) generated by the various development scenarios over the forecast period over and above the existing employment growth ACIL Allen has forecast in its base case (Figure ES 4). This equates to between 82 FTEs, 252 FTEs, and 524 FTEs of net employment growth in each year on average. This includes indirect employment generated by the local spending of the industry. While modest in the context of the overall Northern Territory labour market, this represents the capital intensive nature of the shale gas industry and modelling assumptions (see Section 6). (ACIL report pVI)

The difference between jobs and job years is important. The Inquiry's Draft Report does not actually mention the term 'job years' with long-term jobs and job years regularly conflated in it:

- 13.4.2 Calm scenario (p317): *Over the 25-year modelled period, 119 direct and indirect FTEs will be created in the NT, all in the period to 2021.*
- 13.4.3 Breeze scenario (p317): *The Breeze scenario is estimated to create an additional 2,145 direct and indirect FTE jobs, at an average rate of 82 FTE jobs per annum...*
- 13.4.4 Wind scenario (p318): *The Wind scenario is estimated to create 6,559 additional FTE jobs over 25 years, at an average rate of 252 FTE jobs per annum...,*
- 13.4.5 Gale scenario (p318) *The Gale scenario is estimated to create 13,611 additional FTE jobs over the 25-year modelled period at an average rate of 524 FTE jobs per annum...*

We suggest describing ACIL's employment estimates as:

- 13.4.2 Calm scenario (p317): *The most probable Calm scenario would see additional employment of 70 full time jobs in 2019 during initial exploration. However this would decrease to around 16 jobs in 2020, 10 jobs in 2021 and zero additional employment beyond 2021 due to the non-viability of the shale gas industry in the NT under this scenario (ACIL Report Figure 8.7).*
- 13.4.3 Breeze scenario (p317): *The Breeze scenario would increase employment in the NT by 82 jobs on average, with a peak of 190 jobs in 2042 (ACIL report Figure 9.8). In total this scenario would see additional employment of 2,874 job years over the 25-year modelled period.*
- 13.4.4 Wind scenario (p318): *The Wind Scenario would increase employment in the NT by 252 jobs on average, with a peak of 610 jobs in 2036 (ACIL report*

Figure 10.8). In total this scenario would see additional employment of 6,559 job years over the 25-year modelled period.

- 13.4.5 Gale scenario (p318) *The Gale scenario would increase employment in the NT by 524 jobs on average, with a peak of 1,300 jobs in 2027 (ACIL report Figure 11.8). In total this scenario would see additional employment of 13,611 job years over the 25-year modelled period.*

The confusion between jobs and job years in ACIL's report and the Draft Report have led to misleading discussion in the media:

Lifting Labor's fracking ban in the Northern Territory could theoretically boost the local economy by as much as \$17.5 billion or \$674 million annually in real terms between next year and 2043, and create up to 13,600 jobs over the same period, according to a new study.³

The ABC's headline on the ACIL report originally read "NT fracking inquiry: More than 1300 jobs and up to \$5.8b predicted by economic assessment". The Australia Institute contacted the ABC and the story and headline were corrected, but the original figure is preserved in the URL address of the story - <http://www.abc.net.au/news/2017-10-27/nt-fracking-economic-report-predicts-13000-jobs/9094998>

The most egregious misrepresentation of ACIL's jobs figures in the media came from Inquiry Chair Justice Pepper, when interviewed on Mix104.9:

Q: What did the panel find that the impact that fracking would have on the Northern Territory's economy.

A: Taking in the best case scenario...and there is always uncertainty in any modelling and they acknowledge that. It has the capacity to add \$3.7 billion to the Territory's revenue over the next 25 years, that's an increase of around 2.2%. It has the capacity to create in terms of full time equivalent jobs, approximately 32,000 jobs. So there are substantial benefits to be gained.⁴

Even if Justice Pepper meant to refer to 'job years', she was wrong by 2.5 times ACIL's best-case, least-likely estimates. The more common interpretation of a 'job' being

³ Aikman (2017) *Lifting Northern Territory fracking ban could raise \$17 billion, study finds*, <http://www.theaustralian.com.au/business/mining-energy/lifting-northern-territory-fracking-ban-could-raise-17-billion-study-finds/news-story/d99da9233237abde20008c17859f2d80>

⁴ Mix104.9 (2017) *Final draft report into fracking handed down*, interview with Katie Woolf and Justice Rachel Pepper at approximately 13:30, <https://www.mix1049.com.au/360-with-katie-woolf/latest-from-katie/72439-final-draft-report-into-fracking-handed-down>

longer term would see her be wrong by a factor of sixty. It is concerning to say the least that at this late stage of the inquiry its leader has no grasp of the magnitude of potential employment impacts of unconventional gas.

Justice Pepper’s error was not a momentary misunderstanding. The 32,000 figure does come from ACIL’s report, but it relates not to jobs but population:

Figure 2: Extract from ACIL Table 11.1 gale development scenario, summary of economic impact results

ACIL ALLEN CONSULTING

	Total	Average	NPV (7 per cent)
Total industry employment	13,611 FTEs	524 FTEs	
Real population			
Northern Territory	32,252 persons	1,240 persons	

Source: ACIL (2017) The economic impacts of a potential shale gas development in the Northern Territory, page 131-132. Note: The Australia Institute has never encountered the term ‘real population’ before and have contacted ACIL for clarification.

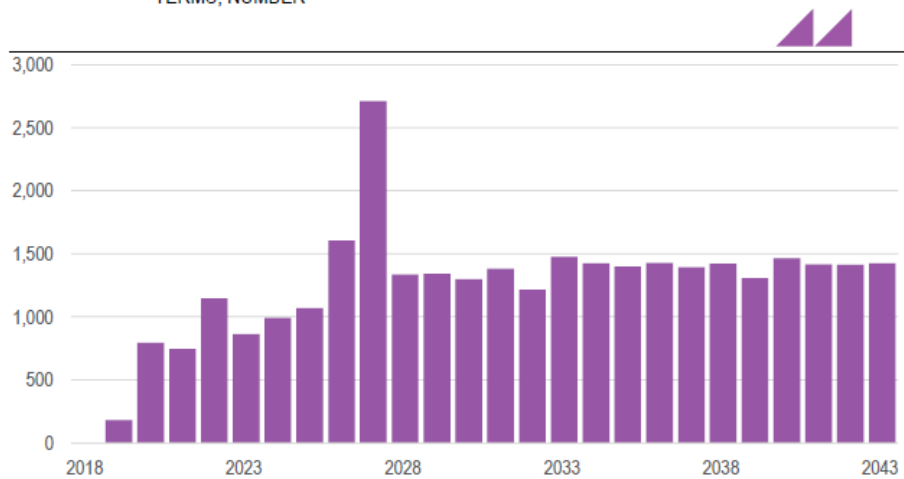
This population estimate is also emphasised in the Inquiry’s Draft Report:

The Gale scenario is estimated to create 13,611 additional FTE jobs over the 25-year modelled period at an average rate of 524 FTE jobs per annum, and support an aggregate population growth of 32,252 persons, or an additional 1,240 persons per year. (p319)

Similar to the confusion between “jobs” and “job years”, the Draft Report misinterprets ACIL’s estimates of population change. This is clear as it does not make sense that a scenario that results in an average increase in employment of 524 jobs would lead to population growth of 32,252 people. This is clear from ACIL’s charts on population:

Figure 3: ACIL Figure 9.11 Gale Northern Territory Real Population, deviation from baseline, real terms, number

FIGURE 11.11 GALE NORTHERN TERRITORY REAL POPULATION, DEVIATION FROM BASELINE, REAL TERMS, NUMBER



SOURCE: ACIL ALLEN CONSULTING

Source: ACIL (2017) The economic impacts of a potential shale gas development in the Northern Territory, page 129

ACIL’s chart above makes it clear that across the modelled period the least likely Gale Scenario would raise the NT’s population above baseline by between 1,000 and 1,500 people, an average of 1,240. 2019 would be much smaller with gas jobs yet to eventuate while 2017 would see a peak associated with construction of infrastructure. The sum of all bars in the figure above is 32,252 person years. In a phone call on 17 January ACIL confirmed that this is the case.

Further confirmation that ACIL’s “total” population change estimates relate to ‘person-years’ rather than aggregate or average population change can be found by dividing ACIL’s population estimates by their job change estimates. As shown in the table below, ACIL assume that for every job or job year there is an increase in population of 2.4 people or ‘person-year’:

Table 1: ACIL job and population estimates

		Population	Jobs	Population/Jobs
Breeze	Years	5061	2145	2.4
	Average	195	82	2.4
Wind	Years	15480	6559	2.4
	Average	595	252	2.4
Gale	Years	32252	13611	2.4
	Average	1240	524	2.4

Source: ACIL Report Tables 8.1, 9.1, 10.1 and 11.1 and Australia Institute calculations.

While this approach to population and employment has the benefit of simplicity, the remote and likely fly-in-fly-out nature of work in unconventional gas would be more complex. People moving to the NT for one year's construction work would be far less likely to bring another 1.4 family members with them than people moving for a longer-term job.

The quote above from the Draft Report (p319) that includes the 32,252 number should be rephrased as:

The Gale scenario would increase employment in the NT by 524 jobs on average, with a peak of 1,300 jobs in 2027 (ACIL report Figure 11.8). In total this scenario would see additional employment of 13,611 job years over the 25-year modelled period. This increase in employment would likely result in an average increase in the Territory's population of 1,240.

The important point to note in this discussion is not the intricacies of population forecasting, but that the Inquiry's Draft Report and the head of the Inquiry have misrepresented ACIL's findings in relation to employment and other economic impacts.

ACIL's presentation of some results is ambiguous and confusing, contributing to the Inquiry's and the media's misinterpretations. It is not surprising that results on employment were misinterpreted with ACIL's Executive Summary claiming unconventional gas development could lead to thousands of jobs, without disclosing until much later that they meant 'job years'.

Other suggested changes to Draft Report

Section 13.2.1.2 Employment

The initial paragraph that references the Deloitte report should be removed:

In its 2015 report, Deloitte Access Economics (Deloitte) presented two scenarios (success and aspirational) for potential onshore gas development in the NT. Associated predictions for employment were between 4,200 and 6,300 full time equivalent (FTE) jobs above the base case by 2040. (p305)

This paragraph should be deleted as the Deloitte study has been repeatedly discredited, particularly by ACIL's report for the Inquiry. At the very least it should be made clear that the report was commissioned by gas industry lobby group, APPEA. Later in the Chapter the Draft Report notes:

In the Panel's opinion, [compared to the Deloitte report] the ACIL Allen assumptions and modelling represent a much more realistic approach to estimating the economic impacts of any onshore shale gas industry in the NT. (p320)

The paragraph should be replaced with contextual information such as:

At the 2016 ABS Census the Northern Territory had 657 residents who worked in oil and gas extraction, out of total employment of just over 100,000.⁵

⁵ Accessed through Tablebuilder Basic, <https://secure.abs.gov.au/webapi/jsf/login.xhtml>

Conclusion

The ACIL report confirms that there is a very low probability of a major shale gas industry eventuating in the Northern Territory. Even if this was to occur, its economic impacts would be minor, particularly on important aspects of the economy such as employment and government revenue. Despite these conclusions, the Inquiry's draft report gives the impression that simply overturning the fracking moratorium will inevitably lead to significant economic benefit. The Draft Report's economic impact chapter needs significant amendment before it is finalised.