



## Options for the implementation of Recommendation 9.8 of NT Fracking Inquiry

---

***Offsetting NT fracking emissions identified by the Northern Territory Government's Fracking Inquiry will cost up to \$4.3 billion in 2030 alone, and \$146 billion from 2030 to 2040***

Discussion paper

**Mark Ogge**

**October 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](mailto:mail@tai.org.au)  
Website: [www.tai.org.au](http://www.tai.org.au)  
ISSN: 1836-9014

# Summary

Extracting gas from the Northern Territory through hydraulic fracturing (“fracking”) is one of the largest potential sources of carbon pollution in the world.

The Fracking Inquiry that reported earlier this year recommended that unconventional gas extraction should only be permitted if the all 135 recommendations are accepted and implemented. All recommendations were accepted by the NT Government when it lifted the gas moratorium.

One of those recommendations is that the NT and Federal Governments ensure that any domestic emissions resulting from unconventional gas are “offset” elsewhere so there is no net increase in emissions.

Using Australian Government projections of the price of greenhouse gas emissions, the cost of offsetting the emissions from fracking the Northern Territory could be up to \$4.3 billion in the year 2030 alone. The cumulative cost of offsets from 2030 to 2040 (the likely operational life of gas fields) could be up to \$146 billion.

The Fracking Inquiry identified a number of alternative offset sources, such as shutting down coal-fired power plants in other states. These alternatives have jurisdictional issues and may not produce many valid offset credits depending on the lifespans of the plants that are targeted.

Offsetting NT gas production through coal plant closures would require shutting down almost all of Victoria’s coal generation, or its equivalent elsewhere in Australia.

The view of The Australia Institute and many of Australia’s leading scientists is that the use of offsets does not justify fracking the NT. This research finds that even if offsets are used, they will be expensive and legally difficult to implement.

# Introduction

The Northern Territory is one of the areas that will suffer most from global warming if global emissions are not decisively reduced. CSIRO projections show that, if emissions continue to rise, Darwin could experience up to 275 days per year above 35 degrees by 2070. Combined with Darwin's high humidity, this could make the region virtually uninhabitable. Increasing extreme heat is just one of many potentially devastating impacts of climate change.

Despite this, a moratorium on unconventional gas extraction in the NT was lifted by Chief Minister Michael Gunner in April 2018, following a Fracking Inquiry that made 135 recommendations – all of which were accepted by the NT Government.<sup>1</sup>

Recommendation 9.8 of the Fracking is:

That the NT and Australian governments seek to ensure that there is no net increase in the life cycle GHG emissions emitted in Australia from any onshore shale gas produced in the NT.<sup>2</sup>

The Fracking Inquiry found that life cycle emissions from NT unconventional gas extraction would increase Australia's annual emissions by up to 38.9 Mt CO<sub>2</sub>e, equivalent to 6.6% of Australia's 2015 domestic emissions.

The Inquiry suggested a number of strategies to implement this recommendation. These included the offset policies, the early retirement of coal-burning power plants, fitting of carbon capture and storage to gas or coal-fired power stations and the increased uptake of electric vehicles.

This paper examines the implications of some of the options suggested by the Fracking Inquiry for offsetting emissions from fracking the NT.

---

<sup>1</sup> Michael Gunner, Chief Minister of the Northern Territory (17 April 2018) *Fracking moratorium lifted - strict laws to be in place before exploration or production can occur*, <http://newsroom.nt.gov.au/mediaRelease/25488>

<sup>2</sup> Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Summary of the final report*, p 35, <https://frackinginquiry.nt.gov.au/inquiry-reports?a=494327>

## OFFSETS REQUIRED

Offsetting is the abatement of carbon emissions by taking measures that reduce emissions elsewhere by the amount that emissions have increased. A common example is people offsetting their flights by paying for trees to be planted.

The volume of offsets required depends on the life cycle emissions of the gas that is fracked.

The Scientific Inquiry into Hydraulic Fracturing in the Northern Territory used three scenarios of shale gas production in its risk assessment. As can be seen in Figure 1 below, the lower scenario was 73 PJ/year, the medium scenario was production of 356 PJ/year and the high scenario was 1,240 PJ/year.

**Figure 1: Life cycle GHG emissions and comparison to Australia’s total GHG emissions**

Total gas production PJ/y (TJ/day)	Location of emissions	Life cycle GHG emissions <sup>160</sup> per year Mt CO <sub>2</sub> e/y	Proportion of Australia’s emissions for 2015 <sup>161</sup> %	Proportion of global emissions %
<b>Based on a 100-year GWP (= 36)</b>				
365 (1,000) <sup>162</sup>	Australia	26.5	45	0.05
73 (200)	Australia	5.3	0.9	0.01
1,240 (3,400) <sup>163</sup>	Australia	38.9	6.6	0.07
1,240 (3,400) <sup>164</sup>	Australia and overseas <sup>165</sup>	98.8	n/a	0.17
<b>Based on a 20-year GWP (= 87)</b>				
365 (1,000)	Australia	316	39	0.04
73 (200)	Australia	6.3	0.8	0.01
1,240 (3,400)	Australia	56.2	7.0	0.07
1,240 (3,400)	Australia and overseas	116.3	n/a	0.15

Source: Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Final report*, table 9.4 (p 231)

The medium scenario was found to result in life cycle emissions of 26.5 Mt CO<sub>2</sub>e/year. It was assumed all the gas in this scenario would be consumed in Australia. This is equivalent to 4.9% of Australia’s emissions in the year to December 2016.<sup>3</sup>

The high scenario was found to produce 98.8 Mt CO<sub>2</sub>e/year, the equivalent of 18% of Australia’s 2015 annual emissions. Of this, 38.9 Mt CO<sub>2</sub>e was assumed to have life cycle emissions located within Australia, equivalent to 6.6% of Australia’s total annual emissions.

<sup>3</sup> The inquiry identified this as 4.5% of Australia’s emissions for that year, however this is a miscalculation. 26.5 Mt CO<sub>2</sub>e equates to 4.9% of Australia’s total emissions of 537.9 Mt as identified by the final report as the basis of the comparison, see footnote 161 (p 228).

This scenario also resulted in an additional 60 Mt CO<sub>2</sub>e/year emitted in customer countries. The Fracking Inquiry found that:

the residual emissions of some 60 Mt CO<sub>2</sub>e/y are emitted overseas, and they should therefore be offset overseas.<sup>4</sup>

Figure 1 also shows the scenarios with a 100-year Global Warming Potential (GWP) which is the time frame usually used for calculating CO<sub>2</sub>e. But methane, which is the greenhouse gas released in shale gas production, is a more potent greenhouse gas that dissipates more quickly than carbon dioxide. Because of this many climate scientist believe that using a 20-year GWP for methane is more appropriate.

The high scenario is by no means an upper limit to Northern Territory gas production. By way of comparison, Queensland CSG production ramped from zero to over 1,200 PJ/year within a decade.<sup>5</sup> Marcellus shale gas production in the US is over 6,000 PJ/year<sup>6</sup> with far lower domestic gas prices and no opportunity for export.

## FRACKING MORATORIUM

---

In February this year, The Australia Institute and thirty of Australia's leading scientists – including many of Australia's leading climate scientists – called for a permanent ban on unconventional gas development in the Northern Territory due to its potential impact on global warming:

Our view is based on the scientifically robust carbon budget framework. On this basis, most existing fossil fuel reserves must remain unburned. Any new fossil fuel development is incompatible with the goal of the 2015 Paris climate agreement that aims to limit the rise in global temperature to well below 2.0°C above pre-industrial levels and to make every effort to limit the rise to 1.5°C.

As scientists and experts concerned about the wellbeing of the people of the Northern Territory, Australia and the rest of the world, we strongly urge that

---

<sup>4</sup> Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Final report*, p 239

<sup>5</sup> 34,329 MMcm CSG = 1278.39 PJ: Australian Government (January 2018) *Australian Petroleum Statistics 2018 issue 258*, table 1A, <https://www.energy.gov.au/sites/g/files/net3411/f/australian-petroleum-statistics-jan-2018.pdf>

<sup>6</sup> EIA (January 2018) *Natural gas weekly archive*,

[https://www.eia.gov/naturalgas/weekly/archivenew\\_ngwu/2018/01\\_18/img/shale\\_gas\\_201712.xlsx](https://www.eia.gov/naturalgas/weekly/archivenew_ngwu/2018/01_18/img/shale_gas_201712.xlsx)

that onshore shale gas and shale oil development does not go ahead in the Northern Territory under any circumstances.<sup>7</sup>

Following the NT Government's decision to lift the moratorium, many of the same scientists who called for a permanent ban on fracking signed a Joint Statement reasserting that fracking should be permanently banned and rejecting the idea that offsetting fracking emissions was sufficient to justifying it being allowed to proceed.

..our view remains that development of onshore shale gas and shale oil fields in the Northern Territory should not go ahead under any circumstances.....we do not accept that "offsetting" the domestic emissions of unconventional gas development would represent "an acceptable outcome".<sup>8</sup>

However, if fracking does go ahead, it is vital that offsets are used that genuinely prevent an equivalent amount of greenhouse gases entering the atmosphere from other sectors of the economy.

---

<sup>7</sup> The Australia Institute (February 2018) *An Open Letter to the Scientific Inquiry into Hydraulic Fracturing in the NT and the Northern Territory Government*,

<http://www.tai.org.au/sites/default/files/NT%20Fracking%20open%20letter%20Feb%202018.pdf>

<sup>8</sup> The Australia Institute (April 2018) *Joint Response to the Greenhouse Gas Emissions chapter of the Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory*,

<http://www.tai.org.au/content/top-scientists-call-nt-keep-gas-ground>

# Offset strategies

The Fracking Inquiry found that the residual life cycle emissions from Fracking in the Northern Territory would be “unacceptable”.

The inquiry found that for fracking to meet the “acceptability criteria” and go ahead, the life cycle emissions resulting from Northern territory fracking must be fully offset, and:

To achieve this outcome, the increase in life cycle GHG emissions in Australia from any onshore shale gas produced in the NT (see Table 9.4) must be fully offset. For example, 26.5 Mt CO<sub>2</sub>e/y must be fully offset for a gasfield producing 365 PJ/y and 38.9 Mt CO<sub>2</sub>e/y must be fully offset in Australia for a gasfield producing 1,240 PJ/y. In the latter case, the residual emissions of some 60 Mt CO<sub>2</sub>e/y are emitted overseas, and they should therefore be offset overseas.<sup>9</sup>

Recommendation 9.8 of the Fracking Inquiry is:

That the NT and Australian governments seek to ensure that there is no net increase in the life cycle GHG emissions emitted in Australia from any onshore shale gas produced in the NT.<sup>10</sup>

The Fracking Inquiry identified a number of strategies that could “fully offset” Northern Territory fracking emissions:

There are a variety of strategies that may either be expanded or new strategies be implemented to achieve this recommendation, including: early retirement of coal-burning power plants; fitting of carbon capture and storage to gas or coal-fired power stations; higher emission standards for fossil fuel-burning vehicles; increased uptake of electric vehicles; international offsets; carbon credit offsets in agriculture and savannah burning; formal offset policies and markets; increased deployment of renewable energy; and reductions in deforestation.<sup>11</sup>

---

<sup>9</sup> Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Final report*, p 239

<sup>10</sup> Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Final report*, p 239

<sup>11</sup> Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Final report*, p 239

# Options for implementing Recommendation 9.8

The following analysis examines some of these options put forward by the Fracking Inquiry to fully offset emissions from fracking.

## PURCHASING ACCU OFFSETS OVER TIME

---

The Fracking Inquiry suggests that fracking emissions could be “fully offset” through:

international offsets; carbon credit offsets in agriculture and savannah burning; formal offset policies and markets.<sup>12</sup>

The Australian Government established a carbon offset scheme in late 2011, known as the Carbon Farming Initiative. The Carbon Farming Initiative was merged into the Emissions Reduction Fund (ERF) in 2014.

Under the ERF, carbon offset proponents are able to earn Australian Carbon Credit Units (ACCUs) for each tonne of carbon dioxide equivalent (t CO<sub>2</sub>-e) stored or avoided through abatement projects. To be eligible, abatement projects must adhere to methods created under the scheme. At present, there are more than 30 methods, covering, amongst other things, vegetation management, agriculture, energy efficiency and waste management.

Projects that reduce emissions or increase sequestration in accordance with the methods receive ACCUs, which can be sold to the government through auctions or in the secondary market. Purchasers in the secondary market can be entities with liabilities under the Safeguard Mechanism or businesses wanting to voluntarily offset their emissions.

### Under the current ACCU price

The average price of ACCUs following the sixth government auction in December 2017 was \$13.08. If all offsets for all domestic emissions from NT fracking could be purchased at this price, they would cost between \$69 million (low production scenario,

---

<sup>12</sup> Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Final report*, p 239

100-year GWP) and \$735 million (high production scenario, 20-year GWP) per year – as shown in Table 1.

If we take the Fracking Inquiry’s middle scenario of life cycle emissions of 26.5 million tonnes of CO<sub>2</sub>e per year, an ACCU price of \$13,08 per tonne gives a total cost of \$347 million per year.

**Table 1: Cost of using ACCUs to offset NT shale gas production under different scenarios**

Gas production scenario	Location of emissions	Life cycle GHG emissions per year Mt CO <sub>2</sub> e/y	Total cost (assuming \$13.08 per tonne)
<b>Based on a 100 year GWP (=36)</b>			
<b>Low</b>	Australia	5.3	\$69 million
<b>Medium</b>	Australia	26.5	\$347 million
<b>High</b>	Australia	38.9	\$509 million
<b>High</b>	Australia and overseas	98.8	\$1,292 million
<b>Based on a 20 year GWP (=87)</b>			
<b>Low</b>	Australia	6.3	\$82 million
<b>Medium</b>	Australia	31.6	\$413 million
<b>High</b>	Australia	56.2	\$735 million
<b>High</b>	Australia and overseas	116.3	\$1,521 million

Note: Global Warming Potential (GWP) shows the potency of various greenhouse gases for creating warming. GWP of 1 is identical to carbon dioxide. Methane is highly potent but short lived in the atmosphere. The shorter the time frame used the higher methane’s GWP is.

## Under future ACCU prices

However, Northern Territory fracking will not begin immediately. The Government has indicated data on methane levels will be collected for six months prior to the commencement of any projects. After that data collection period, exploration can begin and particular projects will have to move through the approval process. This will take a number of years.

Over time, the cost of offset credits is likely to increase. As countries seek to reduce their emissions in accordance with the Paris Agreement, demand for offsets will rise, putting upward pressure on prices.

Economic modelling undertaken on the efforts required to achieve the Paris Agreement's target of keeping temperature increases to 2 degrees Celsius indicate carbon prices will need to be in excess of \$100/t CO<sub>2</sub>-e by 2030.

This is illustrated in the modelling commissioned by the Climate Change Authority for the purposes of its 2016 Special Review, which projected a carbon price of around \$110/t CO<sub>2</sub>-e in 2030 for scenarios consistent with a 2 degrees Celsius outcome.<sup>13</sup>

The carbon price projection adopted by the Authority for its economy-wide modelling is "a common international carbon price, expressed in United States dollars consistent with global efforts with a likely chance of limiting temperature increases to 2 degrees".<sup>14</sup>

As such, the value of Australian and international offsets are assumed to be identical.

Using these Australian Government economy wide carbon price projections, as shown in Figure 2, the annual cost of abatement of Northern Territory fracking would be up to \$4.3 billion in the year 2030.

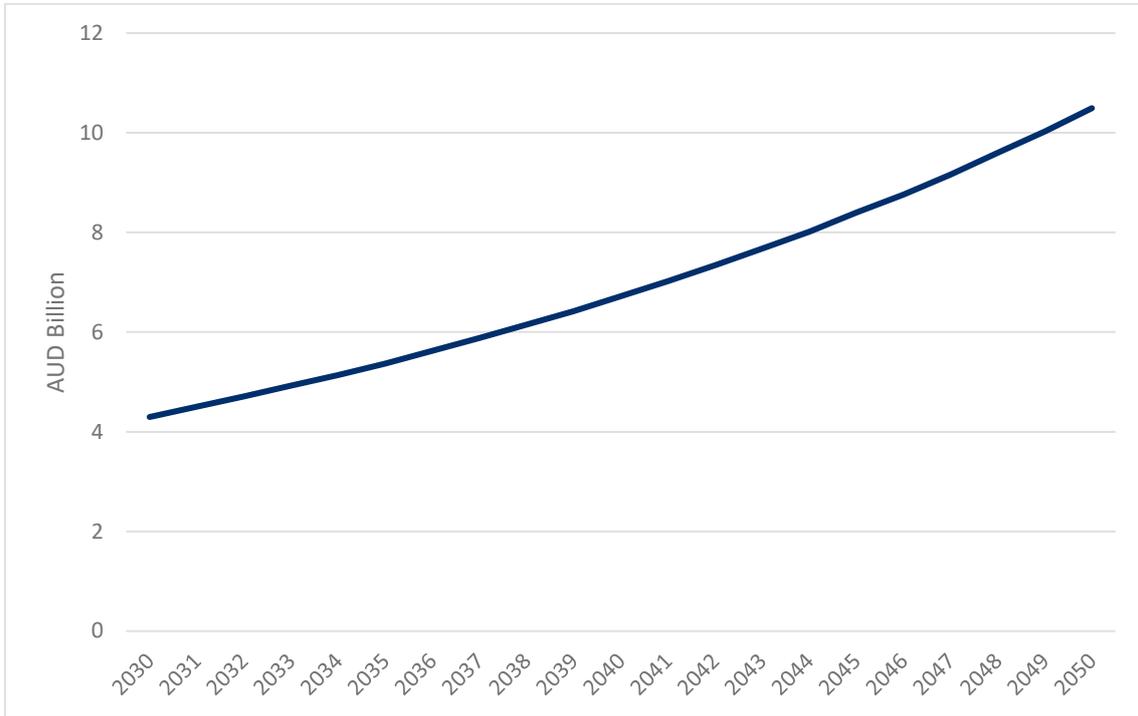
---

<sup>13</sup> Australian Government, Climate Change Authority, *Modelling illustrative electricity sector policies*. <http://www.climatechangeauthority.gov.au/reviews/special-review/modelling-illustrative-electricity-sector-policies>

Jacob Group: Carbon price path for Cap and Trade and Emission Intensity scenarios for 2030 \$100.2-\$110.5/tCO<sub>2</sub>e, Figure 2. Victoria University: Price of GHG emissions in Reference Case \$110.5/tCO<sub>2</sub>e, Figure 1B.

<sup>14</sup> Climate Change Authority (2016) *Policy options for Australia's electricity supply sector- special review research report*, p 17, <http://www.climatechangeauthority.gov.au/sites/prod.climatechangeauthority.gov.au/files/files/SR%20Electricity%20research%20report/Electricity%20research%20report%20Appendix%20C%20for%20publication.pdf>

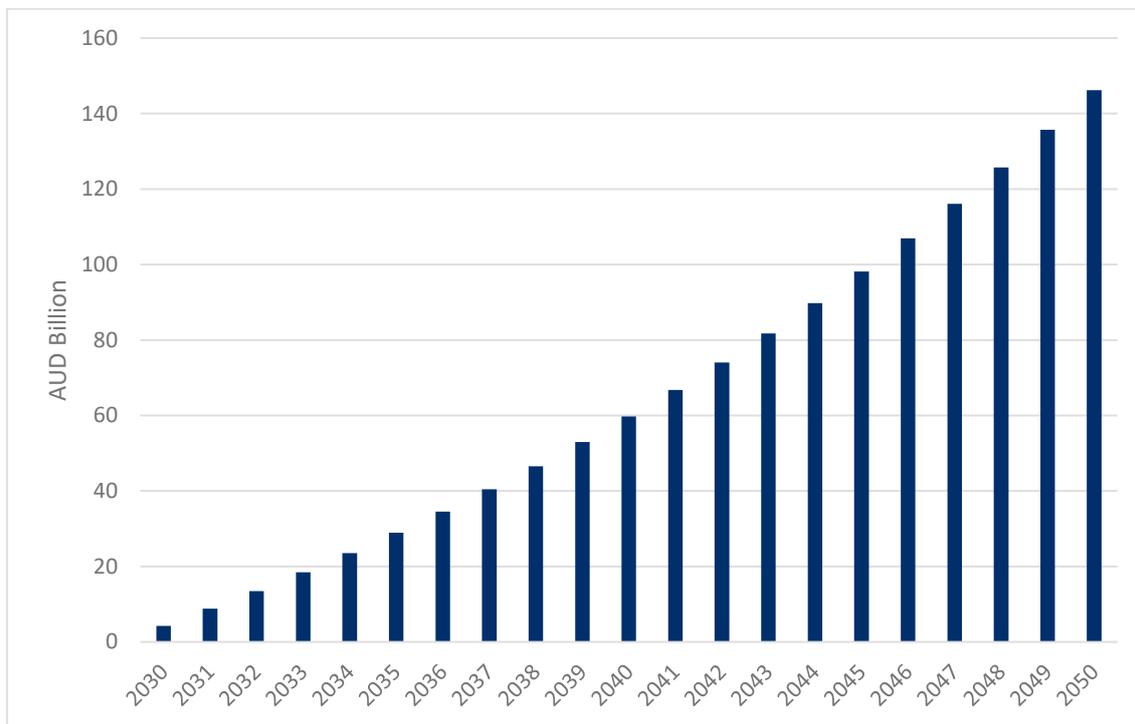
**Figure 2: Annual cost of abatement for NT fracking emissions under 1,240 PJ/y production scenario**



Source: Scientific Inquiry into Hydraulic Fracturing in the Northern Territory Final Report, Victoria University: Climate Change Authority 2017 Special Review Modelling.

As shown in Figure 3, the cumulative cost of abatement from 2030 to 2050 when the gas fields are likely to be in full production would be up to \$146.2 billion.

**Figure 3: Cumulative cost of abatement for NT fracking emissions under 1240PJ/year production scenario (2030-2050)**



Source: Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Final Report*; Victoria University: Climate Change Authority 2017 Special Review Modelling.

## EARLY RETIREMENT OF COAL-FIRED POWER PLANTS

The Fracking Inquiry suggested that one of the strategies that could be used for “fully offsetting” fracking emissions is the “early retirement of coal-burning power plants”.<sup>15</sup>

If this strategy was employed and the closure of the most emissions intensive power plants was prioritised, it could require the early retirement of virtually all of Victoria’s coal power plant capacity.

As shown in Table 2 below, the most emissions intensive coal power plants in the National Electricity Market (NEM) are Victoria’s coal power plants: Loy Yang A, Loy Yang B and Yallourn. Loy Yang A and Yallourn are also two of the oldest and most unreliable power plants in the NEM.

<sup>15</sup> Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Final Report*, p 239

**Table 2: Ten most emissions intensive coal plants in the National Electricity Market**

Power plant	State	Emissions intensity (t/MWh)	Age (years)	Breakdowns (Summer 2017/2018)	Emissions 2016/17 (Mt CO2e)
<b>Yallourn W</b>	Vic	1.29	36-43	6	19
<b>Loy Yang A</b>	Vic	1.18	31-33	7	15
<b>Loy Yang B</b>	Vic	1.12	22-25	1	9.6
<b>Gladstone</b>	Qld	0.96	36-42	5	6.4
<b>Liddell</b>	NSW	0.93	45-47	3	8.9
<b>Callide B</b>	Qld	0.92	29	2	4.4
<b>Callide C</b>	Qld	0.9	17	1	4.9
<b>Bayswater</b>	NSW	0.89	34-36	1	14.2
<b>Mt Piper</b>	NSW	0.87	26	0	6.6
<b>Tarong</b>	Qld	0.87	32-34	1	10.7

The emissions of coal power plants vary from year to year depending on the amount of energy they produce. Using the most recent available emissions data (2016/17), Victorian coal power plants produced 43.6 Mt CO2e of emissions.

As discussed above, the Fracking Inquiry identified that fracking in the NT would require life cycle emissions offsets of up to 38.9 Mt CO2-e per year.<sup>16</sup>

The closure of Loy Yang A and Yallourn Power Stations would offset 34 of the up to 38.9 Mt CO2e of fracking emissions identified by the inquiry. Closure of one of Loy Yang B's two units could offset the remainder.

The strategy of shutting coal-fired power stations early in order to offset Northern Territory shale gas production is highly problematic. Control of power stations is a state issue and there are no coal-fired power stations in the Northern Territory. This means that the Northern Territory has no control over any of Australia's power stations and would have a lot of difficulty arranging the early closure of other states power stations.

Given the age of these power plants and the fact that they are likely to close in the coming years there is also the problem of how much emissions offset closing the power stations really produces. This problem of additionality will be discussed further below.

<sup>16</sup> Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (2018) *Final Report*, table 9.4 (p 228)

## OTHER FRACKING INQUIRY OFFSET STRATEGIES

---

Another strategy suggested by the Fracking Inquiry was fitting existing coal-fired power stations with carbon capture and storage (CCS). This is also problematic. Apart from the same jurisdictional problems as shutting down coal-fired power stations, CCS to capture coal-fired power station emissions has never been implemented at commercial-scale in Australia and is unlikely to be affordable in the foreseeable future. A solution that is not commercially available is not a satisfactory way to offset shale gas emissions.

The Fracking Inquiry also suggested vehicle emissions standards could be strengthened to reduce emissions. This is something that the government has been considering independent of the Northern Territory's proposed shale gas production. This strategy also suffers from jurisdictional issues. It also highlights the problem of additionality.

Additionality is the issue of assuring that all offsetting measures are additional to what would have happened had the offset not been pursued. If vehicle emissions are going to fall regardless of shale gas production in the Northern Territory, then they cannot be counted as an offset. For a project to truly offset shale gas production, it must have only occurred because it is being used as an offset (it must be "additional").

With the exception of purchasing ACCU offsets – which are specifically required to not be additional – the strategies identified by the Fracking Inquiry potentially run afoul of the additionality problem. For example many coal-fired power stations are very old and likely to shut down in coming years. If their shut down is going to occur anyway, they can only offset emissions from the years that they shut down earlier than they otherwise would have.

The best way to offset shale gas production in the Northern Territory is through the purchase of credible Australian credits.