

SCIENTIFIC INQUIRY INTO HYDRAULIC FRACTURING IN THE NORTHERN TERRITORY



Origin Energy
Submission #433

Mr David Close
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cc: [REDACTED]

Dear Mr Close

RE: HYDRAULIC FRACTURING INQUIRY – INFORMATION REQUEST

I refer to the *Scientific Inquiry into Hydraulic Fracturing of Unconventional Reservoirs in the Northern Territory (the Inquiry)*, which was established by the Northern Territory Government under the *Inquiries Act 1945 (NT)* in late 2016 to investigate the impacts and risks of hydraulic fracturing of onshore shale gas reservoirs and associated activities on the environmental, social, economic and cultural conditions in the Northern Territory. The Hydraulic Fracturing Taskforce (**the Taskforce**) has been established in the Department of the Chief Minister to support the Inquiry.

The Inquiry is seeking further information from Origin Energy (**Origin**) on certain issues identified in the Interim Report. Detail on the information requested is outlined below.

1. Flooding

Lock the Gate made the following submission to the Inquiry:

“In the Northern Territory, Origin Energy has used unlined pits for the storage of waste water, and then has failed to responsibly remove all contaminates, leaving polluted water in areas that have then flooded.”¹

Lock the Gate included a photo in their submission, which purports to show *“the state that a shale pad was left in after gas fracking activities stopped in mid-December 2015.”²*

Lock the Gate indicated that water tested at the site had high levels of barium, aluminium, iron and bromine and, further, that the whole area was under water during a flood that stretched from Mataranka to Elliott in late December 2015.

¹ Lock the Gate, Submission No. 171, page 17.

² Ibid.

Please comment on these assertions with reference to Origin's submission to the Inquiry.

2. Well integrity

Origin made the following submission to the Inquiry:

"Cement placed in oil and gas wells is typically stronger and more stable than the rock adjacent to it when placed under ground. It is also exposed to lesser forces of erosion than it would experience if it were above ground (i.e. no oxygen, wind, rain or flowing water, sunlight, etc). What this means is that appropriately designed and effectively placed cement will provide isolation that will be effective for many hundreds or thousands of years to come, likely eroding more slowly than the rock surrounding it."³

Origin further submitted that:

"When a well is no longer required it is permanently plugged and abandoned. These plugs will undergo pressure testing to ensure that they have the integrity required of a long term barrier. As discussed previously, cements used in these applications are specially designed for the conditions and long term isolation. When Origin is satisfied that the abandonment plugs are in place and adequate, the regulator will be notified to provide approval of the abandonment."⁴

The importance of long term well integrity is a key issue for the Inquiry. In this regard, the Inquiry requests that technical references be provided to support the above statements. Further, the Inquiry requests Origin's comments on the potential for groundwater in the Beetaloo Sub-basin to corrode cement and well casings.

3. Flowback and produced water

The Interim Report includes a discussion on the composition of flowback and produced water.⁵ As noted in the report, these waters may contain inorganic and organic chemicals of potential environmental significance in addition to those that were originally found in hydraulic fracturing fluid.

The Inquiry understands that interest holders are required to disclose the chemicals used in hydraulic fracturing fluids to the government. However, the identity and concentration of geogenics, that is, chemicals extracted from the shale formation as a result of the hydraulic fracturing process, do not need to be disclosed. The Panel currently has no Australian information on the actual composition of flowback or produced water from shale gas operations.

In that regard, please provide chemical composition data for the flowback and produced water produced from the Amungee NW-1H production test.

The Inquiry's preliminary view is that the regulatory framework should include a requirement for:

³ Origin, Submission No 153, page 61.

⁴ Ibid, page 68.

⁵ Interim Report, chapter 5.5.3 (page 29) and 7.4.2 (page 54).

- (a) a risk assessment of the geogenic components of flowback and produced water; and
- (b) disclosure of the chemical composition of flowback and produced water.

Please comment on this proposal.

4. Spills

The Inquiry has been provided with submissions to the effect that the likelihood of contaminants in a spill rapidly reaching a surface aquifer prior to any clean up action is low because:

- groundwater aquifers are quite deep (between 50 and 200m below surface in the Beetaloo Sub-basin);
- where appropriate containment facilities are used, spills are unlikely; and
- the interaction with the soil zone reduces the concentrations of many contaminants.

The Panel currently has no specific information regarding the potential for toxic contaminants in flowback and produced water to be removed or diluted when it passes through the soil profile.

In that regard, the Panel requests specific information on the likelihood that on-site surface spills of chemicals or wastewater could reach the groundwater aquifer, and if they do, what could be done to remediate the system. Please make reference to the Beetaloo Sub-basin.

5. Deep groundwater systems

Please advise if there has been any research undertaken in respect of the deep groundwater systems in the Beetaloo Sub-basin or other prospective shale gas regions. Please indicate what is known about them, including their depth, extent, quality, and prospectivity for use in hydraulic fracturing.

If deeper groundwater systems are present, please indicate whether Origin is considering using these resources for hydraulic fracturing rather than the better quality surface aquifer, that is, the Cambrian Limestone Aquifer.

6. Solid waste management

As noted in the Interim Report, the solids produced by drilling represent a substantial waste stream associated with the production of shale gas.⁶ In the United States, the disposal of large amounts of drill cuttings produced by a full-scale industry is the cause of concern given the nature of this material and its potential to leach organic and inorganic components into the near surface environment.

A strategic management issue for any potential shale gas industry in the Northern Territory will be the question of whether this solid waste should be contained in a purpose-built and engineered centralised facility, or contained and managed on a per well pad basis as is currently the case for the exploration regime.

⁶ Interim Report, chapter 5.7 (page 31).

Please comment on this matter.

7. Health assessment

Origin's submission refers to a:

*"risk assessment, modelled on Queensland requirements, to cover an expanded gas development within the Beetaloo."*⁷

Origin advises that the risk assessment is currently underway and is being undertaken in accordance with Australian guidelines for human health and environmental risk assessments. The Inquiry referred to this risk assessment in the Interim Report.⁸

Origin has indicated that the report containing the risk assessment would be made available to the Inquiry in mid-June. Please indicate when the report will be available and whether it will address the chemicals present in flowback water.

Further, Chapter 10 of the Interim Report includes a proposal that a site specific human health risk assessment should be required for each shale gas project in order to fully inform the impact of the project on public health. Please comment on this proposal.

8. Infrastructure requirements

The proposals around infrastructure requirements require careful scrutiny. Experience in the United States has shown that well production and field production typically declines over time, requiring additional wells to be commissioned to meet demand. Shale gas plays in the United States invariably have had "core" areas or "sweet spots", where individual well production is highest and hence the economics are best. Sweet spots are targeted and drilled off early in a play's lifecycle, leaving lesser quality rock to be drilled as the play matures. Therefore, the number of wells required to offset field decline inevitably increases with time. Shale gas plays have high field production declines, typically in the range of 30-45% per year, which must be replaced with more drilling to maintain production levels.

The Inquiry has received submissions to the effect that the potential infrastructure needs of a possible development in the Beetaloo Sub-basin is approximately 200 drill pads and over 1000 wells.⁹ In light of the above discussion, please comment on the proposed infrastructure requirements. Please also comment on the figures provided by the Department of Primary Industry and Resources in their submission.

Please also provide details on the expected:

- initial size of well pads;
- size of well pads during the operation phase;
- length and clearing width for collector pipelines; and
- lengths and clearing widths of any access roads that are not contained within pipeline corridors.

⁷ Origin, Submission No. 153, page 130.

⁸ Interim Report, page 86.

⁹ Interim Report, page 43.

If the moratorium is lifted but the number of well pads is limited within a project area (e.g. to 50), please comment on the relative merits of the two scenarios described below:

- a) **Scenario 1:** wider spacing (5-10 km) between well pads, such that the effective project area would be larger (900 – 3,600 km²), but less-intensively developed; and
- b) **Scenario 2:** narrower spacing (2-3 km) between well pads, such that the effective project area would be smaller (144 – 322 km²) but more-intensively developed within that footprint.

9. Baseline data

If the moratorium is lifted, describe Origin's annual work program for baseline data acquisition for the first five years. Describe the level of effort that is proposed with regard to water quality and biodiversity.

10. Traffic

The Panel notes the community's concern about increased traffic along the Stuart and Carpentaria Highways should the industry be given approval to proceed. This is not just a matter of road safety and increased potential for spills, but also an issue of "amenity" for road users in general, noting that the Stuart highway is a major route for grey nomad traffic during the dry season.

Please indicate the nature and extent of the increase, relative to current conditions, in vehicle movements during each state of development. Please also indicate whether transportation by rail has been considered given the proximity of the rail line corridor to the relevant lease areas in the Beetaloo.

Origin's submission noted that:

*"Detailed modelling of traffic movements would be included in any project proposal and require approval of various agencies."*¹⁰

Please provide additional detail about the proposed modelling. Specifically, please indicate whether modelling has been undertaken for similar projects (for example, in respect of coal seam gas projects in Qld). Please also indicate whether the output from such modelling can be used to infer impacts on accident statistics. This is especially important in relation to the potential for spills of chemicals that are being transported.

Please also identify the legislative approvals that are required as per the above quote, including the legislation under which the approval is given and the Department and/or Minister responsible for giving the approval.

11. Greenhouse gas emissions

The Panel has formed a preliminary view that, if the industry is given approval to proceed, the following mechanisms will be required to minimise greenhouse gas emissions, and in particular, methane emissions:

¹⁰ Origin Submission, No 153, page 133.

- implementation of leading practice standards for emission reduction, such as the United States Environmental Protection Agency's New Source Performance Standards, Permitting Rules for the Oil and Natural Gas Industry;
- baseline measurements of methane levels prior to development; and
- ongoing monitoring of methane levels at key points during exploration, development and production.

The Inquiry invites comments on the above. In addition, please comment on:

1. the technologies that are currently available to obtain baseline measurements of emissions, including the possible use of drones;
2. the scope, including the location, of any emissions monitoring that should occur during the exploration, development and production phases, such as, for example, wellheads during completion, liquids unloading, compressor seals and gathering stations;
3. the use of emission limits that, if exceeded, would trigger an investigation, make-good requirements and/or a penalty;
4. the need for transparency when setting emission limits; and
5. whether or not baseline measurements and on-going monitoring should be undertaken by an independent body.

Finally, the Inquiry requests Origin's comments on section 9.8 of the Interim Report, which has been duplicated at **Attachment A**.

Hearings

Origin has been scheduled to present at upcoming hearings of the Inquiry and the Taskforce will confirm the time and date of Origin's presentation in the near future.

To the extent reasonably practicable, the Inquiry requests Origin address the matters outlined above at the upcoming hearings. If this is not possible, then, in order to meet reporting deadlines, please provide your response by **18 August 2017**.

Yours sincerely



THE HON JUSTICE RACHEL PEPPER
Chair

25 July 2017

Attachment A
 9.8 Preliminary Assessment
Risk assessment

While carbon dioxide emissions dominate the life cycle GHG emissions (because downstream combustion of natural gas generates high amounts of carbon dioxide), methane emissions dominate the upstream GHG emissions. Furthermore, the quantity of methane emissions is more uncertain and they are more amenable to reduction. Accordingly, the focus of the proposed risk assessment is on methane emissions. A framework for an interim risk assessment is given in Table 9.2 for a number of hazards which may prevent lower levels of methane emission performance from being achieved. These levels of methane have been discussed previously.

At this stage, the Panel has insufficient information to make an informed assessment of risk. This risk assessment will be used to identify areas where mitigation of risks is required and to assess strategies to mitigate those risks.

Table 9.2: Interim risk assessment framework for hazards that may prevent lower levels of methane emission performance from being achieved

Hazard	Comments	Likelihood	Consequences	Risk
Regulations are not implemented at either State or Federal level.	Regulations are required for reduced emissions completions, compressor emissions and pneumatic controllers			
Regulations are not fully complied with	This may have the effect of allowing increased emissions			
Monitoring of regulatory compliance is not undertaken or is inadequate	Monitoring by a regulatory authority may not occur because of lack of resources.			
Monitoring of both baseline emissions and emissions during production is not undertaken	Monitoring emissions is one means for assuring compliance and also to possibly detect "super emitters"			
Low production performance means emission performance is not achieved	Wells that have low ultimate gas recovery can give rise to higher emission rates. Such wells may also be uneconomical			
Failure of plant or equipment occurs during the lifetime of the well	Consequences can range from a minor to a catastrophic release of gas for a relatively short period over the life of a well			