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2 March 2012

Hydraulic fracturing

Purpose

This briefing provides some information on hydraulic fracturing (fracking) and sets out proposed next steps.

Action Sought

	Action Sought	Deadline
Minister of Energy and Resources	Forward this briefing to Natural Resources Ministers (Joyce, English, Smith, Carter, and Wilkinson)	7 March

Ministry Contacts

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2 March 2012

Minister of Energy and Resources

Hydraulic fracturing

Executive Summary

Hydraulic fracturing, or fracking, is an issue that has attracted considerable public controversy over its potential risk to groundwater contamination and link to seismic events.

In New Zealand, most fracking activity occurs in the Taranaki region and to a lesser extent in the Waikato region. Fracking can also be used for geothermal development. Mining operations involving fracking are anticipated in Gisborne and Hawkes Bay within the next few years.

The Resource Management Act 1991 (RMA) is the key piece of legislation regulating fracking, giving councils the responsibility of issuing resource consent, imposing appropriate conditions and monitoring compliance. We consider the RMA to be a sound framework and there is no evidence to suggest any need for legislative change. However, fracking will be a new activity for some councils, who may lack the necessary experience or capacity.

Key councils are rapidly upskilling. For example, Taranaki Regional Council has prepared a paper on fracking for other councils. Gisborne District Council and Hawkes Bay Regional Council have recently sent staff to Canada to speak with regulators, environmental groups and the industry.

While the RMA is sound, we consider that there is a role for central government to support councils in its implementation. At a minimum, we intend to support councils in their efforts to develop a common approach and guidelines for fracking.

However, there are a number of additional options that could be undertaken to further support councils and reassure the public. We consider the option of preparing non-statutory guidance is further worth exploring. We will investigate the evidence-base for other options with the Ministry for the Environment.

Recommended Action

We recommend you:

- a **Note** that officials recommend at a minimum supporting the current efforts of regional councils to develop a common approach and guidelines, and that officials continue to work closely with councils to identify any capacity or capability constraints in the short term.

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b Note that the Ministry of Economic Development will continue to work with councils and the Ministry for the Environment to establish if there is any evidence that further central government intervention is required.

c **Forward** this briefing to Natural Resources Ministers (Joyce, English, Smith, Carter, and Wilkinson).

Yes / No

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Hon Phil Heatley
Minister of Energy and Resources

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Hydraulic fracturing

Purpose of Report

1. This briefing provides some information on hydraulic fracturing (fracking) and sets out proposed next steps.

Background

2. Hydraulic fracturing, or fracking, involves injecting a solution of water (90 percent), proppant (7-8 percent) and chemicals (2-3 percent) into a well to widen and lengthen fractures in the rock. Fracking is not a new activity, and has been used around the world for about 50 years. It is used to enhance hydrocarbon extraction. Fracking is also used in geothermal development to fracture the deep hot reservoir rock to improve reservoir permeability and the extraction of heat.
3. In the Taranaki region, where most productive activity has occurred, 33 wells have been fracked between 1993 and mid-2011¹. Fracking has also occurred to a lesser extent in the Waikato region for petroleum and geothermal (see Appendix 1). We are aware of interest in fracking in Gisborne district and in the Hawkes Bay and Horizons regions, although there is potential for fracking in other parts of New Zealand (see Appendices 2 and 3).
4. Hon Hekia Parata received a large amount of correspondence raising concerns about fracking (over 50). You have also received media enquiries and correspondence, including requests for a moratorium on fracking from Christchurch City Council, Selwyn District Council and Kaikoura District Council.
5. Concerns about fracking focus on the potential environmental effects. Primarily, sections of the public are concerned that fracking can contaminate groundwater and cause earthquakes. Other potential environmental effects can include contamination of soil, discharges of emissions to air, and high water use. More information on potential adverse effects is tabled in Appendix 4.
6. Fracking is one of a number of activities that cause human-induced seismicity², and has been linked to causing two very small earthquakes near Blackpool, UK. However, the effects of seismic activity that are typically induced by hydraulic fracturing can only be measured with sensitive monitoring equipment and would be hard to separate from the background level of seismicity. Commentary from GNS indicates that it is very unlikely that fracking operations will result in any noticeable seismic impact, but that it is still important to ensure fracking operations are designed and monitored effectively.
7. On 21 February 2012, Taranaki Regional Council released a geological assessment of fracking activity undertaken by GNS Science that concludes that the practice has had no detectable effect on earthquake or volcanic activity in the region³.

¹ Hydrogeological Risk Assessment of Hydraulic Fracturing for Gas Recovery in the Taranaki Region. February 2012. <http://www.trc.govt.nz/assets/Publications/guidelines-procedures-and-publications/Fresh-water-2/fracking-report-feb2012.pdf>

² Others include geothermal development, mining and the creation of large reservoirs of water (e.g. as a result of constructing a dam).

³ www.trc.govt.nz/seismologists-find-nothing-to-fear/

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8. The controversy about fracking is not limited to New Zealand. Other overseas jurisdictions have imposed moratoria on fracking, such as New South Wales, France and South Africa. The reasons for moratoria are mixed, but tend to stem from concerns that the regulatory regime is inadequate (e.g. NSW), as a response to public pressure due to concerns about risk of groundwater contamination (e.g. France) or due to concerns of insufficient information.

Regulation of fracking in New Zealand

Resource Management Act

9. The key piece of legislation regulating fracking is the Resource Management Act 1991 (RMA). While there will be some regional variation depending on local plan provisions, typically a number of resource consents are required to drill the well, take water, discharge frack fluid into the well and to dispose of return frack fluid (to land or via reinjection into the well). Councils can place conditions on the consents to avoid, remedy or mitigate any adverse environmental effects. Due to the nature of the effects, regional and unitary councils are the main consenting authorities. However, district councils are responsible for some land-use effects.

10. We consider that the RMA framework is sufficient at assessing and managing any environmental effects of fracking. The RMA is a flexible 'effects-based' planning regime which enables councils to focus on managing the effects of activities rather than regulating the activities themselves. Some other jurisdictions with 'activity-based' regimes have imposed moratoria while they amend their regulations to address fracking (e.g. NSW).

Councils response to fracking

11. As fracking operations move to new parts of the country, councils may need to build capacity to consider resource consent applications.
12. Regional councils are already working to develop a common approach and guidelines, which should be supported by government. The Regional Council Chief Executives Forum has requested that Taranaki Regional Council (TRC) draft a paper to provide guidance to councils on fracking. TRC has already developed a high level paper for regional councils on the management of fracking under the RMA which proposes a regional council sector position that each regional council will have an operative regional plan in place with policies and rules that cover the necessary activities. It proposes that most regional plans would treat activities as at least full discretionary and that resource consents will be required.
13. We understand that TRC is drafting a more detailed paper for consideration by regional council resource managers at the end of March. If the paper is adopted, this could lead to regional councils adopting a standard approach to consent processing, minimum requirements for assessments of environmental effects reports or template resource consent conditions, and the possibility of drafting standard regional plan rules to specifically deal with the activity.
14. Taranaki Regional Council has also engaged with other councils on what it considers "best practice" in assessing applications for fracking (and other hydrocarbon extraction activities). TRC is in contact with Gisborne, Horizons, and Hawkes Bay councils on current thinking, and Ministry for the Environment (MfE), MED, Department of Labour (DoL), and Environmental Protection Authority (EPA) officials have facilitated a recent meeting to discuss respective regulatory approaches.

15. The developments above indicate that there is good progress on the issue. TRC has also made efforts to provide fact-based information in the public domain.⁴ Ministers may also wish to consider if further measures (see below) are required to supplement the work mentioned above. As a key focus is likely to be on enhancing councils' ability to implement the RMA, we have worked with MfE to develop the options below. We note also that a point raised by councils in recent discussions is a desire to co-ordinate more closely with the Department of Labour as processes to ensure the effectiveness of well design, well control and completion are relevant to managing the health and safety, and environmental, effects.

HSNO and Health and Safety legislation

16. In addition to the RMA, all substances used on a petroleum exploration well site are subject to the Hazardous Substances and New Organisms Act (HSNO). Under HSNO, all substances are classified and approved by the Environmental Protection Authority (EPA). The controversial chemical additives BTEX (benzene, toluene, ethylbenzene, and xylenes) are not explicitly banned from use in frack fluid in New Zealand.
17. The Health and Safety in Employment Act (HSE Act) requires standard operating procedures (SOP) to be created whenever a potentially dangerous or hazardous task is being undertaken. The SOP relating to frack fluid storage, handling and use are all documented and adhere to industry best practise.
18. The design of the well and frack operation is also subject to the HSE Act to ensure that all risks associated with the drilling and fracking of a well bore are mitigated through design and SOP.
19. Inspections of operations are carried out by DoL to ensure that operations are implemented as designed or modified to improve safety and that all SOP are adhered to. DoL are also charged with monitoring all operations to ensure those operations comply with any HSNO permits.
20. Some local government officials have suggested there is a need to clarify the boundaries between the regulation of chemical use under the HSNO Act, the consents for chemical use under the RMA, and worksite safety pertaining to chemical use under the HSE Act.

Next steps and options

21. As noted above, we consider that the RMA framework is sufficient at assessing and managing any environmental effects of fracking. There are, however, a number of further factors to consider:
- a. As fracking operations move to new parts of the country, affected councils may need to build capacity to consider resource consent applications, and will need a good understanding of the issues in order to manage the potential effects. While the councils' approach to developing common guidelines is a step forward, it may still not fully allay public concerns about fracking, and it may not be sufficiently address issues beyond the RMA, such as the role of various regulators (such as DoL) for fracking.

⁴ TRC has recently released a report that concludes fracking has had no detectable effect on earthquakes and volcanic activity, and has re-released in February their hydrological risk assessment that concludes there is little risk to freshwater aquifers from properly conducted fracturing operations in the Taranaki region.

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- b. Inconsistent approaches between regions and districts may increase costs and uncertainty for business. In particular, differences in approach on whether an application is publicly notified could increase uncertainty about costs and timeliness of decisions.
 - c. There is a risk of duplicative planning processes if councils undertake separate processes to determine rules to incorporate in their district and regional plans
 - d. Balancing the risk of inconsistent approaches, there is a need to provide flexibility to provide for local circumstances. Good information would be particularly important on:
 - The depth of fracking activity and proximity to freshwater aquifers
 - The local geology (i.e. whether there are natural petroleum hydrocarbon seals that trap the hydrocarbons in place) and
 - Earthquake or volcanic activity in the region, and in particular, the location of fault lines.
22. Based on these above factors, we have concluded that doing nothing is not a viable option. Although appropriate regulatory tools are in place, assuring the public of this is required at a minimum.

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25. In addition to the options set out above, we are aware that several parties have requested that the Parliamentary Commissioner for the Environment enquire into fracking. We understand that the Commissioner's office is undertaking early scoping work.

26. The Council of Australian Governments (COAG) is establishing an Independent Expert Scientific Committee on Coal Seam Gas, which will consider fracking. The Expert Committee has a budget of A\$150 million. New Zealand has observer status on COAG and you are a full member of the Australian Ministerial Council on Energy and Resources. We intend to engage with this group, and we will keep you up to date with developments in this area.

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Appendix 1:

Table 1: Regions where fracking is already used

Regions	History	Consents	Monitoring
Taranaki	Has been practiced since 1993 for natural gas extraction, although some oil reservoirs have been subject to the activity. The region has seen increased fracking activity since 2000.	The Council requires consents for water takes and the discharge of frack fluids. The Council notes that residual frack fluids are often disposed of under a resource consent.	Monitoring has involved the tracking of the volumes of each additive, water used and return fluids, and ensuring the equipment is functioning properly. The Council also monitors potential contamination of freshwater aquifers, to ensure compliance with discharge consent conditions.
Waikato	Has been used for coal seam gas extraction, over the last four years, by Solid Energy. Waikato Regional Council notes that fracking has been used for a number of decades in geothermal fields for the same purpose of increasing production of wells.	Council has granted non-notified consents for the related water takes and discharges of frack fluid to land. Some of the return flow was of a high enough level of toxicity that material was taken to a licensed disposal facility, rather than being re-injected via the well.	Waikato Regional Council receives monitoring reports from Solid Energy under consent conditions.

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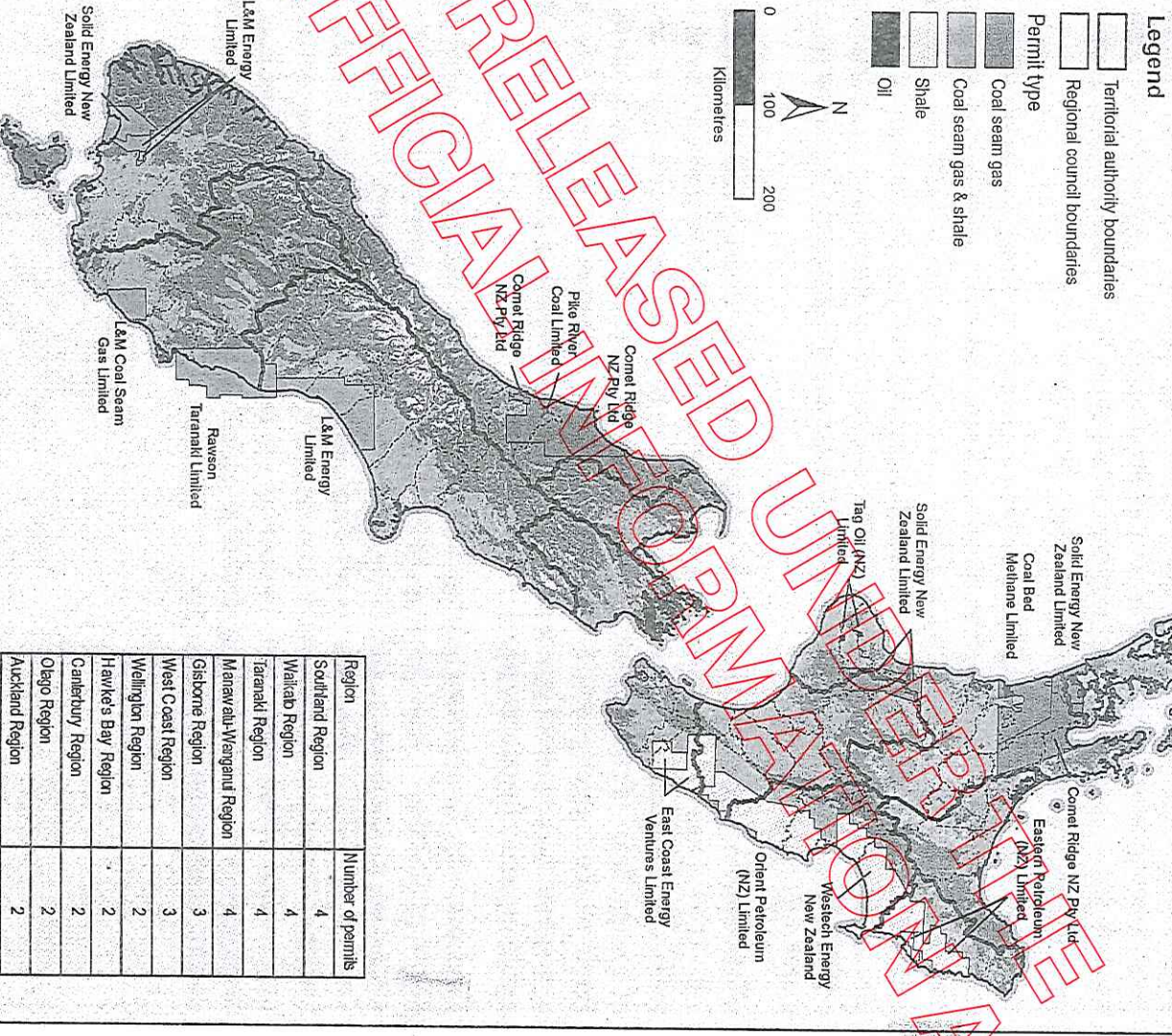
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Appendix 2: Regions likely to have fracking operations

The Ministry for the Environment has contacted councils in the country that seem likely to have to regulate fracking in the near future, based on permits granted by NZP&M.

- **Hawkes Bay Regional Council** have engaged with the Apache Corporation about exploration in southern Hawkes Bay and the possible use of fracking. They have been meeting with NZP&M, GNS and Apache to get up to speed on the technical aspects of the proposal. They say they would most likely require resource consent, but they don't know enough about the activity yet to be sure.
- **Environment Southland** advise that they have not received any applications that relate to fracking, nor have they had any discussions with companies considering fracking. All they have heard is that the coal resources in Southland would be suitable for fracking (through the media). Legal advice sought by Council indicates that the activity requires a consent under section 15 of the RMA. Fracking will be considered a discretionary activity under the general rules around industrial practices in the regional plan.
- **Gisborne District Council** says that no applications for fracking have been received yet. Tag Oil has indicated it would most likely want to use fracking when they drill two wells in the district, construction is scheduled to begin in the second quarter of 2012 at the earliest. Fracking will be considered as a discretionary activity under the Regional Discharges Plan (Rule 6.5.3 Other Liquid Discharges). They will most likely use specialist consultant advice to assist with assessing the application. Applications would probably be publicly notified.
- **Environment Canterbury** advise that they have not received any applications involving fracking. L&M Energy have two permits for onshore coal seam gas extraction in Canterbury. Media initially reported that fracking may be used in Canterbury, but the latest reports are that L&M Energy do not have any plans to use fracking. The Council has prepared a report on how fracking would be regulated in their region which they have forwarded on to MfE. The report concludes that discretionary or non-complying discharge consents would be required for frack fluids, and interestingly for air discharges.

Appendix 3: Permits granted where fracking may occur in New Zealand



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Appendix 4: Potential adverse effects of fracking

Effect	How fracking causes effect
Contamination of groundwater	<ul style="list-style-type: none"> • If the integrity of the well delivery system is compromised, there is potential for leakage through the casing or up the outside of the casing at the base of the well, causing contamination of potable aquifers. • The integrity of the formation receiving and surrounding the subsurface discharge, particularly the geological seal that confines the formation itself, and those seals above, and the potential for a breach of these seals, causing contamination of potable aquifers above. • The discharge of return fluids, containing the degraded frack fluid and contaminants from the formation being fractured, such as naturally occurring BTEX. • Return frack fluids may contain naturally occurring radioactive materials (NORMS) such as radon and uranium.
Contamination of soil	<ul style="list-style-type: none"> • The management of the type of contaminants used in the frack fluids including poor site management measures to avoid or contain contaminant spills. • Disposal of frack fluids to land (known as land farming) or into a landfill.
Seismic vibrations	<ul style="list-style-type: none"> • The build up and release of pressure when frack fluids are injected into the subsurface formations. This can cause a seismic event of between 1-3 magnitude. A report for Taranaki Regional Council by GNS shows fracking has had no detectable effect on earthquake or volcanic activity in the region.
Emissions to air	<ul style="list-style-type: none"> • Some of the methane gas being extracted during fracking escapes or is vented at the well head during the process and contributes to greenhouse gas emissions. In addition, concerns have been raised in some countries from people living near fracking wells about air quality. They have complained of noxious fumes that cause headaches, nausea and other symptoms that could be attributable to some of the substances released during fracking, such as: particulate matter, dust, carbon monoxide, sulphur dioxide, benzene and toluene. • Nuisance effects of noise pollution on residential areas.
Land use	<ul style="list-style-type: none"> • Landscape impacts as fracking requires a large number of drilling sites for well pads, these are usually 1-2 hectares each. In the US, for shale gas, there are about 6 wells per km². • Loss of productive agricultural land. • Associated infrastructure, roading and trucks.
Social	<ul style="list-style-type: none"> • Perceived lack of public participation in decision making process if processed without a consent by councils, or if a council requires consent but it is done on a non-notified basis. There is a fear of the potential adverse effects based on international concern.

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