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Doctors for the Environment Australia
Submission to the
Hydraulic Fracturing Inquiry Northern Territory, May 2014

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Introduction

Doctors for the Environment Australia (DEA) is an independent, self-funded, non-government organisation of medical doctors in all Australian States and Territories. Our members work across all specialities in community, hospital and private practices. We work to prevent and address the diseases - local, national and global - caused by damage to our natural environment. We are a public health voice in the sphere of environmental health with a primary focus on the health harms from pollution and climate change.

DEA asks governments to consider the health effects and costs present and future generations of our energy policies. This is particularly relevant to the Northern Territory (NT) as we make key decisions and create policy settings that will determine our energy supply and economic directions.

DEA members in NT have close contact with many Aboriginal people, because of the high burden of disease of Aboriginal Australians who make up around 1/3 of the NT population. This gives us a unique understanding of NT Aboriginal people, particularly those who remain on their homelands where they have lived and sustained livelihoods for thousands of generations. While we cannot speak for Aboriginal people, we can speak for our knowledge of how their health is determined, including access to land, water, energy, social services and health care.

DEA welcomes the opportunity to respond to the Terms of Reference of this inquiry. Our position is based solely on our duty to examine the evidence and speak out to benefit the present and future health of our patients, the community.

DEA notes the limited terms of reference for this inquiry into hydraulic fracturing. This inquiry could be used as a basis for a more general inquiry into NT energy policy, including the range of options for our own energy supply, and for export to other countries. Hydraulic fracturing enables extraction of hydrocarbon deposits which are one source of energy and economic development. NT has vast reserves of renewable energy sources, in particular solar and wind, which can be used for energy and economic development. The limitation of this inquiry to details about hydraulic fracturing obstructs our capacity to consider all options both now and into the future.

Furthermore, the terms of reference make no reference to health or social impacts of hydraulic fracturing. Since the goal of any industry is ultimately to improve human well-being, often via economic development, it is appropriate to consider any human costs, through health and social impact.

While this inquiry is solely related to hydraulic fracturing which is used in the extraction of unconventional gas deposits, there are other environmental and health concerns with unconventional gas that are not addressed in the terms of reference for this inquiry.

This submission draws on the work of DEA in its submission to a similar inquiry in Western Australia, held in December 2013 (1). However given the increasing concern about threats to health from unconventional gas, consideration should be given to a national independent process of health impact assessment to protect the health of the Australian public (2).

We are alarmed at the proposal to by-pass standard Environmental Impact Assessment (EIA) procedures through this inquiry (3). Each proposal has distinct features in relation to benefits and costs to community, air and water quality, biodiversity, Aboriginal cultural heritage and other issues. Individual impact assessment is important also because extensive use of hydraulic fracturing is a relatively new to the Northern Territory, and needs intense monitoring while we learn of its impacts.

Key Recommendations

Environmental impact assessments in relation to proposals for hydraulic fracturing, and unconventional gas development more generally, should include health and social impact assessment. A broader inquiry into unconventional gas, as part of energy policy and economic development in NT, would draw attention to potential impacts of unconventional gas development that are not included in this inquiry into hydraulic fracturing. This inquiry can provide general guidance but should a decision be made that NT can accept the risks of hydraulic fracturing; every proposal should undergo site-specific Environmental Impact Assessment

Response to Terms of Reference

Hydraulic fracturing for hydrocarbon deposits in the Territory, including the assessment of the environmental risks and actual environmental impacts of hydraulic fracturing and the effectiveness of mitigation measures, and more particularly the matters mentioned in the following clauses:

1. Historical and proposed use of hydraulic fracturing (exploration, appraisal and production) of hydrocarbon deposits in the Northern Territory (number of wells, locations, timeline).

Hydraulic fracturing or "fracking" is used in extraction of unconventional gas (UG) deposits, which include coal seam gas (CSG), shale and tight gas. Fracking involves pumping a mixture of water, sand and chemical additives at high pressure into the coal seam or shale rock via a well. This fractures the rock and provides a pathway for gas to flow back. In coal seams the gas is released through depressurization, where the underground water in the seams is released to the surface as a by-product. This can potentially affect interconnected aquifers above or below the coal seam.

Shale gas seams occur at much deeper levels and hydraulic fracturing involving large volumes of water with chemical additives is required to extract the gas.

From information available to DEA, it appears that hydraulic fracturing has not yet been used in NT. However government and industry sources suggest that fracking has been considered to extend the productive life of the Mereenie field near Palm Valley (4, 5). Even in the absence of fracking, it has been reported that leakage of gas has polluted underground water in this area (6).

While the current inquiry into hydraulic fracturing focusses on issues related to fracking, the fact that gas extraction without fracking has reportedly led to water pollution highlights the overall risks of hydrocarbon industries, particularly in NT where mining can be extremely remote. Therefore DEA recommends a cautious approach recognising pollution risks. It is also noteworthy that the nearby community of Ntaria is powered by a solar energy service, and this highlights the possibilities for sustainable energy in the region (7).

2. Environmental outcomes of each hydraulic fracturing activity for hydrocarbon resources in the Northern Territory (number of wells; frequency of types of known environmental impacts).

Hydraulic fracturing requires drilling large numbers of wells because unconventional gas deposits are of low permeability and each well can only extract gas from a limited area. In addition, each well has limited lifespan, typically 5 to 15 years (8). This means that the industry is not as sustainable in the long-term as say, agricultural industries. Over time many wells are required, over a vast area of land. This creates a huge landscape footprint, with associated huge potential environmental impact. With 90% of the NT land area under petroleum exploration title (9), we could potentially see almost the entire Territory affected by this industry. Considering the effect of

each fracking activity alone fails to acknowledge the broader, long term and cumulative impacts. Given the large uncertainties around the impacts of this industry, there are concerns that governments must address about the environmental and health impacts of fracking and associated processes.

3. Frequency of types and causes of environmental impacts from hydraulic fracturing for hydrocarbon deposits in the Northern Territory and for similar deposits in other parts of the world.

Modern unconventional gas techniques including hydraulic fracturing are relatively new to Australia, so to date there is limited information on environmental outcomes and resulting health effects. Hence we would urge precaution, and a close monitoring of the environmental outcomes of hydraulic fracturing activity being undertaken in Australia and around the world. (10, 11).

A range environmental impacts of hydraulic fracturing have been described, for example, by the United Nations Environment Program (8). Each of these environmental impacts is important, and as doctors with responsibility for human well-being we note the potential for resulting health effects.

Greenhouse gas emissions

Compared with coal, oil and gas produce less carbon dioxide when energy is produced. This has led to the proposal that natural gas should be used to enable societies to transition from using coal to using renewable energy sources. Together with improvements in technology for gas extraction, including hydraulic fracturing, this proposal has contributed to the rapid increase in the use of gas as a fuel globally (8).

However, it now appears that anticipated lower greenhouse gas emissions from gas produced through hydraulic fracturing may have been overstated. There are now concerns that hydrocarbons extracted through hydraulic fracturing have almost the equivalent greenhouse gas per unit energy as coal when the full life cycle is considered. Effective monitoring of methane release may in fact demonstrate that hydrocarbons that are produced through hydraulic fracturing are as dangerous environmentally as coal (8).

Hence from the perspective of greenhouse gas emissions leading to climate change, hydraulic fracturing presents an unacceptable risk (8). Since climate change is the major global health threat facing humanity, hydrocarbons produced through hydraulic fracturing are an unacceptable health risk (12).

4. The potential for multiple well pads to reduce or enhance the risks of environmental impacts.

When hydraulic fracturing is used to extract gas, a large number of wells are required. This makes an industrialised footprint on the landscape as shown in these images from Queensland where almost 19000 wells were approved over a 12 month period (13).



Industrialisation of the food producing Darling Downs area, Tara, Qld, 2011.

Impact on agriculture and food security

Depending on the location of the gas field the large footprint may impact upon agricultural activities, and lead to an industrialisation of agricultural, residential and wilderness landscapes (14). This may be a particular concern to Aboriginal people whose very notion of well-being depends on their relationship to the land (15).

Hydraulic fracturing is an extremely water-intensive practice. Estimates are that up to 20 million litres of water are required per fracturing event, which may be up to ten or more per well. Given the arid nature of much of the Northern Territory, it is critical that sources of water for human, agricultural and ecosystem usage are not threatened by this short term industry (8).

Following the hydraulic fracturing operation, some water flows back to the surface, while the remainder remains in the well. The produced water contains both the chemicals used to disrupt the rock in the operation, and naturally occurring contaminants derived from underground, including radioactive materials such as uranium and heavy metals such as arsenic. Produced water is also extremely saline. The water that flows back must be collected, treated and disposed of. All these operations risk contamination of the surrounding environment. (8) With the remoteness of much of NT we risk inadequate monitoring and supervision of these processes. Even with the best regulation, accidents and spills are known to occur.

Impact on biodiversity

Biodiversity may be affected by water extraction and availability, or from surface or subsurface contamination. Chemical additives used, or chemicals formed or liberated, can be directly toxic to plants and animals, just as they may impact on human health. There are compounds widely used in fracking that may have limited toxicity in humans but are highly toxic to aquatic organisms (1).

There is generally a greater potential for higher exposures to wildlife and farm animals than humans. The adverse impacts on domestic and farm animals have been highlighted by a study by Bamberger and Oswald in the US (16). The paper reports multiple accounts of adverse health effects in herd and domestic animals that live near unconventional gas installations.

Invasive species of weeds can be introduced through multiple vehicle and personal movements, with drilling rigs and trucks being taken from one location to another (8).

Social impact

The social impact of unconventional gas development is affecting community function in Australia and elsewhere, as people respond to conflicting demands for their land or well-being. For example, police in Queensland have forcibly removed people attempting to prevent hydraulic fracturing on their own land (14). There are additional concerns in NT with its significant and extremely disadvantaged Aboriginal population. As occurred with the proposed nuclear waste dump at Muckaty, promises of economic development can be divisive and destructive for Aboriginal communities (17).

Solastalgia, the phenomenon of psychological distress arising from loss of familiar and cherished landscape and sense of place, has also been described in the context of extractive industries such as unconventional gas (18), notably in Tara in Queensland (19).

Fracking poses further risks related to transport, which is required in the development of the gas field, including large numbers of heavy vehicles. NT already has the by far the highest road toll of

states of Australia, and we spend three times as much per capita on road trauma (20). Trucking for hydraulic fracturing can be a 24 hour operation. Increased risks of road transport crashes associated with development of hydraulic fracturing will increase the economic and health burden of our road system (8).

There are possible legal and financial implications to the taxpayer of the health risks of hydraulic fracturing, as shown by a legal case in USA. One family was reportedly granted a payout of \$US3 million dollars compensation as a result of exposure to emissions from hydraulic fracturing (21).

5. The relationship between environmental outcomes of hydraulic fracturing of shale petroleum deposits with geology, hydrogeology and hydrology

Hydraulic fracturing involves the use of multiple chemicals to enable the release of hydrocarbons. Most of the chemicals used for hydraulic fracturing in Australia have not been assessed for their impacts on human health and the environment. Of the 23 identified as commonly used in hydraulic fracturing, only two have been assessed by our national chemical regulator, the National Industrial Chemicals Notification and Assessment Scheme (NICNAS), but not for use in fracking (14). Given sufficient dose and exposures, chemicals used in fracking or mobilised through the process may have long-term health effects that may not be immediately demonstrated. Many have the potential to affect the skin, eyes, the respiratory and gastrointestinal systems, the brain and nervous system, immune and cardiovascular systems, or the kidneys. Some may affect the endocrine system or even be carcinogens. It is essential that companies involved in hydraulic fracturing publically disclose all chemicals that are in use prior to any activity (1,8,10).

A UK conference on hydraulic fracturing noted:

"Environmental exposures include outdoor air pollutants (ie, volatile organic compounds, tropospheric ozone, and diesel particulate matter) and pollutants (ie, benzene, hydrocarbons, endocrine-disrupting chemicals, and heavy metals) in both ground and surface water. Known occupational hazards include airborne silica exposure at the well pad. Toxicological data for the chemicals injected into wells (so-called frac fluid) indicate that many of them have known adverse effects on health, with no toxicological data available for some (10)."

When systems are functioning according to best practice, the industry may promote an acceptable safety record. Nonetheless exposure can occur through accidents leaks, natural events such as flooding, or even through *normal operations*. There are many different possible sources of leakage or infiltration because of the complexity of the hydraulic fracturing process, and the on-going toxicity of the chemicals even after hydrocarbon extraction has ceased. The \$US 3 million payout to a family suffering from fracking-related contaminants, demonstrates legal recognition of this risk (21).

Intensive and on-going regulation and monitoring are essential to minimise risks. However the NT's difficulty in ensuring the safety of staff at Ranger Uranium mine makes the risk of hydraulic fracturing concerning (22). Even in more densely populated states, accidents and spills have occurred, so the risk to NT is worrying (23). Will there be sufficient staffing of departments to provide the additional monitoring and inspection capacity required?

Water consumption

Hydraulic fracturing is an extremely water-intensive practice. A single gas well may use around 20 million litres per fracturing operation. Therefore the United Nations Environment Program states that hydraulic fracturing should be avoided in areas of water scarcity (8). The NT government's recent evaluation of ground-water supplies found significant gaps in our data on water, in particular lack of strategic monitoring of groundwater levels (24). This is despite the fact that ground-water supplies 90% of our water. Significant and on-going investment in water monitoring would be

essential prior to development of fracking in NT.

6. The potential for regional and area variations of the risk of environmental impacts from hydraulic fracturing in the Northern Territory.

Location of hydraulic fracturing activities will determine social impacts. A well-paid, young workforce may have positive impacts by re-vitalising rural areas. However improvements in Aboriginal employment through mining and extraction industries have been disappointing. Mining developments have not always improved the well-being of Aboriginal communities, despite employment possibilities and royalty payments. This is partly because few Aboriginal people are employed, and those who are employed tend to be in lower paid positions (25).

Adverse impacts related to fly-in-fly-out workforces include disparities in wealth and loss of social cohesion. Alcohol consumption by workers can exacerbate this effect, leading to overall negative impacts on communities, despite increases in trade within the community. Studies of mining in Queensland have shown that despite remarkable development in rural areas, local people and their lives may not be improved, and in fact may appear to be by-passed by the development and huge increases in income, as these do not reach the local community (25).

7. Effective methods for mitigating potential environmental impacts before, during and after hydraulic fracturing.

a the selection of sites for wells;

b well design, construction, standards, control and operational safety and well integrity rating;

c water use;

d chemical use;

e disposal and treatment of waste water and drilling muds;

f fugitive emissions;

g noise;

h monitoring requirements;

i the use of single or multiple well pads;

j rehabilitation and closure of wells (exploratory and production) including issues associated with corrosion and long term post closure;

k site rehabilitation for areas where hydraulic fracturing activities have occurred.

Any development approval should require that the site be rehabilitated as far as possible to its original condition - including ensuring no leakage of methane at any stage. The impossibility of ensuring this for decades or centuries into the future highlights the concerns about hydraulic fracturing.

Local, regional and global concerns related to fracking and its medium and long term outcomes, and site rehabilitation continue to be raised throughout the world (1,2,8,10,11). We propose a moratorium on any activity involving hydraulic fracturing until the effects are better understood, and effective mitigating and monitoring methods have been established. Hydrocarbons are fossil fuels that will persist indefinitely and there is no urgency to extract them during these early days of unconventional gas industries.

Summary of recommendations from Doctors for the Environment Australia

Recommendation 1

This inquiry should not be seen to replace individual site-specific assessment of unconventional gas developments in the Northern Territory. Environmental impact assessments should also include health and social impact assessment.

Recommendation 2

A broader inquiry into energy policy and economic development in the NT should be undertaken to complement this inquiry into hydraulic fracturing in order to establish the economic and health effects of all possible energy sources.

Recommendation 3

A broader inquiry into all aspects of unconventional gas development is required, not just hydraulic fracturing.

Recommendation 4

A national health impact assessment process should be developed to guide states and territories and determine a safe regulatory environment

Recommendation 5

The NT government should design a plan to achieve transition from fossil fuels to renewable energy sources for both domestic use and economic development. Royalties and taxes derived from industries based on hydrocarbons should be re-invested in research and development on alternative sources of energy, most likely solar and wind, and on energy-saving policies.

Recommendation 6

A moratorium on hydraulic fracturing should be implemented until there is a better understanding of the health and environmental effects of this technology.

Recommendation 7

All companies involved in hydraulic fracturing should publicly disclose all products used in the process and these should be assessed by NICNAS for safety before any use is allowed.

Recommendation 8

Effective monitoring and enforcement procedures should be implemented, including epidemiological studies of health impacts, and investment in groundwater monitoring. Adequate resourcing of compliance and enforcement by the Territory is essential.

Recommendation 9

All companies involved in hydraulic fracturing should demonstrate that they hold adequate funds for restoration of land and to mitigate any potential impacts on land and water, in order to avoid so-called “extract and run” practices. Legislation should ensure that companies are held liable for remediation irrespective of changes of management and ownership.

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