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11 March 2016

Submission to: Select Committee on Unconventional Gas Mining

From: Frack Free Tas inc.

Summary

Unconventional mining brings with it major impacts on environments, water sources, social dynamics and health of communities as well as economic impacts on other sectors, including agriculture and tourism. Many impacts have been experienced in the U.S., and some are well documented. When proper reviews of all costs and benefits are carried out, including health and economic impacts, bans are imposed. Where political pressure leads to impacts being ignored or downplayed, approval of unconventional mining requires a 'dumbing down' of the information available.

Australia has no independent science bodies that regulators, decision-makers and communities can trust to give objective advice about unconventional mining that is unfettered by the financial interests of mining activity. Even when regulators commission assessments, they are railroaded by industry to avoid the real issues, or have their public release delayed while industry gets to review and collaborate.

There are large knowledge gaps in relation to unconventional mining and the real and potential impacts on environments, particularly groundwater (e.g. Cook *et al*, 2013). Regulators, both state and federal, are under political pressure to assess and approve unconventional mining, even when scientific advice unambiguously points out that these knowledge gaps exist (e.g. (Geoscience Australia, 2015) and the consequences are potentially catastrophic and irreversible.

Coupled with the capture of scientific research, the unconventional mining industry spends large amounts of funds authoring information that gives the illusion that the techniques used are safe, and that the risk of impacts on fundamental resources, such as groundwater, can be minimised by regulation. This biased and slick industry-spin fills the space left by uncertainties and knowledge gaps. Regulators, for various reasons, echo some of this spin, and many of the mistruths or omission of issues are then reflected in policies, regulations and legislation. Communities are left betrayed by regulations that allow absurd situations, where companies get away with sometimes catastrophic impacts, choosing the cheaper option of paying fines over real solutions.

A national approach is necessary, in an overarching guarantee of the safety of clean water and air, including legislation, but also robust and independent scientific investigation of the impacts and the baseline attributes of areas. We, as a nation, currently do not have any of these, and there should be a nationwide ban on unconventional mining if they are not implemented.

Health impacts

Some communities living near gas fields in the US have had a longer history of exposure to unconventional mining and its associated chemicals and contaminants than families in Australia. The experiences of US families have been documented in several studies. The health effects these families report range from serious skin, nose, throat and eye irritations and respiratory ailments to neurological illnesses. When the US health and regulatory authorities discounted and dismissed their complaints, an online register, *The List of The Harmed* (Lisak, 2015) was set up to document the health, social and financial effects of living near fracking sites on individual families.

The list currently has 170 000 individuals outlining their exposure and its effects. Many also have pets and/or livestock either with poor health or have died due to the effects of poisoned groundwater or through other vectors of exposure (fugitive emissions, air borne particles, ingesting reproduced water supposedly deemed safe by the gas companies themselves, inhaling particles from waste water sprayed on roads, contaminated rain water supply etc). In the case of crops grown with produced water or poisoned groundwater, many farmers and their livestock have experienced ill effects from the feed they've grown and consumed and/or poor quality cropping produce. With this comes the lack of monitoring of toxic build-up in cropped products, which has flow-on repercussions for consumers and the agricultural industry.

The Center (sic) for Environmental Health report, *Toxic & Dirty Secrets: The truth about fracking and your family's health* (CEH, 2014), provided research that could be helpful for Australian families and communities concerned about the health effects of fracking, and for politicians and decision-makers who support fracking near residential areas.

“Fracking has also been found to detrimentally impact the immediate and nearby communities. Fracking increases traffic and creates industrial noise, which is correlated with hypertension, sleep disturbance, cardiovascular disease and stroke. Because of the many health problems associated with fracking, the process also strains the communities' healthcare resources.” (CEH, 2014).

The cases in Australia are increasing where ill health has occurred due to exposure to fracking operations. Noise pollution has been well recorded in cases across Chinchilla and Tara in Queensland where compressors and high and low point vents within close range of residents (100m) have been well above safe, legal decibel levels for human ears and nervous systems. Health impacts have only been documented by independent professionals, because state agencies have largely ignored them.

Social and Economic Impacts

Contrary to industry claims, unconventional gas developments greatly undermine the quality of life in rural communities. The supports required by large scale industrial development - the influx of FIFO workers, high volumes of heavy vehicle traffic, the noise and upheaval - bring additional costs to communities and, in some ways more importantly, social consequences that endure long after the drillers have upped stumps and moved on to greener pastures.

Rural areas become industrialized, with infrastructure often close to people's homes. The companies have shown to be very quick in constructing multiple drill pads, bringing more trucks, more piping, destroying roads quicker than they can be fixed and without consulting the private landowner who may have agreed to five wells but ended up with twenty.

The ad hoc fiduciary arrangements energy companies have made with private landholders has seen one individual receive a carton of beer for a well on his property whilst his neighbour received tens of thousands of dollars for his. These types of unfair processes create division within rural communities. Some farmers who have chosen to not have gas extraction on their properties are now also in the position of facing criminal charges when locking the companies out of their properties. For historically conservative farmers to be labelled as 'eco-terrorists' and criminalised by current governments seems ludicrous and highly insulting given that the individual is just trying to maintain independent business practice and dignity with the (often multigenerational) family farm. When one adds that many from these families have sent their sons and daughters overseas in military actions to defend these private property rights and the Australian way of life, one wonders whose interests the governments' have in hand.

Compensation for spills and accidents is also an issue and the waste management of the industry is still a vast problem as the chemicals both injected and produced out of the process are beyond current waste management knowledge and practice. The example of Santos' uranium contamination of groundwater in the Pilliga State Forest in 2014 saw the company receive a \$1500 slap on the wrist from the NSW EPA and still to date a toxic and unrestored natural site, despite finding levels of uranium and other heavy metals 20 times greater than safe drinking levels (Nicholls, 2014). Farmers particularly can have little faith that their businesses, homes and health will be compensated fairly in the event of accident or ongoing hazard. With this type of boom/bust business practice and no watch dog to oversee restoration of sites, many farms and towns have experienced huge declines in property values. Once the water is destroyed, many places are near worthless.

George Bender, a farmer from Chinchilla, took his own life in 2015 after more than a decade of pressure from the industry. His property was surrounded by gas fields; two of his ground water wells dried up from the over-use and extraction by the neighbouring gas sites. His ability to grow organically was destroyed, his property, business and quality of life were devalued and he effectively had no private property rights over a family farm held for multiple generations.

"My father's death can be directly attributed to APLNG (Origin Energy) attempting to force the sale of the Bender family property Chinta for its own benefit to construct CSG wells and associated infrastructure," Helen Bender said. "This and previous Queensland governments have given the industry an open highway, with no speed limits to force or control the pace of the CSG expansion. "Landholders are holding up a massive STOP sign to prevent destruction of our farmlands for corporate profit. Significant changes across legislation, regulations and policies are now a must by this government, who must acknowledge that the adaptive management framework is too great a risk." (Walker, 2016).

Chemical Exposure

Human exposure to fracking chemicals can occur by ingesting chemicals that have spilled and entered drinking water sources, through direct skin contact with the chemicals or wastes (e.g., by workers, spill responders or health care professionals), or by breathing in vapours from flow back wastes stored in pits or tanks.

A 2011 study (Colborn et al, 2011) summarised health effects information for 353 (of the over 700) chemicals used in fracking wells in the US. Health effects were broken into 12 categories:

▪ Skin, eye and sensory organs
▪ Respiratory
▪ Gastrointestinal and liver
▪ Brain and nervous system
▪ Immune system
▪ Kidneys
▪ Cancer
▪ Mutagenic
▪ Cardiovascular and blood
▪ Endocrine disruption
▪ Ecological effects
▪ Other

More than 75% of the chemicals can affect the skin, eyes and other sensory organs, and the respiratory and gastrointestinal systems. Around half could affect the brain, nervous system, immune and cardiovascular systems, and the kidneys. Over a third could affect the endocrine system and one quarter could cause cancer and mutations (Colborn et al, 2011).

Fracking Chemicals with 10 or More Health Effects

This is a list of chemicals used in US fracking operations that have the potential to cause ten or more adverse health effects. Only some of the chemicals are approved for use in Australia, however, the list is telling when viewed in the context of what oil and gas companies are prepared to use to extract gas.

<ul style="list-style-type: none"> ▪ 2,2',2''-Nitrilotriethanol ▪ 2-Ethylhexanol ▪ 5-Chloro-2-methyl-4-isothiazolin-3-one ▪ Acetic acid ▪ Acrolein ▪ Acrylamide (2-propenamide) ▪ Acrylic acid ▪ Ammonia ▪ Ammonium chloride ▪ Ammonium nitrate ▪ Aniline 	<ul style="list-style-type: none"> ▪ Iron ▪ Isobutyl alcohol (2-methyl-1-propanol) ▪ Isopropanol (propan-2-ol) ▪ Light naphthenic distillates, hydrotreated ▪ Mercaptoacidic acid ▪ Methanol ▪ Methylene bis(thiocyanate) ▪ Monoethanolamine ▪ NaHCO₃ ▪ Naphtha, petroleum medium aliphatic ▪ Naphthalene
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<ul style="list-style-type: none"> ▪ Benzyl chloride ▪ Boric acid ▪ Cadmium ▪ Calcium hypochlorite ▪ Chlorine ▪ Chlorine dioxide ▪ Dibromoacetonitrile 1 ▪ Diethanolamine ▪ Diethylenetriamine ▪ Dimethyl formamide ▪ Epidian ▪ Ethanol (acetylenic alcohol) ▪ Ethyl mercaptan ▪ Ethylbenzene ▪ Ethylene glycol ▪ Ethylene glycol monobutyl ether (2-BE) ▪ Ethylene oxide ▪ Ferrous sulphate ▪ Formaldehyde ▪ Formic acid ▪ Glutaraldehyde ▪ Glyoxal ▪ Hydrogen sulphide 	<ul style="list-style-type: none"> ▪ Natural gas condensates ▪ Nickel sulphate ▪ Paraformaldehyde ▪ Phosphonium, tetrakis (hydroxymethyl)-sulfate ▪ Propane-1,2-diol ▪ Sodium bromated ▪ Sodium chlorite (chlorous acid, sodium salt) ▪ Sodium hypochlorite ▪ Sodium nitrate ▪ Sodium nitrite ▪ Sodium sulphite ▪ Styrene ▪ Sulfur dioxide ▪ Sulfuric acid ▪ Tetrahydro-3,5-dimethyl-2H-1,3,5-thiadiazine-2-thione (Dazomet) ▪ Titanium dioxide ▪ Tributyl phosphate ▪ Triethylene glycol ▪ Urea ▪ Xylene
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Shale gas extraction operations require fracking to be used in every drill and the method is a well-documented process used in places such as the Marcellus Shale. Operators thus far have not had to disclose combinations, concentrations and ratios of chemicals used in the process to any conformed or agreed standard. Many chemical combinations used do not even have CAS (Chemical Abstracts Service) numbers due to this ad hoc arrangement happening from frack to frack and with drillers having to ‘trial and error’ the recipe that will yield the most gas per frack point (Colborn et al, 2011). Workers struggle to even document the exact ratios and concentrations used at a larger scale. This not only puts workers at risk when a chemical compound (cocktail) has no MSDS as it has not been formally recognised by the American Chemical Society, but also the surrounding environment, residents and flow-on effects when aquifers are involved .

No Independent science looking after the public good.

CSIRO

Nationally, the body historically trusted by communities in Australia to provide objective scientific investigation and advice has been the Commonwealth Science and Industrial Organisation (CSIRO). In relation to unconventional mining (and other areas), CSIRO has been captured by partnerships with industry. The Gas Industry Social & Environmental Research Alliance (GISERA) includes CSIRO and coal seam Gas heavyweights Australia Pacific LNG and QCG (GISERA, 2011). This partnership removes any independence of CSIRO from the outset, with both the management and research advisory committees including industry representatives. The structure sees many of the projects wholly

funded by industry (sometimes on behalf of APPEA), with CSIRO directed to investigate. Such funding structures are not going to lead to the study of issues that will expose the failings of industry to operate safely.

Of all the 25 projects currently listed as active (GISERA, 2016), none actually investigate either of the big issues that the communities would expect as priorities, i.e. well integrity, fugitive emissions, noise and air pollution, seismic activity from re-injection of waste water or what effects come from spraying waste water on agricultural land or roads near residential areas. In fact all the projects use titles that lend themselves to the narrative that this industry is safe, can be regulated and can co-exist with agriculture (e.g. *'Preserving agricultural productivity'*; *'ensuring biodiversity offset success'*), indicating this partnership is more an exercise in marketing than scientific investigation.

The reality of industry influence is reflected in the direction of which studies to tackle, but also how to proceed with results. An example is the study of fugitive emissions, an issue of great importance to communities with wells in their region, but also to the accurate measuring of the greenhouse impact of the industry which purports to be cleaner than coal, and therefore a transition source before renewables become more viable (a claim based on theoretical results). A pilot study looked at 43 wells, and found 41 of were leaking (CSIRO, 2015). Alarm bells should have been going off with such a result, but the CSIRO, GISERA and APPEA websites played down the significance of these results – pointing to small quantities of leaking gas, and that the leaks were preventable (once found). The fact that those results did not initiate:

1. a program to check all other wells for these 'preventable' leaks, nor
2. a study of a larger set of wells

speaks volumes as to the priorities of this partnership and how to respond to damning results.

Very Recently, it was announced, that the federal government would finance \$15m for a National Energy Resources Australia (NERA), which will foster collaboration between universities, CSIRO and Cooperative Research Centres to build links with business and industry organisations and has a board drawn from across the oil, gas, coal seam gas, coal and uranium industries and their service providers. This arrangement sounds like the federal government has taken the role of funder in a similar arrangement to GISERA where scientific investigation (including CSIRO) is inherently linked to approving and drilling for oil and gas (and coal and uranium).

As mentioned, CSIRO is relied upon by decision makers and communities to provide scientific investigation of the highly technical issues relating to unconventional mining. Many areas of concern are just not being studied, because they are not the priority of industry. Because many of the questions are not answered by research, industry and regulators often just say that impacts will be avoided by following 'Best practice', without having any specific response to specific issues or concerns. Communities across Australia are left without any source of independent scientific advice, and left with massive gaps of knowledge with no studies investigating them.

NICNAS

A \$4.2 million national assessment of the chemicals used in coal seam gas drilling, known as NICNAS, was commissioned by the Federal Government's independent expert scientific committee on coal seam gas and large coal mines (IESC) in 2012 (Burdon, 2016). This assessment is still not released, despite the IESC urging twice in 2014 for it to be publically released. As mentioned above, the list of chemicals used and mobilised in unconventional mining is very long, with many well-known to be hazardous. The potential and real health and environmental effects are numerous and distressing for communities, especially when they are ignored by state authorities. Critics say the NICNAS assessment was already very limited, but the non-publication of it after so much time and money gives the impression that the assessment is inconvenient for industry. The lobby group, APPEA, has access to the report, and so has ample opportunity to influence the final report and pre-empt the ramifications of its release. This is a prime example of a publically commissioned process affected by industry influence.

Knowledge gaps

The pre-eminent publication on shale gas development, referred to several times in the Tasmanian review on hydraulic fracturing (DPIPWE, 2015) is titled *Engineering energy: unconventional gas production* (Cook et al, 2013). This review, for the Australian Council of Learned Academies (ACOLA) has a wealth of information relating to real and potential shale gas exploitation in Australia. Although written with a pro-industry tone, it points to many gaps in knowledge on environmental parameters, safety issues and risks that are associated with extraction of the resource.

Sections include:

GROUNDWATER: (P180)

'We lack data on many deep groundwater systems or an understanding of those systems, and therefore of the potential impact of shale gas exploration and production on those systems. We do not fully understand the chemistry of many groundwater systems, their behaviour, their dynamics, and in particular there are many areas where we have a poor understanding of the physical structure and geology of the basins. As a consequence, we are unable to develop satisfactory 3D models for managing the basins.'

BASIN MODELS

'Much of Australia's wealth comes from our sedimentary basins – our food, our water and our mineral and energy resources, including unconventional gas.

... At present we lack adequate models for managing Australian basins in a sensible manner.'

HYDRAULIC FRACTURING

'... in the Cooper Basin, it is not possible to obtain useful microseismic information because the standard downhole tools are unable to withstand the very high subsurface

temperatures (of the order of 200oC). Therefore, one of the most effective ways for monitoring hydraulic fracturing is not available in one of the most active shale gas areas. This technology need requires further research and development.'

WELL INTEGRITY

'... Associated with this issue is that of abandoned wells, including both the issue of well remediation to avoid contamination of aquifers and of orphan wells. **This issue is not yet a major problem in Australia, but in time it is likely to become one.** There is a need for Australian and international industry, governments and researchers, to jointly study the issue in order to establish a way forward.'

Knowledge gaps filled by industry –spin

At Frack Free Tas inc., we do not have the ability to check and document the vast array of industry information that often turns out to be spin. Much of it is produced by APPEA, with a multi-million dollar campaign about unconventional gas (APPEA, 2013). This body does the lobbying, PR and spin doctoring for the fossil fuel industry, allowing individual companies to avoid scrutiny or even provide basic information for the community.

There is a concerning imbalance that occurs when APPEA write large submissions to forums such as this senate inquiry, using large resources that community groups cannot dream of. More concerning, though, is when regulators start echoing the industry-spin in policies, regulations and legislation.

In Tasmania, when the state government conducted a 'review' of hydraulic fracturing (DPIPWE, 2015), the initial issues paper (DPIPWE, 2014) included industry spin, including:

- 'Small quantities of chemicals are added...' to the fracking fluid (p12). This is a blatant misrepresentation of the facts. An assessment carried out by the New York Department of Environmental Protection in 2009, this "small fraction of chemicals" actually translated to anywhere from 72 to as many as 300 metric tonnes of chemicals per well (CEH, 2014).
- Feature box about BTEX (p15) (benzene, toluene, ethylbenzene, and xylenes, some notoriously carcinogenic): 'Imposing a condition not to use these chemicals would be to ensure these levels do not rise above environmental and human health standard. ' However, the reality is these compounds are naturally occurring, so banning them does not ensure safe levels at all, because fracking will bring them to the surface with the flowback fluid. The regulators involved should know this, and it is reprehensible that they repeat such dangerous lies.

The final Tasmanian report (DPIPWE, 2015), still has some of these attempts to downplay risks (spruiking the BTEX ban again, p35), and with a heavy reliance on the term 'Best Practice' to cover the lack of specific solution or regulations for unconventional mining.

This echoing of industry spin is rife because of the vacuum left by the lack of unfettered study of the most important issues. Many serious issues are also left unmentioned, because they are obviously inconvenient and are unsolvable. In the Tasmanian review again, despite public submissions raising them as concerns (DPIPWE, 2014), the final report made no mention of radioactivity, health impacts

nor an extensive review on the same subject, completed in Dec 2014, in New York State, that led to a ban on the practice.

The knowledge gaps and the echoing of industry spin in regulations, coupled with political pressure to approve projects, leaves communities with absurd situations like:

- an individual protestor gets fined more than a company who has contaminated an aquifer with uranium (Nicholls, 2014).
- Origin energy don't even know how many wells they have plugged and abandoned in the Surat basin of Queensland, because the lack of obligations have let them to lose count. (Butler, 2016)
- A common absurd situation is the approval of projects without any proposed solution to dealing with large amounts of toxic waste. In the case of AGL at Gloucester, the waste ended up in a sewerage plant, and the regulator (NSW EPA) had no course to penalise them. In the case of Santos, they have built waste water ponds at Narrabri despite not having an environmental impact statement and evaporation ponds being illegal. In Queensland, waste water has been sprayed on roads for dust suppression (including sealed roads), blowing into residential water tanks then being ingested by families.

State regulators are controlled by their political masters who have a massive financial conflict of interest. Facts are ignored and distorted by industry and regulators, and there is no source of objective investigation into the issues that communities find themselves living with.

Biased approvals lead to costly impacts. If this industry really was beneficial for the nation, there would be no problem weighing up the costs and benefits in an objective approach, but we already have examples abroad (NY state), that indicate the only outcome of balanced reviews is to ban these unsafe unconventional methods, because the costs are way too great.

We need a national approach in that clean air, water and soil need to be guaranteed by national legislation. Such legislation should help keep companies and state governments in check. We also need to fund science bodies that are working for the good of the public, not just the relevant industries. Without either of these – we will never have balanced assessments of the pros and cons of unconventional mining developments. Fracking and other unconventional mining should be banned nationally until these measures are implemented. At the very least, the EPBC water trigger should be expanded to include all unconventional mining, in particular shale oil and gas.

Yours Sincerely,

Shaun Thurstans

President

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