

**Submission to the
Scientific Inquiry into Hydraulic Fracture Stimulation in Western Australia**

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THE CRUX OF MY CONCERNS

I think about fracking in the context of climate change. The majority of the world's climate scientists warn us that globally we must reduce our carbon footprint for the sake of life on Earth. This means we must transition from fossil fuel dependency, gas included, and move towards clean energy sources and technology. Therefore this generation must "bite the bullet" and do our best to avoid accelerating catastrophic climate change. This means creating the best conditions we can to increase the competitiveness of clean renewable energy applications. If WA develops a major new fracking industry that would severely hamper the power generation transition we need – and how our State could contribute to meeting that need. We are warned by scientists that 50% of known global gas reserves must remain in the ground if we are not to exceed the pre-industrial revolution pollution level by more than 2%

My other concerns about onshore gas industry encouragement in WA are about the risks that high tech extractive mining industry entails. No matter how good regulations might be, they cannot guarantee that fracking can always be executed with safety. Adequate "policing" to ensure compliance with the regulations in sometimes remote areas of WA concerns me. Hence I have concerns over water contamination, air pollution, harm to human health and to indigenous culture and wellbeing, to primary food industries, nature conservation and tourism.

In all I hope that Hydraulic Fracture Stimulation in Western Australia will be banned all over this state, not just in its South West corner.

In my INTRODUCTION I have offered a general overview supporting my concerns. Following that I have addressed more closely particular concerns regarding water, air, health and human and environmental well-being and regulation issues.

INTRODUCTION

Fracking is a manifestation of literally how deeply and how extremely some are prepared to go to wrestle Earth's resources from its farthest reaches. This stage of exploration and mining activity has been reached after we have exploited the more easily and cheaply accessible fossil fuel resources sequestered over vast millennia by Earth. We have managed to do this in just handful of human generations over a couple of centuries consuming these resources without at first understanding what long term damage that would cause to our planet and hence to our health, to the environment, to our weather experience, and finally, to our very existence. So this Inquiry is dealing with an existential matter with fracking and burning that fossil fuel at its core. I am thankful for the opportunity to address it.

In Western Australia's case, to reach unconventional gas reserves in shale or tight rock, vertical frack wells must delve 2 to 4 kilometres below the surface and then via horizontally drilled shafts to access gas deposits by fracking.

Initially human use of fossil fuels was excusable because of our ignorance of and innocence about the connections of such industrial behaviour to global warming and climate change but we are long

past that Forgivable Stage now. Like the smoking lobby pushing cigarettes (in past and still doing so currently), industrial fossil fuel addicts, their lobbyists and certain politicians are pushing gas despite the known harm that the commodity does to the planet and the wellbeing of life on it.

For examples of these activities, please refer to the \$3 million spent by the Australian gas lobby to denigrate climate change knowledge and obstruct any ambitious climate change policies. **See:** [British research group InfluenceMap..](http://www.theage.com.au/national/australian-oil-and-gas-lobby-spent-millions-advocating-against-climate-action-report-20160412-go47ok.html)
<http://www.theage.com.au/national/australian-oil-and-gas-lobby-spent-millions-advocating-against-climate-action-report-20160412-go47ok.html>

Please refer also to article below exposing Chevron's global chairman John Watson's strong resistance to a global price on carbon. We have to be wide awake about the motives for his stance which is to minimise the competitiveness of renewable energy and to give fossil fuels the greatest market advantage possible. See: <http://www.theaustralian.com.au/business/mining-energy/chevron-shell-bosses-dispute-need-for-price-on-carbon/news-story/a7e9a695f31a7388a28699df89da19ad>

In March 2016, Perth hosted the huge **18th International Conference and Exhibition on Liquefied Natural Gas**. Along with thousands of delegates from around Australia and overseas, Prime Minister Turnbull was here actively spruiking for development of a thriving unconventional gas industry in WA. Political benevolence is another massive advantage enjoyed by fossil fuel industries.

An West-East Pipeline enthusiastically backed by Josh Frydenburg, Matthias Cormann and others was given massive \$3.7million support through a federal budget for a pre-feasibility study. If this pipedream ever becomes a reality it would cause major growth in unconventional gasfield development not only in WA but also in the NT and SA. Barnaby Joyce had been another avid proponent wanting it funded by the Northern Australian Investment Fund. Such subsidised progress would make it outcompete renewable energy development which does not enjoy such rampant favouritism. A carbon price would enhance its competitiveness so that is fiercely opposed by the fossil fuel barons.

Setting this argument in a scientific frame and on an "even playing field" would make matters fairer – with renewables given at least the same level of help from political and industrial leaders to flourish. A carbon price would greatly assist reaching the essential goal of decarbonising our economy. We need a decentralised mix of renewables to veer away from the old fossil fuel-based power generation that continues to overburden Earth's atmosphere with CO₂ and methane. Future generations need us NOW to undertake this transformation to a clean economy. Given existing global warming we have no time to waste. Let our direction be informed by the vast majority of climate scientists, not by wealthy lobbyists and industrialists.

Back in 2014, bankrolling clean energy projects was given an amazing \$850 million boost when the present guardians of the Rockefeller family's fortune founded on oil and gas decided to make that investment in clean energy as a 'moral duty'. On the other hand the Koch brothers in the US wielded their enormous power to support continued dependence on the coal, oil and gas industries. We don't just need clean fuels, we need clean incorruptible politicians to legislate and ensure rigorous regulations to bring forth the transformational changes needed to secure climate stability. And we need enlightened, science-informed wealthy proponents to support the transition. More current Rockefellers and far fewer Kochs!

We must all make wise choices based on science, and on what's good for humanity and the rest of life on Earth. We must view potential fracking in WA in the context of global burning of fossil fuels and not just limit our perspective to short term advantage some might perceived. Well-supported

majority climate science tells us that we continue to burn these fuels at our peril; that we are causing increasingly irreparable damage to global weather systems. The impacts of our fossil fuel profligacy are irrefutable as humanity experiences increasing severity and frequency of extreme weather events about the planet. We are heading for runaway climate change. The longer we fail to respond adequately to this growing crisis, the more difficult and expensive our efforts to return balance to world energy systems will be.

Gas was once viewed as a less polluting “transition” fuel while we sensibly weaned ourselves off the burning dirtier coal and oil. However the methods used to obtain unconventional gas by hydraulic fracturing carry huge risks – of environmental damage resulting in long term harm to groundwater resources, air pollution, the spoiling of agricultural and pastoral lands, and impacts on human health.

We need food security before an energy supply depending on fracking. We need more stable predictable weather, less polluted soil and cleaner air. We must support, not literally undermine, the essential services of our food producers on the land.

We have the means to do that by deploying renewable energy technologies that are available to us now and becoming increasingly sophisticated, and cheaper as technology advances and scale of use expands. We have game-changing batteries to store excesses of power gained from using the freely supplied resources of wind, sun and wave. WA is well-positioned to mine and supply lithium for batteries to store power for use when the intermittency of renewable sources leaves temporary gaps in supply. The lifespans of these various batteries do exact their own negative environmental consequences (such as how we manage such batteries after their Use By Date) but we need to focus on Least Harmful Pathways to our energy future, resolving their problems by our human ingenuity.

After the spectacularly famous plunge in South Australia’s power supply during ferocious storms, anti-renewables lobbyists instantaneously blamed the state’s growing dependence on solar and wind power. Then Elon Musk marched into the debate offering to build a huge battery storage setup to protect South Australia from such a recurrence. If it wasn’t finished in three months, he promised the state would not have to pay for it.

We need more entrepreneurship in that direction – especially as fugitive emissions from shale gas fracking are about as bad for the climate as burning dirty coal.

POLLUTION OF OUR AIR & GLOBAL ATMOSPHERE

Methane, the main component of natural gas is 84 times more potent than CO₂ over short periods and 30 times more over long term.

The UK’s Environmental Protection Agency’s Global Warming Potential (GWP) assessed the threat posed by Green House Gases. The GWP measures how much heat one molecule of gas will trap relative to a molecule of CO₂. The GWP of methane is 34 meaning it is 34 times more effective at preventing infrared radiation from escaping the planet. Methane is a great accelerator of global warming.

Minimising leakage of CO₂ and methane from frack wells is of great importance. A mid-2015 report on the fracking industry in the US (commissioned by the Environmental Defence Fund and carried out by environmental consulting group ICF International) found that natural gas drilling only has environmental benefits over coal and oil production if a very tight lid can minimise leaks. Intentional venting and flaring is practised at drill sites for safety and other reasons. The practice can make the process nearly as carbon-intensive as coal, and of course has huge climate change implications.

There is also the problem of unintentional fugitive emissions during the fracking process and leaks during transportation of the gas. Strict monitoring of and adherence to strict standards of fracking would be essential if fracking is to be allowed in WA.

The journal Nature in 2014 published findings of research led by Christophe McGlade, at University College London, which concluded that to avoid dangerous climate change, 95% of Australia's coal reserves must stay in the ground. The study indicates that carbon capture and storage which some advocate as a viable means to continue to our carbon addiction, would make "surprisingly little difference to the amount of coal, oil and gas deemed unburnable" if we are not to exhaust our Carbon Budget. It warns that continued exploitation of such fuels will see them become worthless. Prospects for gas are better than for coal – **but the study still warned that 50% of global reserves of gas should remain unburnt.**

Should we here in WA be burdening our Earth with more methane emissions and more burning of that gas? There IS an alternative energy future into which we should be dedicating our ingenuity and funding – Renewable energy doesn't "cost the Earth." I am delighted to learn that under Labor, investment is underway for a solar PV plant somewhere between Kalgoorlie and Coolgardie. The Goldfields is a wonderful location for such developments, a move certainly in the right direction.

Should we be exporting LNG and so adding to the atmospheric burden as other countries burn that gas – and lengthening their dependency on that atmosphere-harming fuel? Does WA want to build a new gas-fired electricity plant here to replace the old Muja A and B coal-fired plants, so heavily subsidised by the Barnett Government when they were corroding away? If we build a gas-fired facility instead of building renewable energy plant, it would lock WA into a dependency on gas which will in time become a stranded asset as the world successively transitions to renewables. This makes poor financial and environmental sense. More investment in a clean green energy future would be wise – though hard to achieve by the current cash-strapped Labor government.

Another trap is set by the immediacy with which such decisions must be made. Householders and industry naturally want to keep the electricity price as low as possible. Shareholders want to enjoy generous dividends on their investments. Existing industries want to preserve themselves into the future by resisting the "disruptive technologies" that renewable energy poses. The high uptake of solar on WA roof tops is an indicator of the readiness and trust householders feel towards renewables. Financial motivations as well as environmental ones will have guided their decision-making. That has to be a good thing as the more economic solar is the faster it will catch on.

Given the urgency of addressing the global warming problem signalled by melting polar icecaps and Himalayan snow and ice, we need to move faster at all levels – personal, political, industrial – to shrink our carbon footprints. As scientists measure methane being released from thinning retreating Arctic ice and as sea temperatures rise, tragically we are not making enough progress towards meeting goals agreed to at the great UN Climate Change Conference in Paris in December 2016. Above all considerations we must ensure that humanity does not exceed the "safe" fossil fuel limit. We must minimise the amount of coal, oil - and gas - as we simultaneously use more solar, wind, wave power and when appropriate bio-fuels and geothermal. WA must make decisions that are responsible in the global intergenerational context because we all ultimately rely on the health of this planet to sustain us – and all other life on Earth.

Another issue we face is the future of carbon capture and storage(CSS) in the context of staying below that 2 degree temperature rise over pre-industrial revolution level. CSS has attracted huge hopes and funding in the past but without dependable results as far as I know. Even in WA there is a project to sequester fossil carbon somehow around Harvey. I reflect again on the McGlade study's finding on CCS.

The coal industry naturally has an interest in a successful outcome of CCS research but it should not depend on that to expand. Coal use should be progressively phased out. If CCS is ever proved to work safely and is economic, we will have enough existing CO2 excess to sequester that way anyway

without adding more. It would be foolish for new coal and gas deployment assuming CCS will somehow solve their contribution to global air pollution. If it doesn't work, then their expansion has committed humankind to years more dependency on their dirty fuels.

It is so interesting to observe how little if any public support there is for Adani's coal mine in Queensland but how much support there has been for it from the major political parties who keep on getting elected. Gas too has experienced high level community concern as manifested in declarations for gasfield-free towns over past years in affected areas of WA plus strong objections from metropolitan communities. While our governments, both federal and state have been tardy in adequately supporting renewable energy options, the community has spectacularly embraced making changes at household levels by having solar hot water and photovoltaic panels installed on rooftops – especially here in WA as mentioned earlier. This public angst about coal and gas along with demonstrated support for solar rooftops should send a message to political decision makers that there are votes to be won by favouring RE options. "We the People" should have the ear of the politicians more than the industrial giants of the corporate gas-coal-oil world but that is not the case. Wealth and power trumps the people somehow in our democracy. There are always many other issues besides energy jostling for attention during elections and they probably somewhat eclipse proper attention to how we are to power our future. My hope is that this Scientific Inquiry will conclude that we have the wellbeing of this planet in our hands and therefore huge intergenerational responsibility to make the right choices now. We must decarbonise our economy.

WATER IMPACTS

WA is a water-challenged state and I welcome Labor's ban on fracking in the South West which will help to protect our diminishing water supply if that ban holds. This is so important as climate change reduces our rainfall and causes longer hotter summers bringing more savage wildfires just as climate scientists predicted.

An incident at Whicher Range was a timely warning to the chemical contamination that fracking can wreak. I quote an email from the CCWA (dated 2014/4/16):

"We have already had one case where over a million litres of diesel were pumped at high pressure underground in the environmentally sensitive Whicher Ranges near Busselton, and recently, the possibility of a US-style fracking 'frenzy' in WA was reported in the media.

"We need an immediate moratorium on gas fracking in WA to protect our precious groundwater and ecosystems from this damaging industry.... until we have regulations that can guarantee full protection for groundwater, human health and the environment."

While the ban on fracking in our South West is comforting to a degree, Labor's intentions over much of much of the rest of WA have been left somewhat open under a moratorium on the accident-prone fracking industry. Fracking exploration licences have been issued in past over many groundwater aquifers in that vast region including the Kimberley, Carnarvon, the Mid-West. Buru Energy has been a leading proponent eager to exploit gas reserves in its exploration licence area out from tourism-savvy Broome. A clash of land use perspectives between mining, tourism and pastoral industries and certainly with traditional owner cultural obligations to protect country.

Fracking exploration licences have been granted too over the north and south aquifers of Yarragadee which supply Perth and the South West with drinking water. Frack drilling would have to go through aquifers to access trapped gas. Frack fluids usually mixed with water and various chemicals would be pumped under high pressure to the deep hydrocarboniferous formation below where the explosive fracturing releases the trapped bubbles of gas. This high tech risky process is an extreme

method of scrambling to glean gas in difficult situations. More than 500 different chemicals are used due to the complexity of cracking the rocks; many such as benzene, mercury, arsenic, and radium are toxic to humans, livestock and wildlife.

Leakages of toxic “cocktails” of fracking fluids into these Yarragadee aquifers would be irretrievable and threaten to contaminate a large population’s safe water supply along with damage to farming and tourism.

Dealing with the waste water from fracking is a vexing problem. Injecting it deeply below the pierced aquifer is not advisable. Storing it in evaporation ponds on the surface too has problems of possible leakage or breaches of banks during floods such as the Kimberley is experiencing during this cyclone season. Such flooding in future could wash away entire evaporation ponds and their toxic contents spreading them irretrievably and widely over the land. During long hot dry seasons winds could disperse residue toxins and dusts from the ponds.

APPEA would have us believe that fracking is a safe well-regulated industry but are its spokespeople considering the growing extremes of weather that will be hurled at fracking infrastructure as climate change increasingly grips the planet?

Whether we are from metropolitan or regional WA, we should be concerned and be looking for alternative ways to meet our energy needs.

We in WA should look carefully at the relationship of fracking and water elsewhere. Fracking has become a huge industry in the USA where there have been accidents and incidents contaminating water. An example in Wyoming is salutary. Dangerous levels of chemicals were found in underground water, while waste was dumped in unlined pits and barriers to protect groundwater were inadequate. The EPA halted a study into this incident but subsequently scientists found that fracking had in fact contaminated that water. See:

<http://www.theguardian.com/us-news/2016/apr/07/wyoming-fracking-water-contamination-dangerous-chemicals>

An article dated 28 March 2016, in Scientific American, **Drilling for earthquakes** by Anna Kuchment investigates possible links between fracking and earthquakes. She refers to the technological breakthrough of horizontal drilling which enabled a great acceleration in capturing oil and gas which caught on like wildfire in the US, allowing gas to become significantly cheaper to consumers and US gas production to outcompete that in other countries. Along with the increased gas and oil came vast quantities of highly saline water. All three were derived from ancient seas which had been trapped in pore spaces and transformed over time under great heat and pressure. That ancient water is also often laced with naturally occurring radioactive material toxic to plants and animals. Burying that toxic water deep underground is necessary to protect drinking water supplies and a huge task for gas well operators in the US. Injecting that contaminated frack water can increase pressure in existing fault zones which could lead to human-induced seismic activity.

Cornell University has done research into linkage between fracking and earthquakes, I think calling them frackquakes when linkage is found.

A few years ago, industry statistics from Pennsylvania in the USA showed that 6-7% of shale fracking wells had leaked dangerous pollutants into groundwater within three years and that leaks are likely to increase with time as the concrete well casings age and crack. This has ruined the lives of many

local people, including the Sautner family whose water is so polluted their children can't even shower at home, but they are unable to move because their land value has collapsed.

In Australia, firstly the vertical shaft is drilled. Then a cement-coated pipe is inserted, and sealed to stop leakage of the "chemical cocktail". There is no guarantee that this will work for duration of a frackwell's productive life. If it does not, then a permanent toxic legacy will result. In time the steel pipe itself will corrode. Removing this subterranean infrastructure must be nearly impossible and even if it could be done, extremely costly and unattractive to the mining company after profits had been obtained. Some of the companies that would be involved would be overseas-based – and so most of the profits would go out of this country anyway. Examples are giant multinational corporations Mitsubishi, Conoco-Phillips and Petrochina who have eyes on the shales and tight gasfields under the Fitzroy Valley in the Kimberley.

The European Commission commissioned a thorough report (2012) into risks of shale fracking concluding that there is an overall **high risk** of groundwater contamination from unconventional gas fracking activities, and found fracking processes include toxic, allergenic, mutagenic and carcinogenic substances which even in minute quantities can make water toxic and potentially dangerous.

The UK's Department of Energy and Climate Change obtained a list of chemicals approved for hydraulic fracking and used by the company Cuadrilla. The chemicals were polyacrylamide friction reducers, hydrochloric acid and biocide – potentially dangerous if they contaminate water supplies.

Fracking in shale can connect with pre-existing vertical fractures possibly enabling contaminated fluids or gas to escape to the surface or enter groundwater, be absorbed by crops and eventually enter the human food chain. Fracking could also disturb radioactive materials and arsenic already in the earth making it bioavailable. Infants and children would be particularly vulnerable to harm from such materials. Exposure in utero could cause very harmful consequences. An aquifer on Australia's east coast was revealed to have been contaminated with levels of uranium 20 times the safe drinking level because of fracking in March 2014.

Further data to explain harm to water from fracking. See <http://cleanwaterhealthyland.org.au/content/water-O> The primary sources of risk come from:

- **Fracking Fluid ('slickwater')** - the fluids used in fracking comprise a mix of water and sand (98%), combined with around 2% additional chemical additives (such substances are also known as 'slickwater'). The chemicals used in fracking fluids include known toxic, allergenic, mutagenic and, carcinogenic substances.[\[iv\]](#)
- **Toxic particulates released from the shale itself** - released from the source rock after fracking, and returning to the surface as 'flow-back fluid', usually kept in open-air, on-site ponds. This new mixture can contain harmful substances such as heavy metals, naturally occurring radioactive materials (NORMs - including Radium, Thorium and Uranium), high concentrations of salts, oils and other contaminants, including arsenic, benzene and mercury[\[v\]](#).

This same report into shale gas fracking also found an overall **high risk of surface water contamination** from unconventional gas fracking activities[\[vi\]](#) as chemicals and other dangerous substances listed above could reach surface water bodies, such as rivers, lakes and wetlands. Pollution of surface water would directly affect environmental and human health, as well as agricultural production.

HEALTH IMPACT

Gasfields in remote locations have been found to have ozone levels higher than that in heavily polluted urban locations. Documented evidence indicates increased risks of cancers, particularly leukaemia, neurological diseases, impacts to the nervous system, aggravation of existing heart diseases, asthma and other lung diseases such as chronic obstructive pulmonary disease, headache and irritation of throat and eyes. (Refer to R. W. Howarth *et al.* 'Methane and the greenhouse-gas footprint of natural gas from shale formations')

The gas fracking industry wants to develop on farmland and close to regional towns - placing families at risk of toxic, harmful chemicals and health effects.

Rising complaints of rashes, nausea, headaches, heart palpitations, memory loss, dizziness and nose bleeds among people living near the Tara gasfields in Queensland were reported to Dr Helen Redmond (from NSW Chapter of Doctors for the Environment) in 2016.

Another member of Doctors for the Environment, Dr Greg Glazov in WA warned in 2015 that "Chemicals present in the enormous quantities of wastewater released in the process of shale gas extraction are known to potentially have adverse, long-term health effects, including hormone system disruption, fertility and reproductive effects, and development of cancers. Internationally, there is growing evidence that fracking has contaminated groundwater and caused air pollution and the potential long-term health effects are starting to be detected. ... The accepted practice of doctors is to follow the precautionary principle in any new development, rather than risk exposing the public to potential serious health risk."

The McGowan Government has gazetted its promised **hydraulic fracture stimulation bans for the SW, Peel and Perth metro areas**. This a great cause for comfort but would be more so if it extended the ban to the rest of the State. The outcome of this Inquiry will I hope favour that course.

SOCIAL IMPACTS AND HUMAN RIGHTS

The development of horizontal slick water fracking in the late 1990s is being applied globally and has greatly increased the reach, productivity and environmental impacts of this form of mining and of course its social impacts. It would be the same in WA.

There is an argument that because there would be fewer vertical wells compared to coal seam fracking, the above ground impact would be less due to the horizontal reach of shafts taking off from the base of each vertical well. However the surface footprint of each well once truck parking and access roads are factored in is around 4 hectares. The impact on the overall landscape would be massive.

The footprint of fracking on the land can conflict with food production and livelihoods. The network of mining roads for heavy haulage can be very disruptive to existing community travel, upsetting food production and social life. Tourism in the outback would be less attractive in fracked areas where movement would be limited because of mine haulage roads which might prohibit other traffic and an industrialised landscape is far less pleasing to the eye than intact wild places. Visual impacts on scenery, and flora and fauna would deter tourists and be upsetting to communities living there. Potential harm to water supplies through leakage of chemically contaminated frackwater and air pollution from leaked gas, would be a constant worry. Dust would probably increase with the extra

heavy mining traffic and there would be wear and tear on roads that would be difficult for local people and other travellers. There can be health impacts as mentioned above.

Aboriginal rights have been trampled on by fracking companies. An example is Micklo who defended his country inland from Broome from Buru Energy by setting up his camp across the gate of their exploration lease in the Kimberley and refusing the miner's entry. It was Micklo's ancestral country and he needed it intact so that he could pass on his ancient culture and knowledge to his children – and they in turn to pass it on to their own children – as had happened for many thousands of years.

The Minister for Mines and Petroleum has been legally able to grant exploration, retention and development titles over 'private land' while landowners have not been able to prevent the entry of frack miners onto their land/farms/stations. That restriction has to be removed. Landowners should have rights too and ought to be consulted fairly.

The WA Farmers Federation has long wanted land owners to have the same veto power over oil and gas activity on their land which mining companies enjoy.

A couple of years ago the CCWA commissioned a poll which indicated that Western Australians had then an overwhelmingly negative attitude towards gas fracking. In affected regions up to 70% of people had a negative view of fracking and in Perth suburbs, more than twice as many people were opposed to fracking compared to those who supported the industry.

Back then communities were taking action to protect their land, water and livelihoods from the perils of living in a fracked landscape. A growing number of affected those communities made "gasfield free declarations" backed by 96-98% support in their communities. A petition was delivered to WA Parliament with 30,000 signatures calling for a moratorium on fracking. Some entire countries have banned fracking, so great has been the distrust of that industry.

Central Greenough was the first WA town to declare itself "gasfield-free". In Sept 2014, the Shire of Coorow called for a moratorium on any fracking activity until health and environment checks carried out on its drinking water supplies proved safe. The farmers around Carnamah objected publically. These moves were challenged by APPEA and annoyed energy company AWE then doing exploratory work on Drover-1 well east of botanically diverse Mt Lesueur National Park and near Green Head and Leeman. Residents there, mindful of potential health impacts, were very upset about possible damage to the Mount Peron aquifer and cumulative impacts on agricultural land.

There are strong reasons why affected communities object to having fracking imposed on them and they need to be taken seriously in considering if fracking is a suitable and necessary industry for WA. I think it is neither.

REGULATION

Shale gas is methane (natural gas) and as such is generally considered to be a form of petroleum production and has been governed by WA's *Petroleum and Geothermal Energy Resources Act 1967*. The Act sets out an entirely separate tenement regime for petroleum exploration and production than that used for coal mining or the mining of other subsurface minerals under the *Mining Act 1978* (WA).

The PGER Act provides limited rights to farmers and private land owners – but much leniency was extended to exploration or development companies after unconventional gas resources on ‘private land’. This signalled that land was open for shale gas mining.

Clearly there was great need for more rights to those in the pastoral community to prevent open slather for industrialised mining of onshore gas; also that the environment needs better protections from the risky activities of fracking, including reduced food production from the large extent of surface land taken up by well pads and network of wide roads for mining transportation. Even with upgraded regulations over the fracking industry, balance between the mining companies, farmers and environment can probably never be guaranteed. Mining interests are very powerful.

Resource companies should fully disclose what chemicals and substances they intend to use. If any would pose a risk to the environment, to human or other animal health, to surface or groundwater or to property they should be denied their use as a precautionary measure. Recapturing fugitive toxic frackwater is probably impossible and permanent harmful contamination must be avoided.

Regulations cannot guarantee safety during and after fracking operations. Regulations are only good as their implementation. Resource companies must be constantly overseen by independent inspection. Transgressions should be met with meaningful fines and the fines should be paid up fully before the mining activity may resume.

The whole fracking process is so fraught with risks even though regulators and the industry claim strong regulations are in place to protect communities and environment from harm from gas fracking. Frack shafts will leak. Fugitive gases, likely to be methane, will pollute the air. Over the life of a frackfield, the chances are that chemically contaminated water will escape into groundwater, surface water and onto land. Accidents will happen. Including during transportation. People’s health will be impaired. Governments have been reluctant to impose fines and those fines must be imposed and enforced.

In 2011, the DMP commissioned an independent expert Dr Tina Hunter to review its regulatory arrangements for gas fracking in WA under the PGR Act. Dr Hunter’s report concluded that **“there are no legal provisions in the [petroleum] Act that specifically pertain to the management of the environment in onshore petroleum activities.”** Also she noted that **“under the current legislative framework the Environmental Management Plan is legally unenforceable.”** Some improvements were made after this exposure of shortcomings, but not to Dr Hunter’s satisfaction. How can the WA community have confidence in the regulatory regime for shale fracking in WA? Another independent report back then, the Auditor General’s Review also had found that the Government’s preferred approach to regulating fracking was totally inadequate with the DMP lacking the legal powers to hold the gas industry to account. Both reviews found that the Department was comprehensively failing in its duties to manage the environmental impact of all mining activity in WA.

Sources: Hunter, T (2011) *Regulation of Shale, Coal Seam and Tight Gas Activities in Western Australia*, Faculty of Law, Bond University

Some progress in regulation I think has been made since these two reviews were published. There remains a need for tightening of the regulatory regime if fracking be approved for this State. I hope that after this current Inquiry that will never happen.

The following minimum standards must apply before any gas fracking activities are allowed to take place in WA:

- A requirement for rigorous independent testing of all chemicals before they are used, to demonstrate that **drilling and fracking operations will have no adverse impacts on groundwater, human health and the environment;**
- **independent assessment of the cumulative impact of gas fracking proposals** (including surface operations, groundwater impacts and carbon pollution) to demonstrate that the activities will not have an adverse impact on WA's unique ecosystems or agricultural lands;
- **absolute transparency** is provided to the public about the chemicals used in all unconventional gas drilling and hydraulic fracturing ('fracking') activities;
- public release of all other information relating to environmental management and compliance by the fracking industry, including proponent documentation, management plans, compliance reports and groundwater and environmental monitoring data;
- any liability for contamination of ground water, land or community assets or greenhouse emissions due to methane leakage to be borne by the company conducting the operations rather than the State and people of Western Australia;
- private and Indigenous landholders have a legal veto to prevent gas fracking activities occurring on their lands;
- no reduction of groundwater levels as a result of water use in gas fracking operations;
- no uncontrolled methane leakage from drilled locations, wellheads or borefields;
- no reduction in available agricultural land in WA.

CONCLUSION

Natural gas produced by fracking is not a sustainable energy source. Once mined and used, it is gone forever whereas the sun and wind will continue shining and blowing – intermittently as they do but by combining various forms of RE and by using battery storage, we can smooth out the supply to make electricity available round the clock. WA is blessed with rich resources of renewable energy including wave power. We should rely on such clean free sources for WA's energy needs. Studies show that carbon pollution from LNG production is similar to that produced from coal burning so let us move away from LNG.

I would recommend the ban on fracking be extended to the whole state of WA.