T R A N S C R I P T

STANDING COMMITTEE ON THE ENVIRONMENT AND PLANNING

Inquiry into unconventional gas in Victoria

Torquay — 13 August 2015

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Mr Michael Blackam (affirmed), Senior Principal, Coffey.

The CHAIR — Michael, I am going to ask Keir to swear you in and then ask you to give a brief presentation. Then we will ask some questions. I apologise for our delay, but as you have heard, we have had lots of very good evidence.

Mr BLACKAM — It cannot be helped.

The CHAIR — We have your submissions too.

Visual presentation.

Mr BLACKAM — Excellent. My name is Michael Blackam. I work with Coffey, an environmental and geoscience consulting company, and I hold a position there as a senior principal. I am employed as a specialist consultant in hydrogeology, hydrology, geology, and one of the qualifications I hold is a bachelor of applied science with honours in environmental and exploration geology. I am a professional member of the Australian Institute of Geoscientists and the United States-based National Groundwater Association. In a professional capacity, and as relevant to my submission, I have worked across a wide range of sectors including water resources, groundwater management, mining, coal seam gas and contaminated land.

My submission is tendered primarily to address items 2 and 3 of the terms of reference. My interest in unconventional gas commenced in the late 2000s when I became involved in groundwater assessment for the environmental impact statements for coal seam gas projects in Queensland in both the Surat Basin and the Bowen Basin. This work included assessing the environmental impacts in the context of groundwater resources and groundwater-dependent ecosystems, as well as detailed consideration of the potential impacts caused by hydraulic fracturing, including risks associated with geological faulting, subsidence and the measures required to mitigate against those risks. Ultimately, this led me to writing the two papers which I have presented to support my submission.

The first paper, *Source, Fate and Water-energy Intensity in the Coal Seam Gas and Shale Gas Sector*, explores the relationship between energy and water in the unconventional gas sector. The second paper, *Geomechanics of Hydraulic Fracturing — Environmental Effects in the Australian Context*, involved significant research and review of the science underpinning the hydraulic fracturing of unconventional gas reservoirs in the context of the Australian geological and tectonic stress setting. This paper looks at a number of things, including the history of hydraulic fracturing as a method for well stimulation, and the science of geomechanics that underpins fracture development and behaviour, and considers the potential for hydraulic fracturing to result in induced seismicity and to cause migration of fracturing fluids towards supply aquifers.

My submission looks at three aspects associated with unconventional gas development, which I will talk about briefly. If we look at the first aspect — that is, the potential for hydraulic fracturing to result in fracture and/or fluid migration to drinking water resources — the obvious thing that we find is that fracking, as it is called, has been widely criticised within the community as something that has great potential to impact the environment and water supplies. We hear claims, for example, that we just do not know enough about the technology or about how it works, it has not been tested long enough and we cannot say for certain that it is safe. Accordingly, these fears have led to a great deal of anxiety about onshore unconventional gas developments.

If we review the literature and look at the science we see that in fact hydraulic fracturing is a very mature technology, having been practised for over 65 years. Perhaps the best-known geophysicist in the world during the post-war period in the 20th century, Marion King Hubbert, summarised early work on the subject in a seminal 1957 paper *Mechanics of Hydraulic Fracturing*. At the time he said:

> The hydraulic-fracturing technique of well stimulation is one of the major developments in petroleum engineering of the last decade. The technique was introduced to the petroleum industry in a paper by J. B. Clark of the Stanolind Oil and Gas Company in 1949. Since then, its use has progressively expanded so that, by the end of 1955, more than 100 000 individual treatments had been performed.

This one statement alone, made almost half a century ago, demonstrated that hydraulic fracture stimulation was recognised as a critical and widely adopted technique for the petroleum industry from the outset, and it remains so today. I might add that Marion King Hubbert was the first person to postulate the concept of “peak oil”— way back in the 1950s — and his predictions were really quite accurate.

In terms of the science, the principles of hydraulic fracturing are underpinned by geomechanics, which is a complicated discipline, and the whole problem of environmental impact due to hydraulic fracturing is multidisciplinary. Because of this, it is not particularly easy for laypersons to understand. One key thing is that to understand how fractures propagate within the earth under pressure of fluid injection, you need to understand the nature of the stress state within the rock at depth. You may understand how we can describe objects, for example, by their three dimensions. In a similar way we can describe the stress field within rocks in the subsurface in terms of three principal stress directions. This is important, because if we hydraulically fracture the rock, it is a fundamental principle that the fracture plane will always be perpendicular to the least principal stress. So it follows that if we can measure that stress field, we can predict the orientation of fractures.

There are a range of methods available for measuring these stresses, and understanding them is important to petroleum geologists, structural geologists, seismologists and so on. If we look at the data available for stress measurements, we can find that the Australian continent is predominantly in a compressive tectonic state. So what does this mean? The least principal stress is the vertical stress, and accordingly, any fractures will typically propagate horizontally, limiting the possibility of large, vertical fracture extents.

Some unconventional gas developments around the world, unlike in Australia, are not located in a compressive tectonic region. For example, the Barnett Shale in Texas is a good example of an extensional tectonic environment where considerable shale gas development has been undertaken, and in this environment fractures tend to develop in a vertical plane. What we see — if we have a look at the plot — based on a study of measured fractured extents is that the potential risk of fractures extending to the surface and impacting aquifers and surface water is not demonstrated. Even in this extensional stress regime we find that the risk of out of zone fracturing impacting on water supply aquifers — which you see at the top — is really quite low.

Now if you look at the second aspect — that is, the potential for hydraulic fracturing to induce damaging earthquakes — the principles of this are detailed in my paper, so I will not cover them here. But what we find, based on observation, is that the hydraulic fracturing can result in microseismic events or very low-level earthquakes. These are commonly less than a magnitude of 1 or 2. Very occasionally it can be higher; for example, in cases where the migration of a hydraulic fracture intersects an existing geological fault that is under stress. Because this can reduce the friction on the fault it is possible that a fault movement can occur. So we have a mechanism to explain this, but what does the observation show? Based on a recent comprehensive study by Davies and others in 2013, that study found that the hydraulic fracturing of shale rocks usually generates very small-magnitude seismic events when compared to other causes of induced seismicity, such as coalmining, filling of reservoirs and waste fluid injection. The chart shows the typical ranges expected from these various causes, and it should be noted that magnitudes under 3 are considered to be not usually felt at the surface, and damage generally does not occur until we get magnitudes above 4 or 5. We do not see anything near these magnitudes resulting from hydraulic fracturing.

If we look at the third aspect, and that is the intensity of water use of unconventional gas development and how it compares with other energy sources, a useful metric to help us understand this is the water-energy intensity in megalitres of water produced per petajoule of energy released. A petajoule is 10 to the power of 15 joules, which is by the way a very large amount of energy. For context, Australia’s total domestic energy consumption is in the order of around about 4000 petajoules annually. I managed to compile the water-energy intensity from a wide range of sources and across a number of energy sectors and charted these for comparison. The results on the chart are categorised as unconventional fuels on the left, conventional and fossil fuels in centre and biofuels to the right. One thing to note is that the y-axis in megalitres per petajoule has a logarithmic scale, so each grid line increases by a factor of 10 in terms of water energy intensity.

What we see is that unconventional gas varies depending on the type, whether is shale gas or coal seam gas, and on the location. For example, in the Bowen Basin and the Surat Basin in Queensland, those basins are part of the Great Artesian Basin and you have to produce a significant amount of water to extract coal seam gas. Whereas in the Sydney basin, around Camden, you have a much lower produced water requirement from those similar sort of coal seam gas operations. But in general we find that unconventional gas is reasonably favourable when compared with conventional fossil fuels. Biofuels — one so-called green energy option — are noted to rank very poorly.

To sum up, based on my review of the literature and in the context of the questions that I was considering, I conclude that the development of unconventional gas resources is based on technologies that are very mature, predictable, and, assuming an appropriate regulatory system manages development, can be developed without unmanageable impacts. I also consider that these resources should be developed because it is important that we establish and maintain an energy and gas feedstock base for Victoria's industry in order to remain nationally and internationally competitive. In this regard I think that there is a pressing need to ensure that our gas resources are not developed without due consideration of ensuring a sufficient allocation of low-cost supply to the domestic and industrial markets in this state.

Finally, I would like to thank the committee for considering my submission and providing me with the opportunity to present my findings, and of course I would be pleased to answer any questions that you may have.

The CHAIR — Michael, thank you. I note your paper, which we have had a good look at prior and it does cover a lot of very useful ground for us. If I can just summarise, and you have done this nicely: essentially your argument is that Victoria, rather than Australia from our perspective, is a relatively stable environment for these sorts of activities and we have no particular reason to believe that there would be untoward impacts of drilling and associated fracking, that the technologies themselves are predictable and that we should have no particular concerns where there is a proper regulatory regime.

Mr BLACKAM — Yes, that is what I believe. We are dealing with a very mature technology that has been in use for a long period of time. The science — the geomechanics — that underpins that demonstrate quite clearly that the prediction and the extent of fractures that you produce during hydraulic fracturing can be predicted and controlled, and they can also be measured. We can measure them using, for example, microseismic arrays and tiltmeters at the surface, so as we are actually conducting the hydraulic fracturing event we can get data about where the extent of the fracture is. That certainly leads that to be very predictable.

One of the concerns is that out-of-zone fracturing leads to fracking fluids moving through the rock, up through the strata and impacting on the water supplies. It does not really seem credible, certainly for most shale gas developments, that that is feasible, given that most of those developments occur at depths of between 1000 and maybe 4500 metres. Some coal seam gas projects where the target one body is typically much shallower than that, usually in the range of around about 200 to 700 or 800 metres depth below the surface, you are much closer to water supplies. In those cases you might want to provide much tighter controls on hydraulic fracturing.

Having said that, for example, the Arrow Energy coal seam gas project in the Surat Basin does not use fracking because we find that the shallower formations tend to open up due to structural unloading as the earth erodes and those formations are moving up from the subsurface. As a result of that, they have a good degree of natural fracture connectivity through them in any case. Whereas deeper shale rocks are very homogenous, massive rocks with very little fractures in them, so you have to create the fractures to be able to provide the pathways for the gas to come out.

Ms SHING — Thank you very much, Michael, for your submission and for the clarity with which you have expressed the views in the slides that we have seen and also in your oral comments to the panel today. Given the summary of conclusions and the way in which you have couched your findings around the technology being mature and predictable, the science and the evidence showing that risk of damage to property or environment due to induced seismicity is very low, the conclusions being consistent with the findings of the US EPA as well as indicating that unconventional gas, in particular shale gas, is not seen to be unfavourable in terms of water-energy intensity when compared with other energy sectors, I would like to ask you for your views about how it has occurred that the industry's views on this and the technology, the studies and the evidence which you have relied upon in your submission and your comments has departed so significantly from community sentiment and community opposition to the development of exploration or extraction in various communities around Australia.

The reason I am asking this is that where we have conclusions such as the ones you have outlined, they should, if presented to communities, provide a significant degree of certainty. Why is it the case that in fertile, productive land throughout Victoria we have huge amounts of opposition — and not just for sentimental reasons but for reasons that go to productivity, to marketability and to safeguarding against future risk?

Mr BLACKAM — Yes, it is certainly a problem, and it is something that I think coal seam gas proponents have grappled with in Queensland, and I think they are making pretty good progress with it now. But early on in the establishment of their operations this was certainly a really big problem. Some of those were trying to get approvals at the time that the *GasLand* movie in fact came out.

I think there is certainly a difficulty that the science, as I said, is multidisciplinary, and it is complicated. It deals with things that the average person does not have any understanding of, because it is all sub-surface stuff; it is physics in a geological environment at great depths. It is very difficult to convince non-technical people with arguments based on science because it goes over their head. But what happens is, it seems to me, it becomes a campaign of misinformation that can be very emotive, and if it is targeted very carefully, it really pulls at the heartstrings of people and they latch onto it.

I remember when I first got involved in this and I started doing some research on the internet, I thought, 'My goodness, this is all really bad. What's going on? I am working on this coal seam gas project. Apparently it is something that has significant environmental impacts, and I am not necessarily all that happy about it'. I took it on my own and thought, 'I really need to find out more about this', so I spent a lot of time researching and reviewing papers. It let me to come to my own conclusions about it. It is not easy to get there. The paper that I produced was intended to at least present the basics of this without dumbing it down too much. You have got to have some science in it, but then it becomes inaccessible to the non-scientific person. But it is accessible, for example, to colleagues of mine who work in the industry, so that is where I felt it would have its greatest use.

I think companies, proponents and scientists in general are by large not very good at selling what they do and at explaining it in a good manner. I do not know that I can even explain it very easily.

Ms BATH — It feels to me as though you are suggesting, or stating from your fairly in-depth research and your work as a geologist, that the risks are limited in terms of unconventional gas drilling. You are saying that you have studied it and there is limited risk to our land and our aquifers. I guess my question is: there may be limited risks, but what is the prospectivity of it? Is there actually sound evidence that deep within our soils, in our shale and tight gas is the gas in there worth taking out on a commercial basis? If we can do it, is it something that needs to be done and is worth doing? Is there gas trapped under Gippsland and the Otway Basin?

Mr BLACKAM — Yes, I have not had any experience or involvement in explorations in any of those basins in Victoria, so I cannot comment directly on the prospectivity. But I would say that if companies such as Lakes Oil and Beach Energy and others are spending money drilling, that would indicate that they have targets that they consider may be prospective; otherwise they would not be spending the money on the drilling.

But if the question is: do we have those resources and will they be realised? I cannot say that for certain. I consider that based on the variability of geology across the state of Victoria, there will at least be some places in some of the geological provinces and basins that will have some resources that have extractable gas, but just what the extent of that is is hard to say. It is not going to be like the United States with the massive Marcellus Shale, the Barnett formation and the Antrim formation, and very extensive shale beds.

It will be different. I think it will not be as big and dramatic as the Queensland developments, or the Western Australian developments for that matter. But one thing it does have the advantage of is that it will be very close to existing gas infrastructure, and that is a real bonus for any potential gas operations. For example, there are a lot of sedimentary basins across parts of Western Australia and the Northern Territory that are highly prospective for shale gas, but because they are so far away from pipelines and access to processing plants, the development of those is very costly because there are very large up-front infrastructure costs, just to be able to move gas, even if it is there and accessible. But Victoria has a very good, mature and well-established gas network.

Mr LEANE — Michael, I do not want to put words into your mouth, but at the start of your submission you said that the concerns about environmental impacts to water have been overblown with the exploration and extraction of coal seam gas.

Mr BLACKAM — Yes.

Mr LEANE — But to reconcile that, only a couple of days ago this topic was on the *7.30* program, but I am reading now from an article which talks about the situation in WA where, in the towns of Greenhead and Leeman, the communities are calling for a halt to that exercise. What they did, through documents released through freedom of information at this particular AWE Drover-1 well, was that it had been drilled in a catchment zone of Mount Peron water supply, which supplies drinking water for the Greenhead and Leeman communities, and there have obviously been some investigations around this. I would like to read a quote to you: ‘The results of the monitoring of the actual water and the concerns will not be released publicly’. To reconcile what you are saying, if the concerns around the water supply in this operation are a myth, how do you reconcile that we have had these instances locally, interstate and internationally?

Mr BLACKAM — Thank you for the question. I think what that points to is probably a failure of regulation. The best place to look at this is Queensland at this point in time, where they have covered a lot of territory over the last six or seven years, revised and revamped a whole range of acts, have set up an Office of Groundwater Impact Assessment to consider all of these matters, and also the requirements on undertaking any exploration or development of any gas wells requires that significant baseline investigations be undertaken and that those results are made public. So they become public data. I think that is really important. Those things need to be considered in the necessary requirements and amendments to any legislation that would go through.

Mr LEANE — Just to follow up on that, you are saying a breakdown in regulation, and you mention Queensland as a superior jurisdiction in this area?

Mr BLACKAM — I would not say superior, but I think that is the jurisdiction where they have had the biggest issues to deal with and have made the greatest deal of progress to establish a regulated regime that is consistent with the real requirements.

Mr DALLA-RIVA — Michael, thank you for your submission. It is quite detailed. We have heard a lot of evidence from people saying that there are issues about the aquifers, surface water supplies, seismicity with hydraulic fracturing or fracking, waste fluid injection, methane escapes and everything else. All those are real risks, though, am I correct in asserting that?

Mr BLACKAM — Yes. There are risks; I am not saying there are no risks. There are risks associated with everything. There are risks associated with me driving down here today.

Mr DALLA-RIVA — Yes, I understand that.

Mr BLACKAM — I should have bought a helicopter.

Ms SHING — That is the best helicopter joke we have had in these hearings, so well done.

Mr BLACKAM — For example, there is certainly a risk in hydraulically fracturing a well that if there is a failure or an improperly prepared well casing seal near the surface, there is a possibility that you will lose fluid from that into a shallow aquifer. So there is a possibility that casings can fail, in particular if the wells have been not completed and constructed to suitable and appropriate standards. That is something else that has been completely revamped in Queensland as well — a new set of guidelines and standards for petroleum and gas wells, recognising that this is one of the primary means that you could impact surface water supplies through hydraulic fracturing. It is not going to be impacted in the fracturing at depth.

The other thing of course is the potential for spillage. You are dealing with quantities of water, depending on the well, somewhere between 2 or 3 megalitres and up as high as maybe 15 or 20 megalitres, so you need to have a lot of water on site to undertake the operation. There is potential for tanks to fail, pipes to burst and leaks to occur at the surface. You need significant controls on that, some sorts of works approval controls, to make sure that that is conducted not in a cavalier fashion but in a proper, well-controlled fashion, and that is something else that has been undertaken.

The interesting thing is that the approval regulations in Australia compared to the US are much superior. I do not know whether you have had a chance to read the US Environmental Protection Agency draft report on the subject. I have been waiting for this to come out and I was happy to find that it is not inconsistent with what I found. In the US, for example, they estimate that 25 000 to 30 000 new wells were drilled and hydraulically fractured annually between 2011 and 2014. That is a lot of operations — 25 000 to 30 000. That is a lot of operations.

Ms SHING — Could you just read the full title of that document onto the record?

Mr BLACKAM — Certainly. It is *Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources*, and that is from the United States Environmental Protection Agency, June 2015. So we are dealing with a huge number of wells in the US, and it is not surprising that you might come across some impacts. There are risks associated with every one of those wells, but I think with a strong and rigorous regulatory regime, those risks can be reduced dramatically such that there may be some impacts but the potential for impacts overall is going to be fairly low. One of the major findings from this same report is:

> From our assessment, we conclude there are above and below ground mechanisms by which hydraulic fracturing activities have the potential to impact drinking water resources. These mechanisms include water withdrawals in times of, or in areas with, low water availability; spills of hydraulic fracturing fluids and produced water; fracturing directly into underground drinking water resources; below ground migration of liquids and gases; and inadequate treatment and discharge of wastewater.

But under that they conclude:

> We did not find evidence that these mechanisms have led to widespread, systemic impacts on drinking water resources in the United States. Of the potential mechanisms identified in this report, we found specific instances where one or more mechanisms led to impacts on drinking water resources, including contamination of drinking water wells. The number of identified cases, however, was small compared to the number of hydraulically fractured wells.

It is not possible to deny that there is some potential for impact, but this is what has happened in the US under a regulatory regime that could be considered really very poor in comparison to Australia. I am sure anyone here who has had an involvement in trying to deliver an environmental impact assessment for a large mining company or a coal seam gas development will know it is really rigorous and stringent. They do not have that in the US; it is a state-by-state based arrangement.

Mr DALLA-RIVA — They have identified the risks, though. There were examples. I thought at some point you said the evidence that you found was that there was no potential for harm to water, yet you have just read from the US EPA assessment which says there is.

Mr BLACKAM — Yes, I guess.

Mr DALLA-RIVA — The only reason I am saying this is I have just come back from the States, and in particular New York. I was at the New York stock exchange, where surprisingly — it was in the energy section — they even said, 'Oh yeah, we have earthquakes from fracking'. This was from the guys who are on the New York stock exchange trying to sell the commodity. Whilst I understand the risk of seismic activity, it was almost like a given in the States that it occurs.

Mr BLACKAM — Yes, so — —

Mr DALLA-RIVA — It is just a given, pretty much like the EPA report: 'Look, we know it happens, but in the context of the thousands we accept that there might be a few hundred. We know that fracking may cause earthquakes — small ones — but on the odd occasion we know it does'. There was a sort of acceptance in the States that these things occur in the ordinary course of the processes of what they are doing. Your evidence indicated to me that it was so low that it does not occur.

Mr BLACKAM — Yes.

Mr DALLA-RIVA — I am trying to reconcile what you have just read out, what I understand from the States and what you have said in evidence.

Mr BLACKAM — I can answer that.

Mr DALLA-RIVA — Yes, I saw that.

Mr BLACKAM — What I was talking about on this one is simply that there is no demonstrated potential for impacts from fractures at depth impacting on water supplies due to the great vertical extent and the lack of fracture extent. But going back — —

Mr DALLA-RIVA — But that does not reconcile with the report from the EPA.

Mr BLACKAM — The report from the EPA also refers to some jurisdictions where they are fracking at very shallow levels. I mentioned that in terms of policy and gas, where there could be some risks, but — —

Mr DALLA-RIVA — That is right; you have mentioned that. The other one was the seismic — —

Mr BLACKAM — The induced seismic events. What you find with hydraulic fracturing is that in fact I think there are only two documented cases of earthquakes caused by hydraulic fracturing that were felt at the surface. They were in Blackpool in England — there is a British Geological Survey report that describes those. They are well documented. They are included in this part of the bar, which is above magnitude 3. In the US there are a lot of induced earthquakes being caused by the reinjection of waste fluid from fracking operations. Basically that is their disposal method; they pump 20 000 gallons of water or whatever into the well, frack the well, pump it back out, and then they have disposal wells where they pump it down into aquifers at great depth, where it is out of harm's way, into saline formations. The problem is, there is a risk that by injecting that fluid at depth, the well and some of the formation may intersect an existing fault. What happens is prolonged injection of fluid into a fault reduces the friction on the fault and can lead to fault slippage. There are quite a number of documented, fairly significant, earthquakes caused or associated with fracking, but they have all been caused by the reinjection of wastewater elsewhere and not the fracking of the actual well.

Mr DALLA-RIVA — It is a play on words. The realities are if it is part of the process of the mining, whether it is at the start of the fracking process or the wastewater at the end, you would have to admit that there is enough evidence in the States to demonstrate that there has been seismic activity as a result of mining activity, not necessarily the initial fracking.

Mr BLACKAM — Yes, that is correct.

Mr DALLA-RIVA — Thank you.

Mr BLACKAM — But I might say too, not all fracking operations dispose of their water by reinjection into the surface.

Mr DALLA-RIVA — Yes, thank you.

Ms DUNN — Thank you, Michael, for your presentation today. I want to turn to the figure you presented as part of your evidence, figure 1, which looks at water energy intensity of unconventional gas, conventional fossil fuels and biofuels. You also have a baseline there for hydro-electricity. I am wondering if you have any data available on water energy intensity of solar or wind electricity?

Mr BLACKAM — No, I would not have any data for those. You would probably find that they would rate very low.

Ms DUNN — I am just wondering, in terms of weighing up water energy intensity of various fuels, why they would not be included as part of that figure?

Mr BLACKAM — One of the problems is that the data probably is not available. If I had the data, I would present the data. It took quite some effort to even compile enough data to cover these. If you have a look at the references on table 1, the previous table, some of that data is from the US, some of it from Australia, in unconventional gas. The two biodiesel ones, derived from rapeseed or from soy, have come from a range of different sources. This metric, which is really useful for us, is not commonly used or necessary to report elsewhere. The reason for that is that it is hard to find that information.

The one for hydro-electricity is interesting because it is fundamental to generating electric power from hydro-electric that you have to run a lot of water out of a dam down through a turbine to drive the generator, so naturally it is going to be very high. Another thing is you should not directly compare that value to the other fuels, because that figure for hydro-electricity is showing you the water used to generate that power in kilowatts — I have simply converted kilowatts to petajoules, because they are both a measure of energy and they are convertible — whereas if you were generating the power, for example, from coal or gas, although the coal may contain, say, 1 or 10 petajoules of energy, by the time you burn it to heat a boiler, run a steam turbine plant and generate the electricity, the overall thermal efficiency is going to be about 50 per cent. That would change where you would rank those in comparison.

Ms DUNN — In terms of an earlier question from Shaun, you talked about Queensland and their regulatory framework. I want to quote from an article by ABC News online that appeared earlier this week, on Tuesday at

11.21 a.m., which is headed, ‘Linc Energy: Secret contamination report must be released, Queensland landholders say’. It says:

> The ABC obtained a secret state government report that found hundreds of square kilometres of prime land in the south-east Queensland food bowl are at risk from a cocktail of toxic chemicals and explosive gases.
>
> The study, commissioned by the environment department, alleges Linc’s trial plant had caused irreversible damage to strategic cropping soil, contaminated aquifers, and made workers sick from exposure to poisonous gases.

I know that is a very recent case that has come to light, but I am wondering if you have formed any views as to whether it is from a regulatory failure at this point in time that Queenslanders are facing this sort of issue?

Mr BLACKAM — Thanks for the question. I do not know too much detail about it. It is not something that I have followed. I understand that the Linc Energy operation was an underground coal gasification process.

Ms DUNN — Yes, that’s right.

Mr BLACKAM — Which is different to coal seam gas.

Ms DUNN — Yes.

Mr BLACKAM — I have from time to time seen reports in the media in relation to potential impacts that they have produced that have arisen as a result of their endeavours to get this underground gasification process working and operational. It seems to me like they are struggling in terms of the technology and how to manage it and manage the impacts. It would not be fair of me to make too much more in the way of comment without actually seeing the real data and finding out where it came from and how it occurred.

Ms DUNN — No.

Mr BLACKAM — There does not seem to be a great deal of pressure in the market in Australia to be developing underground coal gasification. It was talked about widely about five or seven years ago when many of the coal seam gas operators were trying to get established, but it never got the establishment that they got. I am not sure how much more we will hear about it, but it is interesting.

Ms DUNN — Thank you for that. The last thing I want to touch on is from Dr Carman’s presentation to us this morning. I think you were in the audience when he was speaking.

Mr BLACKAM — Yes.

Ms DUNN — He suggested that there is very little prospectivity in Victoria. I just wonder if you have any views in relation to that statement?

Mr BLACKAM — All I could state really is that, as I said before, I do not know what the prospectivity is. There certainly is coal in the state. We have a lot of brown coal in Gippsland, and brown coal is not generally favourable for generation of gas. In terms of the harder coals, black coals, we do have some deposits of those. How extensive they are and what the gas content is I am not aware. All I would say is that if people are exploring for it, then someone thinks that certain parts of the basins may have some potential for it. It may not be the case, and I suspect there may be more potential for shale gas than for coal seam gas in Victoria.

Ms DUNN — Okay. Thank you, Michael.

Mr RAMSAY — Just one quick question. Are you satisfied that Victoria has the appropriate regulatory framework to stop any compromising of our water? You have talked about the US not having such a robust regulatory framework, so are you satisfied that we have one?

Mr BLACKAM — The Water Act and other acts are pretty comprehensive, have been around for some time now, and are well tested and well tried. They certainly seem to function very well in terms of the potential for impacts that might arise associated with general industry. But whether or not they are at a stage in terms of amendment and update to account for the requirements of unconventional gas development, I would be surprised if they were. I think it would be very similar to Queensland, where they have a petroleum and gas act, a petroleum and gas safety act, and a water act. I forget all the acts now; it has been a few years. But they made a lot of revisions to a lot of acts to kind of account for the fact that coal seam gas users had to extract large quantities of water. That was allowed under, for example, the petroleum and gas act, because it was produced water, but then they were not allowed to sell it on because the selling of water was covered under the water act. So they could extract the water, but then they could not do anything with it. That was one of the early reforms that changed some aspects of how they do things up there. I think those things would need to be considered here. I am not saying that Queensland necessarily has done a great job of it, but they have done a version of it. If you were to look for what we should be doing here, I think that would be a good place to start.

The CHAIR — Michael, thank you. We very much appreciate your contribution. I think there is an enormous wealth of material for us there.

Ms SHING — Thanks very much, Michael, for your evidence.

Mr BLACKAM — Thank you.

Witness withdrew.