



Katherine – Dr Errol Lawson

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Katherine Godinmayin Yijard Rivers Arts & Culture Centre, Katherine

Speakers: Dr Errol Lawson

Hon. Justice

Rachel Pepper: If you could state your name for the recording and, if you're appearing on behalf of anybody, who that company or entity is.

Dr Errol Lawson: Yes. I'm Errol Lawson. Some of what I present will be part of the Don't Frack Katherine Group and some of it's my own research work dating back a few years. I brought a lot of copies of my paper.

Hon. Justice

Rachel Pepper: Yes we all have, thank you very much. Thank you for making that available.

Dr Errol Lawson: I haven't burdened your staff with an electronic copy because I think I went through about five different versions of the first one, which caused some trouble, so a wait list has gone over and I'll see what you said and I'll probably mean it. I'll start to read the paper and I'm sure I'll ad-lib pretty soon

Hon. Justice

Rachel Pepper: Thank you. I might get the microphone just to come a little closer to you, if you just move it. Yeah, just so I can ... Thank you. You've got a lovely soft voice. Thank you very much.

Dr Errol Lawson: It's probably 'cause I'm not used to microphones, I'm used to ...

Hon. Justice

Rachel Pepper: It's recording, thank you.

Dr Errol Lawson: I can see how I go. And I'll start reading and then we can ...

Hon. Justice

Rachel Pepper: Thank you very much.

Dr Errol Lawson: I understand that the interim report is essentially a round up of the evidence received by the panel during the first round of public hearings and community consultations. So I'm addressing the interim report and that it follows the format of the issues paper, which is the starting point of inquiry. I welcome the opportunity to respond to the interim report proposed, address my remarks to aspects, which I believe are incomplete or missing.



So it's not well done, it's well done, it's good, but there's stuff that I think has been left out for a number of reasons. I know the description of the report, as interim, and with the exception of the preliminary assessment that the practise of injecting waste water into aquifers should not occur I understand that the judgement is not yet been written.

It shows you on my thing. My discussion falls under two headings, obviously fracking and regulations. I include such a licence in my discussion of regulation since my research strongly indicates both a reprieve condition for success in any complex, multi disciplinary project, which is extended both in time and space. Base lines are also inexplicably linked to a successful regulated regime.

Is that voice coming out alright?

Speaker 3: Yup, thanks.

Dr Errol Lawson: Fracking. The object of this section is to discuss incomplete treatment of the subject arising from the tendency to confine discussion of fracking to the act of fracturing the shale itself or at least making the act of fracking incentive of presentations. This had been phenomenon that we've experienced over the few years that we tried to get on top of this job that discussions were focused on the fracking and when we tried to extend it beyond that ... am I right to you, you hear me? ... Then we drew a blank.

This is inhibited discussion of long term effects and this contributed to a dialogue of the ..., which those of us who already know it probably understand. This limitation contributes to the fact that to precisely define the elements of the process, which are central to the analysis of risk and consequences of the development of an unconventional gas industry. It is also inhibited thanks to consideration of the long term effects. The consequences of fracking encompass all social, economic, and environmental changes. But if during, as well as beyond the life cycle of any production field ... Now that's my basic proposition. If we consider it an unconventional gas industry we'll be well beyond the immediate act of fracking and go way out into the future.

My first introduction to fracking, to high volume high pressure hydraulic fracturing to shower reservoirs, was a presentation by Santos in May 2014. And the first slide is taken from that presentation. It divides the pathway development and identifies five stages leading to execution, which I take to mean production, and, which estimated by Santos, production to commence eight to ten years from the start of exploration appraisal and lasting for 20 years. So I don't see any way that they could reasonably reduce that. And I think that some of your industry presentations suggest that slow and steady is a better way to go given the infrastructure, witness that we already have.

My early interaction with the industry spokesmens, as well as my individual readings, in order to understand the implication of industry plans, were against this five stage model. And people who asked about well integrity and



aquifer contamination into the future beyond production had not been given any answers of substance. Presentations stand along the diagram below or some variation of it as a simplified illustration of the equipment's configuration comparing unconventional gas extraction in deep shale with horizontal wells, with conventional gas extraction coals in anti gas. Now, I'm sure you're all familiar with that beautiful, vertical well than the beautiful right angle bin in the horizontal well, which is the focus of the conversation, except they seem to leave out perforation. With particular reference to questions on well integrity failure and the...that probability of aquifer contamination, answers to how long will the cement last range from imperpetuity. And we really had someone from the industry say that twice, the decades and I think I heard that in some of the presentations you got already.

This failure with no answer will achieve a constructive dialogue set the patent with proponents that confine in their presentations up to the end of production and the proponents attempting to extend the consideration of risks and consequences into the post production years. And that's just a little beef I had about the difficulty of getting to a full picture of what the whole gas industry process project would bring.

I want to emphasise that throughout the ensuring years, along with those who were concerned about the long term consequences of an unconventional gas industry, I tried to get answers from the industry. with you the measures taken to ensure that no harm shall ensure subsequent departure of the gas industry. So if I can just emphasise that point. My experience has been, consideration stopped when production stopped. And it tends to get conversations going on what happens after that. Didn't get very far.

My attention focused on the cement barriers intended to float isolate the fractured shale reservoir from the surface, and then taking advantage the geology, the particular concern is that side of the cement barriers could lend migration of residual gas from the shale into the overlying aquifer into the atmosphere. And while there are concerns about other consequences about the life of the unconventional gas industry and beyond the contamination, consequences of contaminating on the townships, communities, industry, and the environment, are well into the red zone of the risk consequences matrix. And that's my judgement .

As a scientist, the panel would be aware that the general aquifer has currently been studied for the concentration and point spreading behaviour of contamination arising from the years of fire fighting foams. And I just popped that in to say that we're not able to ignore the aquifer for any longer. We've got experience right now of contaminated aquifer done quite unintentionally with the best of will and now the army, the defences, is playing catch up as hard as they can. So if there was ever any event that said, 'For goodness' sake, be careful,' that's one.



I trust that having expressed my deep concern of the long term consequences of aquifers of an unconventional gas industry in my frustration of the apparent inability of the industry to pronounce some failure rates of abandoned wells into the future after the industry department. The panel understands my critical response to inclusion in Section 5.3.3 of the interim of information from the APPA submission. That for wells constructed in modern standards, this right has been reported to be only .004% compared with .2% for all the wells. I have to say that without qualification, the failure rate quoted .004 repeatedly in the interim report, quickly interpreted as being accepted by the inquiry as applied well failure rate of any kind of a life cycle and beyond so ...

Sure you could say that, I thought long and hard. I thought long and hard about bear poking. But the point is other people look at that and say it's there uncritically reported and it has the authority of the panel of inquiry, rather than it passed whatever authority it deserves.

5.3.3. I have two guiding principles, which generally keep me out of trouble. One of them is not to poke the judge too hard. The first is carry an MTOP, which certainly applies to the unconventional gas proposition. The second is that, if it looks too good to be true, it probably is. I applied both to the .004 figure and traced it back to its source. The following is an extract from the APPA submission. And there it is, "The Reason as viewed by King and King, 2013." Of the data for 253,090 wells in Texas found that only one in every 100,000 wells constructed by modern standards experienced a loss in well integrity. This led me back to the 2000 review by King and King.

I'll put the folders right here, because this guy loves his titles and there's an essay alone in ... This is his title, "Environmental Risks Arising From Well Construction Failure Differences Between Barrier and Well Failure, and Estimates of Failure Frequency Across Common Well Types, Locations, and Well Age." George King and Daniel King. And that title alone tells you a lot because it's lumped in there, the estimates that he's giving of common well types, common well locations, and common well age.

And the King and King paper does include the figure of .004, no question in that, in Table 10, under the heading, 'Well Integrity, Failure, Containment, Loss.' But also in the introduction, King and King says environmental risk to groundwater from the integrity of producing wells is addressed in this study." Producing wells. "Which also examines several other possibilities of environmental impact during the product producing life span." And here's the clincher, "From the end of construction until plugging and abandonment." So please take on board that if you're using figures then locate them where they belong. Because you may know what you mean but a lot of us out here would say, 'Oh that's got your credibility behind it.'

And again, King says, "Estimate accuracy depends on sufficient database of wells with sufficient database of wells with documented failures divided into barrier failures in a multiple barrier system that did not create pollution and well integrity fails that created a leak path whether or not pollution was



created. Estimated failure-frequency comparisons are valid only for a specific set of wells operating under the same conditions with similar design and construction quality. Well age and construction era are important variables. There is absolutely no universal definition for well-failure frequency."

So one of the reasons, I'm sure, is when we ask industry what the failure rate was going to be well into the future. If they'd said, 'Quite honestly we don't know, because we don't have any previous experience of shale wells, shale beds of this age, 1500 million years.' Which I think is about the oldest shale bed there is, made up of the early forms of organic life, not vegetable material. So we've got shales here that's quite different and we've only got one sample that's only a few months old. So the point there is nobody know what the failure rate after plugging and abandonment is.

As the panel surely knows, there are figures flying all over the place. They're only useful and relevant if they are referred in a particular stage of the life cycle from which they would arrive. The King and King paper analyses data up to the end of production. It does not contain any information on failure rates and subsequent stages of the life cycles of wells. And that's what my concern is because there's a lot of people that still live here and work and play after the gas people go home.

That led me to another paper by George King. He is very prolific and the industry seems to like him because a lot of their papers refer King and King. So I'm beautiful neutral, I'm not cherry picking. Which, we all do and we want to ... we think we get away with it. It's unlikely.

"Hydraulic Fracturing 101-" now this one is ridiculous. "What every representative, environmentalist, regulator, reporter, investor, university researcher, neighbour and engineer should know about estimating frack risk and improving frack performance in unconventional gas and oil wells." Now you know why I read out the title, it says it all. This paper puts to light the following definitions, which are useful in defining what stages in the life cycle of a well, particular said of further statistics and risk consequences applies. Now this model made me realise that why Santos model wasn't helping me very much. Because this model has got the things divided into virtually engineering and operational phases.

Barrier failure is a multiple barrier system. In multiple barrier systems it signals failure of one of the sequence of casings and cements that are in place during construction of the well. As there are several barriers in sequence, pollution or contamination will neither escape from nor enter into a well.

Well integrity failure. All barriers in a sequence fail in which fluids, oil and gas, may move from inside to outside the well, contamination and pollution, or from outside to inside the well, intrusion of saltwater.



Drilling and completion. The phase taking the well up to the point of handing over the production crew. In contractual terms, this marks, for me anyway, the delivery of a production readied well to the supplier of construction by the supplier of construction services and acceptance as fit for purpose by the production operator. I need to explain that a bit.

Back in my former life, I built electronic equipment for the department of defence. And so I was in the analogous position of drilling and completion. And I would finish the piece of kit, I would test it in private. And then I would say to the customer, in analogy of the operator, 'Come in, I will prove to you that it does what you want it to do, you take it away and I'll operate it, and pay me.' And the clincher is that, there's a contractual interface there, which I can't in the infrastructure of the gas industry. And I don't know if you have, but this hand over of responsibility. And that fades then into, who's responsible way, way into the future if something goes wrong, when something bad happens. And it's not enough for the regulator to say, 'I've signed off on you and your plugging and abandonment,' and you're like, 'No.' There's evidence that something bad can happen. So here we get to the real liability.

Plugging and abandonment. The conclusion of the life cycle of the well and the rest of the regulator mandates further involvement the gas company has no ongoing interest in the well. I've actually seen that in writing from a minister in the last week. That, besides of my own. There's another paper, which I've just come across and I left a copy of this one for you, called "Energy Well Integrity, Nova Scotia Hydraulic Fracturing Independent Review and Public Engagement Process." Now that title is so similar to what you've been doing that I thought it's gotta be helpful. It's a short title but this time the list of panellists is huge. One, two, three, four, five, six, seven, eight, nine, ten, eleven, twelve, thirteen.

Hon. Justice
Rachel Pepper:

It's bigger than in the inquiry.

Dr Errol Lawson:

Anyway, the paper has sections each of which addresses stages in the life cycle of a well. Section 6. Well abandonment and long term integrity is particularly relevant to my concern. That the risks and consequences after the regulator has released the gas company from further obligations are not addressed. The Nova Scotia Review addresses this issue.

In any case most jurisdictions have often well funds, provided by an ironer production that are used to fix wells for which an ironer cannot be found. Otherwise, responsibility is that the owner fix the leaking abandoned well to the standards set by the regulator agency. So in Nova Scotia, they certainly have a mechanism, which they all often well funds, and that recognises that ironers cannot be found quite frequently and that the value-ment of tax payers are often left holding payment.

I've made the point, which is also not addressed in the interim report, and probably absent from submissions tonight, is that the risk management, risk mitigation step between risk identification and determination of consequences is not addressed. After risks are identified, you might ... oh



right okay ... we'll just finish this off because this is the important one, the regulation one you can read. I'll make the point that after risks are identified and consequences, if nothing done is described as nothing done there is a second round during which risk mitigation measures are developed and consequences after the mitigation are described.

So in a normal organisation, you do your first pass, risk consequences if nothing happens. And then you settle down as a you must do something. Everybody will do something and we've been finding out why. Then you go in the second round and you work out that so then you can do your risk consequences matrix again and management might even want you to do a third round but they certainly would want you to keep under a few. And so I suspect that's a little bit of an illumination for the sake of risk matrix, that you'll find.

Consider the three major stages in the life cycle of oil: construction and completion, operations, abandonment. At each of these stages there are different personal involved and different objectives, different skill sets and equipment. I expect each would have their own best management plans but each would be different in detail. For example, the construction and completion stage is strongly engineering equipment. During operations, the engineers and their equipment is somewhere else while after abandonment everyone is somewhere else. So you've got different capabilities at each of those stages and so that implies that should reflect into their risk management plans. It should also reflect into the resources they make about 'em.

The time lies from an occurrence of an event the manifestation of a risk. To be available at the scene, of people and equipment to prevent unwanted consequences, would be very dependent on the stage of the cycle. I completed this section with the following request: recognise that the risk and consequences of an unconventional gas industry extend beyond the plugging and abandonment wells and analysing the information on failure, which determine what stages in the life cycle of a well the information refers and that also means the wells and their age.

In view of the cabinet and the summary of the 2013 King and King paper, note that there are no valid figures presently available for failure rates in unconventional oil in the Northern Territory. So we don't know and I think I'll jump a little bit because I get on to something what's important place plugging and abandonment. BP has advised that at the conclusion of project the operator must demonstrate that rehabilitation of the site has been carried out in order to receive the immediate requirement of rehabilitation secure at ... leaves a government exposed to higher risk of having to fund harm that may take decades to manifest itself.

"A Nova Scotia Review Well Integrity" states that most jurisdictions have often well problems. The problems stated loss of well integrity of abandoned wells, is monitoring and there is mention of that in the Nova Scotia paper. What physical properties are monitored? For how long? Who



is responsible? How labour accounts into it? What to monitor? Probably the prisons of methane at the surface under groundwater, pressure in abandoned casings. How long for how often? The experienced will tell, start off uncertainly. Who is responsible? Has to be the regulator, funded from a production lab.

Labour intensive, and I suspect this is the big argument. SCADA, modern SCADA, that's surveillance, communication, and data acquisition equipment, could easily accommodate the manageering of several oil wells, especially multi patents wells, marking more players reporting on a routine basis all but exception with a parameter exceeding the predetermined limit.

Should I stop there?

Hon. Justice
Rachel Pepper:

You've got another, probably, three minutes.

Dr Errol Lawson:

Okay, I have, along with everybody else that I talked to, a deep concern that one of the biggest risks is the regulator. The difficulty that the regulator has ... I can tell that the regulator regime is much more in the document ... includes the inspectors and the resources which enable them to do their job. A regulator regime when, it becomes a robust regulator regime, when the overseers are experienced knowledgeable in the industry and are sufficient in numbers. Above all regulator regime can be undermined once the industry learns that other management including the political class is willing to intervene.

And now I've this discussion from my own experience, which draws on some Japanese teaching, writings, that 80% of an organization's knowledge on to conduct its operations is it's test of knowledge, which is like catering the shared experience of the participants in the involved agreements on how things are done. They have it all set up here, so yeah. These experiences do not map on the organisation chart, cannot be caught on a project flow chart, or on a decision tree on the list of processes. They exist in the structure networks of interpersonal licensure which parallel formal structure and take time for them. They provide the vehicle with ... problems are solved and bourgeois model of social structure these multiple risks constitute the social capital. And as I stated in my input on social licence that the source of social licence ... both documented regulations inform that work based structures are necessary for preconditions in the past to succeed.

Second aspect of management of a complex enterprise is as highlighted by the capability in maturity model. Now try this on Allen Hawk, it can get you any and all property and because it demonstrates the disparity that I suspect exist between government regulators and the industry. Capability to maturity model shows our strengths and weaknesses, examines free level process areas, defines five layers of capability ranging from level one, performed informally to level five, continuously improving. Defence mandated level three will define ... it's difficult to rate industry in order to ... til you're coming at any higher than one performed informally.



Now that diagram there shows that improvement path. I'm pretty sure that the industry in terms of their engineering projects normalisation would claim level three, possibly level four. I suspect that if the regulator with the regulations that are currently in existence as Tina Hunter says it still needs improvement. If they're a level one, they've still got a long way to go. So the disparity between the two levels is probably too great and so the highest risk, I would say, is that we are up there within the top right hand corner is this disparity between the regulator and the regulated. And how we define that risk, I don't know. I've seen the term 'regulated capture' but I think I've also seen an America one state 'regulated dominance,' and the disparity was too great.

I should stop there. I've got a bit about water disposal but I was pleased to hear Mr Crowe say that they're think of a water treatment plant. It would still be the scaling up problem of traffic but not nearly as much as going from here to Queensland. But it would be centralised. That enough for me.

Hon. Justice
Rachel Pepper:

Thank you very much, Dr Lawson. And thank you again as ever for your detailed and thorough presentations, which the panel always looks forward to.

Dr Errol Lawson:

I must confess it was just finished this morning.

Hon. Justice
Rachel Pepper:

It doesn't matter as long as it's finished and particularly because you've given up references, which is very, very helpful. I suppose it's really more a comment than anything else and forgive me if it sounds a bit defensive, but we do know that we have more work to do on well integrity. Both at the start, basically, the drilling and the fracking, and at the end the decommissioning as well. And you're quite right, the figure is very widely under the cut as you've quite properly pointed

You can compare AB as figures in their submission versus a Queensland gas fields commissions reporting up to 9% ... sorry that was WIA I should say, WIA department of Mont D'Or petroleum found that 9% had production achieving failures. For example 3% had production casing failures. So in essay again the figures vary as well. So they do swing widely about the place and we are having a bit of difficulty pinning that down. And of course that depends in part on, what is a well failure? Is that a complete failure that results in aquifer contamination? Or some other form of fugitive emission? Or is that just one of the casings happens to crack?

Dr Errol Lawson:

Or if it's just a barrier failure.

Hon. Justice
Rachel Pepper:

Yeah that right, and so it does vary and, as I said, we are aware that we need to do a lot more work on that between now and end of the year.

Dr Errol Lawson:

Having decided that we don't know or we can't know until we do something and so the precautionary principle is really, really important so what do you



do what I've done in my former life I just started monitoring everything I could possibly think of because then they really enter the experiments, it's a scientific experiment at that stage

Hon. Justice
Rachel Pepper:

And I suppose one way of encouraging that, very strongly encouraging that to occur, which the panel is giving consideration to is it has a warmed fixed opinion of this is to reverse the onus of proof so that if there is a problem then it's up to the operators to prove there isn't a problem, that has the very strong advantage of making sure that they do those base line monitoring the base line tests and data obtaining and doing the monitoring as well

Dr Errol Lawson:

Yes we skipped the paragraph on base lining, which I think is just so fundamental and I cannot believe that Hawk recommended 'get on with it' that the regulator or the government has allowed the industry to present its base lining as adequate and, I mean you would know more than I would, but if an industry fronts up a litigation with a complainer like me who says my voice is messed up and you say that 'What's the base line?' Would you accept then one of the complaints, one of the defendant's evidence of an independent plausible credible base line. I suspect not so base lining has to do be independent and certifiable otherwise folks like you would say, nothing to argue about, there's no grounds. I don't think that already happening in Queensland. So that was me telling you your job, which is still cheeky but I'll do it

Hon. Justice
Rachel Pepper:

Thank you, yes. Any questions for Dr Lawson? Yes, Professor Hart?

Professor
Barry Hart AM:

I thought you were a bit tough in your opening remarks suggesting that we'd only focused on the fracking process

Dr Errol Lawson:

Oh I'm sorry it wasn't you it was the ...

Professor
Barry Hart AM:

On your first page.

Dr Errol Lawson:

Yeah I know. I tried to describe the interim report as a round up of all your evidence and then I went on to say, tried to say, the thing is with the industry they draw respect always to fracking to blowing holes in rocks and letting gas out.

Professor
Barry Hart AM:

Sure because that's how it turns to references to go out into the social environmental instead of private we'll let that one go, and you didn't you as you said skipped over the base line and we think that's extremely important. I was just going to suggest that your suggestion there you focused on base line as a foundation for litigation? Yup, totally agree with that but I think that undervalues the other very important component of base line information and that's actually planning, planning what they do what government does, whether they let it go etc, etc. So what I just expand I think the panel is certainly seeing base line requirements as pretty vital, on your regulator regime comments, can I ... we've had a number of people who have said pretty much the same as you can't trust the government etc, etc. And so a number have been bringing up the concept of an independent



regulator, you've obviously thought seriously about that, could you just roll out what is an independent regulator in the unconventional gas industry, what's it look like?

Dr Errol Lawson: Well I come at it from another direction

Professor
Barry Hart AM: Sure

Dr Errol Lawson: I lived my life in the public service and there were many, many levels any if you bring an independent regulator in, the buck still stops up at the government and so what we've doing is put another interface in another awkward transition and I mean you can, just like the regulators themselves you can write the terms of reference you can write the rules of engagement but unless you can get good people that are knowledgeable of industry, that have that test of knowledge and this is definitely this stuff is important and I've seen that happening.

I worked in very stable organisation with those networks we called it 'the old boy network' and if we saw a problem we just rang around and say 'who the hell knows about this' and I tried that on when I was lecturing to industry, defence industry, I said the same thing and theses companies were very high bound because they were infected with managerial-ism and I say to these practising engineers 'what happens when you get a problem when you can't solve it?' And without exception 'ring a mate' and this is the wicked problems, the ones that are outside things and these are the ones that bring it down, so if it happens again then you put it in the regulations but they never happen again.

I'm a fan of networks and I could talk for a while on them but networks will form, people will form networks and people belong to multiple networks and they will talk to each other and if management ignores them and resists them, then you've got a subversible organisation, if management and the one I was in, management was all part of the networks and so we could work at our level, solve the problem and then tell bosses, and that was ideal, now any agency you put in place, if it doesn't have that capability if it's only got a book of rules than it's only gonna be addressing 20% of what's going on and then you'll be blindsided.

Professor
Barry Hart AM: Well look I appreciate that I think that's good, but the networking, this internal solving of problems is great, but that doesn't say much for the community in terms of transparency, how do you convince the community that this independent body your set of mates is actually doing a good job.

Dr Errol Lawson: That's where the social licence comes in, 'cause wen you've got multiple networks, and this is the amazing thing, the Morgan university in ... that studied multiple networks extensively and so we're in a church we're in a profession, we have kids go to school, we meet in the shopping centre we play a sport and so up here there's more professional network but if I want, I used to go to church to play a game in one of the other divisions and I



couldn't put nothing to church and say he was a son of the captain of the hms Australia and so he'd never heard of that he knew, which is, you know these things and you behave respectfully but I could get to him any time I liked, and that's the way it worked. Now if there's no one and they're visible then the community accepts what they do if they're not if they're closed, if they're an oligarchical clique government.

Professor

Barry Hart AM: Thanks that's great.

Hon. Justice

Rachel Pepper: Yes, Dr Beck, but mindful of time.

Dr Vaughan Beck AM: You have clearly articulated some issues and the reference of the Nova Scotia one is particularly relevant and we've recently had some other references given to us and other papers as well so thank you very much for that, I just want to come back to your, perhaps the leaking with the defence industry because you've outlined here on the final page, sort of a process capability aspect, I really just wanna explore with you how on one hand applicable that is to the gas industry and I think we also have to admit we only know too well from the defence industry that there have been some monumental failures in terms of delivery so the defence industry has got its problems as well too so, and many of them, and they're still trying to grapple with them, so given that we know that we've got some issues in the gas industry, given that we know the defence industry has its problems, what is your pathway for the golden age

Dr Errol Lawson:

Thanks for that 'cause I hoped you'll ask me what the currency of this because I think that it felt like a little balloon in defence, it was just too difficult and in fact there were no career opportunities in pushing that manager-ism had taken over well and truly and one very brave engineer gave a talk at a conference where he analysed ... and he was for inside defence procurement and he analysed his own agency and came out at level one, which was a very career hurting move 'cause he was never heard of again, so I put this in mainly to say that 'well here's a quick look at ...' there have been attempts made that you can, you feel there's something going wrong and if you look at this and you say ' well if they are just at level one perform, informally and they're dealing with people at level three then they're gonna miss, but this doesn't work and I don't have an answer I really don't expect to slow things down, when in doubt go slow and this one has got so many doubts, you have to ... in particularly but it's such ahead of stable enthusiasm and I said to one of the industry men at the Katherine show, there someone to tell Canberra or Frydenburg that it's not a case of sticking a straw and putting someplace and then that will solve the east coast gas prices before Christmas and if they know that eight to ten years Origin themselves said that if we go recognising the limits on the number of wells we have then we'll be fracking continuously and producing continuously when there won't be a fracking constructive complete phase and those wells, those people will know.



So to weaken my own case if reproduction if something happens that requires the construction and completion people and their equipment and they're not that far away as long as the roads aren't wet so it's whatever way you look at that it says to me there's so many other no ones. And it just begs for time and that's the only conclusion I come to, I went through a process 'well what would my mechanic an engineering friends do?

And I think of the....and that was a sign of whether it was released out of an aeroplane and in the canister about that big diameter, and it followed about five or six span of the arms, that expanding making some of the packaging of that was just a brilliant piece of mechanical engineering, it took them years to perfect that, it took them building a facility down in the southeast of south Australia where they could get down into the one the very very clear ponds in the limestone things and they just fired this things until they worked and that was a massive experiment and I thought how will I do that with a gas well, I thought how could I do an experiment where I pick an area that's got shale that representative but there's no aquifers so I don't do any harm, then what will I do, and it's not the nature of the beast, they are in fact an industry that's used to crashing on an their whole history of persistent and improvement which is very admirable, it says for me that when they encountered the event and then they react to it and when you've got an environment like this where the aquifers so important to the existing society and communities and the industries and these industries want to be more organic suppliers of food and it really is and I was gonna say do I have to translate my Latin?

Dr Vaughan Beck AM: No it's fine thank you

Hon. Justice
Rachel Pepper: Thank you very much

Dr Errol Lawson: Okay

Hon. Justice
Rachel Pepper: We'll have to leave it there, Dr Lawson, I can see our next presenter waiting very patiently thank you very much again for your detailed presentation it's very much appreciated thank you

Dr Errol Lawson: Thank you