STANDING COMMITTEE ON ENVIRONMENT AND PUBLIC AFFAIRS

INQUIRY INTO THE IMPLICATIONS FOR WESTERN AUSTRALIA OF HYDRAULIC FRACTURING FOR UNCONVENTIONAL GAS

TRANSCRIPT OF EVIDENCE
TAKEN AT PERTH
MONDAY, 10 FEBRUARY 2014

SESSION TWO

Members

Hon Simon O'Brien (Chairman)
Hon Stephen Dawson (Deputy Chairman)
Hon Brian Ellis
Hon Paul Brown
Hon Samantha Rowe

Hearing commenced at 1.33 pm

Mr DAVID GUGLIELMO
Country Manager, Halliburton Australia Pty Ltd, sworn and examined:

The CHAIRMAN: On behalf of the committee, I welcome you to this meeting. Before we begin, I must ask you to take either the oath or affirmation, please.

[Witness took the oath.]

The CHAIRMAN: You will have signed a document entitled "Information for Witnesses". Have you read and understood that document?

Mr Guglielmo: Yes, I have.

The CHAIRMAN: These proceedings are being recorded by Hansard. A transcript of your evidence will be provided to you. To assist the committee and Hansard, please quote the full title of any document you might refer to during the course of this hearing for the record. I remind you that your transcript will become a matter for the public record. If for some reason you wish to make a confidential statement during today's proceedings, you should request that the evidence be taken in closed session. If the committee grants your request, any public and media in attendance will be excluded from the hearing. Please note that until such time as the transcript of your public evidence is finalised, it should not be made public. I advise you that premature publication or disclosure of the uncorrected transcript may constitute a contempt of Parliament and may mean that the material published or disclosed is not subject to parliamentary privilege.

Would you like to make an opening statement?

Mr Guglielmo: Yes, I would.

The CHAIRMAN: Please go ahead.

Mr Guglielmo: Thank you for the opportunity of appearing before the committee to assist with this inquiry into the implications for Western Australia of hydraulic fracturing for unconventional gas. My name is David Guglielmo country manager responsible for Halliburton's hydraulic fracturing operations in Australia, based in Perth. I have worked at Halliburton since 1992 in a variety of engineering and management roles, both in Australia and internationally in Europe and Russia.

Mr Chairman, I would like to briefly introduce to the committee Halliburton, the role that we play in the unconventional gas sector in Australia and around the world and review the key points of our submission addressing hydraulic fracturing. Halliburton is a service company that is contracted by operators that are leaseholders in the upstream oil and gas industry. We provide services to our customers throughout the life cycle of a reservoir. This includes geological data management; drilling and formation evaluation; well construction, completion and production optimisation throughout the life of the field.

Cementing and hydraulic fracturing services are core components of Halliburton's business. Halliburton is committed to providing the highest levels of customer service and leading innovative products while maintaining its global commitment to sustainability. Halliburton is one of the largest providers of products and services to the energy industry. The company has over 80 000 employees in nearly 100 countries. That includes over 1 000 staff in Australia with more than 360 of those employees being based in Western Australia. We have also engaged WA vendors as part of our business here. For example, in 2013 Halliburton spent $130 million in Australia of which $32 million was spent on sourcing materials and services from over 160 Western Australian companies.

Our Australian corporate office is in Perth with bases in Jandakot and Dampier and new facilities planned for Broome. We are currently providing services on Barrow Island for the Gorgon project and other locations both onshore and offshore in the north west of the state. We are also involved in planning for onshore hydraulic fracturing work in the Canning Basin later this year. Hydraulic fracturing is a proven, longstanding production enhancement technology, the continuing evolution of which is critical to the recovery of oil and gas from shales and other unconventional formations. These unconventional sources generally must be stimulated to produce oil and gas in economic quantities.

Natural gas development, particularly from unconventional sources, has yielded important social, economic and environmental benefits over the years. In the US, for example, the average natural gas price has almost halved between the years 2008 and 2011. This has led to the creation of jobs, major new investment in manufacturing and cheaper energy costs for consumers. Western Australia is estimated to contain 280 trillion cubic feet of shale and tight gas compared to its annual domestic usage of around half a trillion cubic feet. The continuing rise of gas prices in WA over the past decade, together with significant new investment and employment opportunities, means that the development of a substantial unconventional gas resource presents a major opportunity for the state.

Halliburton is a world leader in production enhancement technologies, including hydraulic fracturing. Over the past 60 years, Halliburton has performed services on hundreds of thousands of wells in a variety of geographic settings and formations including the Perth Basin and Barrow Island in WA Western Australia. As a company we invested $460 million into global research and development in 2012, aimed at creating innovative and environmentally benign products and services for our customers. Examples of these include a fracturing fluid system made entirely from additives sourced from the food industry, high-efficiency multi-well pad technologies that reduce land requirements for a well site from 10 acres to as little as three acres; a bacteria treatment process that involves ultraviolet light instead of using biocides; a process that enables water recycling from fracturing flowback fluids; and chemical systems that allow brackish produced water to be used in the fracking process instead of taken from freshwater sources.

[1.40 pm]

In addition to new technologies, Halliburton also invests resources into understanding and mitigating risks associated with our operations. The knowledge and operational expertise allows us to confidently say that hydraulic fracturing can be performed safely and effectively. This is supported by numerous international studies that have concluded the risk of contact between hydraulic fracturing operations and drinking water aquifers is extremely low. The key to groundwater protection in oil and gas operations is well integrity. The proper construction of wells, using multiple layers of cemented steel casing, minimises any formation or well fluids' migration into drinking water aquifers. This well construction process is governed by extensive regulatory requirements as well as industry standards and best practices.

Halliburton in the US recently commissioned leading environmental consulting firm Gradient Corporation to prepare a national human health risk evaluation report that confirms that the risks associated with hydraulic fracturing are low and can be safely managed. We have provided a link to the Gradient report in our submissions to this committee. In over 60 years, in which more than a million wells have been hydraulic fractured globally, there is not one single confirmed case of contamination of hydraulic fracturing fluids via subsurface migration into overlying drinking water aquifers. Halliburton believes that the industry and public and regulatory agencies need to work together to support regulation and practices based on peer reviewed risk-based science.

Mr Chairman, I am pleased to have the opportunity to assist the committee on behalf of Halliburton. Personally, I have many years of experience and broad knowledge about the industry in Australia and overseas; and if I do not have the necessary direct knowledge and experience to answer your questions I will make proper inquiries and come back to the committee with a response.

The CHAIRMAN: Thank you very much, Mr Guglielmo, and also for your submission, which we received. What is your professional background as it relates to these activities?

Mr Guglielmo: I am a mechanical engineer by training. I graduated from the University of South Australia and joined Halliburton in 1992. I initially started working as a frack engineer in the field and worked also after that for a period of time in well cementing and other well intervention technology. Field engineering design, planning, desk engineering and office execution–type are the different types of roles that I have been involved in. Over the last six years or so I have been in managerial roles, so region management roles throughout the Asia Pacific and predominantly for the most part country management roles in Australia and Australasia.

The CHAIRMAN: As you would be aware, the main range of activity that we are inquiring into, which is generally characterised as fracking, relates to the possibilities of recovering gas from shale and tight gas deep reservoirs using a technique of horizontal drilling and then hydraulic fracturing. How does that differ from the processes of drilling for oil or gas through their own type of well without the horizontal drills?

Mr Guglielmo: I guess when we are talking about wells that need hydraulic fracturing, normally they are tight gas wells or unconventional resources where the rock is impermeable or not permeable enough to produce on its own. A conventional one is one that has enough permeability to be able to produce on its own without hydraulic fracturing or any other stimulation techniques.

The CHAIRMAN: Would such a well be subject to pressure applied from the top?

Mr Guglielmo: Yes, it would be. They are both subject to varying different pressure regimes—in terms of production, that is formation pressure. Because a conventional well may be permeable enough to produce on its own, often it would not need any special stimulation techniques; it may not need horizontal wells to be able to access the drainage area that you want. You can drill horizontal wells in a conventional formation; it just depends on the drainage area, the extent of the reservoir, and also, sometimes in an offshore environment, where you have a platform you may economically be better off drilling a horizontal well from that platform rather than having to go to the expense of establishing other facilities—other offshore installations, for example. That sort of economic aspect plays as well.

The CHAIRMAN: You have mentioned that your company has been involved in oil wells in the Pilbara. I think you mentioned Barrow Island and the Perth Basin. What is the difference between those sorts of oil wells and what we are discussing as part of this inquiry, essentially?

Mr Guglielmo: The Perth Basin has been tight gas—what you would call unconventional gas, which is pretty much the same scope of what we are talking about here. With the Barrow Island wells, so far the work that has been done on Barrow Island over the years has been shallow oil, but we have fractured those as well to increase production. I do not think all of them need to be fractured though, because of the permeability there. Some formations have low permeability that could benefit from fracturing and I think others do not.

The CHAIRMAN: What about the Perth Basin? Has there been fracking in any of those wells?

Mr Guglielmo: Yes, there has been in the Perth Basin. There have been six or seven wells in the Perth Basin over the last five years or so.

The CHAIRMAN: I would like to come back and ask you some more questions about your experience with those. What I am trying to establish in the first instance is what level of practice we have at the moment whereby chemical mixtures, or fracking fluids, are forced under pressure down wells that currently exist in the normal course of business. How new a phenomena is it?

Mr Guglielmo: It is not new at all. We have been doing it in Australia since the late sixties and globally since probably 1949, so it is not new at all.

The CHAIRMAN: How much of it is on the mainland or has it mostly been on Barrow Island?

Mr Guglielmo: I would say most of it has in the Cooper basin and there has been quite a bit on Barrow Island, too. I remember work there on Barrow Island in the early 90s, but I think it was prior to that as well, before my involvement.

The CHAIRMAN: We might be able to get to the Cooper basin and have look in the field in due course, but by the mainland I mean Western Australia. I am sorry if I was being a bit parochial there! Apart from Barrow Island, which is offshore of course, is there much mainland stuff in Western Australia?

Mr Guglielmo: Yes, just the Perth Basin—the handful of wells that I mentioned. We perform work on those wells in the Perth Basin, and there was one other that we did not perform work on but there was one in the Canning Basin in 2010.

[1.50 pm]

The CHAIRMAN: In terms of fracking operations in WA, how many wells do you currently have that are either operational or in the exploration phase, or, most importantly, that have been abandoned or closed? If you do not know off the top of your head, we can take it as supplementary information.

Mr Guglielmo: Halliburton does not have any wells as such, so we come on board and provide services to the operating companies—the leaseholders. We actually do not have any wells, but the varying operators throughout this state own those wells.

The CHAIRMAN: Perhaps I could phrase it in this way: how many wells have you been associated with in those categories, either exploration, operational or abandoned and closed?

Mr Guglielmo: With or without hydraulic fracturing?

The CHAIRMAN: With hydraulic fracturing.

Mr Guglielmo: In terms of hydraulic fracture treatments, we have performed over 2 500 in Australia. I am not sure of the split in terms of Western Australia and the rest of Australia. I guess most of those would have been in the Cooper Basin, we did those six wells here I think in Perth Basin, and there would have been an average of maybe four or five zones there. So, yes, those would be the wells we have been associated with. If you need some more exact information, I could certainly come back to you with that.

The CHAIRMAN: We might ask about that, and thank you for your willingness to look at that.

I know my colleagues all have some questions but just before I pass over to them, you mentioned about Halliburton developing fracking fluids that have ingredients or the overall compound of which is more I think you said environmentally benign.

Mr Guglielmo: Yes.

The CHAIRMAN: What has been the problem that means you have to develop products that are environmentally benign? Does that mean we have some stuff that has been used for 60 years that has not been environmentally benign?

Mr Guglielmo: I would not say there has been a problem with what we have had or what we have used in the past, and I can get a little bit more into sort of the risks associated and how the risks are managed with our products. But there is also a series of other things we consider not only just in terms of the fracturing process, but there are other processes when you are talking about our workers in terms of occupational health and safety, so the handling of chemicals at surfaces. Each particular type of chemical or category of chemical requires certain handling processes and equipment and all those sorts of things, so that the cleaner the chemicals that you need, that means that it is simpler and it makes the operation simpler, and it is easier and safer for the workers who handle the chemicals at surface. Also, it minimises our impact in terms of transportation and those sorts of things. All these processes are regulated as well. But it basically makes sense from a health

and safety perspective, an environmental perspective and from the perspective of spills and transport to use the cleanest possible products that can be used.

The CHAIRMAN: Is there a problem with disclosure of what those products or their ingredients are?

Mr Guglielmo: No; Halliburton fully supports transparency and disclosure of the products we use. We have a website that actually has the Australian fluids we use and you can go in there and any member of the public can see every single additive listed and what the common household uses are, or it will give generic names—if not, the actual scientific name—and it will give what people call the chemical abstract service number, I think it is, the CAS numbers. So that is fully disclosed. The only component is that there are a couple of additives that would be considered proprietary where the CAS number would not be given and a chemical family name would be given instead of the exact compositional formula because those particular additives are protected by proprietary issues.

The CHAIRMAN: Can you just expand on that a little more? It has been suggested to us that there are problems and sensitivities with disclosure. I am just trying to work out exactly where Halliburton is on this. You are either happy for information to be disclosed or you are not. I do not think it is possible to say, as you might be saying if I heard you correctly, "We support transparency", and then say, "But we have a couple of special things we do not want to talk about." That is the problem.

Mr Guglielmo: Yes, I understand.

The CHAIRMAN: Could you discuss that a little?

Mr Guglielmo: One of the things we would encourage is a system whereby we provide all the possible information there is to a regulator or an agency; we work that way in other jurisdictions and other countries. We are more than happy to provide all the possible information there is and fully disclose everything to that agency or regulator. The issue then becomes that there are certain additives we do not want publicly disclosed, and the reason is for our competitors to know. Predominantly, it is the CAS numbers that are the issue.

The CHAIRMAN: What is a CAS number?

Mr Guglielmo: A chemical abstract service number. Basically, it is like fingerprint; it is a series of seven, eight or 10 digits that fingerprints what the additive is.

The CHAIRMAN: Forgive me if I bring this down to the kitchen table level so that I and perhaps others present can comprehend it a bit easier. We are all aware of other corporate entities such as Coca-Cola with their secret recipe—we have all heard about that—and I think Colonel Sanders had his 11 herbs and spices and what have you. They are all jealously guarded recipes, but they seem to be able to disclose the ingredients on the side of food packaging, as required by Australian law, without it compromising their commercial sensitivity. Can we achieve the same thing with the proprietary products you are talking about, or is that a problem?

Mr Guglielmo: We probably give more information that that, but they disclose in a similar method to what I just described. If you look at the Coke can it will have sugar, caffeine, food additive such and such a number, and then it will have something called "flavours". That "flavours" is not a chemical or anything, that is their secret component. That is the bit they do not disclose. So what we do, instead of saying "flavours" we will just say, okay it is a type of chemical family of such and such. So it is pretty similar to what we are proposing.

The CHAIRMAN: So is it a case of disclosing the generic but without the precise formula?

Mr Guglielmo: That is exactly right; the generic name of a chemical, not just to say it is a flavour but it is actually this type of flavour.

The CHAIRMAN: That might be something we might be seeking further information about—I will not hold us up any longer on that just now. It is a key point, I think, of understanding or misunderstanding in this, so we might have to come back to you and get a bit more information.

Mr Guglielmo: Sure; no problem.

The CHAIRMAN: Perhaps we might be able to correspond about that.

Hon BRIAN ELLIS: Your submission states there is disclosure through FracFocus. You are saying that that is operating in America?

Mr Guglielmo: Yes, it is.

Hon BRIAN ELLIS: But it has also functioned effectively as a voluntary reporting mechanism, so do not all companies disclose?

[2.00 pm]

Mr Guglielmo: Certain states in the US make it a requirement and quite a lot have actually adopted it now; I think there are six states possibly—somewhere around that—Colorado being one of them, Wyoming, Texas. Quite a few use it and there has also been Canada that has adopted its own FracFocus—it has started its own one up. It is quite a good tool that we think works very well. It basically allows any landowner or farmer to go onto a Google map type of thing and see their own property and what wells are on that property. It is basically a requirement for the operators of those wells to list all the fluids that have or may have been pumped in a hydraulic fracture treatment on that well—so additives, concentrations, constituents—and disclose it in a similar way to what I described.

Hon BRIAN ELLIS: There would be some exceptions?

Mr Guglielmo: Yes, there would be just for those proprietary additives. There would be stuff like a couple of small pieces like the CAS number that is withheld and a family name given; that would be the difference.

Hon SAMANTHA ROWE: Following right on from Brian's question, do you think something like FracFocus should be mandatory in Australia?

Mr Guglielmo: I think it would be a good thing and we would be more than happy to support that. I think it would work very well and it really gets out the most information in the hands of the public that there possibly can be, and I think it is a good thing that they have as much information as possible.

Hon STEPHEN DAWSON: Just to be clear, Halliburton are very happy to disclose everything to a regulator, including the flavours, as the chair put it, and on, say, a DMP website or whatever it would just have the generic —

Mr Guglielmo: That is right, yes.

Hon STEPHEN DAWSON: I had a question in relation to the maintenance and/or the ongoing monitoring. Once you have fracked a well, who is then responsible for the maintenance and/or monitoring around that? Is it the energy company or does Halliburton play an ongoing role?

Mr Guglielmo: The energy company has production operators who man the field and control the production, so they continually monitor that on a 24-hour basis and maintain the wells. We come in and provide services. If there is something that they require from us, they will contract from us. If there are any sort of services that are needed to maintain those wells throughout the life, we can provide those services.

The CHAIRMAN: I think you mentioned earlier that there are five or six wells in the Perth Basin that you have been involved with. How much fluid, fracking or otherwise, would have been sent down those wells? Are they all subject to those practices?

Mr Guglielmo: There would be, I would say, probably about 1 million litres per fracture treatment. If you say that there have been 20 fracture treatments pumped in those five wells—it is just sort of round numbers—there would probably be 20 million litres of fluid and most of that is water and sand.

The CHAIRMAN: What happens to that fluid? Does it all stay down the well?

Mr Guglielmo: You flow back some of that fluid to clean up the fracture treatment to allow the gas to produce. Some of it remains, but then you recover probably anywhere between 30 and 70 per cent of that fluid out of the well. Sometimes you recover more than that and the reason is that there might already be water within the formation that starts to come back. In those situations is not a good thing for productivity because it means that the well is going to struggle to produce gas if it cannot clean up water. The water is heavier than the gas gradients, so your well will not produce if you cannot clean water off of it.

The CHAIRMAN: What happens that water that is extracted—is that the term?

Mr Guglielmo: Yes, flow-back. What would be done? You would have testing equipment and pressure equipment at the surface that basically contains the pressure, because it will be coming under a certain amount of pressure at surface. You may be taking measurements of flow rates; condensate might be there; there might be gas or maybe oil or water. Then you would basically separate the hydrocarbon portions. You would flare the gas perhaps or if you are in a production situation the gas would go down to the production line and the oil would be separated from the water and collected in tanks. Then the water itself would go to the holding tanks or triple-lined or double-lined pits and that would be disposed of from there.

The CHAIRMAN: How would you dispose of that water normally?

Mr Guglielmo: Halliburton does not provide actual disposal services of flow-back fluids, but there are other environmental contractors that come and basically take the fluid away to a disposal facility and they would use various disposal methods.

The CHAIRMAN: Let us go back to one of those half a dozen wells in the Perth Basin, which of course does not mean the Perth metropolitan area, it means the geological formation north of there. Is the fluid that remains in the well still under pressure?

Mr Guglielmo: If the well is suspended—I am not sure whether they have been abandoned; I do not think they have or not all of them have been anyway—they would be suspended. They would basically have fluid placed inside them. As I said, most formations are normally pressured. What that means is that a water gradient, the weight of water or the column of water will maintain the gas in the ground; it will not come out once you have filled that with water. Then you would have other barriers installed. You could have what we call bridge plugs placed in the well. They would basically have a rubber packer seal that is forced out against the casing and then you would put cement on top of that and you would fill—in an abandonment situation or even actually in suspension situations you would do the same to one extent or another—you would cement up the well.

The CHAIRMAN: In the case, seeing as you raised it, of a closed or abandoned well that has been subject to the proper treatment you have just described, what possibilities then remain for what I would call the residue fracking fluid that has remained deep underground to escape, either from the surface to an aquifer closer to the surface or any other way?

Mr Guglielmo: With the case of abandonment that you are referring to the well would have come to the end of its useful life or producible life, which means that without extraordinary types of lifting or assistance, it cannot produce gas. There is not enough pressure in the well to produce gas; it probably is depleted. In most cases even if there is, water will maintain that pressure on the ground, but if it is an under-pressured formation, it is even less likelihood. On top of that when you

put your barriers, your cement and your bridge plugs, in that instance it makes it even more difficult and extremely improbable that that could happen.

The CHAIRMAN: There is a lot of concern about fracking fluid finding its way somehow to underground aquifers, as you know. Would the residue or remnant fluid in an abandoned well be able to do that through fissures in the rock or any other way?

Mr Guglielmo: No, it is extremely improbable that that could happen. I guess the highest situation is during the fracturing process where you are pumping it under very high pressure. Even in that scenario it is extremely improbable that that could happen, let alone in an abandoned depleted pressure scenario.

[2.10 pm]

You have a couple of thousand metres of impermeable rock and formation above that that basically makes it extremely unlikely or very improbable that the fluid can migrate upwards over that much impermeable rock. Even in a fracturing treatment under pressure we have a process called microseismic monitoring. It is running geophones into offset wells that may be, say, 500 metres away from the target well you are fracturing, so we relay the microseismic data to the fracturing command centre where our engineers are watching the pressure responses on the fracture treatment itself. It is little pops of very, very small sound that get collected by the geophone and tell you exactly where the fracture is growing. We have collected data from a couple of fields in the US. One of them is in the Dallas–Fort Worth area called the Barnett shale. Using our microseismic services we have mapped out 3 000 wells in that particular shale and shown that not a single one of them has grown within more than a couple of thousand feet in terms of fracture height. So, the fracks are very contained. All the drinking water aquifers are much, much shallower. You are looking at maybe 100 metres. No cases have shown that.

The CHAIRMAN: Thanks for that. Turning to, say, exploration and operational wells, we have been advised that the most likely cases of fluid escaping and potentially contaminating groundwater are either through a presence at the surface through flow-back or through a leak somewhere in the well in the vicinity of the aquifer level. Have you been aware of any such problems in the Perth Basin wells?

Mr Guglielmo: No; I am not aware of any problems in the Perth Basin wells.

The CHAIRMAN: Not from either source—not only the leaks but the surface level contamination from flow-back?

Mr Guglielmo: We are not really involved too much in the flow-back process, but I have not heard anything on that side either. In terms of the process we are involved in, no, there has not been.

The CHAIRMAN: How common are well leaks around the world? There have been a heck of a lot of wells, so there must be a reasonable body of information.

Mr Guglielmo: On actual leaks that escape to the environment, as I said, there have be no instances on a hydraulic fracturing operation itself. But apart from hydraulic fracturing, actual leaks that escape to the environment, there have been some studies done internationally on that. The US groundwater protection agency has done a study there. They looked at some of the densely well-populated areas in terms of population of oil and gas wells. They looked at Texas and in that study between 1993 and 2008, they looked at 183 000 wells and there were failures of about 21, so that is about 0.01 per cent. Obviously, none of those are related to hydraulic fracturing. In Ohio, they studied 33 000 wells from 1983 to 2007, and 12 had failed, so that is 0.03 per cent. In both of those cases, most of the failures occurred in the 80s and 90s before modern well construction practices and as tight regulations as you have today, so it is extremely low.

The CHAIRMAN: What was the nature of those failures? What sort of quantities of contaminant escaped into the environment?

Mr Guglielmo: I do not have the exact figures; I can get those to you. My understanding is that they were low quantities and all of them have been remedied pretty quickly. Once you get a gas leak or something like that, especially with these onshore wells, it is very easy to go up there because you can drive there, so you can have access to the land to be able to quite easily pump some water in and control that well. It is quite an easy process. They have all been remedied quickly as far as I know.

The CHAIRMAN: If you could provide that information we would be very interested to see it and thank you for your assistance in doing that.

Hon STEPHEN DAWSON: We have heard evidence and there is general community concern about WA's regulatory regime. I think in your submission you said that WA's regulatory regime was adequate and robust. How are we any better than anywhere else in the world?

Mr Guglielmo: It is very robust and it is definitely one of the most robust regulatory regimes there is on our side of things in terms of chemical toxicity. It goes into a lot of detail, a lot more than I have seen anywhere else in terms of a risk analysis of chemicals, looking at the disclosure of chemicals—which we have already talked about—but not only that, looking at the toxicity of each particular component and the risk assessment in terms of each type of mixture that is used. It goes into a lot of detail that I have not seen anywhere else.

Hon STEPHEN DAWSON: In earlier evidence, again, an organisation suggested that perhaps it is the health department that should be the regulatory agency that gets to see what chemicals are used in the fracking process. Does Halliburton have a view on that?

Mr Guglielmo: No; I do not see any issues with that at all, if that is the way the regulations are deemed to be most suitable. I do not have a particular issue. We are more than happy to disclose, as I said, to any particular regulator or provide the same level of information, whether it be to the health department or the DMP as the case may be.

Hon PAUL BROWN: On page 6 of your submission at points 5 and 6 you mention in relation to the WellLock resin, "thereby protecting against potential migration of gas and water." I fully understand that during the operational phase of the fracturing and stimulating process and extraction that you, as a company, provide those services to the gas company. What happens to that well and the cement and steel casing after operations have ceased? Do you, as one of the companies that have provided all the WellLock resin, the dry polymer and a range of other things, go back after that well has been abandoned in five, 10, 20 years and check that your additives and your chemicals are still maintaining?

Mr Guglielmo: We do not go back to each of the individual wells, so it would be the operators there who are operating the fields—the leaseholder—who would be monitoring for that. Presumably, they may have some nearby operations and they would be monitoring for that in some instances. On our part, we provide the up-front design and engineering that goes into ensuring that those particular cementing additives, in this particular case, match up to the life of the well.

Hon PAUL BROWN: When you say "life of the well", you mean the operational life of the well, not the life of the well that is 50 to 100 years. The well is still there well after the operational phase is finished.

Mr Guglielmo: Yes; we define in our software, for example, what that life should be if you are particularly interested in seeing it in 10, 20 years or whatever the case may be. We basically simulate what that well is going to see over that period in terms of heat, cycling, production and fracturing. Then we can basically determine through that scientific method the best type of cement slurry that will be intact over that particular period through cycles.

[2.20 pm]

Then we do cement tests. Basically, we look at our cement slurries and not only do the compressive strength testing, but we also do what is called ductile strength testing of the cement. So that we pull it apart and it is that ductility that actually withstands cyclic pressures.

Then we take that data and put it into the actual—what we call a well-life simulation model, and then we can say, okay, we need to use—and it is particularly important for hydraulic fracturing that we use a sort of elastic-type of cement that can withstand that cycling and that sort of thing. Then there are certain additives that we put in the cement, such as rubber that reacts—or even foam cement, for example, which is using nitrogen to give it that ductility and elasticity.

Hon PAUL BROWN: But you cannot or do not guarantee life beyond the operational phase of that well? Therefore, do you know of any other company worldwide, beyond the operational phase, who actually goes back to check those wells to maintain—or at least investigate the integrity of those wells? I am talking about the decaying of cancerous cement and the corrosion in the steel down those wells for up to three kilometres. Does anyone go back and actually check those wells after the operational phase?

Mr Guglielmo: That is probably more something that an operating company would do. On that side of things in terms of being able to guarantee, I do not think—you know, in any sort of industrial processes, there are always risks associated. So people cannot guarantee and say things are not going to happen. But we can say that it is extremely unlikely that there would be a breach.

The other thing about that is, if you look at concrete buildings and pillars, and stuff like that is open to the atmosphere and open to the environment, that lasts for quite a number of years—concrete and steel, but then you take that into a down-hole environment and then you have the earth's pressure pushing up against that. So you have pressure of your fluids that is in the formation—the actual pressure of the earth itself; that is actually compounding and keeping that together even more so as it would be in a building and in an open environment.

In fact, prior to the 1920s, when cementing was first introduced to oil and gas wells, wells were not cemented. So cementing is an improvement on that. But in those cases, they actually relied on the earth coming in on the steel pipe and actually providing that barrier. So here you have got the cement, the steel, the multiple layers of steel, plus you have the earth helping you out, keeping it all intact—plus you have the pressure of the formation that is all keeping it intact.

The CHAIRMAN: In any case, referring here again to a closed or abandoned well—or I assume those terms are synonymous—you mentioned before that the well would be plugged down deep with concrete or something. Would that reduce the pressure on the integrity of the well above that plug point, presumably?

Mr Guglielmo: When you are actually putting the plugs in, you have got the actual fluid in there, so that is one barrier; then, you put the plugs on top and the cement plug on top of that, and you still have fluid. Then you put the next barrier. So right the way through, you have got fluid, plus the cement plugs in between.

The CHAIRMAN: That is to stop, is it, anything coming up?

Mr Guglielmo: That is right. You have got the actual perforated pipe at the bottom of the well, which is where the oil and gas has been producing through the pipes. So what you want to do is you want to seal that. Then you have—as you were talking about the actual casing and cement, annular barriers around it, which also seals on the annular side.

The CHAIRMAN: Are you currently involved in the Canning Basin or elsewhere in installing wells or commissioning wells?

Mr Guglielmo: We are working in the Canning Basin at present, drilling. We are providing drilling services—drilling fluid services, cementing services at present, yes.

The CHAIRMAN: We might contact you away from this hearing with a view to seeing about the possibility of visiting some of those sites.

Mr Guglielmo: Sure.

The CHAIRMAN: We might do that.

Mr Guglielmo: Sure. Yes, that should not be a problem. We will work with our clients that are in those areas in the Canning Basin, and if there is any other particular areas of interest, whether it be the Cooper Basin or also some of the more active areas in Texas, for example, around where our operations are there, you are more than welcome to visit and have a look at those areas.

Hon BRIAN ELLIS: You mentioned in your submission product innovations. You mentioned a couple of names, CleanStim and PermStim. Can you explain why they are better products than you have been using in the past or what is different about them?

Mr Guglielmo: CleanStim is something that has been basically a fracturing fluid that is using additives that are sourced entirely from the food industry. Obviously, it makes it a more benign product in terms of handling and usage. PermStim is actually a fracturing fluid that looks more at the productivity side of things in terms of the actual clean-up of the fluids, such that you can basically produce more oil and gas out of the well. Those are the sort of innovations that we have come up with, yes.

Hon BRIAN ELLIS: There is just one question I was interested in. Can hydraulic fracturing happen without the chemicals? If they cannot, what do the chemicals do in the fracturing process to assist the fracturing process?

Mr Guglielmo: Sometimes you use very few chemicals. There are treatments that we pump in various fields that are just water and sand with a bit of acetic acid or vinegar—that sort of thing. Generally, you would normally run a biocide if you did not have that ultraviolet technology that I was telling you about. Halliburton is sort of unique in that we have that ultraviolet light technology, but sometimes even downstream, where you are controlling bacteria, you do not want bacteria to form in the fluid or in the well because that can create problems for you in terms of longevity of the well and actually its integrity. What you want to do is to make sure that you are controlling bacteria, but generally that sort of what you would use there is very similar—like, it could be chlorine that you could use in a swimming pool, what people use in drinking water, reservoirs, to control bacteria there.

Other additives — in some instances, especially in some of the deeper wells, you want to viscosify the fluid a little bit such that it can carry the sand into the well. Actually then, you can carry the sand through the fractures into the formation. You would normally use viscosifying polymers like guar. Guar is used in things like ice cream and stuff like that to gelate. We use it for the same reason because when we want to give it a bit of viscosity, then you want to—say, hydrate that guar. So you want to drop the pH of that to hydrate it, which means it gets thicker. We use acetic acid. Again, that is, vinegar, basically, to hydrate it.

These are the sorts of additives that you use, and there are various reasons. There are additives that you use for scale inhibition because some waters are incompatible with each other, they form scale. That harms the productivity of the well. You will not produce out of it, if the fluid that you are pumping may be of a different freshwater composition—say, to a saltwater composition. The two mixed together are incompatible and form scale. These are the sorts of additives that you run. Certainly, it has been done. In certain formations, you do not need to. You minimise whatever you have to. You do not obviously want to use chemicals if you do not have to use chemicals, but sometimes you do need it, particularly in tight gas wells, you need some of these chemistries in there for productivity reasons.

Hon PAUL BROWN: Just one last question. The diagram that you provided to us as part of your submission, and this leads on from the last question by my colleague, it has a range of ingredients

there, but they only add up to about 0.3 per cent. We have heard through testimony over the last couple of days that it started originally at five per cent. Then it was one per cent, and then it was 0.5 per cent. In your submission, it says 0.3 per cent—that is, the additives that take place. That is the best-case scenario, I would imagine, except for when you have nothing. How much does that vary from 0.3 per cent of the additives of the total volume to whatever? Obviously, like I said, that is the best figure we have heard in any discussion that we have had. Is that the best-case scenario or does it migrate a fair range in percentages?

[2.30 pm]

Mr Guglielmo: It is normally pretty low. Nowadays I do not think we would run anything more than one or 1.5 per cent, something around there. In most cases about 0.5 per cent, as you say, or half of 0.3 per cent is pretty normal.

Hon PAUL BROWN: 0.3 per cent in the diagram that you have given us —

Mr Guglielmo: Yes. That is pretty normal.

Hon PAUL BROWN: That is not the industry norm; that is the absolute best-case scenario that you have provided us with?

Mr Guglielmo: I would say that is pretty normal, yes.

Hon PAUL BROWN: I thought you just said it was one per cent or about one per cent.

Mr Guglielmo: It would not be any more, no. That would be the complete max. You would be looking at 0.3 or 0.5 would be the norm. Then the rest, let us say it is 0.5 per cent chemistries, then you are looking at an average of, say, 9.5 per cent sand and 90 per cent water, something like that. That is a fairly normal number.

Hon PAUL BROWN: It is just the ingredients were then changed depending on the circumstances and the geological structure?

Mr Guglielmo: That is right. Then a lot of those ingredients—you are looking at guars and things like that. You then have an even smaller proportion of that that you would consider to be hazardous.

The CHAIRMAN: During testimony during another hearing we heard about the experience of some people in the United States who had had a very rough time in their households with illnesses and other problems that was put down to fracking operations in and around their properties or next door to their properties. Have you heard of those sorts of claims?

Mr Guglielmo: In general terms I have heard of those sorts of claims. I am not sure of specifics about —

The CHAIRMAN: I think they were aired in a documentary or a film called *GasLand*. Are you familiar with those sorts of claims?

Mr Guglielmo: Yes. I am familiar with those claims from there. Looking at that particular instance, I think a lot of those; for example, one of the areas that the film touched upon would have been Pennsylvania. In some of those areas you are looking at people who are showing instances of methane, for example, in their groundwater creating health problems, as you mentioned. They have actually done some testing through those areas and shown that looking at, say, water bores, people's water bores on their properties that contain methane, contain methane from other sources and they have contained it for a long, long period of time. Even in the early 1900s people have drilled water bores and have produced gas. A lot of that methane I guess in more recent times has been tested and shown to be biogenic gas. That means that it is generated near the surface by decomposition of organic matter at the surface. People know that. We know that because the test results that have been run in terms of the gas itself has been shown and characterised not to be the gas which is prevalent in that particular shale formation which they call the Marcellus shale. It is a completely different gas from a completely different source. Other examples in the Franklin Forks area of

Pennsylvania, which has been the subject of a lot discussion as well, they actually analysed that gas. There is actually a national park just sort of near there that has a water egress that people can light. It has been an attraction in that park. They have analysed the gases coming out of that. It is the same composition as the gas that would come out of people's water bores. It is an issue but it is not an issue that has been created from hydraulic fracturing.

The CHAIRMAN: You have been involved in this field for over 20 years. What threats do you think hydraulic fracturing can pose to individuals and communities?

Mr Guglielmo: I do not think it poses a risk or a threat, if that is the term that you would use. It is a very, very low risk in terms of if you look at our track record, certainly over my 20 years I have never seen personally in all the numbers of hundreds of wells that I have been associated with there has ever been any well failures during hydraulic fracture treatment or contamination due to a hydraulic fracture treatment. We go back to beyond my experience and some of the data that I talked about before: there has been no confirmed contamination from hydraulic fracture treatments of groundwater. To me, that conclusively, based on the scientific evidence, shows that there is very, very low risk. You cannot say there is no risk. You can never really say that there is no risk. There is always risk associated with an industrial process, but the risk is very low.

Hon SAMANTHA ROWE: What action is Halliburton undertaking to engage with the community on this issue?

Mr Guglielmo: I mentioned that we are involved in some of the planning processes of the hydraulic fracturing operations in the Canning Basin. We are working with our clients there. The operators have been holding community information sessions. We have employees that support our client in that and have been participating in those information sessions providing information data. A lot of these information sessions have actually been for the traditional owners. There have been a lot of questions there. We have been able to meet with them and try to explain and allay people's fears about it as well, to participate in that.

The CHAIRMAN: I have one final question: when talking today we have used the term "fracking". How much of Halliburton's business is directly associated with fracking operations as opposed to everything else that you do?

Mr Guglielmo: It would vary from place to place, but I would say roughly, off the top of my head, probably a quarter, maybe 20 per cent, something like that.

The CHAIRMAN: I am sorry that we have run a few minutes over time. We appreciate having the benefit of advice from someone who is an engineer in the field. Thanks very much for your submission and for coming along today. We will look forward to you providing supplementary information that we referred to earlier in the hearing. Perhaps we will talk again at some stage. Thank you very much for your cooperation and your attendance here today.

Mr Guglielmo: Thank you very much. I really appreciate the opportunity to come and speak. By all means, we will endeavour to provide all the information we discussed, but if there is anything else that you need, any backup, further information that may come to mind, contact me, and once again any field visits that you would like us to facilitate or visits to our facilities or our technology centre in Houston, we would be more than happy to facilitate that for you. Thanks once again.

Hearing concluded at 2.38 pm