

The following is the viewpoint of a Petroleum Engineer with over 30 years of experience who has designed and implement fracture stimulation projects.

It comes a time to challenge the motives of these inquires. The industry is suffering from inquiry fatigue. Now governments NT & WA are doubling up inquiries. What is more disturbing is that this inquiry is labelled as a “Scientific inquiry”, yet there is no-one on the tribunal that has designed or operated a fracture stimulation project. Imagine having an inquiry into farming and farmers excluded, brain surgery and no neurosurgeons etc. Fracture stimulation is an engineering process. In the USA and states like Queensland it is illegal to give engineering advice unless you are a registered engineer. The legality of this panel’s expertise needs to be tested, but in any case, I believe there is a moral obligation of the panelists to refrain from giving engineering advice. Thus, making the inquiry pointless. At a bare minimum they need to replace the word “Scientific” from the title to what the true motive of this inquiry.

Introduction

This following document endeavours to clear up some misconceptions, identify the futility of and the need to change the inquiry’s terms of reference, demonstrate that Hydraulic Fracture Stimulation is safe and suggest a few ideas that the inquiry may consider.

Misconceptions.

Hydraulic Fracture Stimulation Vs Fracing Vs Fracking

The “Background and Issues paper” [Ref1] for the inquiry frequently uses the word “fracking” which is inappropriate and unprofessional. The industry often abbreviates Hydraulic Fracture Stimulation [HFS] to “Fracing” but only in conversation, not in official papers. In recent times activists and the media have added the letter “k” which has a negative connotation. Using unscientific language that is both slang and provocative maybe perceived as a reflection of the panel’s viewpoint.

The Panel’s makeup.

The panel’s credibility is further eroded as there is no Fracture Stimulation Petroleum Engineer. HFS is highly technical engineering process and the concepts are often difficult for unqualified persons including oil and gas industry spokespersons to comprehend. The panel’s terms of reference include recommendations regarding regulation of Hydraulic Fracture Stimulation. This is akin to giving “engineering advice”. None of the panelists have designed or operated a Fracture Stimulation project, are registered chartered engineers or worked in the industry. The act of giving unqualified “engineering advice” is illegal in many jurisdictions, such as Queensland and the USA. The legality of the panel’s goals may need to be clarified but it does not change the fact they must reframe from recommendations relating to the engineering process.

Unconventional Resources Definition

In section 7.2 [Ref1] definition of unconventional and conventional resources is wrong, further eroding the confidence and credibility of the inquiry. The inquiry is a legal entity and therefore should use definitions that would stand up in court.

The only valid reference regarding the definition of conventional and unconventional resources is the Society of Petroleum Engineers: Petroleum Resource Management System [SPE-PRMS, Ref 2] which is the predominant guideline used to determine oil and gas recoverable hydrocarbon volumes, often referred to as Reserves and Resources. The SPE-PRMS is prepared by the Society of Petroleum Engineers [SPE] and reviewed and jointly sponsored by World Petroleum Council [WPC], American Association of Petroleum Geologists [AAPG] and the Society of Petroleum Evaluation Engineers [SPEE].

SPE-PRMS Section 2.4, page 12 defines conventional and unconventional resources as follows;

*“Conventional resources exist in discrete petroleum accumulations related to a localized geological feature and/or stratigraphic condition, typically with each accumulation bounded by a downdip contact with an **aquifer**, and which is affected by hydrodynamic influences such as buoyancy of petroleum in water.”*

“Unconventional resources exist in petroleum accumulations that are pervasive throughout a large area and that are not significantly affected by hydrodynamic influences.”

The prime difference between Conventional and Unconventional resources is that the latter is “not significantly affected by hydrodynamic influences”. The definition does not refer to permeability differences nor the constituents of the rock matrix.

Using terminologies and definitions which are not recognised in the oil and gas industry highlights the underlying ignorance pertaining to this inquiry.

Hydraulic Fracture Stimulation [HFS]

HFS as a concept is generally understood but there are many misconceptions relating to the geometry of the induced fractures. The geometry is complex as it is influenced by tectonic forces, Young’s modulus of the rocks and pore pressure. The following is a general overview of the geometry of the fracture network around the wellbore.

The target reservoir must be greater than 300 meters deep and in most cases the reservoirs are usually at a depth of 1000 to 4000 meters. The target oil/gas reservoir height varies considerably, from a few meters to, in rare cases, hundreds of meters. In vertical wellbores, the HFS of a reservoir endeavours to induce a vertical fracture network height of 10 - 30 meters

extending 30 - 200 meters in an oval shape from the wellbore in the direction of maximum horizontal stress. This varies from case to case. HFS's performed along the horizontal section though greater in quantity, i.e number of stages, are usually smaller in dimension than the vertical wellbore fractured rock discussed previously. The induced fractures have a limited life, in the range of 3 to 7 years. HFS is rarely performed at shallow depths [<300 meters] because the weight of the overburden is less than the maximum horizontal stress and this will induce horizontal fractures which do not improve the petroleum well's productivity and therefore the process is uneconomic. Since this fracture network is horizontal these fractures cannot extend vertically into shallower water aquifers. Finally, an unconventional resource is defined as "pervasive" meaning the areal extent of the resource can range from tens to hundreds of square kilometres and therefore the overall size of a HFS induced fracture network relative to the geological structure is negligible.

Chemicals.

The word "chemicals" seems to scare people. Unfortunately, the majority of the populous has not studied chemistry and therefore easily disturbed by the complexity of the science. Also, no matter how stringent and regardless of the strictest chemical protocols the public is not appeased due to their distrust of the industry, scientists and government regulators. A different approach is needed to assure the community that the chemicals used are safe.

Is Fracture Stimulation and chemicals used safe for the environment and people?

There have been numerous inquiries in Australia, USA and England which conclude that the practice can be regulated for safe operation. In relation to chemicals the community is easily disturbed. The word "chemicals" seems to scare people. Unfortunately, the majority of the populous has not studied chemistry and therefore easily disturbed by the complexity of the science. Also, no matter how stringent and regardless of the strictest chemical protocols the public is not appeased due to their distrust of the industry, scientists and government regulators.

Therefore, the community requires reassurance independent of institutions and scientists. The following outlines a different approach to reassure the community by looking at the historical performance and how the law has protected the environment.

What is the evidence that Fracture Stimulation is safe?

We need to appreciate the history of this technology to understand where we are today. Fracturing rock technology is over 150 years old [1865 Col Roberts, Exploding Torpedo Patent] and has been utilizing high pressure water for 70 years [Late 1940's]. The first HFS performed in Australia was in 1958 [Ref 4]. During this time thousands of scientists and engineers have developed a process which is both safe and environmentally sound. Millions of wells have been stimulated safely which is borne out by the fact there have been no environmental litigation cases – especially in the highly litigious USA. The public should be rest assured that lawyers are eager to litigate oil and gas companies (e.g the BP Gulf of Mexico oil spill). Litigation has

stopped asbestos, some types of silicone breast implants, drugs such as thalidomide etc. After 150 years with no litigation, the community should have confidence the process is safe. Where litigation has occurred regarding aquifer contamination it has been due to chemical contamination originating from surface industries or wellbore construction issues. An enquiry into wellbore construction of petroleum, mining and agricultural wells would be more beneficial in protecting aquifers. Ironically Fracture stimulation has benefited aquifers as the increase in monitoring has identified previously unknown contaminates forcing many industries, manufacturing & defence industries to reform their practices, e.g Catherine on the Northern territory and Oaky in Queensland.

Why take the risk?

Baseless banning of any product or process will have unintended consequences such as encouraging radicalism and discouraging investment elsewhere in the state. Fear campaigns have proved more effective than positive messages as demonstrated in political elections. Baseless banning will affect our way of life and freedom, so I hope the people of WA keep their unique independence and determine what is best for themselves. Again, the best protection the community has against dangerous products is litigation.

What are the benefits of HFS?

HFS has enable the world access to abundant petroleum products at affordable prices. The recent crash in oil prices, due predominately by HFS increasing USA oil production, have improved the living standards of the poorest nations. Poor people living in poverty have little concern for the environment. For example, with the rise in Chinese living standards in the last three decades for the first time environmental issues are now being discussed at community levels in the country. HFS has the potential for nations to be energy self-sufficient, thus reducing conflict. In Australia we have been reducing our refinery capacity, relying on imports from Asian refineries. Australia will become increasingly vulnerable if our economy and military becomes reliant on foreign refined product. Australia geologically is a Natural Gas continent. Natural Gas is a low emission, reliable energy source and capable of suppling energy 24 hours a day 365 days per year. Natural Gas generators can operate continuously or intermittently with renewables and as peaking plants. The cost effectiveness, reliability and widespread usage of electrical storage technologies for renewable resources is still many years away so natural gas is essential for reliable electricity supply. Products developed from Natural Gas such as fertilizer and plastics are essential. Of concern to the farmers is the demise of the Australian fertiliser manufacturers. Incitec Pivot Ltd [Ref 3] has warned that they may have to close their Queensland fertiliser plant due to the Natural Gas shortage. Importing fertiliser will mean that Australia will lose the quality control of the process and this could damage agricultural land. For the people of Western Australia investment from petroleum companies has and will continue to improve their living conditions. Conversely random banning of a product or process creates economic uncertainty and could discourage long term investors in many industries. Additionally, petroleum royalties take pressure off the Western Australian Government tax revenue.

What about the farmers?

In today's environment the concept of property ownership is complex. The farmer owns the land, the petroleum company owns the petroleum, the mining companies own the coal and minerals etc. Also there are stakeholders that cannot be ignored such as native title, heritage, and environmental groups. With multiple owners of the property and numerous external stakeholders the role of government is paramount. The Western Australian Government has a great opportunity to take the lead and formulate a setting that is both fair and transparent. To alleviate individual farmers' anxiety in negotiating with oil and gas or mining companies the government should consider setting up aquifer protection and compensation agreements before issuing the petroleum or mining exploration permits. The government may consider giving the farmer the opportunity to buy the petroleum, coal and mineral rights. This way the farmers can be assured they are all treated equally and they understand their rights before the exploration license has been sold or issued.

Summary

The "Background and Issues paper" [Ref1] is littered with slang, incorrect scientific terms and none of the panelists have any scientific experience in the design or operation of the process, does not bode well for the inquiry's credibility.

The panel's reliance on previous inquiries and their lack of knowledge of HFS indicates their outcome will be no different. What's the point other than wasting taxpayer's money.

With so many inquiries and now with WA and NT going for a second round it's time to confront those who oppose HFS and understand what their true motives are as these expensive inquiries obviously do not cover their concerns.

Don McMillan

FIEAust CPEng; NPER; RPEQ; APEC; IntPE(Aus)
Registered Engineer #13987

Reference 1:

<https://frackinginquiry.wa.gov.au/sites/default/files/Scientific%20Inquiry%20into%20Hydraulic%20Fracture%20Stimulation%20in%20WA%20-%20Background%20Paper%20-%203%20November%202017.pdf>

Reference 2: Society of Petroleum Engineers Petroleum Resource Management System:
http://www.spe.org/industry/reserves.php?redirected_from=/industry/reserves/

Reference 3: IPL ASX announcement 16 May 2016.
<http://www.asx.com.au/asxpdf/20160510/pdf/43743xztgyvm2q.pdf>

Reference 4: Western Australian Department of Mines and Petroleum "Petroleum information sheet Hydraulic fracture stimulation" <http://www.dmp.wa.gov.au/Documents/Petroleum/PD-SBD-NST-106D.pdf>