WA Fracking Inquiry 2018

Comments on Appendix 10 -- Green House Gas Emissions

by Humphrey Boogaerdt

The report which should have been listed as have included a disclaimer that a a scientific panel they have to disclaim the quality. It should have included the following :
Disclaimer by the Panel** : "**The report is incomplete because it cannot be regarded as scientific or to include any essential scocio-economic assessment.

- *Scientific evidence ignored*
  - *Medical & health*
  - *IPCC reports, briefly mentioned but not used as evidence*
  - *Understanding the geomechanics of faults*

As well the report comes short on any social impact assessment.

- *Social and economic*
  - *Impact on people's lives.*
  - *Externalities are not even mentioned. Therefore no balanced cost-benefit analysis.*

For the above reasons the WA Government has to extend this inquiry or start a new inquiry to deal with the above listed shortcomings.

¡¡¡ **Comments on Findings** !!! :

One of the problems I have with the Fracking Inquiry Report (FIR) is that it raises, discusses and describes all the overall issues, but then basically makes findings and recommendations based on the impacts on one well. It is like writing a report about a scenario when a person walks into a swarm of angry bees. Describing and assessing all stings, then as conclusion just noting the impact of one bee-sting. Not taking into account the total impact of all the bee-stings on the person. Differently described by someone else that the report is using the "gangster argument : There are many murders, so one extra murder does not matter".

Risk matrices are nowhere to be seen in the report or any risks properly explained. Summarised for the various issues in the "finding" words like "low risk" are used. It would be expected that for clarity that there is a classification of what terms like "low risk" mean. That is an omission in a scientific and transparent process. For example, even in the recent court case in The Netherlands of The Dutch State against Urgenda (environmental group), in the verdict the court always specified percentages of risk in brackets when terms like "likely" where used. All based on IPCC reports, for example the wording "more likely than not" is equal to "chance of more than 50%".

As said the report notes the risks of mishaps of the various issues as small, low or negligible, and then concludes that the overall risks are low. In these individual findings conclusions are drawn on small issues without linking it to others. This a misleading use of statistics, because the risks of all the different aspects of fracking are additive; and not very scientific use eihter. To illustrate this point using some arbitrary percentages, let's have the scenario

of a cyclist riding along a busy highway full of road trains. Chance of accident is 1% during a clear day. The darkness of the night gives a 1% risk. The cyclist does not have any lights on his bike, 1% risk. The heavy rain is a 1% risk. The FIR would conclude that the cyclist at night without lights in the rain along the highway has a 1% risk of accident. A "real" scientific report would conclude that the risk would be 4%. This is an incorrect use of statistics and this is a problem throughout the whole of the inquiry.

In the report they compare conventional wells with in-conventional wells. There is nothing wrong with this comparing, however they do not mention the difference in numbers of wells. The number of fracked wells is hundreds of times higher than for conventional drilling. For example, in rough figures, the Canning Basin is 430,000 km^2; assuming a 10% prospectively for the basin that means an area of 43,000 km^2. A fracked well covers at most 10 km^2. To frack the prospective area 4,300 wells are needed. Using conservative numbers like these it is obvious that the total volumes of emissions will be enormous.

Are there any reports by the industry that indicate problems with any of the fracking practices? Is the industry honest enough to provide *that* part of the argument or do they only provide positive spin?

The whole GHG debate on how we are travelling in relation to GHGs is totally skewed by the Federal Government, because they use 2005 as a base year. Australia's emissions are the second highest with 20.3 t CO2 /capita. While the international community lead by the IPCC is using 1990 as a base year. Australia had then 16.3 t CO2/capita. The Australian Government 26% reduction target for 2030 would bring it down to 15.1 t CO2/capita. Relative to 1990 level the 15.1 t CO2/capita would mean only a reduction of 7.5%.

The panel failed in its **Duty of Care** because the FIR ignored scientific evidence and failed to be scientific consistent and therefore is this report **misleading**.

<u>Below comments listed according to page number in the report, text extracted from report in italics.</u>

p365 :
"..., there is an overwhelming volume of scientific evidence that the level of GHG emissions associated with the use of fossil fuels is harming the global environment, and therefore Western Australia's environment, by changing our climate. "

"GHG emissions associated with hydraulic fracture stimulation for developing Western Australia's oil and gas resources has a negligible impact on the environment through their influence on climate."

This is contrary to statement above. Why would fracking have less GHG, while literature says there is more fugitive CH4? Many small amounts will add up to a large amount. It is also immoral to use this style of reasoning if everyone has this attitude that we will steer towards 10 degrees by 2100 if we do not kill ourselves beforehand by over-polluting.

p365 :
"A narrow interpretation of the scope of this inquiry, under its Terms of Reference, would only consider the risks of GHG emissions from the hydraulic fracture stimulation process per se.

That is, it would not include emissions associated with the construction of the well, the production and processing of gas, and any leakage following abandonment "

Problem : not a proper assessment could be done because ToR. As a "scientific" panel they should have taken all science into account. In an appendix, footnote or disclaimer they should have explained the shortcoming of their brief and concluded that the report is incomplete, possibly biased and not scientific. That is what "real" scientists would have done.

p365 :
"*..., there is an overwhelming volume of scientific evidence that the level of GHG emissions associated with the use of fossil fuels is harming the global environment, and therefore Western Australia's environment, by changing our climate. ...*"

This evidence was first found in research by Shell and Exxon, who hid it for the next 40 years. Therefore how can the panel conclude that a little GHG here and there is not harmful?

p366 :
"...How much more GHG is associated with oil and gas production requiring hydraulic fracture stimulation over and above that emitted by conventional petroleum developments?"

Assuming that a conventional well and a Un-conventional well use/produce the same amount of GHG. To extract the same amount of unconventional gas compared to conventional wells, there need to be many more fracked wells. So if we divide the area of a conventional reservoir by area of a frack well, we have the multiplier that needs to be used for total GHG emissions calculations. Where in the report is any kind of reasoning used?

p366 :
"...Given the strong likelihood (supported by submissions to this Inquiry) ..."

There also many submissions that do not support any more gas field developments. Is this an "endorsement" for fracking proponents and ignoring evidence from opponents?

p367 :
" "The Terms of Reference of the Inquiry are tightly cast, focusing particularly on the operational aspects of hydraulic fracturing. However, it is essential the climate risk implications, globally and locally, of such developments, be given full attention. This may sound extreme to those not close to the climate science and evidence, but it should be the primary concern of this Inquiry" – submission from Ian Dunlop, former Chair of the Australian Coal Association and former Chief Executive Officer of the Australian Institute of Company Directors."

The GHG risk reported by this Inquiry is therefore presented from two very different perspectives:
1. The risks associated with the relative upstream emissions between unconventional and conventional gas assuming one directly substitutes for the other in the marketplace; and

2. The risk of not 'leaving it in the ground' with the implicit assumption that the consumption of any produced unconventional gas would be over and above (directly additive to) Australia's fossil fuel emissions, if this resource was not developed. ..."

Is this been quoted as a feelgood statement? The statement has not been followed up with real assessment.

p366 Finding 32 :
"Much of the risk posed by greenhouse gas (GHG) emissions does not result directly from hydraulic fracture stimulation. ..."

Finding 32 :see comments above

p366 : Finding 33:
"The risks posed by greenhouse gas (GHG) emissions depends on whether, at one extreme, the gas directly substitutes for conventional gas sources, or at the other extreme, the gas adds to total fossil fuel consumption. It is the view of the Panel that for the foreseeable future in Western Australia, the former is far more likely than the latter. Emission values are presented for both cases."

Ask gas companies why they do not carry out fracking in the ocean? There must be plenty suitable geology.

p368 :
"The accuracy, precision and realism of current (and foreseeable) global climate models fall well short of being able to forecast the contribution to changes in Western Australia's climate resulting from changes in local emissions."

Irrelevant how many the rest of the world emits. Australia is with USA the largest per capita emitter. Australia as a signatory of various international climate agreements has the obligation to minimise emissions.

Since when is "realism" used in the scientific debate? Climate models, as any scientific model, are tested and refined over time. Climate models are shown to be accurate about the trends in the climate. Look at the model of 70 years ago, predicting ozone layer problems, has been proven accurate.

p368 :
"The Panel notes that unlike all other Australian States and Territories, Western Australia has no GHG emissions or climate change mitigation target that might provide a context for an objective for this Inquiry."

But the Federal Government has targets and IPCC has targets which are the most important. Because WA does not have its own target would it therefore be ok to get more emissions due to fracking? It is like arguing that because WA does not have a charter of human rights; it can ignore the UN's Human Rights Declaration.

p369 :
"*Reasonably practicable levels of GHG minimisation, however, may not necessarily be acceptable or prudent."*

What are reasonable practicable level GHG minimisation? Who proposes these levels? IPCC has well documented what safe levels of GHG are, there none. The IPCC also states that we have to go to "negative emission".

p369 :
" "GHG and methane emissions from a new shale gas field must be minimised. The contribution to global anthropogenic GHG and methane emissions from a new gas field in the NT must be 0.1% or less" (Northern Territory Government 2018)"

Why not run the argument that the amount of CO2 on Jupiter or so is much much larger than on earth so what we do on earth is irrelevant. If everyone reasons this way why do we bother? It is the previously mentioned "gangster" argument.

p370 :
"... , this Inquiry recognises that the Australian Government has responsibility to meet its international agreements on GHG emissions, which presently commit the nation to reduce emissions by 26-28 percent on 2005 levels by 2030"

This is a real low value, the IPCC, therefore also the EU, measures relative to 1990. Doesn't the panel know this? If not, why not? If it knows, why does it make this misleading inconsistent statement?

p370 :
"A value less 0.5 percent was considered to have a low consequence to Australia meeting its international GHG commitments and to the climate more generally, ..."

So it looks only at meeting Australia's weak international commitments not at the real impacts, not a very scientific approach. Another time of weasel word "low consequence". Gorgon etc. have far too high emissions, therefore no extra emissions from fracking can be accepted.

p370 :
"GHG emissions from onshore oil and gas fields developed with hydraulic fracture stimulation must be minimised. The contribution to Australian anthropogenic upstream GHG emissions

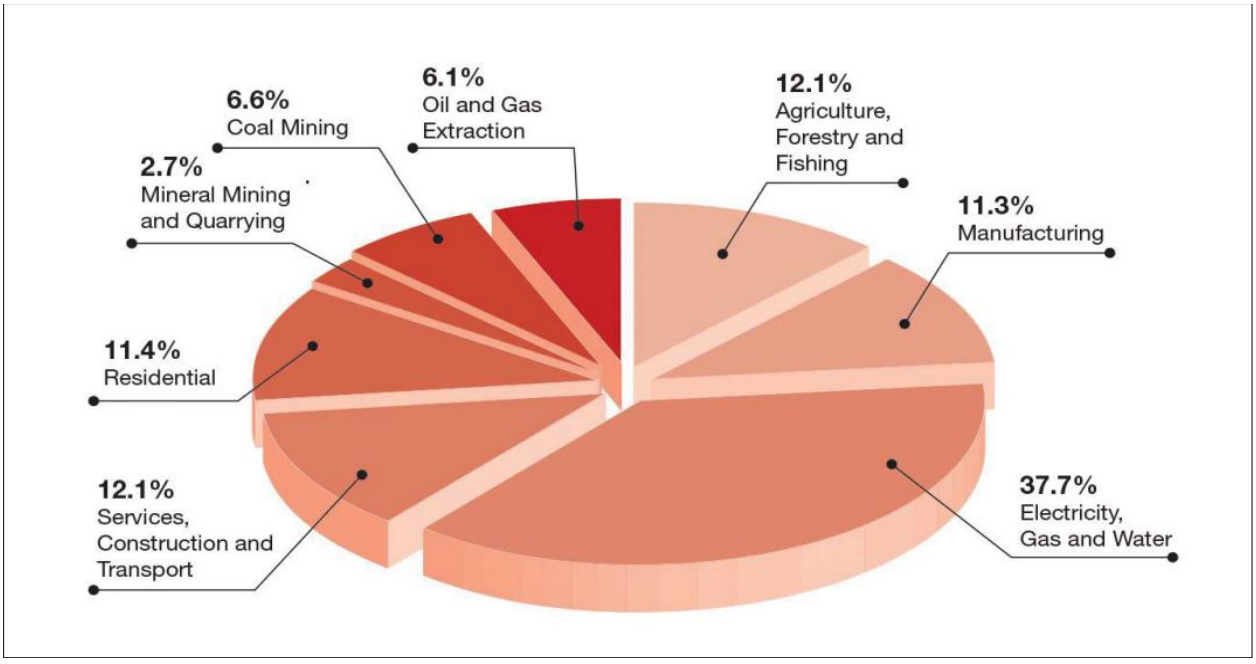
from onshore fields in Western Australia must be 0.5 percent or less of 2016 Australian GHG emissions"

GHG emission to be minimised, conclude should not open up more gas fields. Why use 2016 as a year? It is **misleading** because now emissions cannot be compared. <u>In a scientific report one has to be consistent when comparing results</u>!

p370 :
"The value of 0.5 percent of Australia's 2016 GHG emissions equates to about 0.05 percent of current global emissions."

What our share is globally is not relevant. We have as a developed country with one of the highest per capita emissions the moral obligation to reduce our emission. To compensate for all the emissions in the past which made Australia a rich country, we have the moral obligation to do more.

p371, fig 10.1 :



Oil & gas extraction only 6.1% , This is enormous!!!! No wonder the report does not want to include emission data from the downstream gas use, because then the figure would be much larger.

p372 :
"Other specific concerns regarding GHG emissions that were raised through this Inquiry included the potential leakage of GHG (particularly methane) through well failures (both operational and decommissioned);"

The more wells the more venting/flaring is a logical conclusion. Why does the report not conclude this? Looks if panel is ignorant of the number of wells a fracking campaign drills. Another example of lack of scientific rigor.

p372 :
"GHG emissions from a well, or well field, are difficult to precisely determine. Published estimates of emissions are often based on measurements at differing scales, each having advantages and disadvantages, but rarely comparable and more rarely reconciled (Howarth 2015; Lafleur et al. 2016), but see Brandt et al. (Brandt et al. 2014)."

Why? Companies know how much they get to sell so they should also know how much they flare/vent. Time they start paying royalties on vented/flared gas. If they cannot work it out, let's have a base rate of 10% of total production. It then likely that they suddenly know how much they vent or flare.

p372:
"In any place, there are natural sources and background levels of both carbon dioxide and methane not attributable to gas development, and studies estimating industry emissions rarely enjoy comparison with baseline measurements prior to development (Moritz et al. 2015)."

Indicates a need for compulsory baseline studies well before any drilling can commence.

p372 :
"Some published estimates for projected Western Australian emissions from unconventional gas development are based on theoretical and implausible development scenarios (Bista, Jennings & Anda 2017; Frogtech 2013; Hare et al. 2018)."

Why implausible? Please explain. How come only anti-fracking scenarios and findings are implausible?

p373 :
"Associated with practices like those required and adopted under the current regulatory arrangements in Western Australia; ..."

Why are IPCC findings not be mentioned here? Did they critically assess these practices or just accepted them on face value, forgetting they are from the industry that wants to frack?

p373 :
"Associated with geologies broadly like those in Western Australia;"

The problems with fracking are related to drilling not so much with geology! It would be unscientific to blame geology for the problems with fracking.

p373 :
"All activities associated with natural gas development result in GHG emissions, including site development, well construction, production, processing and transport. These gases mainly comprise carbon dioxide and methane but can also include hydrocarbons such as ethane and propane, as well as small amounts of nitrogen, water vapour and hydrogen sulphide. These emissions result from combustion engines and other energy usage, as well as direct venting or leaks."

On frack-sites there are banks of engines for pumping the slickwater around. Those engines, adding up to 40,000hp, going 24/7 will add GHGs, not even taking into account the GHGs that are associated with transporting the fuel for these engines.

p374 :
"Leaks (the unplanned or 'fugitive' methane emissions) that occur through poor well containment (well failure), including from abandoned wells and emissions arising from pathways to the surface created by the hydraulic fracturing itself, apart from those directly associated with the well containment failure."

No reference to Igraffea etal (2014) or any of the other publications he has about well leaks.

p374 :
"... on the basis of measured methane changes in the atmosphere that there was an absolute upper limit of about seven percent methane leakage from natural gas production. ... median estimates of methane emissions across the entire natural gas supply chain at 0.8 to 2.2 percent of production."

That are huge 0.8 - 2.2 percentages. How may tons of GHG. Percentages not always give a good indication because they may look small, like in this case.

p375 :
"..., the airborne study of emissions from the Bakken region ..."

But Bakken is for large part oil. So what is the brake down of GHG there?

p376 Finding 34 :
"In the absence of actual measurements, the emission rates typified for unconventional oil and gas production, associated with hydraulic fracture stimulation, as reflected in current United States Environmental Protection Agency (U.S. EPA) and Australian Government guidelines, are a justifiable basis upon which to estimate greenhouse gas (GHG) emissions from unconventional gas fields in Western Australia, noting the variation in estimates reported in the scientific literature."

Before more drilling need for compulsory GHG baseline studies, including airborne.

p377 :
"... a gas well connected to an underground storage facility in California resulted in a release of 97,100 tonnes of methane to the atmosphere, doubling the emissions of methane from the entire Los Angeles Basin for a period of more than three months ... found that 83 percent of methane leakage emissions in the Uintah Basin was from only 20 percent of well pads."

Having1 in 5 wells leaking is high risk. What does the panel see as high risk? In the report is no section were risk matrices are explained and described what the risks for the many different components are.

p377 Finding 35 :
"... Following development, ongoing monitoring, screening and intervention (repair) to minimise emissions from leaking gas infrastructure would mitigate the risk to the climate and to public health."

Some major issues with this finding :

- Who is doing the monitoring
  - How regularly is the monitoring done?
  - How long before action is taken?
- What are the consequences
  - What are the fines?
  - Are operations stopped until the leaking has stopped and remediation has been completed?

<u>Until this is put into legislation this statement means nothing!</u>

But the risks are still there and so why would this suggestion mitigate the risk to the climate and public health?
Where is the proof of this? What about the impact of emissions during or immediate after the leak?

p377 Recomm 10 :
"Baseline measurements of atmospheric levels of greenhouse gas (GHG) should be acquired prior to the development of onshore wells employing hydraulic fracture stimulation, and should be the responsibility of the regulator."

Who pays for that?
Well life cycle is that just production or till it fails in 30 years time?

p378 :
"... , there is broad agreement that the fracturing of the rock itself is unlikely to contribute to significant vertical migration of gases to the atmosphere"

"broad agreement" by whom? Comment based on outdated research?
Why is there no reference to Mullen (2017)?

p378 :
"... work by CSIRO on CSG methane emissions (Day et al. 2017) found that the rates of methane emitted during well completions and workovers were less than half of the estimates for these emissions reported for United States shale operations ...."

Do they use in the USA different methods of measuring? Where are the references to peer-reviewed papers to compare data and methods?

p378 :
"... by the New York State Department of Health lacked a baseline, ..."

This makes a good case to insist for baseline studies before any drilling starts.

p379 Finding 36 :
"There is little risk of methane migration to surface aquifers or the atmosphere resulting from activities associated with hydraulic fracture stimulation, apart from those associated with pathways provided by the well itself (equivalent to the broader issue of containment of all fluids within the well)."

Mullen's (2017) study totally ignored. The deliberations above give the strong impression that the panel does not understand faults and geomechanics, i.e. also not understanding the work pro-fracking geomechanics guru Zoback (2007) either.

p379 :
"Brandt et al. (Brandt et al. 2014) estimated that there are three million plugged and abandoned oil and gas wells in the United States, but could find no empirical data to characterise leakage rates."

How come Ingraffea et al. (2014) could, and he was also keynote speaker at a Schlumberger sponsored well integrity conference in 2010?

p379 :
"The authors noted there was no regulatory requirement in the United States to monitor or account for methane emissions from abandoned wells."

If there is no regulatory requirement to monitor but know about 30% wells leak within 10 years the amount of methane leakage must be enormous. Watson & Bachu (2009 [1]) researched 340,000 wells in USA, 70% of deviated wells leak. It is much more difficult to cement a deviated well.

p379 :
"The implication of these findings is there are natural sources of methane emissions and that faults can be (but are not always) a conduit to the atmosphere."

It is unlikely that this point has been questioned. What research has shown is that it is possible for fracking to re-activate faults and these become conduits for methane to reach the surface. In other words do not frack.

p380 :
"Where the company that drilled the well no longer exists, or has been taken over or merged, (53 percent of wells in the United Kingdom), liability for any well integrity"

Can the Panel explain why Ingreaffea et al. (2014) has totally different outcomes?
The whole argument till now about methane emissions shows that the "World's Best Practices" are of a very low standard; and that the industry cannot guarantee not to produce methane emissions.
The liability is an externality paid for by the taxpayer.
Maybe calculate the cost of rehab of wells and then put a levy on existing gas producers so they can pay for the sins of their brethren who did their work according to "best practices"

p380 :
"... Day et al. ... of a gas well of unknown origin near Chinchilla, Queensland that was leaking substantial quantities of methane and subsequently plugged, but inadequately for preventing methane from continuing to diffuse around the well. New South Wales' Code of Practice for CSG wells requires abandoned wells to be sealed with concrete to the full"

What regulations in WA?

p380 :
"... review of 1,035 wells in Western Australia that had not yet been decommissioned, found 122 (about 12 percent) to have had some form of failure (... Upon decommissioning, plugged and abandoned wells must be expected to maintain containment for thousands of years and there is no data available in Western Australia on the long-term performance of decommissioned wells."

The panel does not appear to be alarmed by this 12% failure rate. This sort of figures is inline with the data from Ingraffea et al (2014) and Watson & Bachu (2009).

1 It should be noted that SPE articles are **not** peer-reviewed, in other words just opinion pieces.

p380 :
"There was no correlation of methane levels with the age of the well. "

p381 : recomm 11 :
"The Western Australian Government should implement an emissions monitoring program of decommissioned wells with respect to well integrity in general and methane emissions specifically, complemented by a research program to give further confidence to their long-term containment."

Who pays for that? Should be upfront payment.

p381 :
"About 60 percent of total global methane emissions are anthropogenic and the rest is from natural sources."

The amount of natural methane emissions will increase with increasing anthropogenic climate change due to melting permafrost.

p382 :
"In short, per unit emitted, methane is a more powerful GHG than carbon dioxide and is the largest contributor to non-carbon dioxide GHG emissions. That is why methane emissions from gas developments is a focus of concern."

Even more reason to stop methane emissions.
The problem with this report is that they state the negative impact of methane and use in some context some small percentages to make it look not too bad.

p384 :
" "…the Inquiry should be aware that Geoscience Australia has described very large volumes of prospective petroleum liquids (shale oil) in Western Australia… The Inquiry should therefore report on the health, environment, and other risks associated with producing oil from unconventional reservoirs… for liquids-rich shales, the value of the liquids can greatly exceed the value of the gas. Indeed, gas can have zero value if markets are not found for the gas nor infrastructure put in place to collect, process, and transport the gas" - submission from Tim Forcey, Energy Advisor to the University of Melbourne"

Irrelevant if large or small amount of gas to be found.

p387 Finding 41:
"Where regulations or approvals specify greenhouse gas (GHG) emission outcomes, the regulator must have and demonstrate sufficient capacity, competency, diligence and transparency to ensure that industry is achieving those outcomes. This is likely to require a combination of top-down and bottom-up monitoring, and thus technical partnership with agencies or institutions with advanced capabilities."

A lot of the arguments are like as if I as an individual throw some rubbish around it does not matter because it is only a very small percentage of the total.

p387 :
"... modelled a 23 percent improvement to overall GHG emissions associated with shale gas development assuming implementation of these new performance standards."

A 23% improvement is good. However in an analogy if someone is 23% less violent, it still means that the person is 77% too violent.
Again baffling with percentages but in reality not achieving much.

p389 :
"GHG emissions from onshore oil and gas fields developed with hydraulic fracture stimulation must be minimised. The contribution to Australian anthropogenic upstream GHG emissions from onshore fields in Western Australia must be 0.5 percent or less of 2016 levels. "

Have they calculated the potential number of wells in all prospective areas and multiplied this number with the estimated emissions per well. The result would be an enormous amount of GHG.

p391 Recomm 13 :
"Consideration should be given to offsetting the additional greenhouse gas (GHG) emissions from any onshore unconventional oil and gas production associated with hydraulic fracture stimulation. As a minimum, this should extend to the increase in 'fugitive' emissions over conventional upstream oil and gas production, plus reservoir carbon dioxide discharged to the atmosphere."

Nice words, but NO action

References :

Ingraffea, AR, Wells, MT, Santoro, RL & Shonkoff, SBC 2014, *'Assessment and risk analysis of casing and cement impairment in oil and gas wells in Pennsylvania, 2000-2012'.*, Proceedings of the National Academy of Sciences, vol. 111, no. 30, pp.10955–10960. Available from: http://www.pnas.org/cgi/doi/10.1073/pnas.1323422111.

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Zoback, MD 2007, *Reservoir Geomechanics* , Cambridge University Press, Cambridge. Available from: https://www.cambridge.org/core/books/reservoir-geomechanics/71717D4521278CE16D1DED0476ACEDBE.