



Review of Report on Induced Seismic Mitigation to the DECC

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The following is a summary of my conclusions following my review of the report to the DECC on Induced Seismic Mitigation (Presse-Hall Shale Gas Fracturing: Review and Recommendations for Induced Seismic Mitigation). That document itself was a review of the study "Geomechanical Study of the Bowland Shale Seismicity" published 2nd Nov, 2011.

I am an independent Chartered Engineer who has conducted an eighteen month study, (still ongoing), into the practice of regulation regarding the on shore oil and gas industry and in particular use of hydraulic fracturing. The evidence I used to draw upon was taken from Freedom of Information Act responses, letters, mails, teleconferences and actual conferences. I consulted with the DECC, EA, HSE, Cuadrilla, DECC Select Committee, IGEM and the BGS.

The report, the media coverage and the DECC portrayal of it now appear to be a general statement on whether fracking should continue or not and so I have sub-divided my conclusions into Induced Seismic Activity and Necessary Regulation.

Induced Seismic Mitigation:

- Report does mention that there may well be more earthquakes in future and does not accept original study's findings that this is unlikely. However, it goes on to discuss magnitude 3.0M_L as being a potential maximum and refers to no damage to houses etc. It completely misses the crucial point of damage to the cement around the borehole so vital to ensuring no methane or fracking liquid migration to the intermediate and upper areas.
- There is no mention of a delivery vehicle for verifying the new regulations (onshore and cement bond). At present it is the HSE but nowhere does it mention this and the HSE have made it clear to the author that they see no need for CBLs and no need for any new on shore specific regulations. They have also stated they have no funding for this.
- How is this to be funded? I have produced a set of recommendations that I developed with Cuadrilla and here I outline a possible route for funding. This is not mentioned in the report but is the primary reason given by the HSE and EA for not regulating. It is fundamental to all future regulation. Without an agreed strategy all these reports and recommendations etc. are just going to be self-regulatory. This will be totally unacceptable.
- It is unclear as to whether the new regs are to be industry wide or just apply to Cuadrilla. All regulations must be clear and be industry wide.
- It is unclear if the micro seismology will apply to "the next hydraulic fracture treatment" or all wells in future. The report contradicts itself here. Again is this UK/industry wide or just Cuadrilla and just Lancashire? This needs clarification. If it is every well then this represents a significant increase to the costs of drilling and needs building in to the financial plan of the exploration companies.



- The authors state that well integrity not affected. They have no hard evidence to back that up. Only conjecture based on lack of zone communication. That's not good enough in these circumstances. We have no CBLs or post tremor logs to call upon as stated in my original review of the study. They also agree with my finding (no ultrasonic log post event) but do not seem to then see this though to its logical conclusion.

Just because the upper area appears fine (annular pressures etc.) it does not give you any information on whether the intermediate cement has been compromised and likely migration of gasses/fluids into the St. Bees sandstone and beyond. I have stated that we need to know the quality of the cement. This report also states the importance of 'good cement' but there is no verification of any regulation relating to the cement quality. This needs to be included in any new on shore regulations. It has been missed by this report but needs including. To rely on annular pressure readings (as they imply) is not sufficient.

The reports main conclusions relating to seismicity are on the whole sound. Use of prefrac, traffic lights, micro-seismicity and immediate flow back. The conclusions outside of this – Cement Bond Logs and Need for On Shore regulations I have been calling for over the last twelve months. The authorities have insisted I am wrong in these demands so I am glad this report agrees 100% with my assertions. (transmitted in an official capacity to Fylde Borough Council in Feb 2012). One astonishing remark is in App B – “ 4.intermediate string inclusion, if necessary”. This needs to be modified to state that all wells shall have surface, intermediate and production casing as a standard.

The authors of the report see no reason why Cuadrilla should not be allowed to proceed with fracking. The only caveat relates to seismicity. They have not considered the other 90% of conditions needed to allow for safe hydraulic fracturing. These are considered below.

Necessary Regulation:

The following is a subset of a full detailed analysis by the author of regulation necessary in the on shore hydraulic fracturing industry to ensure safe practices are developed, implemented and verified.

- On Shore Gas Regs - There is a clear need of specific On Shore exploration regulations. At present there are none. The offshore regs developed in the 1990s following Piper Alpha disaster are not sufficient to address the issues with on shore drilling, exploration and production.
- Verification – independent (financially and professionally) verification, testing and inspection of the wells to the new regulations. Presently virtually all self –regulatory. What is now required is a 'hands on' inspection regime of a type similar to that a number of US states have now adopted. Each well is inspected with both random and pre-arranged trips – approx 10/15 times whilst the well is being drilled and then “fracked”.
- Regulations need to cover cement quality (on site sampling and laboratory testing) , cement bond logs, annular pressure readings (instruments used, calibration, how recorded in SCADA etc.), examination of formation integrity tests as they are executed, seismic monitoring , surface methane detection (baseline and operational), post tremor actions, flow back water storage and disposal (Permit), recycling of flowback (presently illegal – need a reg to define this process and legalize it), flowback water quantity verification, sourcing water from mains (pressure issues) and testing of local boreholes/wells.



- Overview – DECC should appoint a person of suitable engineering background to oversee the regulation of the Shale Gas Sector in the U.K. The author has collated a number of examples of confusion and misunderstanding between the authorities with no one person taking on the responsibility. Each has a number of different roles to perform. To ensure all are performed an overview is needed so that the public can be given re-assurance and the regulators can be given logistical assistance when and where needed.
- Compliance – The regs should be implemented through random and agreed on site visits when key actions (like cementing) are happening. There needs to be serious repercussions if an operator is found to be in breach of the regs. Fines, license revocation and criminal proceedings if necessary.
- Funding – a seriously robust regulatory regime requires funding. Random inspections, frequent site visits to a rapidly expanding industry will mean a significant increase in costs to the HSE and EA. A new funding structure, negotiated with the industry, needs designing and implementing. The author has developed such a plan and discussed it with the industry. It must be done and soon to ensure we have not only the regulations but also the implementation of them at the well site.

This is a brief summary of the key recommendations. For each point above and additional points not shown, I have a considerable amount of detail already developed. The regulations bullet point I developed and then had peer reviewed by Cuadrilla. They were highly supportive of the list. I would be very happy to work with all interested parties in the bringing forth of new regulations. These must be both sensible and practical for the industry to follow. They must also ensure the industry is safe and seen to be safe in the view of the general public.