Clare McMullan

From: [redacted]@thetimes.co.uk>
Sent: 10 November 2014 13:08
To: Robert Westaway
Cc: Paul Younger; Ross Barker
Subject: Re: University of Glasgow energy engineers call for new regulatory framework for fracking

Thanks Rob. What are the benefits of raising the earthquake threshold as you suggest? is it simply that it reduces the risk of shutdowns, such as happened at Preese Hall in 2011?
Also, I think the two minor quakes then were much smaller than the maximum you propose: 2.3 and 1.5. Was there any damage caused by those quakes?
And are the possible impacts of a 3.6 quake limited to minor plaster cracking or are there other possible, if highly unlikely, consequences?
many thanks
[redacted]

Ben Webster, Environment Editor
020 7782 5896
Twitter: @bwebster135

On 10 November 2014 12:50, Robert Westaway <Robert.Westaway@glasgow.ac.uk> wrote:
Yes, that's right.

RW

Dr Rob Westaway
Senior Research Fellow

From: [redacted]@thetimes.co.uk]
Sent: 10 November 2014 12:48
To: Robert Westaway
Cc: Paul Younger; Ross Barker
Subject: Re: University of Glasgow energy engineers call for new regulatory framework for fracking

Thanks Rob. When you refer to "induced earthquakes of this size", presumably you mean 3.6?

[redacted]
020 7782 [redacted]
Twitter: @[redacted]

On 10 November 2014 11:33, Robert Westaway <Robert.Westaway@glasgow.ac.uk> wrote:
Dear all

What we are saying is that, first, we are noting that current 'fracking' technology utilizes a sufficient volume of water at a sufficient pressure to produce fracture networks that may be up to ~600 m long. Second, if such a large fracture were to develop in a single fracturing event it would be equivalent to an earthquake of magnitude ~3.6. However, it is extremely unlikely that such a large fracture will develop in a single event, since the fracture networks tend to develop incrementally, but the possibility should nonetheless be considered. One possible solution would be to impose regulatory limits on, say, the volume of water that can be used in a single 'frack', to reduce the upper bound

to the fracture network that might develop, and thus reduce the size of the maximum possible induced earthquake that might result. However, we suggest, instead, that an alternative appproach would be to accept that there is a chance that induced earthquakes of this size might occur very occasionally but to compensate people in the area if any damage results to their property and/or if the strength of the ground vibrations exceeds the appropriate threshold that we are setting out. Combined with monitoring of the induced seismicity, the technique that we have developed, and which is capable of future refinement, will enable the strength of the ground vibrations to be estimated at any point on the Earth's surface to facilitate such assessments.

Best wishes, Rob

Dr Rob Westaway
Senior Research Fellow

Begin forwarded message:

From: [redacted]@thetimes.co.uk>
Date: 10 November 2014 10:16:40 GMT
To: Paul Younger <Paul.Younger@glasgow.ac.uk>
Subject: Fwd: University of Glasgow energy engineers call for new regulatory framework for fracking

Hi Paul, is this suggesting that earthquakes up to magnitude 3.6 could be permitted, with compensation for any minor damage?
Thanks
[redacted]

Sent from my iPad

Begin forwarded message:

From: Ross Barker <Ross.Barker@glasgow.ac.uk>
Date: 10 November 2014 09:26:43 GMT
Subject: University of Glasgow energy engineers call for new regulatory framework for fracking

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0001hrs TUESDAY 11 NOVEMBER 2014

News Release

Tuesday 11 November 2014

Energy engineers call for new regulatory framework for fracking

Leading energy engineers are suggesti ng t hat UK regulations on the surface vibrations c aused by s hale gas fracking are unnec essarily restrictive.

University of Glasgow academics st ate in a new paper that widely applying restrictions similar to thos e currently in force on fracking would require a ban on heavy vehicles from passing houses or walking on wooden floors.

They also state that the threat of serious earthquakes caused by fracking activity is considerably lower than commonly feared.

The report, written by Dr Rob West away and Professo r Paul Younger of the University of Glasgow's Sc hool of Engineering, is published today (Tuesday 11 November) in the Quarterly Journal of Engineering Geology and Hydrogeology.

They suggest that adopting a new fracking regulatory framework closer to the rules which gov ern activities such as quarry blas ting would be a clear improvement on the current guidelines.

Dr Westaway said: "Currently, the Department of Ener gy and Climate Change's regulation is that any fracking oper ation whic h induces surface vibrations greater than m agnitude 0.5 on th e Richter scale should be shut down immediately.

"That level of vibration is extremely low. To put it in perspective, if regulations for other vibration-c ausing activities were similarly restrictive you'd hav e to prevent buses from driving in built-up areas or outlaw slamming wooden doors.

"By analys ing the seis mic waves whic h trav el through the earth as a result of fracking activity, we'v e been able to determine a sc ale of activity which will create surfac e vibrations withi n those already allowed for by quarry blasting r egulations. For example, induced earthquakes of magnitude 3 from fra cking activities 2.5km below the earth's surface will create surface vibrations similar to the limits allowable from quarry blasting.

"Conversely, induced earthquakes at t he current UK regulatory limit of magnitude 0.5 would be ex pected to produce vibrations in a person's home that are smaller than those typi cally caused by the movement of buses or lorries past the end of t heir garden and comparable to many other widely-accepted forms of 'nuisance' vibration".

The authors state that the largest possible fracture which c ould conceivably be created by cur rent drillin g process es on pro perly-surveyed land would be 600 metres long. The maximum length of fractures is determined by the amount of fracking fluid us ed in the process, which would be used up before any fracture could reach more than 600m.

Professor Younger said: "We've det ermined that a fracture of that length created in a single rupture, which is very unlik ely, would likely correspond to a maximum quake of magnitude 3.6. That might be sufficient to cause minor damage on the surface such as cracked plaster. Again, however, there is already regulation in place for compensation for similar inc idents caused by RAF fly -bys or mining

operations and we'd suggest it would make sense for similar schemes to be put into place for fracking.

"From the knowledge we've gained from tens of thousands of fracking operations elsewhere in the world that by far the biggest cause of serious seismic incidents isn't the drilling or the fracking process itself. Instead, it's the practice of disposing of waste water back into the borehole once the process is finished. This washes away particles of sand holding open the fractures created during the process, which can cause earthquakes.

"In Britain, we've adopted longstanding EU groundwater regulations which bar subsurface disposal of wastewater completely, meaning there is no danger of this sort of event happening here. Instead, the water would be treated and disposed of safely elsewhere."

Dr Westaway and Professor Younger's paper, titled 'Quantification of potential macroseismic effects of the induced seismicity that might result from hydraulic fracturing for shale gas exploitation in the UK', is published in the Quarterly Journal of Engineering Geology and Hydrogeology.

ENDS

For more information contact Ross Barker in the University of Glasgow Media Relations Office on 0141 330 3535 or email ross.barker@glasgow.ac.uk

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