

THE US has led the world in extracting gas from shale but interest is now spreading elsewhere. The British Geological Survey (BGS) recently estimated that the UK has 150 billion cubic metres of shale gas, about half of its more conventional reserves. World shale gas reserves are 450,000 billion cubic metres.

Shale gas has been a success story in the US. But fracking has had some bad press, with the main concerns being earthquakes and the contamination of groundwater with gas and chemicals. In the documentary film *Gasland*, for example, a man is shown igniting water from his kitchen tap.

Some of the worries are justified. Badly managed fracking has recently been shown to have contaminated water wells in Wyoming, though this involved a shallow sandstone reservoir rather than much deeper shale. But with so many vested interests, getting reliable information is difficult. So peer-reviewed science must play a big role in deciding what the risks are.

Most geologists see contamination of aquifers as unlikely because of the great difference between the depths at which fracking is carried out and the shallow aquifers from which we get our water. Put simply, there is a lot of hard, impermeable rock between the two.

However, there is little peer-reviewed research. A [US study from 2011](#) showed high levels of methane in water wells close to shale gas wells, but has been criticised for lacking data on levels of background natural methane in the water. In fact there are very few such baseline studies.

It is a little known fact that many aquifers naturally contain methane. So its presence in tap water is not proof of contamination.

How can we tell if fracking has contaminated an aquifer? Shale gas is generally thermogenic - generated by heat acting on organic matter - while methane in water is usually biogenic, or generated by bacteria. Showing that methane in a water well is thermogenic might be a clue that a fracking operation is leaking, although thermogenic methane is sometimes found naturally in aquifers so you have to know the baseline levels. This is why the BGS is working on a baseline survey.

Meanwhile, there is no peer-reviewed evidence that frack fluid can leak into groundwater.

As for earthquakes, it is undeniable that fracking causes them because they are used by geologists to track the progress of fracking operations. The quakes are usually infinitesimally small, but not always.

On 1 April 2011, Blackpool, UK, was struck by a magnitude 2.3 earthquake that was clearly the result of fracking. Some areas of the UK are used to quakes of this size but it came as a surprise to the people of Blackpool, as well as the gas company Cuadrilla. Even so, the energy released was inconsistent with the claimed damage, including a crack in a road and a toppled traffic signal.

One suggestion to guard against future quakes is to implement a traffic light system. Operators would have to monitor tremors and if they started to get bigger fracking would have to stop. They would also have to avoid fracking near known active faults.

If fracking operations are managed properly the risk of accidents will be small. Diligent monitoring should ensure that companies are doing their job properly and allow us to safely tap a useful source of energy.