

# Fracking linked to earthquakes and increased levels of radon in homes

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A newly released study indicates that a significant correlation exists between areas where fracking (high volume hydraulic fracturing combined with horizontal directional drilling used to extract oil and natural gas from shale deposits) is taking place and elevated levels of radon.

Radon is an odorless, colorless radioactive gas, a known carcinogen, which accumulates in homes and commercial buildings. It is a radioactive decomposition product of radium-226, and is the second leading cause of lung cancer after smoking.

The study, published in *Environmental Health Perspectives*, was conducted by researchers at the University of California, Berkeley, UC San Francisco, and Johns Hopkins University.

In a separate study, government researchers identified a statistically significant correlation between increased seismic activity and the proximity of injection wells used to dispose of huge quantities of contaminated fracking wastewater.

Neither of these findings is entirely surprising. It has been known for years that the fracking process employs huge quantities of water and a witch's brew of toxic and carcinogenic chemicals to break open the shale bedrock in order to release oil and natural gas trapped within. It is also known that, in addition to the hydrocarbons, the resulting wastewater "backflow" may also bring up harmful heavy metals and radioactive materials. However, the industry and its political supporters have consistently denied that this is of concern.

The findings regarding radon are based on analysis of over 860,000 measurements taken in Pennsylvania homes and other buildings from 1989 to 2013. Levels of radon began to increase noticeably in 2004 as fracking activity intensified. Between 2005 and 2013, 7,469 fracking wells were drilled in the state.

Radium is a naturally occurring inclusion in the shale deposits being fracked. As it decomposes into radon gas, it normally travels to the surface in varying quantities and can accumulate in building basements, posing a health danger to the occupants. However, the significant increase in radon levels in recent years correlated with the expansion of fracking strongly suggests a cause and effect relationship, posing a marked increase in health risk.

Joan Casey of University of California Berkeley, a coauthor

of the study, said in a statement released by Johns Hopkins University that, "By drilling 7,000 holes in the ground, the fracking industry may have changed the geology and created new pathways for radon to rise to the surface."

Among the study's findings was that radon concentrations were 21 percent higher in buildings that used well water as compared to municipal sources. Buildings in rural areas where fracking is prevalent were found to have radon in concentrations 39 percent higher than those in urban areas, where fracking is not taking place.

Radon has a half-life of about four days. Within 20 days it has lost 95 percent of its radioactivity. Therefore, the source of radon contamination must be in close proximity to the locations where increased levels have been found.

The new study contradicts earlier findings by Pennsylvania's Department of Environmental Protection, published in January, that there is "little potential for additional radon exposure to the public" due to fracking. Last fall, earlier DEP studies downplaying the dangers of fracking were brought into question when it was revealed that they omitted measurements on many important contaminants. Given that the state's politicians are heavily supportive of fracking, the latest DEP study must be viewed as suspect. The reliability of the UC/Johns Hopkins results is bolstered by the very large sample size of the data used and the fact that the source of the data is the DEP itself.

Another study, published last October, using data from five states, found elevated levels of eight toxic chemicals near fracking sites. These included benzene and formaldehyde, both known carcinogens. And, a September study by the National Institutes of Health found that Pennsylvanians who live close to natural gas wells are twice as likely to report skin and respiratory problems as residents who live farther away.

Not only does fracking pose dangers stemming from the release of toxic and radioactive materials, but the disposal of the huge quantities of contaminated wastewater that result is also a major problem. Treating this effluent to make it safe to return to the environment is technically difficult and expensive. Most sewage treatment plants are not capable of accomplishing this task. Therefore, the industry employs various methods to make the waste "disappear."

One favored method is the injection of the fracking fluid deep underground, where it is supposedly “sequestered,” preventing environmental contamination. In Oklahoma, more than 50 billion gallons of wastewater went into disposal wells in 2013 alone, according to the Oklahoma Geological Survey. Not only does this make the water unavailable for future use, an especially troublesome problem for arid areas, but it is becoming increasingly evident that introducing large quantities of water under pressure into geologic formations where it did not formerly exist is resulting in seismic disturbances—earthquakes.

A study by the US Geological Survey, released last Thursday, demonstrates a clear correlation between the increasing frequency of earthquakes and the injection well disposal of fracking wastewater. In Oklahoma, the hardest-hit state, earthquakes are hundreds of times more likely than they were a few years ago, before the underground disposal began. Elevated seismic activity associated with this practice was found in eight other states as well.

According to the report, Oklahoma is now experiencing quakes of magnitude 3 or greater at the rate of one or two a day. Previously, such events occurred there only once or twice per year. The state government has been forced to publicly acknowledge the link between the increased seismic activity and fracking wastewater injection wells.

This comes after years of denials by industry and government representatives across the country. There has been only limited regulation of fracking fluid disposal using this method. In 1988 the federal Environmental Protection Agency (EPA) cited a loophole in the Resource Conservation and Recovery Act (RCRA) which regulates hazardous and solid waste, exempting the waste from oil and gas exploration, development, and production from oversight, leaving responsibility to even weaker or nonexistent state regulations.

Earthquakes of magnitude 5 or greater are capable of producing structural damage. In 2011, Oklahoma experienced a magnitude 5.6 quake, which is the largest yet recorded that can be linked to fracking wastewater disposal. The cumulative effect of increasing numbers of disposal wells, especially when concentrated in close proximity appears to increase not only the frequency but also the intensity of such events.

Estimates suggest that quakes of magnitudes up to 7 or 8 could result from this practice. This is within the range of naturally occurring tremors that caused major damage. For example, the 1995 Los Angeles earthquake reached 6.7 and the San Francisco quake of 1989 measured 6.9.

Further confirmation of the link between well disposal and earthquakes comes from the observation that in the few areas where this practice has been halted, the frequency of quakes has dropped dramatically.

The Kansas Corporation Commission (KCC), a state regulatory agency, stated in an official report, “The commission finds increased seismic activity constitutes an

immediate danger to the public health, safety and welfare. The commission finds damage may result if immediate action is not taken.” However, in deference to the power of the petroleum industry, the order is limited to areas where an increase in earthquake activity has already been observed.

The influence of the industry over state regulators is illustrated by a recently revealed incident in Oklahoma. As shown by emails obtained under the freedom of information law, the state seismologist, Austin Holland, was summoned to a meeting in 2013 with Oklahoma City-based oil and gas tycoon Harold Hamm. Hamm, who has been called the founding father of the US fracking boom, expressed his “concern” that earthquakes were being linked to the fracking process. Holland indicated that meeting was “intimidating.” This was reportedly at least the second such meeting with industry executives.

The pattern seen emerging from multiple efforts by a variety of researchers consistently points to one conclusion: the combination of high-volume hydraulic fracturing and horizontal directional drilling used to extract oil and natural gas from shale deposits, as currently practiced, poses a marked and immediate danger to human health and the environment. Despite persistent industry claims to the contrary, the process itself and the resulting waste create safety hazards.

Leakage and spillage expose humans, both industry workers and residents in nearby communities, as well as plants and animals in the environment, to carcinogens and other toxic materials at unsafe concentrations. Furthermore, tremendous quantities of water, contaminated by the fracking process, are difficult or impossible to safely return to the environment. Efforts to sequester the wastewater by injection deep underground not only remove it from any further practical use, a concern especially in more arid regions, but also causes increasingly dangerous earthquakes.

The vast proliferation of fracking in the US, where it is currently being conducted in 18 states, and increasingly around the world, is driven by a combination of the unfettered drive for profit by energy companies and increasing geopolitical rivalries without regard to the consequences.



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