

Some studies have linked increased seismicity rates to the disposal of produced water in saltwater disposal (SWD) wells, while other studies have assessed the potential linkage between hydraulic fracturing and increased seismicity rates. In 2016, ConocoPhillips developed a risk-based Global Induced Seismicity Guideline for the planning and operation of our new injection wells and for screening third-party injection operations, if circumstances warrant. The guideline helps characterize seismicity risks by assessing historical seismicity, identifying geological faults of concern, assessing actual or proposed injection operating conditions, and considering proximity to people and population centers. It also provides possible monitoring, management and response planning options if the assessed risk is elevated.

We are working with our peers and academic researchers to better understand and document if, where and how fluid injection and hydraulic fracturing may contribute to the phenomenon of increased rates of seismicity over background trends. ConocoPhillips is committed to the ongoing study of the causes of seismicity in areas of oil and gas production. We fund independent university research and support assessments by government agencies.

About Seismic Activity

The Earth's crust is dynamic. Constantly shifting tectonic plates interact, building and storing energy. When the stress or pressure becomes great enough, the crust shifts along pre-existing faults, releasing energy. The natural release of stored energy are earthquakes. The amount of energy released from an earthquake is measured on the Richter scale.

Most earthquakes are naturally occurring and according to the United States Geological Survey, millions occur annually worldwide. There are an estimated 500,000 detectable earthquakes in the world each year. 100,000 of those can be felt, and 100 of them cause damage.¹

While most earthquakes are caused by natural forces, some human activities can trigger seismic events. Felt seismicity associated with the oil and natural gas industry has been attributed to both water injection and, to a much lesser degree, hydraulic fracturing.

Water Injection Wells

Injection wells have been safely and reliably used in the U.S. to dispose of produced water from oil and natural gas operations since the 1930s. The water is separated from the oil and natural gas and then re-injected deep underground to protect the environment, and in some cases, enhance oil recovery.

Injection wells are regulated in accordance with the Federal Safe Drinking Water Act Underground Injection Control program. Of the more than 180,000² oil and natural gas-related injection wells in operation in the U.S., only a small percentage have been associated with felt seismicity. In the cases where injection-related seismicity has been felt at the surface, reducing fluid injection rates or shutting in injection wells has mitigated seismicity. The risk of such events happening can be reduced through robust disposal well site selection and injection design, both regulated activities. The oil and natural gas industry is not the only industry to use injection wells. The chemical, manufacturing, agriculture and steel industries

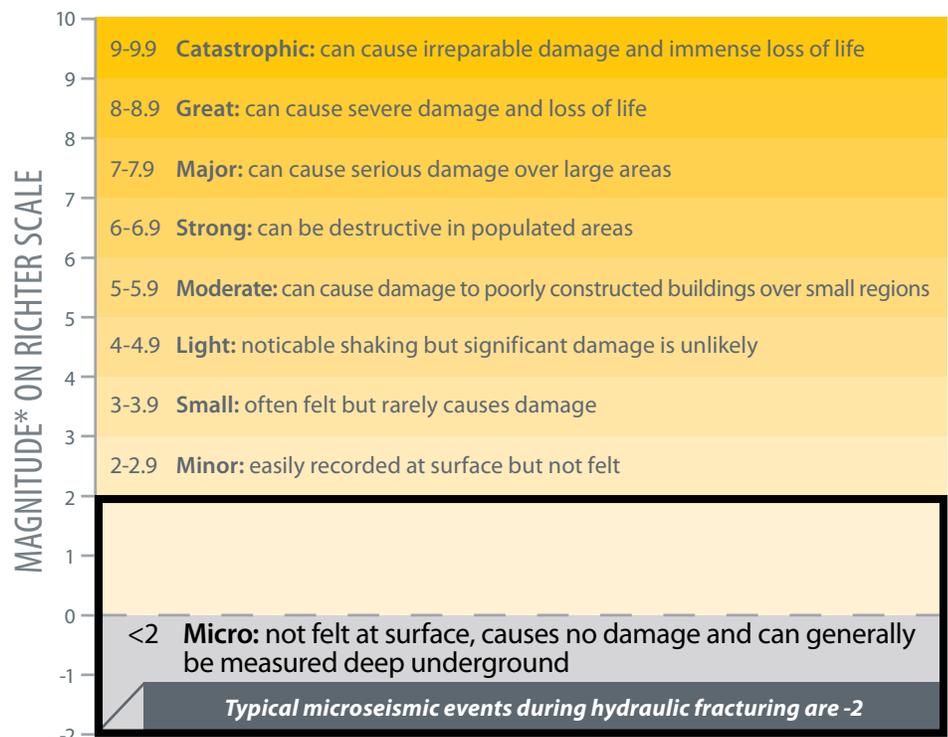
also rely on injection wells as a safe method to dispose of waste products.

Hydraulic Fracturing

By design, hydraulic fracturing, or fracking, releases energy deep in the subsurface to fracture the rock within the targeted hydrocarbon formation.

More than two million wells have been hydraulically fractured worldwide during the past 70 years. Over this period, it has been rare for hydraulic fracturing to trigger a seismic event that can be felt at the Earth's surface, much less cause damage. Measurements made with highly sensitive listening devices indicate the reason seismicity is seldom felt is because the energy released is usually 1,000,000 times smaller than the felt seismicity threshold. As with water injection wells, prudent site selection can reduce the risks of seismicity.

SEISMIC EVENT IMPACT



**Each whole number increase on the Richter scale represents 32 times more energy release and 10 times more ground motion.*

Sources, additional information

¹<https://earthquake.usgs.gov/learn/facts.php>

²<https://www.epa.gov/uic/class-ii-oil-and-gas-related-injection-wells>

For more information: www.powerincooperation.com