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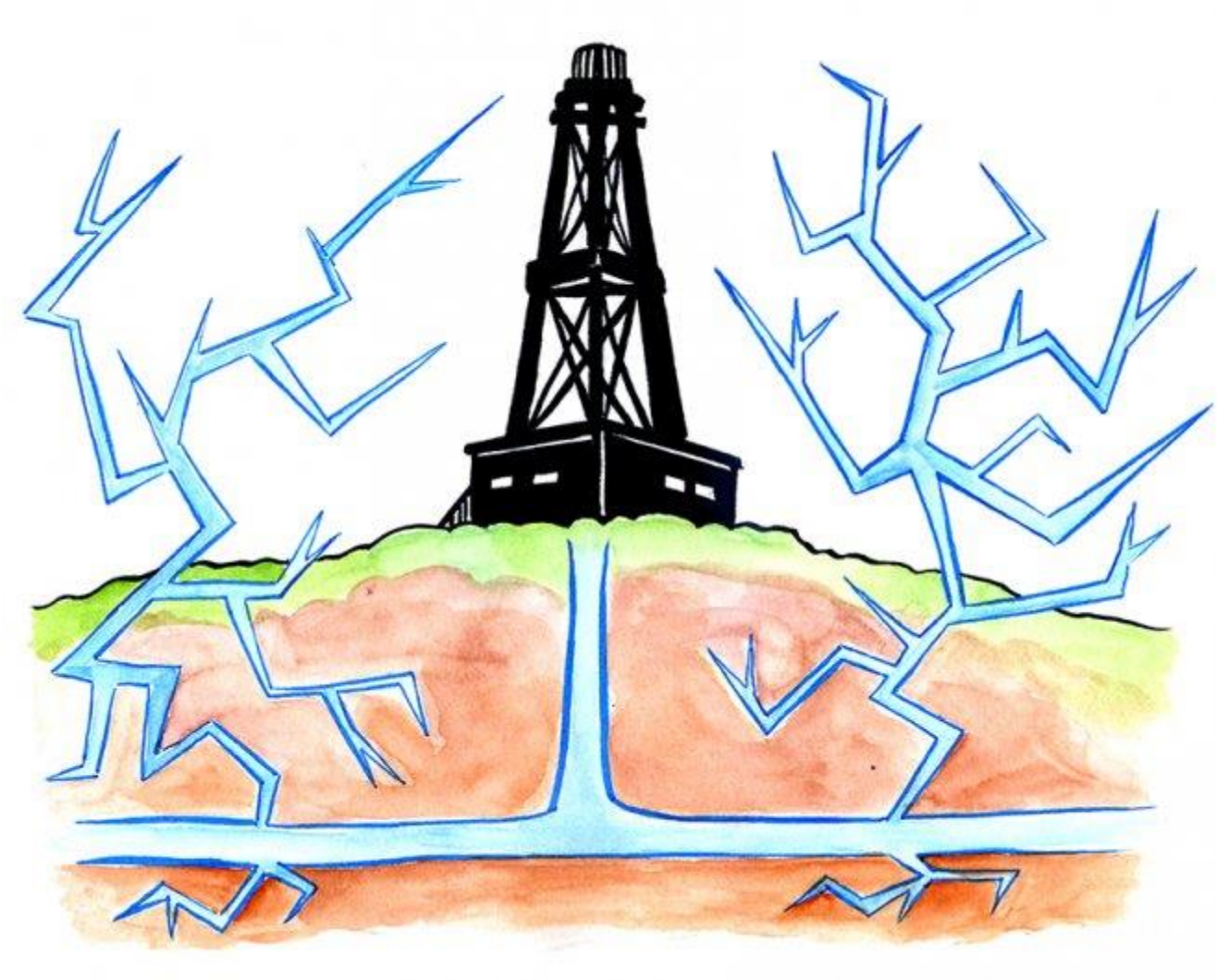
Water reuse in Permian Basin has potential to reduce seismicity



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By Areeba Khwaja

A new study found that the reduce-reuse-recycle mantra may make oil drilling more productive.

Researchers at UT-Austin's Bureau of Economic Geology found that reusing large amounts of water from hydraulic fracturing can reduce potential seismicity, or earthquakes, in the Permian Basin — an oil deposit in west Texas and southeast New Mexico.

Hydraulic fracturing is a drilling process applied to oil and gas wells that works by injecting water, chemicals and sand at high pressure to increase their permeability. This provides better access to the oil and increases productivity, according to Bridget Scanlon, a hydrogeologist at the Bureau.

According to the U.S. Geological Survey, the Permian Basin constitutes almost 20 percent of U.S. oil production and could hold 20 billion barrels of oil. Hydraulic fracturing, a more recent technology used in the basin, makes it easier for companies to access oil reserves in shale formations. These formations are a type of sedimentary rock which are typically less permeable and more difficult to drill into without hydraulic fracturing.

"There are many different layers of rock of interest in that area, all with different dynamics in place," Frank Male, a postdoctoral fellow at the Bureau, said.

In addition to requiring water to permeate the shale formations, producing oil through hydraulic fracturing also brings more water from the ground to the surface, according to Robert Reedy, a research associate at the Bureau.

"Wells in the Permian basin produce a lot of water, often more water than oil," Male said.

This water is extremely salty and not safe for drinking so a large portion of it is injected into saltwater disposal wells. In areas such as Fort Worth, Pecos and north-central Oklahoma, scientists noted increased seismicity, which may have resulted from re-activated faults caused by injecting this water into the disposal wells, according to Male.

"Induced seismicity is related to the disposal of large volumes of produced water in such a way as to create a locally significant instability in the subsurface environment," Reedy said.

The study said that instead of injecting water into these disposal wells, it could instead be recycled into a new set of wells for hydraulic fracturing, thereby saving water and reducing seismicity. Reusing the water only requires minimal cleaning and is more sustainable.

"Recycling produced water with oil and gas for hydraulic fracturing of new wells reduces water demand from other sources and also reduces disposal of produced water which has been linked to seismicity," Scanlon said.

The data for the study, taken over a period of 10 years from 2005 to 2015, was largely from the Texas Railroad Commission's IHS database and from FracwFocus, a public database.

Scanlon and Male said they were interested in further researching fluid balance in the Permian Basin. Specifically, they are excited to research expanding pipeline and storage infrastructure to support reuse of water, finding different approaches to reusing produced water, and how to tie their data into 3-D geomodels or computerized representations of Earth's crust.

"The more we understand about the demands and dynamics of water management, the better our ability will be to anticipate potential problems before they can develop," Reedy said.