SEISMICITY ASSOCIATED WITH WASTEWATER DISPOSAL WELLS

BACKGROUND

Advanced hydraulic fracturing and horizontal drilling are the technology engines driving America's ongoing energy renaissance – surging oil and natural gas production that ranks first in the world. This oil and natural gas production, enabled by hydraulic fracturing, strengthen U.S. energy security, boost the economy and lower consumer energy costs. In addition, the increased use of cleaner-burning natural gas is the main reason U.S. greenhouse gas emissions from electricity generation are at their lowest level in 25 years. For decades hydraulic fracturing has been used safely – thanks to proven engineering, effective industry risk management practices and standards as well as federal and state regulations.

Industry takes seriously earthquake incidents that may be associated with the disposal of produced water from energy development – salty brines and other fluids that come to the surface during oil and natural gas production. On average, about 10 barrels of brine are produced with each barrel of crude oil.[1] Once separated from the oil, brine typically is returned to the underground formation it came from (or a similar formation) via disposal wells managed under EPA Class II Underground Injection Control (UIC) regulations. In the U.S. there are approximately 30,000 active Class II wells used to dispose of these fluids that are a byproduct of oil and natural gas production. These are a subset of more than 800,000 permitted UIC wells nationwide that serve the needs of many different industries and governmental entities. The majority of disposal wells in the United States do not pose a hazard for induced seismicity, but under some geologic and reservoir conditions a limited number of injection wells have been determined to be responsible for induced earthquakes with felt levels of ground shaking. (*Hydraulic fracturing itself is not the issue here. It is understood that certain unique and limited geologic conditions combined with hydraulic fracturing may induce an earthquake felt at the surface of the earth but such events have been rare.*) To evaluate the need for mitigation and management of the risk of induced seismic events, it is important to understand the science.

Documented since at least the 1920s, induced seismicity also has been attributed to a number of other human activities, including impoundment of large reservoirs behind dams, geothermal projects, mining extraction, construction and underground nuclear tests. In that context, the science of seismicity should be understood when discussing quake mitigation measures and/or risk management.

Induced seismicity may occur when a geological fault is present and under stress. Increased pressure from fluid injection may unclamp the fault and allow slippage, resulting in surface shaking.

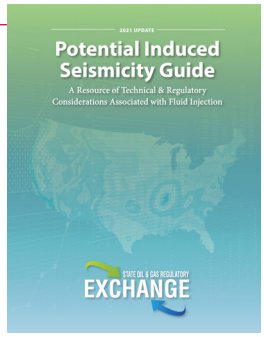
BOTTOM LINE: Induced seismicity is a complex issue, and the knowledge base surrounding it is rapidly changing. A one-size-fits-all approach isn't practical because of the significant differences in local geology and surface conditions – population, building conditions, infrastructure, critical facilities and seismic monitoring capabilities. As such, state regulators are best positioned to address potential issues linked to oil and gas injection wells in their state.

States are developing diverse strategies for avoiding, mitigating and responding to potential risks as they locate, permit and monitor Class II disposal wells. Many state regulators work with experts from government agencies, universities private consultants and industry experts on these issues. Effective planning involves identifying where there's risk of harm from a seismic event because people and property are located nearby. Again, state regulators are best able to make these assessments and plan adaptive responses in the event of a quake, such as adding seismic monitoring, adjusting injection rates and pressures, suspending injection well operations or halting injection altogether and shutting in a well.

Both hydraulic fracturing and the underground disposal of produced waters from oil and natural gas operations have proven safe and environmentally reliable. Industry, academia, and government entities are clearly committed to pursuing further research to better understand the complex science and physical mechanisms associated with induced quaking events. Our companies are committed to science-based measures to reduce risk. It's an integral part of making energy development as safe as possible.

[1] **United States Department of the Interior (USDI), 2011, Oil And Gas Produced Water Management And Beneficial Use In The Western United States:** Science and Technology Report No. 157 https://www.usbr.gov/research/dwpr/reportpdfs/report157.pdf

To **DOWNLOAD** the 2021 State Oil and Gas Regulatory Exchange Potential Induced Seismicity Guide (PDF): https://76df3998-d2d3-4c50-b713-68d19a2fa19e.filesusr.com/ugd/2c9022_a8086011c7eb40bd832d7b18d4bd93a6.pdf



TO LEARN MORE VISIT US:
www.api.org

SOURCE: https://www.api.org/~/media/Files/Oil-and-Natural-Gas/Hydraulic-Fracturing/seismicity-and-saltwater-wells.pdf

American Petroleum Institute