

All shook up: induced seismicity

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“Induced seismicity” refers to earthquakes that are triggered by human activities. The subject is attracting considerable attention. This article provides background and addresses recent litigation and regulatory actions relating to induced seismicity.

Background

For decades, scientists have said that a variety of activities can trigger earthquakes. These activities include mining, impounding water behind dams, withdrawing fluids from the Earth’s subsurface, and injecting fluids into the subsurface. This subject is receiving more attention now because of a dramatic increase in the frequency of earthquakes in the central United States—an increase that scientists believe is attributable to induced seismicity. The most dramatic increase has occurred in Oklahoma. From 1978 through 2008, Oklahoma averaged 1.6 earthquakes per year with a magnitude of 3.0 or greater. But the number of earthquakes began increasing in 2009, and in 2015 Oklahoma experienced approximately 905 earthquakes with a magnitude 3.0 or greater. Arkansas, Kansas, Ohio, and Texas also have experienced recent earthquakes that may have been induced.

Injection disposal

Scientists believe that the increase in seismicity is being caused by the operation of injection disposal wells. The oil and gas industry uses such wells to dispose of various types of wastewater, including “flowback,” the wastewater that is recovered after the completion of hydraulic fracturing (a/k/a “fracing” or “fracking”). But flowback accounts for only a small portion (perhaps 5 percent) of the water that is sent to injection disposal wells in Oklahoma. About 95 percent of the wastewater sent to such wells is produced water.

Produced water is water that is naturally found in many of the same underground formations that contain oil or gas. When a well is drilled into such a formation, produced water flows to the surface along with the oil or gas. Many oil wells generate more produced water than oil. Indeed, on average, an oil well in the United States generates about nine barrels of produced water for every barrel of oil. This water, which tends to be very salty, is typically considered wastewater. Injection disposal usually is the most economic method of managing such water.

Fracking

Scientists believe that fracking itself can induce seismicity. They point to earthquakes in Canada and the United Kingdom, and also near Poland Township, Ohio, that may have been induced. But scientists say that fracking is not playing a direct role in the recent increase in seismicity in the central United States.

Why now?

The oil and gas industry and other industries have been using injection disposal for decades. Why the recent increase in seismicity? The answer is not entirely clear, but some areas of Oklahoma that have seen large increases in seismicity have also had large increases in injection disposal rates. The increases in injection disposal are the result of increased production of oil from fields with unusually high water-to-oil ratios.

Litigation

Most induced seismic events do not cause damages. However, some have caused aggravation and a few have caused damages. Plaintiffs have filed lawsuits in Arkansas, Texas, and Oklahoma, seeking compensation based on theories of negligence, strict liability (under the abnormally dangerous activities doctrine), nuisance, and trespass. None of the suits have gone to judgment on the merits (some in Arkansas appear to have settled).

The lawsuit that has received the most attention is [*Ladra v. New Dominion*](#), 353 P.3d 529 (Okla. 2015), which arose from an earthquake that occurred near Prague, Oklahoma. Ms. Ladra alleges that the earthquake was induced by the operation of injection wells and that it caused rocks to fall from her chimney and injure her. The district court dismissed her suit, concluding that the state's oil and gas regulator (the Corporation Commission) had primary jurisdiction over her complaint. The Oklahoma Supreme Court reversed and remanded the case to the district court so that Ms. Ladra could pursue her claim. The higher court explained that the regulator has primary jurisdiction over "public rights disputes" relating to the oil and gas industry but that it does not have jurisdiction to hear private disputes, such as tort claims. Courts must hear those claims.

Ladra is one of at least four damages actions (including two putative class actions) that have been filed in Oklahoma. In addition, environmentalists have brought a citizen-suit under the Safe Drinking Water Act, seeking an order requiring industry to reduce the amount of water that it sends to injection disposal wells. *Sierra Club v. Chesapeake Operating LLC*, No. CIV-16-134-F (W.D. Okla. filed Feb. 16, 2016).

Regulation

Regulators in Arkansas, California, Colorado, Illinois, Kansas, Ohio, Oklahoma, and Texas have taken steps to address induced seismicity associated with injection disposal, and California and Ohio have taken steps with respect to fracking. These steps include: evaluating the likelihood of induced seismicity in an area before granting new injection disposal permits, prohibiting injections in areas or at depths where earthquakes have occurred, and restricting injection rates in certain areas. Oklahoma, for example, has required significant reductions in injection rates and has taken steps to prevent injections at depths where most of the recent earthquakes appear to have originated.

In addition, some states have implemented so-called “traffic light” protocols. Under such protocols, an operator has a “green light” and can inject at the full rates allowed by its permit, so long as no significant seismic events occur in the injection well’s vicinity. If seismic events above a specified magnitude occur, the operator may get a “yellow light” that triggers more frequent monitoring and a reduction in injection rates. If seismic events of an even greater magnitude occur, the operator may get a “red light” that requires it to cease injections until the regulator determines that it is safe to continue.

Future

It is too early to know whether recent regulatory actions will yield a decrease in seismicity and a halt in the rush of new litigation. If they do, this issue may fade, leaving behind injection disposal regulations that are more restrictive than before, but which are manageable for industry. If seismicity rates do not decrease and additional regulations significantly increase the costs of wastewater management, it may become uneconomic to produce oil from fields that have high water-to-oil ratios.

Déjà vu: Supremes hold Corps’ jurisdictional determinations constitute “final agency actions”

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For the second time in just four years, the Supreme Court has expanded the list of Clean Water Act (CWA) actions immediately reviewable by the courts under the Administrative Procedure Act (APA). In 2012, a unanimous Court held in [Sackett v. EPA](#) that a U.S. Environmental Protection Agency (EPA) administrative compliance order, in which EPA determined a