# Legal Developments Relating to Induced Seismicity

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# Locations of Induced Seismicity Linked to Oil & Gas Activity Include

- Arkansas
- Colorado
- Kansas
- New Mexico
- Ohio
- Oklahoma
- Texas

- Alberta
- British Columbia

- United Kingdom

# Legal Developments

- Litigation
- Challenges based on environmental impact statements required under the National Environmental Policy Act
- Regulations

# Litigation

# Litigation

Where?

- Oklahoma
- Texas
- Arkansas

Results?

- No judgments on merits yet
- Some cases have settled

# Causes of Action Asserted

- Negligence
- Strict liability
- Private nuisance
- Trespass
- Public nuisance
- Emotional distress (outrage)

# Proving Causation

- Proving causation may be a challenge.
- Expert testimony will be needed.
- Was earthquake induced or natural?
- If induced, which injection disposal well is responsible?
  - Perhaps multiple injection wells responsible for raising pressure within a large area.

# Environmental Impact Statements

# EIS Challenges & NEPA

- Project proponents should anticipate potential permit challenges.
- They and agencies should consider including seismicity risks as part of environmental impact statement analyses.
- Some enviro groups starting to raise induced seismicity in NEPA challenges.

# Regulations

# Relevant Laws in U.S.

- Historically, no federal or state laws whose main purpose was to control induced seismicity
- Underground injection control ("UIC") regulations exist under federal Safe Drinking Water Act
- UIC regs designed to protect underground sources of drinking water ("USDW")

# Federal vs. State Role in UIC Regulation

- Safe Drinking Water Act (SDWA) includes underground injection control (UIC) regulations
- EPA will delegate “primacy” for UIC regulation to a state if state UIC regulations meet federal standards
- Most, but not all, oil and gas states have primacy
- EPA administers federal SDWA UIC regulations in states without primacy

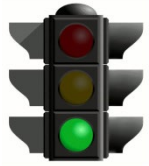
# Regulatory Activity

- **At least 8 states (Ark., Cal., Col., Ill., Kan., Ohio, Okla., Tex.)**
- **Alberta and British Columbia**
- **Evaluation of seismic risk during permitting**
- **Restrictions or prohibitions on disposal in certain areas, depths**
- **“Traffic light” systems**

# Minimizing Seismicity Risk

- Evaluate site for past seismic activity and presence of critically stressed faults
- After beginning operations, use “traffic light” system

# Traffic Light System



**Green light** – few or no restrictions if no indication of significant risk or seismic events

**Yellow light** – increased monitoring and possible reduction in injection rates if seismic events above certain magnitude occur

**Red light** – stop injections if seismic events of significant magnitude occur

# Seismicity Regulations
# Aimed at Hydraulic Fracturing

- California
- Oklahoma

# Regulations Relating to Hydraulic Fracturing

# California

- Operators of wells being hydraulically fractured must monitor California Integrated Seismic Network during fracturing and for ten days afterward. 14 Cal. Code Regs. § 1785.1

- Must halt fracturing if there is a seismic event 2.7 $M_L$ or larger within radius of 5 times "ADSA." 14 Cal. Code Regs. § 1785.1

- ADSA = max. length of fractured area. 14 Cal. Code Regs. § 1781.

# Oklahoma

Corporation Comm' has adopted seismicity protocol that requires operators engaged in hydraulic fracturing in certain areas to

- Develop a seismicity response plan prior to fracing
- Use seismic array to monitor seismic activity in a 5 km area around wellbore
- Implement seismicity response plan if it detects earthquake greater than 2.0 $M_L$

# Regulations Relating to Injection Disposal

# Seismicity Regulations Aimed at Disposal Wells

Regulations require one or more of

- Shutdown of certain wells or reduction in injection rates
- Permit applications to include info. on seismicity and/or faults
- Monitoring of seismic activity
- Increased monitoring and reporting of injection pressures/rates

# Arkansas –Ark. Admin. Code 178.001-H-1(s)

Generally prohibits Class II disposal wells within

- "Moratorium Zone" defined in regulation
- 1 mile of a "Regional Fault"
- 5 miles of a known Moratorium Zone Deep Fault
- 5 miles of an existing Class II well disposing in a zone below the Fayetteville Shale
- ½ mile of an existing Class II well disposing in a zone above the Fayetteville Shale

# Arkansas

- In addition, the regulation generally requires operators of Class II disposal wells to report injection volumes and pressures to the Arkansas Oil & Gas Commission on a daily basis.

  Ark. Admin. Code 178.001-H-1(s)(5)(b)

# Colorado

- Colorado now includes a seismicity review in its evaluation of Class II UIC permit applications for disposal wells
- In some cases, applicants for permits required to use geologic data to
  - define seismicity potential
  - show proximity to faults

# Illinois

- Statute requires state agency to develop “traffic light” regulations for Class II injection disposal wells. 225 Ill. Comp. Stat. 732/1-96.

# 62 Ill. Admin. Code 240.796

- "Yellow Light Alert" issued to all UIC Class II disposal wells within 6 miles of epicenter of seismic event between 2.0 and 4.0 in magnitude.
- Must reduce injection rates if receive 3 Yellow Light Alerts within 1 year.
- Must halt operations if receive 5 Yellow Light Alerts within 1 year.

# 62 Ill. Admin. Code 240.796

- "Red Light Alert" issued to all UIC Class II disposal wells within 10 miles of epicenter of seismic event ≥ 4.0 in magnitude.
- Must halt operations if receive Red Light Alert and well is within 6 miles of epicenter.

# Kansas

- In 2014, Governor Brownback creates task force to develop “State Action Plan” regarding seismicity.
- Final draft of State Action Plan issued in January 2015.
- March 2015—Kansas Corporation Comm’n issues order that appears to be based in part on State Action Plan.

# Kansas—the 2015 Order

- The 2015 order reduced maximum allow injection rates into Arbuckle formation in certain areas.

- Required operators of injection disposal wells in certain area to measure daily injection volumes and pressures and to report those to the Corporation Commission each month.

# Kansas—the 2016 Order

- In 2016, the Corporation Commission issued an order further reducing the maximum allowable injection rates in certain areas.

# Ohio

Ohio Admin. Code 1501:9-3-06 provides that, as part of permit application for a Class II disposal well, the Div. of Oil & Gas Resources may require

- testing and geological investigation to assist in identifying faults in area near proposed well
- submittal of plan for monitoring seismicity

# Ohio

Ohio Admin. Code 1501:9-3-07 requires

- Daily monitoring of injection volumes and pressures
- Compilation of average and maximum injection volumes and pressures monthly, with annual reporting

# Oklahoma

- Corporation Comm'n now considers seismicity issues when reviewing Class II disposal well permit applications.
- In some areas, more frequent recordation of injection pressure and volumes is required.
- Comm'n has focused on Class II wells that inject into or below Arbuckle formation (which lies just above basement rock).
- Comm'n has ordered numerous injection disposal wells to shutdown or reduce their injection rates.

# 16 Tex. Admin. Code § 3.9 and 3.46

- New Class II disposal well permit applications must include seismic information from USGS database for a 100 square mile area (5.64 mile radius) around proposed well.
- Texas Railroad Commission staff may require permit applicants to submit information not normally required, such as logs, geological cross sections, pressure front calculations, structure maps

# 16 Tex. Admin. Code §§ 3.9 and 3.46

- RRC staff has authority to modify, suspend, or terminate permit if data shows well is likely inducing seismicity.
- Comm'n may require operators to report injection volumes/pressure more often than annual (the usual requirement).

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