EPA Actions on Induced Seismicity

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Induced Seismicity Presentation

- EPA’s Authority
- Our History of Involvement
- EPA National Technical Workgroup
- Summary Points
EPA’s Authority
Safe Drinking Water Act

- Authorizes the Federal Underground Injection Control (UIC) program
- Requires protection of Underground Sources of Drinking Water
- Requires development of UIC regulations
- Establishes options for state UIC program delegation
UIC Injection Well Classes

I. Industrial or municipal deep wells
   o Non-hazardous & hazardous
II. Oil and gas related deep wells
III. In-situ mining wells
IV. Shallow hazardous waste wells (banned)
V. Wells not included in Classes I-IV
   o Geothermal, experimental, and other wells
VI. Geosequestration wells
UIC Seismicity Related Regulations

- Siting & testing requirements
  - Class I Hazardous
  - Class VI Geosequestration
- All classes: Director discretion
- Class V Geothermal – no specific rules
  - DOE guidelines in-progress
EPA’s History of Involvement

Earthquake Hazard Associated With Deep Well Injection—A Report to the U.S. Environmental Protection Agency

U.S. GEOLOGICAL SURVEY BULLETIN 1951

Where it all began: Earthquakes & Shale Plays

[Map showing earthquake locations and associated regions]
EPA Involvement – Induced Seismicity

- 1990 USGS report in cooperation with EPA
- Tracking seismicity events & State responses
  - North Texas & Arkansas
- Response to citizen complaints
- EPA/ORD National Hydraulic Fracturing (HF) Study excludes seismicity
  - HF generally yields microseismicity; -2 to +1 mag.
- Established project under national workgroup
UIC NATIONAL TECHNICAL WORKGROUP PROJECT TOPIC: #2011-3

Technical Recommendations to Address the Risk of Class II Disposal Induced Seismicity

Background
Recent reports of injection-induced seismicity have served as a reminder that the UIC Program can and should implement requirements to protect against significant seismic events that could ultimately result in USDW contamination. The UIC Program’s Class I hazardous and Class VI siting provisions require rigorous evaluations for seismicity risks. The other well classes, in contrast, allow the UIC Director the flexibility to decide if and when such evaluations are needed. In light of the recent earthquake events in Arkansas and Texas, the UIC National Technical Workgroup (NTW) will develop technical recommendations to inform and enhance strategies for avoiding significant seismicity events related to Class II disposal wells.

Project Objectives
The UIC NTW will analyze existing technical reports, data and other relevant information on case studies, site characterization and reservoir behavior to answer the following questions:
EPA Induced Seismicity Workgroup

- Task: Develop technical options to assist regulators in managing seismic risks
  - Timeframe: June to December 2011
  - Region 6 assigned lead
  - Workgroup representatives from EPA HQ, various EPA Regional offices and State agencies
EPA Induced Seismicity Workgroup

- Final product by end of 2011
- Limited to Class II disposal wells
- Established six part strategy
Seismicity Workgroup Strategy

1) Literature review
2) Three case studies
   • North Texas; Central Arkansas; & Braxton Co., West Virginia
   • Engage researchers
   • Request specific information from operators
3) Explore reservoir engineering approaches
   • Industry & regulatory experience
   • Pressure transient test analysis
   • Operational injection data evaluation
Log-Log Plot of a Disposal Well Exhibiting Radial Flow

Unit slope during wellbore storage period

Transition period

Derivative flattens during radial flow period
Falloff Test from Suspect DFW Area Disposal Well

Half slope trend on pressure and derivative representative of linear flow due to a fracture

Flat linear derivative indicating linear flow

Derivative decline indicating pressure support
Seismicity Workgroup Strategy

4) Partner with USGS seismologists
5) Develop decision tree
   • Practical application
   • Investigate potential regulatory tools
   • Provide rational approach with options
6) Solicit peer review
UIC Seismicity Summary

- Existing UIC authority to address risks
- EPA developing a strategy with options for UIC programs to manage seismic risks
  - Risk assessment of seismic events
  - Based on actual injection details
  - Coupled with geologic interpretation
- Product based on existing knowledge level
Induced Seismicity Summary Points

Arkansas Moratorium area
Questions?