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Regulatory Approach to Induced Seismicity

Dr. Todd Shipman

Alberta Energy Regulator

Abstract

Induced seismicity is a relatively new hazard which has been a challenge to regulate, due to the lack of scientific knowledge on the matter and heterogenic nature of the subsurface hazard. Regulators have taken an outcome based regulatory approach, which points to the outcome required by the regulator and doesn't prescribe the solution for that outcome. Mitigation of induced seismicity is a "toolbox" not a recipe, which inhibits a prescriptive approach. Prescriptive approaches to regulation often follow a "best practices" definition, which has taken all understanding of the hazard and risk to formulate it into a best practices document. Induced seismicity is currently an "emerging practice", which will still require more experience and knowledge to achieve a prescriptive approach. Most regulatory approaches are outcome based that follow a traffic lights with thresholds of seismic loading tolerances.

Traffic lights (TL), work as you would expect, as a threshold-based system that requires actions at each threshold. Thresholds are chosen with respect to the tolerance for risk for a given area, this is based on the surface and subsurface. This approach allows for the opportunity to mitigate, which is represented by the yellow phase of the TL. Yellow phase points to the toolbox of mitigation to prevent a Red phase, which has one outcome of shutting down the operation due to it exceeding the tolerance agreed upon before operations. The most important phase of a TL is the yellow and where operators have the greatest opportunity to affect the outcome. The best mitigatory steps would occur at the development stage and require subsurface knowledge that could identify hazards to avoid, if possible, a pre-hazard assessment. In summary the current approach for regulating induced seismicity in Alberta is an outcome based that requires traffic lights and pre-hazard assessments.

A key example for how regulatory intervention is successful is Subsurface Order No. 2. Several large earthquakes occurred in Dec 2014 and Jan 2015, which then led to the development of Subsurface Order No. 2. Subsurface Orders were selected since hydraulic fracturing doesn't require approval beyond the well approval. Subsurface Order No. 2 was invoked Feb 2015 and has experienced two "red light" events. Operators collaborated and shared practices through working groups, which developed a keen understanding in mitigation. Analytics show that since 2015 we have seen an increase in hydraulic fracturing operations and a steady decrease in earthquakes in the region. This represents a good example of regulatory outcome through supporting collaboration of industry to achieve outcomes that support safe resource extraction.



Biography



Todd Shipman has a Master in Geology from Northern Arizona University 1999 and a PhD from the University of Arizona in Geoscience 2004. Todd worked at the Arizona Geological Survey until 2009, where he developed the first earth fissure monitoring program for the State of Arizona. In 2010 Todd started work at the Alberta Geological Survey, where he became manager of the Landscapes and Geohazards Group. Todd Shipman was one of the authors of Subsurface Order #2 and currently Senior Advisor for Induced Seismicity for AER.

