

# PROJECT FACT SHEET

## INDUCED SEISMICITY WORKING GROUP

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### ***Induced Seismicity by Injection Associated with Oil & Gas Development: A Primer on Technical & Regulatory Considerations Informing Risk Management and Mitigation***

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#### **Purpose and Scope**

In most states, the jurisdiction for managing the risks associated with induced seismicity related to oil and gas activities rests with a state oil and gas division, board or commission. Recently, the frequency of seismic events that appear linked to underground injection of fluids has increased. Some of these events are occurring in more populated areas that have not previously experienced noticeable seismic activity. Consequently, these events have led to an increased level of public concern and a heightened need for a document that can provide regulatory agencies with a list of the considerations for identifying the likelihood of injection induced seismicity and the tools available for mitigating these events.

The Primer will provide regulatory agencies with a guide to the causes and effects of induced seismic events. It will also detail the data needs, management tools and public information protocols available to conduct an evaluation of induced seismicity risk, develop strategies for managing and mitigating associated risks and provide information to the public in a transparent and effective manner. Although the Primer includes case studies, it must be stressed that no two situations are comparable and the case studies are included only to provide a sense of the breadth of responses to induced seismic events and not to offer a particular methodology for handling a specific event.

The principal focus of this document is the underground disposal of oilfield-produced fluids, including flowback fluids. Although other activities such as hydraulic fracturing and enhanced oil and gas recovery may pose some possibility of inducing felt seismic events, these appear to be much less likely than those resulting from the underground disposal of fluids.[1] Therefore, while information concerning these activities is included in this document, they are covered in less detail than underground disposal reflecting their lower overall risk.

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The **Induced Seismicity Working Group** is a collaborative effort of state oil and natural gas agency members and other advisory experts including industry and academia representatives to share science, research and practical experience that will equip the states with the best decision making tools to evaluate the possible connections between seismic events and injection wells, minimize risk, and enhance appropriate readiness when seismic events occur.

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[1] “Induced Seismicity Potential in Energy Technologies”, National Academy of Sciences, 2013 263 pp.

### Induced Seismicity Working Group (ISWG) members include:

- Representatives of state regulatory agency
- Representatives of state geological surveys

### Thirteen ISWG States:

AK	Steve Masterman, Alaska State Geologist and Director of Geological and Geophysical Survey
AR	Larry Bengal - Director, Arkansas Oil & Gas Commission Scott Ausbrooks – Geohazard Geologist, Arkansas Oil & Gas Commission
CA	Mark Nechodom – California Department of Conservation John Parrish – California Geological Survey
CO	Bob Koehler – Colorado Oil and Gas Conservation Commission Matt Lepore – Director, Colorado Oil and Gas Conservation Commission
OH	Rick Simmers – Chief, Ohio Dept. of Natural Resources, Div. Oil & Gas Resources Management Bob Worstall – Deputy Chief, Ohio Dept. of Natural Resources, Div. Oil & Gas Resources Management
OK	Tim Baker – Manager Pollution Abatement, Oklahoma Corporation Commission, Oil & Gas Division Austin Holland – Oklahoma Geological Survey - University of Oklahoma
IL	Richard Berg - Chief Scientist, IL Geologic Survey Robert Bauer - IL Geologic Survey
IN	Herschel McDivitt – Indiana Division of Oil and Gas John Rupp – Indiana Geological Survey
KS	Ryan Hoffman – Director, Kansas Corporation Commission, Oil & Gas Division Rex Buchanan – Interim Director, Kansas Geological Survey
TX	Leslie Savage – Chief Geologist, Texas Railroad Commission Craig Pearson – Seismologist, Texas Railroad Commission
UT	Jon Baza – Director, Utah Department of Natural Resources John Rogers – Utah Department of Natural resources
WV	Jason Harmon – Deputy Chief, West Virginia DEP Office of Oil & Gas Zac Stevison – West Virginia Department of Environmental Protection
WY	Mark Thiesse - Groundwater Section Manager, Wyoming Department of Environmental Quality

### Working Group Co-Chairs:

**Rick Simmers** – Chief, Ohio Department of Natural Resources (**Ben Grunewald**, GWPC Staff support)

**Rex Buchanan** – Interim Director, Kansas Geological Survey

### ISWG Initial Areas of Focus and Editorial Committee:

**Traffic Light:** Review of the traffic light decision approach

**Tim Baker** -OK, **Ed Steele** -GE Global Research Oil & Gas Technology Center  
(**Mike Nickolaus**, GWPC Staff support)

**Data Sharing:** Review of the concept of establishing information sharing data

**Rex Buchanan** -KS and **Kris Nygaard** – ExxonMobil  
(**Steve Music**, GWPC Staff support)

**Seismic Monitoring:** Review of the concept surface motion (or ground movement) rather than (or in addition to) magnitude as a measurement that would lead to more appropriate communication to the public as well a more appropriate measurement for decisions

**Leslie Savage** and **Craig Pearson** -TX, **Hal Macartney**- Pioneer  
(**Joe Lee**, GWPC Staff support)

**Ground Motion:** Review of the issues regarding seismic monitoring

**Herschel McDivitt** -IN & **Ivan Wong** –URS,  
(**Gerry Baker**, IOGCC Staff support)

Induced Seismicity Working Group (ISWG) Advisors Include:

Federal

US Environmental Protection Agency  
US Department of Energy  
US Geological Survey

Environmental

Environmental Defense Fund

Industry

ExxonMobil / XTO  
Devon Energy  
Pioneer Natural Resources  
Pinnacle  
Hess  
Hilcorp  
AltaRock (geothermal)  
ALL Consulting  
PDC Energy  
SpectraSeis  
Continental Resources  
Itasca Microseismic & Geomechanical Evaluation  
SandRidge Energy  
American Petroleum Institute  
Chevron  
Shell  
Rex Energy  
American Natural Gas Alliance  
Veil Environmental  
Seismic Hazards Group URS Corporation  
Anadarko

Universities & Research

University of Southern California  
Stanford  
University of Texas  
Southern Methodist University  
General Electric Global Research  
National Energy Technical Laboratory  
Lawrence Berkeley Laboratory  
Hull Risk Analysis Center  
Underground Injection Technology Council

Support

Ground Water Protection Council  
Interstate Oil & Gas Compact Commission  
Ground Water Research & Education Foundation

The Induced Seismicity Primer is being developed by the States First Induced Seismicity Workgroup (ISWG) members, with input and support from the ISWG technical advisors, to help inform all stakeholders and the broad public on technical and regulatory considerations associated with traffic light systems, monitoring systems, information sharing, and the use of ground shaking metric.

It is also intended to summarize the range of approaches that have been used, or are currently being used, in many areas to manage and mitigate the risks associated with seismicity that may be induced by injection.

The Induced Seismicity Primer will be an informational document, and is not intended to offer recommended rules or regulations. The ISWG recognizes that management and mitigation of induced seismicity is best considered at the local / regional levels due to the significant variability in local geology and surface conditions (e.g., population density, building conditions, infrastructure, critical facilities, monitoring capabilities, etc.).



*States First is a state led initiative aimed at facilitating multi-state collaboration and innovative regulatory solutions for oil and natural gas producing states. The States First is a joint venture of the Interstate Oil & Gas Compact Commission and the Ground Water Protection Council. Through States First programs, state regulatory agencies are collaborating and communicating with one another in an ongoing effort to keep current with rapidly changing technology, as well as to share the very best and most innovative regulatory procedures from state to state.*

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