UNIVERSITY OF CALGARY | SAIT

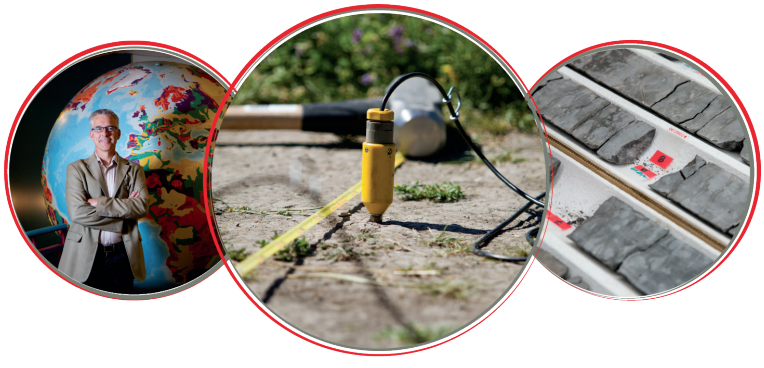
# Global Research Initiative in Sustainable Low Carbon Unconventional Resources

## Transforming energy research to fuel a clean energy future.

The Global Research Initiative in Sustainable Low Carbon Unconventional Resources (GRI) is a major vehicle to translate lab-based technology innovations into field-deployable solutions. Focused on collaborative research between the world-class innovators from the University of Calgary and international partners, GRI creates a network of global hubs for discovery, creativity and innovation in unconventional energy research.

Originating from the $75 million Canada First Research Excellence Fund (CFREF) awarded to the University of Calgary in 2016, GRI has made huge progress in generating clean-tech solutions by seeking new, innovative unconventional energy systems that are low or zero carbon.

## Theme 2: Tight Oil and Gas



Tight Oil and Gas is one of three pillars of energy research in GRI. The overall goal is to improve completion efficiency while reducing the environmental footprint, including improving ground water quality and reducing fugitive emissions into the air. This will be achieved through the mitigation of induced seismicity, enhancing recovery rates and improving hydraulic fracture design.

**26** research projects

**26** GRI faculty members involved

**49** student opportunities created

**41** postdoctoral fellows recruited

**42** new jobs created

**16** Corporate Collaborators

**24** awards received by GRI researchers

**276** CFREF supported proceedings & publications

## Projects

- Can we mitigate and manage induced seismicity?
- Fracture surveillance (Sustainable Hydrocarbon Recovery from Low Permeability Reservoirs)
- How to accurately assess and subsequently reduce environmental impacts of development of low permeability hydrocarbon resources
- A Scalable Mobile Methane Sensing System for Emissions Detection, Quantification, and Reduction
- Fugitive Emissions and their impact on potable water
- Methane Emissions Policy and Regulation in Canada: Assessing Options and Effectiveness
- Distributed Acoustic Sensing Integration
- Analysis of Acoustic Emissions to Investigate the Effects of Fault Roughness
- Duvernay Pilot Hydraulic Fracture Test Site
- Optimising recovery and GHG sequestration
- Novel approaches to data analytics
- Airborne GHG emission detection

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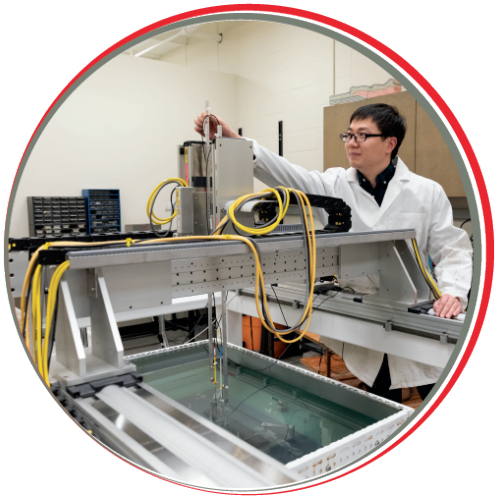
## Tight Oil and Gas

Research on tight oil and gas resources (Theme 2) has built upon well-established industry partnerships to address two grand challenges: imaging and controlling hydraulic fracturing and enabling small-footprint recovery from low-permeability reservoirs. Integrated solutions are focused on a set of big questions: Can we mitigate and manage risks of induced earthquakes? Can we improve hydrocarbon recovery efficiency while reducing resource utilization and sequestering greenhouse gases (GHGs)? How can we assess and reduce environmental impacts?



The induced seismicity team has accelerated commercialization of risk-based software focused on characterizing critical fractures and developing a validated predictive framework calibrated using data analytics. The fracture-surveillance team has deployed the first-ever field prototype for a multicomponent distributed acoustic sensing system and has delivered an industry short course on machine learning in geophysics. Enhanced-recovery research teams have advanced our understanding of adaptive asynchronous $CO_2$ huff-and-puff processes and developed novel optimization strategies for water alternating gas (WAG) processes.

Research teams investigating environmental impacts have collaborated in an injection experiment to quantify the fate of methane in groundwater, developed recommendations for groundwater monitoring, conducted life-cycle assessment for tight oil and gas development and developed a highly competitive scalable mobile methane sensing system for emissions detection, quantification and reduction.

*Theme 2 is led by Prof. David Eaton with support from Research Associate Ashley Krakowka. Other University of Calgary faculty members leading projects under Theme 2 are Prof. Kris Innanen, Prof. Bernhard Mayer, Prof. Chris Hugenholtz, Prof. Jennifer Winter, Prof. Per Pedersen. Prof. Chris Clarkson, Prof. Don Lawton, Prof. Milana Trifkovic, Prof. Jeffrey Priest, Prof. Steven Bryant, Prof. Rachel Lauer, Prof. Kristen van de Biezenbos, and Prof. Benjamin Tutolo, Prof. Cathryn Ryan. Prof. Nancy Chen, Prof. Apostolos Kantzas, and Prof. Rick Tofani from SAIT.*

# Driving Innovation. Fueling Results.

Partner with UCalgary and help us transform energy research to fuel a clean energy future. Get started: ucalgary.ca/gri

CANADA FIRST RESEARCH EXCELLENCE FUND

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