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 1: Heavy Oil and Bitumen

Heavy Oil and Bitumen is one of three pillars of energy research in GRI. The focus of this theme, is to step away from current energy-intensive oilsands recovery processes. We have deployed several technologies to lower bitumen viscosity and reduce interfacial tension. In the coming years, we aim to develop an efficient, low-temperature, recyclable solvent-based oil recovery system.

34 research projects

39 GRI faculty members involved

13 start-up companies

76 new jobs created

95 student opportunities created

76 postdoctoral fellows recruited

51 awards received by GRI researchers

234 CFREF supported proceedings & publications

Projects

- Beyond Steam – Additives to Significantly Improve the Emissions and Energy Intensities of Oil Sands Recovery Processes
- Next Generation Adaptive Wells and Optimal Placement for Improved Recovery
- Asphaltene Deposition Kinetics / Structure
- Molecular Origin of Heavy Oil / Bitumen Viscosity, Asphaltene Self-assembly
- Green Solvents
- Surface tension driven flows
- Phoretic flows at Pore Scale
- Mass Transport and Edge Chamber Effects
- Heavy Oil & Bitumen (HOB) Policy Toolkit
- Interfacial Tension - Relative Permeability
- Technological-Economic-Social-Environmental Reservoir Simulation Toolkit: TESERS Toolkit
- Rheology in enhanced oil recovery
- Solvent-Additive (Nanoparticle/Emulsion) Dynamics and Interactions
- Enzyme enhanced oil recovery
- Carbon recycling in oil sands recovery

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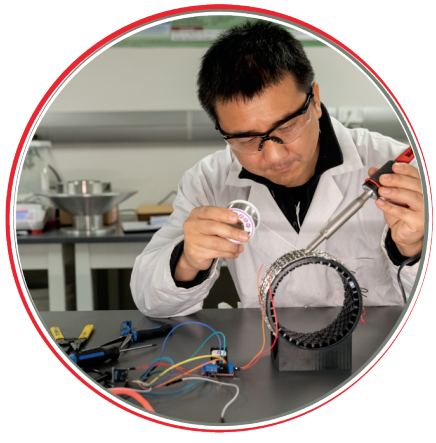
Heavy Oil and Bitumen

Unconventional petroleum resources are typically defined by being of low mobility — either high viscosity oil (e.g. heavy oil or bitumen) or low permeability reservoir rock (e.g. tight oil and gas, shale). The focus in Theme 1, is on systems containing high viscosity heavy oil and bitumen. Typically, heavy oil has viscosities between thousands and a few tens of thousands of centipoise (unit of dynamic viscosity) whereas bitumen has viscosities exceeding one hundred thousand centipoise and often in the millions of centipoise.

There are two requirements that must be met to produce these resources — first, mobilize the oil (lower its viscosity) and second, move the mobilized oil to a production well. At present, for oil sands reservoirs, bitumen mobility is improved by injecting high temperature and pressure steam into the reservoir. This implies high cost and greenhouse gas emissions from these recovery processes.

Research in Theme 1 is focused on improving oil mobility and imaging, and controlling the recovery processes to lower the environmental impact, improve the economics and raise the energy efficiency of these processes. Theme 1 specific targets of the research being conducted are the use of additives with mild heating to improve bitumen mobilization as well as next generation drilling, monitoring and control to improve recovery process performance.



Theme 1 is led by Prof. Ian Gates with support from Research Associate Jingyi (Jacky) Wang. Other University of Calgary faculty members leading projects under Theme 1 are Prof. Roman Shor, Prof. Michelle Dolgos, Prof. Samira Siahrostam, Prof. Hector De la Hoz Siegler, Prof. Giovanniantonio Natale. Prof. Anne Benneker, Prof. Getachew Assefa, Prof. Hossein Hejazi, Prof. Qingye (Gemma) Lu, Prof. Jinguang Hu, and Prof. Md Golam Kibria.

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