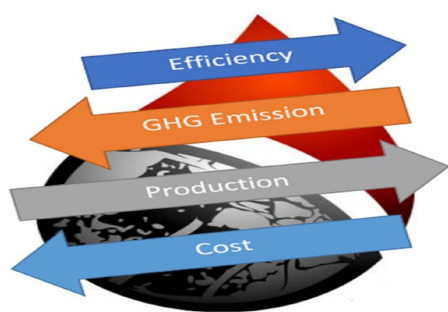


Fundamentals of Unconventional Resources Phase II

Unconventional Resources are defined as heavy oil and bitumen (HOB), as well as tight oil (T). Within this context, the program deals with EOR in these domains under the two streams, HOBEOR and TEOR. Within HOBEOR the program addresses cold production enhancements, chemical EOR and solvent processes, as well as thermal production enhancement. Within TEOR the program addresses fundamental processes such as competitive adsorption and chromatographic separation. The tools used are laboratory and modelling tools for studying multiphase flow in porous media but with emphasis on pore level physics. Identification and modelling of pore level physics also includes pore level modelling (PNM). The objective of the program is to improve recovery factors under reduced environmental footprint and reduced emissions. As such utilization of CO₂ as a displacement and voidage replacement fluid is evaluated whenever possible. A parallel objective is to train highly qualified personnel under a fostering of diverse and inclusive environment. To that effect students and PDFs are working in a collaborative and productive environment.

**RECIPIENT:**

Apostolos Kantzas
UofC

**TOTAL BUDGET:**

\$1,740,000

**PROJECT DATES:**

JUL 2021 –
JUN 2026

**PARTNERS:**

ConocoPhillips
CNRL
Enerplus
Chevron Canada

**AI FUNDING:**

\$200,000

**PROJECT TRL:**

Start: 2
End: 3

APPLICATION

The program develops and/or validates technologies for the environmentally responsible recovery of hydrocarbons such as heavy oil, bitumen and tight oil. Cyclic processes (such as cyclic solvent injection), cold processes (such as foam injection, solvent injection, and nanofluid injection) and thermal improvement processes are continuously evaluated. There are also possibilities for immediate field testing via pilot projects that are evaluated by the sponsors. The highest probability for a field trial currently lies with solvent testing with two possible locations being considered.



ALBERTA INNOVATES CLEAN ENERGY

ADVANCED HYDROCARBONS

CLEANER HYDROCARBON PRODUCTION

PROJECT GOALS

- Provide solutions for extending the life of thermal operations through NCG injection and steam foams.
- Identify new mass transfer mechanisms for heavy oil and bitumen processes.
- Develop a reliable and reproducible way to extract relative permeability data for heavy oil and bitumen displacements, in particular thermal displacements.
- Understand NCG and bottom water effects on bitumen recovery.
- Understand how emulsions promote recovery of heavy oil.
- Understand transport phenomena in tight porous media to prolong the life of tight oil reservoirs.
- Determine petrophysical properties of tight media for incorporation into EOR predictions.
- Develop novel recovery methods for TEOR.
- Evaluate competitive adsorption as a mechanism for TEOR.

BENEFITS TO ALBERTA

- Alberta provides a safe, reliable, secure source of energy for the global community.
- The value of this program for Albertans is training HQP in areas that have been identified by industry as necessary skills.
- The industry partners are working with the team and are seeking results specific to their industry need. The students are working on those needs, building skills in how to understand the industry need.
- The decline of traditional sources creates an energy source gap that can be filled by unconventional and tight oil enhanced oil recovery.
- The reliance on fossil fuels as a primary energy source will continue, even during the aggressive deployment of renewable energy sources.



74 Publications



**26 Students
Trained**



11 Patents



7 Project Jobs



16 Future Jobs



**3 New
Products/Services**

CURRENT STATUS

JUL 2025

The program is entering the last year of this phase. Project has developed a solver model for CSI or Solvent processes. A novel sensor for multiphase metering is being developed. A new software package for pore level modelling is being created which could be used to optimize the non-condensable gas injection for bitumen recovery. Other activities like emulsion characterizations, mass transfer improvements are also nearing completion. Projects results are available to partners. A meeting has been set up with operators /sponsors to obtain support for piloting the developed technologies in this project.