

## CLIMATE CHANGE INNOVATION AND TECHNOLOGY FRAMEWORK

### Awardee Summary

<b>CCITF PROGRAM</b>	Clean Technology Development
<b>PROJECT TITLE</b>	Geothermal Power from co-produced fluids and hydrocarbon reservoirs throughout the Western Canadian Sedimentary Basin
<b>SECTOR</b>	Low Carbon Electricity Waste to Value-Added
<b>ORGANIZATION</b>	University of Alberta, Earth and Atmospheric Sciences
<b>PROJECT LEAD</b>	Jonathan Banks
<b>AI PROJECT ADVISOR</b>	Maureen Kolla
<b>GRANT AMOUNT</b>	\$950,000
<b>START DATE</b>	11/1/2018
<b>END DATE</b>	3/31/2021

**PROJECT OBJECTIVE:** To produce a comprehensive assessment of geothermal co-production opportunities throughout Alberta, and to build a database of all co-produced fluid geothermal opportunities in the province, classifying and modeling opportunities according to stratigraphic, thermodynamic, hydrogeological and geochemical information.

**PROJECT PROFILE:** Co-produced fluids in Alberta transport peta-joules of thermal energy (heat) to the Earth's surface every year. Geothermal power may be generated from these co-produced fluids, thereby diversifying the income stream and reducing the environmental footprint of hydrocarbon producers in the province. The concept of using co-produced fluids to harness Alberta's geothermal potential is well-known to academics, government officials and industry players alike. Yet, Albertans still have not installed any geothermal capacity in the field. Economic and regulatory issues notwithstanding, the fundamental challenges associated with the establishment and growth of a local geothermal industry are technical unknowns.

This project will produce a comprehensive assessment of geothermal co-production opportunities throughout Alberta. We will work directly with Razor Energy to design and install a pilot well-head waste heat recovery system in their South Swan Hills asset that will test the heat exchange efficiency of a three-phase (brine, oil and gas) flow, as well as develop mitigation strategies for geochemical and geomechanical risks associated with geothermal co-production in an active hydrocarbon field. Results from this field pilot will be used to help Razor plan a 10+ MWe scale-up and will be a key element in evaluating and validating models of the province-wide scope of this unique opportunity.

Concurrently, we will also partner with the Alberta Geological Survey (AGS) to build a database of all co-produced fluid geothermal opportunities in the province, classifying and modeling opportunities according

to stratigraphic, thermodynamic, hydrogeological and geochemical information. This database builds on work done previously in CanGEA's Well Filtration study in terms of its scope, degree of geotechnical detail, and economic evaluation. Similarly building on the University of Alberta's Deep Dive analysis, which focused on green-field power opportunities near populations centers, this work will quantify the co-produced geothermal power potential available to hydrocarbon producers as carbon offset and behind the fence generation.

The purpose of this project is to take the concept of using co-produced fluids from the computer, through the laboratory, and into the field. We will use a combination of computational methods, laboratory experiments, pilot-scale field tests, and economic assessments to de-risk geothermal co-production opportunities, province-wide. Our research group has one-of-kind capabilities in Canada and will position UAlberta as a global leader in low-enthalpy and enhanced geothermal systems research. Experiments in this project will be performed to determine the hydrodynamic properties of geothermal fluids, test the responses of reservoir rocks to non-isothermal flow, and predict the geochemical hazards associated with various co-produced fluid geothermal scenarios. Results from this project's experiments will allow the many models of Albertan geothermal systems to be validated with empirical evidence and will significantly reduce the technical uncertainty of deploying geothermal power on a commercial scale.

#### **GHG EMISSION REDUCTION SUMMARY:**