



UNIVERSITY OF
CALGARY

**Geothermal Energy Laboratory
Department of Chemical and Petroleum Engineering**

Calgary Geothermal and UNWASTE Workshop

‘Geothermal Anywhere’ and recovering wasted resources

May 18, 2022

University of Calgary | Zoom

Registration:

<https://www.eventbrite.ca/e/calgary-geothermal-and-unwaste-workshop-tickets-325189068257>

ucalgary.ca/labs/geothermal/annual-meeting

Welcome

In 2021, the University of Calgary formally launched the **Geothermal Energy Laboratory** to help achieve the vision of '**Geothermal Anywhere**'. The morning's agenda will include some technical updates on work being conducted by researchers in the lab followed by a discussion of new research directions and opportunities.

In the afternoon, we are excited to launch the **UNWASTE** initiative. Thermal heat recovery is one of these – significant amounts of heat are vented to the atmosphere through heat exchangers and venting, which presents an opportunity to capture and use some of this heat. Similarly, manufacturing processes generate waste, produced fluids are reinjected into disposal wells and tailings ponds are subject to remediation rather than resource harvesting. UNWASTE proposes to extract value from these waste streams of energy and resources.

The workshop will be chaired by **Dr. Roman J. Shor** and **Dr. Apostolos Kantzas**, co-leads of the Geothermal Energy Laboratory and members of the Department of Chemical and Petroleum Engineering at the University of Calgary.



Dr. Apostolos Kantzas is a professor in the Department of Chemical and Petroleum Engineering at the University of Calgary and held a Canada Research Chair (CRC) in Energy and Imaging and is currently an Industrial Research Chair (IRC) in Fundamentals of Unconventional Resources. Dr. Kantzas has extensive experience with transport phenomena in porous media.



Dr. Roman J. Shor is an associate professor and associate head for undergraduate studies in the Department of Chemical and Petroleum Engineering and works primarily on modelling and control strategies for drilling systems, on integration of exploration, drilling and production workflows and applications of machine learning and artificial intelligence for energy systems.

Schedule

Wednesday, May 18th A.M. – Geothermal Technical Update

8 a.m.	Breakfast & Coffee	
8:30 a.m.	Opening Remarks	Roman Shor
9:00 a.m.	Geothermal Technical Program	
10:00 a.m.	Coffee Break	
10:30 a.m.	New Geothermal Projects	Roman Shor & Apostolos Kantzas
11:30 a.m.	Lunch	2 nd Floor ICT

Wednesday, May 18th P.M. – Launch of UNWASTE

12:30 p.m.	Introduction of the UNWASTE Initiative	Apostolos Kantzas
1:00 p.m.	Technical Program	
2:00 p.m.	Far Fetched Ideas	
2:30 p.m.	Coffee Break	
3:00 p.m.	Group Discussions: what is UNWASTE? <ol style="list-style-type: none"> 1. Heat Harvesting 2. Mineral Extraction 3. Water valorization 	
4:15 p.m.	Review and Next Steps	
5:00 p.m.	(Virtual) Energy Beers	The Den

Session Information

Geothermal Technical Program

May 18, 2022 | 9:00 a.m. – 10:00 a.m. | ICT 2nd Floor | Zoom

Presentation of selected published work from the Geothermal Energy Laboratory from the past two months focusing on well construction, thermal reservoir characterization and a first feasibility study of open-loop geothermal for the University of Calgary campus.

9:00 a.m. – 9:15 a.m.	Performance Optimization for Rotary Percussive Drilling Presented at the 2022 Stanford Geothermal Workshop and the 2022 ARMA Conference
9:15 a.m. – 9:30 a.m.	Digital Twinning of a Drilling Rig Presented at the 2022 European Geothermal Conference
9:30 a.m. – 9:45 a.m.	Characterization of Thermal Conductivity in Reservoirs Presented at the 2021 SPE Geothermal Workshop
9:45 a.m. – 10:00 a.m.	Geothermal for the University of Calgary Campus 2021-2022 Multidisciplinary Capstone Design Project

New Project Proposals in Geothermal Energy

May 18, 2022 | 10:30 a.m. – 11:30 a.m. | ICT 2nd Floor | Zoom

Expanding on the existing research projects in the Geothermal Energy Lab, two new research projects are proposed:

1. **Materials and corrosion for high temperature and high pressure applications.** Building upon strengths at the University of Calgary in pipeline engineering, a new project is proposed to address challenges in materials design for open-loop and closed-loop geothermal systems.
2. **Thermal reservoir management.** Once geothermal systems are deployed, long term management of the thermal reservoir is necessary for long term thermal production, particularly in scenarios where energy production is not considered as baseload.
3. **Minerals extraction from reservoir brines.** Low cost and scalable solutions for mineral extraction for Lithium, Magnesium or Nickel, especially as a modular bolt-on solution can provide significant economic benefit.

UNWASTE Technical Program

May 18, 2022 | 1:00 p.m. – 2:00 p.m. | ICT 2nd Floor | Zoom

1:00 p.m. – 1:10 p.m.	Heat Harvesting Systems
1:00 p.m. – 1:10 p.m.	Electrokinetic Techniques for Mineral Extraction
1:10 p.m. – 1:20 p.m.	Electrochemical for Mineral Extraction
1:20 p.m. – 1:30 p.m.	Circular Economy
1:30 p.m. – 1:40 p.m.	Electrification in the Chemical Industry
1:40 p.m. – 1:50 p.m.	Monetizing CO₂

Far Fetched Ideas

May 18, 2022 | 2:00 p.m. – 2:30 p.m. | ICT 2nd Floor | Zoom

What if we used a reservoir as a giant CO₂ filter? Could we use ocean pressure as a method to separate CO₂? Can buildings be designed to capture CO₂? The following ideas will be pitched, and new ideas may be developed:

1. **Reservoir as a CO₂ filter.** Imagine a system where a modular system can be installed at the surface of a natural gas well which includes a heat recovery system and a small gas turbine. Flue gas may be directly injected into an injection well for (1) reservoir pressure management and (2) flue gas storage where CO₂ displaces methane. This system can be connected to the grid, to an EV charging station or to a micro server farm for distributed computing.
2. **Ocean based CO₂ separation.** CO₂ changes phase and becomes a dense fluid at 10 MPa. Can a buoyancy based system be developed to store energy by sinking 'bags' of air to the sea floor, capturing condensing CO₂ and then generating power as the bag rises back to the surface.
3. **Atmospheric Filtering in the built environment.** Can building envelopes be developed to clean urban air and capture pollutants or carbon?

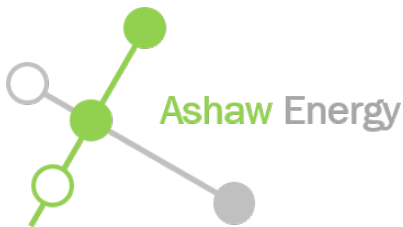
Sponsors

The Geothermal Energy Laboratory would like to thank our industrial and governmental sponsors for their financial support.

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