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Adventures in Pore Space: Shared Reservoirs in New Energy
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Educating Current and Future Generations on the Opportunities - and Challenges - of Shared Pore Space Development

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Abstract

Leveraging subsurface 'clean energy pathways' (such as geothermal energy, hydrogen storage and production, critical element production – such as lithium - and geological sequestration of CO_2) is critical for transforming global energy systems. In the Western Canadian Sedimentary Basin, there are numerous examples where multiple clean energy pathways exist in the same geological system (i.e., utilize the same storage reservoir pore space and caprock system) which could be accessed and utilized simultaneously. One such example includes use of the Leduc reef system (Alberta) pore space for CO_2 storage, geothermal energy, and critical element (lithium) production. Multiple uses of these shared pore spaces has practical implications for achieving the energy transition. However, significant technical, policy, and regulatory challenges are present when the pathways compete for the same pore space; increased demand and competition presents, at the same time, elevated risks for litigation that prevents more widespread and effective use of these resources. To further advance Canada's ambitions for a low-carbon future, a transdisciplinary approach to the co-development of subsurface clean energy pathways is required. Post-secondary institutions must therefore offer educational programs that reflect the increasingly diverse challenges of clean energy development in order to train the current and future generations charged with shaping Canada's energy future.

In the Department of Earth, Energy, and Environment (formerly Department of Geoscience) at the University of Calgary, exciting new transdisciplinary educational platforms are being developed to support the energy transition. For example, a new micro-credential program titled "Subsurface Evaluation for Clean Energy", offered to hydrocarbon industry professionals and graduate students, has been established in collaboration with industry and academic subject matter experts, with financial support from the Government of Alberta. The primary goal of this new program, offered through the University of Calgary's Continuing Education department, is to demonstrate how petroleum geoscientists and engineers can apply their skills to the evaluation of the aforementioned clean energy pathways, while increasing awareness of the non-technical challenges to their development. The Department is also exploring the creation of new undergraduate programing to equip science students with the skills and knowledge to contribute to the growing field of energy science. Indigenous knowledge systems are also being considered, grounded in an understanding of the lived experience of Indigenous Peoples. The vision for this programming encompasses energy production, storage, transportation and end use, to ensure that future students are trained to describe sustainable and affordable energy systems and the choices made surrounding their use in supporting society.

Biographies

Dr. Sara Hastings-Simon is an associate professor in the department of Earth, Energy and Environment, and School of Public Policy at the University of Calgary where she directs the Masters of Science in Sustainable Energy Development. She is a macro energy system researcher and her work is focused on understanding how low-carbon energy transitions happen within different sectors of the economy, and how policy responses can improve outcomes. Sara is also co-founder and co-host of Energy vs Climate a webinar and podcast that explores the energy transition in Alberta, Canada, and beyond. She is the chair of the panel for Clean Growth with the Canadian Climate Choices Institute and a member of the board of directors of Emissions Reduction Alberta and the Pembina Institute.

Her previous roles include Director of Clean Economy at the Pembina Institute, founder of Business Renewable Centre Canada, and practice manager for Clean Technologies at McKinsey & Company. Dr. Hastings-Simon holds a PhD in physics from the University of Geneva.

Professor David Eaton is a seismologist in the Department of Geoscience at the University of Calgary. He has received international recognition for his research on induced (human-caused) earthquakes and the lithosphere-asthenosphere boundary (base of tectonic plates) beneath continents. He has served as President of the Canadian Geophysical Union and the Eastern Section of the Seismological Society of America. Together with graduate students and postdoctoral fellows, his work focuses primarily on advancement of research, education and technological innovations in microseismic methods and their practical applications for resource development. In 2007, he rejoined the University of Calgary as Head of the Department of Geoscience, after an 11-year academic career at the University of Western Ontario. His postdoctoral research experience included work at Arco's Research and Technical Services (Plano, Texas) and the Geological Survey of Canada (Ottawa). In 2018, he published a textbook on Passive Seismic Monitoring of Induced Seismicity. His work has been recognized by the 2020 J. Tuzo Wilson medal from the Canadian Geophysical Union, a Killam Annual Professorship and a 2019 NSERC Synergy Award for Innovation.

Christopher R. Clarkson is a professor and the Ovintiv/Shell Chair in Unconventional Gas and Light Oil research in the Department of Earth, Energy, and Environment (formerly Geoscience), and an adjunct professor with the Department of Chemical and Petroleum Engineering at the University of Calgary. His work focus in the industry was on exploration for, and development of, unconventional gas (UG) and light oil (ULO) reservoirs. His research focus, since coming to the University of Calgary in 2009, has been on advanced reservoir characterization methods for UG-ULO, such as rate- and pressure-transient analysis, flowback analysis, DFIT analysis, and reservoir sample analysis. He is also interested in the application of these advanced reservoir characterization methods to the evaluation of transitional and clean energy pathways using the subsurface, such as carbon capture and storage (CCS), hydrogen storage and geothermal energy. Clarkson currently leads an industry-sponsored consortium called "Tight Oil Consortium," focused on these research topics for unconventional light oil reservoirs, and has recently initiated a consortium called "Transitional Energy Consortium", focused on these topics for transitional energy pathways.