

CLEAN RESOURCES

CLEAN TECHNOLOGY

HYDROGEN

De-Risking Underground Hydrogen Storage Through Deep Biosphere Genomics

Understanding the scientific basis for different underground hydrogen storage options is needed to enable versatile hydrogen hub development. Alberta is ideally suited to capitalize on this opportunity, given the large number of reservoirs and the considerable expertise in subsurface geoscience and engineering throughout the province. Through novel tool development for site feasibility assessment, this project will accelerate this opportunity using deep biosphere genomics to better understand the risk of hydrogen loss through bio-oxidation (consumption via naturally occurring microorganisms). This successful application of DNA sequencing will positively impact investment potential into the scaling of large hydrogen projects.

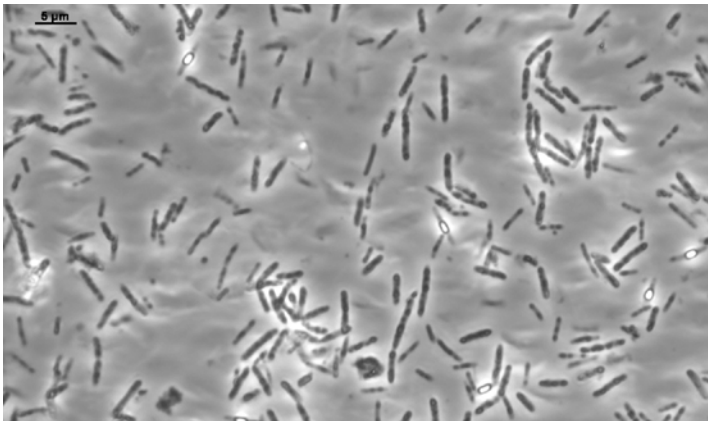


Photo: microscopy showing bacteria from the subsurface

FUNDING DETAILS



RECIPIENT:

University of
Calgary



PARTNERS:

Geogenomics Inc,
Geological Survey of
Canada, Canadian Nuclear
Labs, Monash University,
UC Berkeley, Lawrence
Berkeley National Lab



TOTAL BUDGET:

\$484,000



AI HCOE FUNDING:

\$300,000



PROJECT DATES:

APR 2023 –
JAN 2025



PROJECT TRL:

Start: 4
End: 8

APPLICATION

In Alberta, the target market for subsurface genomics feasibility testing for underground hydrogen storage will include the companies that own the subsurface pore space (caverns or reservoirs) being considered for this purpose. Deep biosphere genomic monitoring over time will be important for operators once in/out hydrogen storage and use ramps up. Losses due to microbial activity (and associated biofouling or souring) are issues that can be monitored and managed using genomic bioassays.



PROJECT GOALS

The key goals of the project are:

- Analyze the subsurface microbiome from relevant candidate storage environments, with a focus on hydrogen metabolism and the taxonomy of hydrogenotrophic microorganisms
- Identify genes from within subsurface microbiomes that are diagnostic for hydrogen oxidation, and link them to microbial taxonomic groups
- Develop molecular bioassays for hydrogenase genes and the organisms that encode them
- Inform microbial control measures for mitigating subsurface hydrogen losses by microbial activity and associated biofouling and reservoir souring

BENEFITS TO ALBERTA

The successful implementation of this technology or use of the knowledge generated could result in:

- Development of a better understanding of underground hydrogen storage options in Alberta, contributing to realization of economic benefits of the hydrogen economy
- Successful technology development in the form of bioassays for hydrogen assessment, paving the way for other applications in tailings management, oil spill clean-up, biocorrosion management, wastewater treatment, and in other sectors needing geo-microbiome management, thereby strengthening Alberta’s offerings globally.



3 Publications



3 Students Trained



1 Patent



2 Project Jobs



10 Future Jobs



3 New Products/Services



2 Spinoff Companies

CURRENT STATUS

FEB 2023

Project kick-off is slated for April 2023, initial work will commence with gene sequencing of select subsurface microorganisms to identify gene sequences related to hydrogen oxidation.