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Zoom Luncheon

Two Critical Conditions Necessary to Achieve Financial Success in CCS Projects

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Summary

Whether you agree or not, the world is increasingly fearful of Climate Change. Governments are looking for many avenues to reduce their country's carbon footprint. Carbon Capture and Sequestration (CCS) have become preferred methods to get to "net zero." The planning and costs for each CCS project are significant regarding capital investment and mitigating uncertainty. This presentation will explore two critical conditions for financial success in developing a CCS project and how geosciences can help mitigate those risks.

The first condition is determining the integrity of the reservoir your company plans to inject the CO2 into. The second condition confirms that you have acquired the pore-space rights to inject into the critical target formation(s) and secured the pore-space rights above and below your injection horizon(s).

Background

Through the Alberta Energy Regulator (AER), the Alberta government has approved 25 submissions through their Request for Full Project Proposals (RFPP) process to develop CCS hubs in Alberta. Alberta has many small Carbon Capture and two extensive CCS facilities, one at Quest near Fort Saskatchewan and the other at the termination of the Alberta Carbon Trunk Line (ACTL), both NE of Edmonton.

Initial Project Stage

In their early stages, CCS projects are characterized based on four specific criteria.

1. Where are the source(s) and daily volumes of CO2?
2. How is the CO2 going to be transported to the injection site?
3. What and where are the target injection horizon(s)?
4. Where will your CCS facility and injection well(s) be placed?

The initial site location for a CCS project needs a clear and well-defined injection reservoir based on reliable and repeatable geological, geophysical, and engineering data. Without careful attention to these disciplines and the technical guidance they can provide, the CCS project is at a high risk of financial failure.

Pore space ownership is the other condition that needs to be secured.

Your surface and subsurface landmen need to be engaged early to secure the pore space for future injection or unforeseen leaks of the CO2 plume.

What is the value of information (VOI) of the geoscience data?

The geology and geophysics disciplines provide the best technical guidance concerning criteria 3. What are the characteristics of the target injection horizons?

1. How continuous is the injection reservoir?
2. What are the injection zone(s) lithologies and possible facies changes?
3. What is the structure and faulting history of the generalized area
4. How competent and continuous is the vertical seal or cap rock?
5. Is there a secondary cap rock? How competent and continuous is this secondary cap rock?
6. How deep is/are the injection horizon(s)?
7. How far from the Precambrian basement is the injection horizon?
8. Is there any history of induced seismicity in the project area?

Scenario One:

Potential CCS site in North Dakota

CCS Project Story:

A government agency in North Dakota, working with an operator, was characterizing three sandstone layers about 1 to 2 miles below the surface to demonstrate their suitability to store CO2 permanently.

The initial modelled reservoir layers were based on well control only

The operator used this data to create the initial plume model

The subsequent reservoir modelling was based on 3D seismic tied to the well control.

The new model indicated that the plume would rise to a structural high where the operator did not own the pore space.

Takeaway:

Integrate the geology and geophysics in your early CCS project stages

Provide your client with injection location options based on their 3D seismic and land holdings.

Scenario Two:

Potential CCS Site in West Central Alberta

CCS Project story:

The operator identified a general area for a CCS injection site

The operator acquired a large trade 3D.

The geoscience staff evaluated the regional, local, and site structural styles

The geoscience staff tied the 3D seismic data to well control

The geoscience staff identified, mapped, and modelled the stratigraphic and facies changes

The project team integrated the seismic reservoir characterization, geology and reservoir engineering data.

The technical team created a reservoir characterization model for the injection horizon and offsetting horizons. This model was evaluated for reservoir continuity, caprock integrity, structure, and injection plume migration.

The operator did a great job of doing their due diligence on the technical side of the project but did not on the ownership of the rights above the injection horizon.

This oversite resulted in the operator spending millions on litigation costs.

Takeaway:

The geology, geophysical, and engineering data supported a quality CCS facility location
The project team recommended that the CCS facility be built.
Acquire 3D Seismic data to minimize reservoir integrity risk.

Conclusion

To maximize your company's financial success, do your due diligence by carefully investigating the injection reservoir risk and acquiring the pore space rights above, below, and in the injection horizon before building any CCS facility.

It is essential to acquire geoscience data, especially 3D seismic data, during the site selection and reservoir characterization stages. This information needs to be integrated with the geology, non-seismic geophysics, 2D and 3D seismic, reservoir, production, and drilling engineering data to help mitigate the technical side of the uncertainty risk of a CCS project.
Collaborating with the surface and sub-surface landmen to acquire the pore space rights and having a transparent relationship with the company's financial advisors will create a successful, profitable, and environmentally safe CCS project.

Biography:
John L.J. Duhault, P.Geo.

John Duhault is an "Interpreter Uncertainity-Mitigator Trainer" geoscientist with over 44 years of industry experience, including over 50,000 hours as a geoscience interpreter in Canada and internationally. Know as "The Sage," he is passionate about teaching the business value of integrated geophysics through the "storytelling" of case histories. He has presented papers in North America, Europe, and New Zealand.

Mr. Duhault is the President of Starbird Enterprises, a consulting and training company. He specializes in geophysical interpretation for conventional exploration (Onshore and offshore), unconventional resource plays, CCS and wastewater injection projects. He has been a subject matter expert in acquisition and structural geophysics. He loves to teach "Rock Stories" to elementary school students.

Mr. Duhault is a Past President of the Canadian Society of Exploration Geophysicists (CSEG) and is the Vice-Chair of the Society of Exploration Geophysicists (SEG).

He graduated from the University of Manitoba with a BSc in Geological Engineering and is a member of APEGA, CSEG, SEG, CSPG, and SPE.

Please note: Mr. Duhault will be teaching his "Mitigating Uncertainty in Carbon Capture and Sequestration Projects" during the CSEG's Doodletrain in November 2023.