



GEOTHERMAL TECHNICAL DIVISION TALK

Carbonates as they relate to green energy – An Overview taken from literature and work experience in the Western Canadian Basin

Presenter: Eva Drivet, Drivet Geological Consulting Ltd.

February 11, 2021, 12:00-1:00 pm Mountain Time

1 CPD (Continuing Professional Development) credit will be awarded for this event

ABSTRACT

Devonian carbonates in the Western Canada Sedimentary Basin (WCSB) have been the “bread and butter” of the petroleum industry since the mid 1900’s, with high impact discoveries like Leduc#1 in Alberta having a major influence on Canada’s oil production. Many of these carbonate reservoirs continue to produce hydrocarbons to this day.

Fast forward to 2021, Canada’s energy sector is undergoing dramatic changes, triggering several green energy initiatives that could transform the way we look at carbonates today. A literature overview highlights possible geothermal targets in Devonian carbonates that produce a source of thermal energy for electrical generation and direct use (Hickson et al., 2020; Majorowicz and Grasby, 2020). Potential Formations identified include the Devonian Swan Hills (e.g. Virginia Hills, Banks et al. 2020), Leduc and Nisku along the Rimbey Meadowbrook and Bashaw reef trends, as well as the Nisku in the Brazeau area (Banks 2017; Alberta#1 Project Hickson et al. 2020a, Weydt et al. 2018). The same stratigraphic zones along these Devonian reef trends have been targeted by E3 Metals for lithium (E3 Metals, 2020a; E3 Metals, 2020b; Huff, 2016). Carbonates from the Devonian Duperow Formation in the Williston Basin (Leduc equivalent), have recently drawn attention for lithium potential (Nicolas, 2020; Jensen 2020).

In British Columbia, near Fort Nelson, the brines associated with hydrocarbon production in the Middle Devonian Keg River and Slave Point Formations in the Clarke Lake gas field have been identified as a possible thermal energy source (Walsh and Tu, 2014). A geothermal resource characterization study by Minnick and Renaud (2020) is currently evaluating the Slave Point potential. Drilling and geothermal testing is planned for Q1-2021 to assess the economic viability of this project.

While there are many aspects that need to be further investigated (technical, financial and regulatory), this review brings forward interesting observations and questions about the role and prospectivity of carbonate reservoirs in the WCSB as new green resources in the geothermal and lithium spaces, as well as their usage for CO₂ Carbon Capture Utilisation and Storage (CCUS). This presentation will provide a summary on the basics of carbonates, a literature overview on the topic of green energy as it relates to the potential in these carbonate reservoirs, and will be combined with the author’s perspective and experience with Devonian carbonates of the WCSB.

References:

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Hickson, C.J., Noone, F., Raymond, J., Dusseault, M., Fraser, T., Huang, K., Marcia, K., Miranda, M., Poux, B., Fiess, K., Ebell, J., Ferguson, G., Dale, J., Groenewoud, L., Banks, J., Unsworth, M., Brunskill, B., Grasby, S., and Witter J., 2020a Geothermal in Canada, Kickstarting an industry, in Proceedings World Geothermal Congress 2020, Reykjavik, Iceland, April 26 – May 2, 2020.

Huff G.F., 2016, Evolution of Li-enriched oilfield brines in Devonian carbonates of the south-central Alberta Basin, Canada, in: Bulletin of Canadian Petroleum Geology, Vol. 64, Number 3, p. 438-448.

Jensen G.K.S., Pollard A. and Rostron B.J., 2020, Lithium concentration in the Duperow Formation: preliminary results of geochemical analyses of core samples from two wells in Souttheastern Saskatchewan, in: Summary of Investigations 2020, Volume 1, Saskatchewan Geological Survey, Saskatchewan Ministry of Energy and Resources, Miscellaneous Report 2020-4.1, Paper A-2, 8p. and 1 appendix.

Majorowicz J.A. and Grasby S.E., 2020, Heat transition for major communities supported by geothermal energy development of the Alberta Basin, Canada. Geothermics 88 (2020) 101883.

Minnick M. and Renaud E., 2020, Geothermal resource characterization of the Middle Devonian carbonate reef reservoir at Clarke Lake Field, Fort Nelson, B.C., Canada, Presentation at GeoConvention 2020, Calgary, Alberta.

Nicolas M.P.B., 2020, Helium occurrences and lithium brine potential in the Williston Basin, southwestern Manitoba, Presentation at GeoConvention 2020, Calgary, Alberta.

Walsh W. and Tu A., 2014, Geothermal potential within Devonian carbonates in the Clarke Lake Gas, GRC Transactions, Vol. 38, p. 656-660.

Weydt L., Heldmann C.D. J., Machel H., Sass I., 2018, From oil field to geothermal reservoir: assessment for Geothermal utilization of two regionally extensive Devonian carbonate aquifers in Alberta, Canada, in: Solid Earth, 9, p. 953-983.

A more detailed and complete reference list will be provided by the author to registered participants on February 11.

BIOGRAPHY



Eva uses an integrative and team approach, combined with a focus on looking at rocks, to solving geological problems, and finding opportunities, in carbonate reservoirs. While she continues to offer her services to the petroleum industry, she is also interested in expanding her knowledge on the role carbonates will play in the green energy landscape. She completed her M.Sc. under the supervision of Dr E.W. Mountjoy, one of her highly influential mentors and an internationally renowned carbonate sedimentologist. Her thesis area was in the Devonian Leduc Formation along the Rimbey Meadowbrook reef trend in Alberta. She is thrilled to see the same Leduc trend being showcased in the literature for geothermal and lithium energy potential, and nearby at Clive for a carbon capture project. Eva has

twenty five years of experience working on exploration and development projects for major to intermediate sized petroleum companies: from Paleozoic carbonate reservoirs in the Williston Basin (Saskatchewan and Manitoba), to a focus on Devonian targets in the Western Canadian Sedimentary Basin (Alberta and British Columbia). In the past ten years, Eva has been working as an independent consultant, generating opportunities within carbonate reservoirs for various companies. Eva has published several papers on the topics of carbonate sedimentology and diagenesis and conducts industry short courses on carbonates.

Eva Drivet is a registered Professional Geologist with APEGA, and an active member of the CSPG and AAPG.