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Tu Deh-Kah Geothermal – Technical Update

Jamie Capot-Blanc, Tu Deh-Kah Geothermal
Evan Renaud, RESPEC Inc.

Summary

Two wells were drilled in the summer of 2021 to the Precambrian basement at Clarke Lake Field, Fort Nelson, B.C., Canada to investigate the geothermal reservoir potential. The first well, C-87-I, is designated as an injection well and the second well, C-A87-I a production well for a flow test that will circulate formation water to the surface and back into the formation. A full suite of logs was run for each well to corelate porous and fractured zones within the Precambrian and Devonian carbonates that include the Granite Wash, Chinchaga, Lower Keg River, Upper Keg River, Sulphur Point and Slave Point formations. Limited well testing was performed in Q4 of 2021.

Theory / Method / Workflow

A full suite of well logs were conducted for wells C-087-I and C-A87-I to understand the porosity, lithology and fracture distribution within the Precambrian to Slave Point formation stratigraphic succession. Porosity was determined using density and neutron logs, calibrated to dolomite, limestone and sandstone, whereas lithology was determined by barns/electrons values measured by a photoelectric log. The gamma ray log was used to correlate formations between wells. Previously interpreted sequences internal to the Slave Point Formation were also identified and correlated (Renaud et al., 2021). Flow units were correlated using a 10% porosity cutoff and represent laterally continuous zones with high porosity beds (>10%) within reservoir formations. A short-term flow test was conducted between the wells at mass flow ranges between 30 l/s – 69 l/s, pump limited. Additional long term flow testing will be conducted in summer of 2022 with additional data collection including fluid and gas geochemistry, dynamic pressure/temperature/flow (PTS) logs, and tracer testing.

Results, Observations, Conclusions

Average photoelectric absorption factor values indicate dolomite as the predominate matrix material within the Granite Wash to Slave Point section, whereas the Precambrian is dominantly composed of quartz. When comparing the DPHI DOLO and DPRD logs (dolomite calibrated density logs), porosity is generally higher within C-087-I. In both wells the average porosity for the Upper Keg River to Slave Point section range from 8.7 to 10.8 %. Porosity is relatively lower in the Granite Wash to Lower Keg River section and ranges from 1.9 to 4.4 %. Similar relatively low DPHI SS (sandstone calibrated density log) porosity values are associated with the Precambrian.

Internal sequences in the Slave Point Formation (S1, R1, R2, R3, D1, D2 and D3) and reservoir formations are separated by boundaries corresponding to major flooding surfaces, which can be correlated from the reef margin into the reef interior and have a variable impact on reservoir

compartmentalization. Locally they controlled the movement of dolomitizing fluid, and thus, the development of dolomitized reservoir rock (Renaud et al., 2021).

Flow units range in thickness from 5.3 to 19.3 meters (referred to as P1, P2, P3, P4 and P5) and are related to high primary porosity zones at the top of shoaling upward cycles (Renaud et al., 2021). The first two flow units, P1 and P2, are located at the base of the Slave Point Formation and within sequences R1 and S1, respectively. The third flow unit, P3, occurs at the top of the Sulphur Point Formation. The final two flow units, P4 and P5, occur at the top and in the middle of the Upper Keg River Formation, respectively. The structurally lower position of strata at well C-A87-I is likely due to previously interpreted north-west and south-east trending faults that are associated with solution collapse zones. Conductive fractures exist throughout the stratigraphic section and show no preferential orientation, whereas borehole breakouts show a northwest – southeast orientation consistent with the regional stress regime.

The well flow test results indicate a favorable economic geothermal resource for both power production and direct use. Data to be collected during the summer 2022 long-term (30 day) flow test will further define the resource potential. Data will be used for final well field design, and geothermal power output and direct use calculations to support project financing for full development.

References

Renaud, E., Weissenberger, J. A., Harris, N. B., Banks, J., & Wilson, B. (2021). A reservoir model for geothermal energy production from the Middle Devonian Slave Point Formation. *Marine and Petroleum Geology*, *129*, 105100.