Experience “cross-over” between oil and gas and geothermal industry: a service company’s perspective

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Unlike other renewable energy sources, the successful appraisal and development of geothermal resources requires understanding and solving the uncertainties of the subsurface. The oil and gas industry has accumulated decades of experience characterizing and accessing deep and ultra-deep formations, including in challenging conditions which are commonly found in geothermal sites (high temperature, pressure, salinity, corrosion…). Oilfield service companies, in particular, have been developing innovative and efficient solutions to explore, map and produce these resources.

The pre-drilling phase – exploring and assessing the geothermal resource – can be crucial to the success of the project. The resource needs to be identified and quantified accurately and the way it is exploited needs to be optimized. Geophysical surveying, notably by electromagnetic methods, allow imaging the subsurface to a high depth and collecting useful information regarding the geologic, compositional and hydraulic conditions of geothermal systems. The acquired data can be processed with a multi-physics approach, involving seismic and other geophysical methods, such gravity and magnetics. Geophysical and wellbore data can be further integrated in a multi-domain software platform to construct a geological model and simulate the hydro-thermo-mechanical behavior of the field, so as to quantify its expected performance and understand the operational risks.

Drilling the injection and production wells is the most cost-intensive activity of a deep geothermal project. For this reason, tools and techniques developed in the oil and gas industry have been applied to improve the efficiency of drilling and the accuracy of well targeting. Deviated and sub-horizontal wells can improve the reservoir contact and improve flow rates; studies can be performed upfront to select the best suited bits, muds, and steering tools; and measurement-while-drilling tools, specially developed for high pressure, high temperature (HPHT) environments, ensure the acquisition of key data to understand the behavior of the geothermal reservoir. Wireline logging, a standard service for hydrocarbon wells, dramatically improves the characterization of reservoir properties, notably including fractures, and is key to evaluating the well integrity by verifying cement placement and pipe corrosion.

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