Geothermal Potential Assessment Through an Integrated and Agile Modeling Solution

It is widely agreed that geothermal energy is a key resource for the provision of clean, reliable and sustainable energy; however, its current global contribution is still a relatively low part of the energy mix. High geological risk and resource uncertainty are often seen in the early stages of geothermal projects, preventing investors from undertaking the costs of drilling and data acquisition at the exploration and appraisal stages, needed to confirm the existence of an economical geothermal resource. In order for the number of geothermal projects worldwide to grow, there is a need for a solution that enables the integration and modeling of all subsurface information, to provide a reliable estimation of geothermal potential. This presentation describes a workflow that can accelerate time to results and overcome the above challenges.

To gain a deep understanding of the geological setting and the geothermal system, all types of subsurface data are first analyzed in a single modeling environment. As a result, maps and iso-surfaces are extracted from well data to quickly provide insights into the reservoir quality and temperature field. An advanced volumetric modeling approach (SKUA-GOCAD) is then used to efficiently create a 3D structural model. In the methodology presented, the geoscience team can choose to build a regular grid to fast track the resource assessment, or create a geologically constrained grid derived from the structural model, for a more accurate assessment of geothermal potential. The 3D grid, combined with the results of the well data analysis, is used to support the geothermal resource estimation. Based on the available data and the user's objectives, three approaches are available to assess geothermal potential:

- A qualitative approach based on the concept of "play fairway analysis" to identify locations of high potential geothermal systems based on geologic factors that control the occurrence of a geothermal system.
- A static quantitative approach that allows the estimation of heat-in-place, theoretical capacity and technical potential. The calculation uses the 3D information about porosity, rock and fluid density, rock and fluid specific heat, and temperature.
- A dynamic quantitative approach by exporting the 3D grid to a flow simulator such as TOUGH2 to simulate the forecast production.