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The Influence of Physical and Operational Reservoir Parameters on the Well Placement Strategies in Geothermal Reservoirs: A Case Study in Rittershoffen Faulted Geothermal Reservoir, France

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Well placement strategies have a rigorous effect on geothermal system's performance and its economic feasibility. As well drilling takes a substantial portion of the capital cost for the exploitation of subsurface resources, an efficient well placement and configuration is of crucial importance to various fields of subsurface reservoir engineering, such as Enhanced Geothermal Systems (EGS), hydrocarbon reservoirs, CO_2 sequestration, etc. Especially, in geothermal reservoirs, well placement is more challenging as the placement of injection and production wells has great impact on the lifetime, amount of heat extraction and hence the profitability of the project. This becomes more important when considering the relatively low profit margin of the geothermal projects comparing to other subsurface sources of energy.

In order to have an efficient well placement strategy, it is required to have detailed information about the reservoir's structure, geometry, petrophysical and hydrothermal properties. In particular, existence of highly permeable flow paths, such as fault and/or fractures can have a major impact on well placement strategies.

The aim of this research is to determine and formulate the influence of the relative well configuration in a doublet setup (positioning, function, -spacing and –producing interval) on the overall performance of a typical faulted geothermal reservoir. Moreover, how such an influence is mediated by reservoir/operational parameters, namely, flow rate, injection fluid temperature, fault permeability anisotropy and subsurface geothermal gradient. This study explores such an interrelationship in the form of a sensitivity analysis, taking into account different combinations of the above-mentioned parameters for the Rittershoffen geothermal reservoir (NE France). A numerical Hydro-Thermal (HT) model based on the Finite Element Method (FEM) developed in COMSOL Multiphysics is used to perform simulations.