OPTIMAL GEOTHERMAL RESOURCE EXTRACTION IN ALBERTA, CANADA

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Geothermal resource offers a significant clean and sustainable energy production technology but as yet, optimized operating strategies for energy harvesting have not been presented. The key features of an ideal geothermal energy production system would be to have the amount of energy extracted equal to the amount of natural heat flux from lower formation together with maximum heat transfer area and overall maximum effective heat transmission (working fluid flow) with the smallest heat storage, in other words the maximum possible effective thermal diffusivity. In this research we explore, by using underground thermal engineering and well placement and operating strategy, optimal operating strategies for energy production from a geothermal reservoir in Alberta, Canada. The results show that the well operating strategy has to be balanced with the heat rate through the understrata to the geothermal resource as well as the flow (permeability) and heat storage (heat capacity and porosity) properties of the geothermal resource. This is especially that case for controlling the thermal breakthrough time, the time at which the injected fluid reaches the production wells at a threshold low temperature at which heat recovery makes the energy extraction process infeasible.