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Use of Hot Fractured Rock Technology to Enhance the Productivity of Non-Commercial Geothermal Wells

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This research paper aims to maximize the generation of geothermal energy by making use of the hot rock basement found beneath non-commercial geothermal wells. Even though there is a continuous source of heat within the earth, the extraction rate of the heated fluids and steam may exceed the replenishment rate and therefore the well may become unproductive at which time it can be converted to a reinjection well. Often, non-commercial wells are as a result of low permeability and insufficient steam or hot water in the geothermal reservoir. Hot fractured rock technology under enhanced geothermal systems involves developing a non-commercial well by pumping water from an external source down an injection well drilled in to the hot basement rock adjacent to the non-commercial well. Injecting water is done at sufficient pressure to cause fracturing of the hot basement rock and it is heated as it finds its way through to the production well.

The concept would recover thermal energy contained in the hot rock basement by creating or accessing a system of open, connected fractures through which water can be circulated down injection wells, heated by contact with the hot rocks and returned to the surface in production wells to form a closed loop. This technology can help improve non-commercial geothermal wells by setting up geothermal systems including binary, flash-binary combined cycle, double flash plant or single flash plant (with several adjustments in power plant components). The idea is based on a numerical simulation of a doublet (an injector and a production well pair). The injected water temperature is assumed to be at 80°C and the injection rate is dictated through reservoir simulation, by the production rate assigned; the production well is allowed a maximum drawdown of 3.2 MPa and the injection well limited to a build-up pressure of 6.0 MPa. The simulation results show that the net power that can be produced by this project is 150 MW after subtracting the parasitic power needed by the injecting pumps. This would yield a steady power generation from these non-commercial wells and reduce the possibility of having unproductive wells within the geothermal power generation sector.

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