Fracture Characterization and Geological Modeling of the Darajat Geothermal Field, West Java, Indonesia

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Darajat is a vapor dominated geothermal field located in West Java, Indonesia. The world's highest-performing geothermal well is located in Darajat with a production of 40 MWh. The Darajat field has energy-equivalent reserves in the order of 300MM BOE.

Geological setting: Darajat is a volcano-hosted system situated along the Sunda-Banda volcanic island arc. The volcanic reservoir exhibits a complex, non-layer cake distribution, with very low porosity and permeability intrusives and extrusives (andesite, microdiorite and basalt-andesitic lavas), and higher porosity pyroclastics (tuff, lapillis-tone, and breccias).

Fracture characterization: Quantitative fracture characterization used image log data from 18 wells and continuous core. Two main sets of steeply dipping (55°-80°) fractures predominate in the reservoir. The first set strikes mainly SE-NW (140°-320°) and the second WSW-ENE (070°-250°). Fracture control on well productivity (from PLT logs) and well connectivity (from interference tests) was incorporated in the reservoir simulation model through reservoir permeability variograms.

Fracture density (fracture surface area per rock volume), fracture porosity and other parameters were computed for each well. Fracture density varies from 0.001 frac/ft to 5 frac/ft. Although the reservoir is distinctly non-layer cake the fracture density distribution shows a consistent depth-related variation, and high fracture density zone occurs between 500-1200 m elevation (1500-4000 ft). This suggests a lack of lithological control on the fracture density distribution. Variograms describing the observed vertical density distribution, lateral connectivity and pseudo permeability have been used to populate a Gocad simulation sgrid with the calculated fracture properties.