Geochemical Fracture Characterization – Water Rock

Geochemical Enhancement of Enhanced Geothermal System Reservoirs: An Integrated Field and Geochemical Approach

Principal Investigator: Dr. Joseph Moore
Co-Principal Investigator: Dr. David Norman

Project Summary

This project examines the geochemical effects of injecting fluids of different compositions into Enhanced Geothermal System (EGS) reservoirs. EGS systems, because of their inherently low permeabilities, are particularly susceptible to the effects of mineral deposition and dissolution. These effects are poorly understood and underestimated. The goal of the project is to improve reservoir performance by mitigating and reversing the effects of mineral deposition resulting from fluid injection.

Work performed on this project will represent a cooperative effort between Energy & Geoscience Institute (EGI), the New Mexico Institute of Mining and Technology under a subcontract to EGI, Coso Operating Company and the Calpine Corporation.

During the initial phase of the project, rock samples from redrilled injection wells at Coso and The Geysers will be used to characterize the mineral and geochemical changes that occur as a result of injection. These wells were specifically drilled to replace injectors whose performance had declined after being in service for only 5 to 7 years. Mineral deposition is the most likely cause of their reduced performance. The new wells are located immediately adjacent to the original wells or drilled through the same collars. Thus they provide a unique opportunity to characterize injection-induced effects. Samples from the original and redrilled injection wells at Coso will be used to establish the mineral assemblages and their geochemical characteristics prior to injection. Fluids consisting of flashed brine were injected into the Coso wells. At The Geysers, Lake County treated wastewater is used for injection. The results of these investigations will be used to constrain numerical modeling of fluid-rock interactions and mineral changes in the near well bore environment. Once the models are tested, they will be extended to predict mineral deposition and dissolution in the reservoir rocks downstream of the injection wells. Fluid compositions from the simulations will be compared to the compositions of produced fluids from wells that receive injectate, as indicated by tracer tests. Appropriate injection strategies will be developed by geochemical simulations for present and planned injection fluid compositions.

This proposal addresses Objective 1 of the solicitation: “Increase the identified economically-viable domestic geothermal resources to 40,000 megawatts” by improving reservoir performance. Higher well injectivities and productivities will result in a reduction in the number of wells that have to be drilled. This will lead directly to a decrease in the price of electricity (Objective 2 of the solicitation).