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Multiple Zone Stimulation of Newberry EGS Project – Key to Reservoir Optimization and Minimizing Cost of EGS Power Production

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Most EGS projects to date have involved stimulation of a single zone in the open-hole section of an injection well. While this has been accomplished successfully, it does not take advantage of the full open-hole interval, and, thus, is not economically ideal. The creation of multiple stimulated zones in the open-hole section of an EGS well would greatly improve the overall efficiency of heat extraction on a per well basis. Analysis has shown that multiple zone stimulation could significantly reduce cost of EGS power production by increasing flow capacity and production on a per well basis. Therefore, the development and proving of technologies that allow for multiple zone stimulation is a very important step in the commercialization of EGS power production.

Options for stimulation of multiple zones in a given EGS well include both mechanical and chemical isolation systems. Mechanical systems involve the installation of an open-hole liner or some type of open-hole packer system. A detailed description of the various systems will be provided along with a qualitative comparison of cost to deploy each. Advantages and disadvantages of the various systems will be discussed. In addition, the conceptual design for an ideal open-hole packer system will be provided along with the risks and rewards associated with utilizing such a system.

Chemical diverter systems involve the use of temporary blocking agents, which seal off existing and/or newly stimulated fractures, allowing the fluid pressure to be directed to additional fracture set. Ideally, the chemical system would be deployed at the end of the first stimulation stage. It would seal off that zone, and allow additional pressure to be applied to the wellbore so that a second set of fractures could be stimulated. This procedure would be repeated until the desired number of fractures had been stimulated. The chemical diverter system must maintain a hydraulic seal during the entire duration of the stimulation event, which could be days or even weeks. After the stimulation treatment is completed, the diverter would ideally break down into non-damaging components, which would dissolve into the wellbore's geofluid. A description of the advantages of a chemical diverter system will be provided along some of the challenges associated with such a system.

Both the mechanical and chemical diverter systems will be discussed and explained as they related to EGS development of the Newberry project in central Oregon. Additionally, results from a recent field test of a chemical isolation system will presented. This test was conducted in an existing geothermal well. Results demonstrate the effectiveness of chemical diverter systems in a challenging environment where the open-hole interval is lined with an uncemented, slotted casing, the formation is highly fractured and permeable and management of subsurface fluid levels is necessary.