Seismicity near the Fallon FORGE Site and Development of an Induced Seismicity Mitigation Plan

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ABSTRACT

Because of its role in EGS reservoir creation, induced seismicity (IS) is an intended consequence (hazard) of EGS operations. If not mitigated properly, IS can derail a project indefinitely, as occurred at the EGS project in Basel, Switzerland. Thus, understanding the local conditions existing prior to EGS operations and the likelihood that moderate to large seismic events may occur in EGS projects requires careful consideration and the development of an Induced Seismicity Mitigation Plan (ISMP).

The FORGE site in Fallon, Nevada is situated in an area of low natural earthquake activity, despite its proximity to major faults system capable of large earthquakes (i.e., the Rainbow Mountain Fault system and the Dixie Valley / Fairview Fault system). Within a 10 km radius of the proposed Fallon FORGE site, seismicity since 1950 is characterized by low activity (a total of 12 events recorded by the Advanced National Seismic System, or ANSS) and low magnitudes (<M2.4). To date, local seismic monitoring with a dedicated shallow borehole network of 10 stations within and around the proposed Fallon FORGE site has recorded only regional seismicity outside the footprint of the local monitoring network.

Given the low level of existing seismicity, the preliminary ISMP relies heavily on two approaches: 1) analog studies of similar field sites (specifically, the nearby Desert Peak and Bradys Hot Springs geothermal areas) and 2) numerical modeling of likely injection and seismicity scenarios based on the detailed geological / geomechanical model of the subsurface in the Fallon FORGE area. Given the experiences at nearby geothermal and EGS stimulation experiments at Desert Peak and Bradys Hot Springs - both of which resulted low levels of microseismicity (in terms of both frequency and magnitude) - it seems likely that EGS stimulation at Fallon would yield similarly low levels of IS. Various stimulation scenarios are currently being evaluated using a coupled thermo-hydro-mechanical simulator to assess the validity of and improve upon the information from analogue projects.