

# GEOLOGIC CHARACTERIZATION OF PRE-TERTIARY ROCKS AT THE DESERT PEAK EAST EGS PROJECT SITE, CHURCHILL COUNTY, NEVADA

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## **Key Words:**

*Desert Peak, Enhanced Geothermal Systems, EGS, hydrothermal alteration, stratigraphy, Basin and Range, pre-Tertiary, Hot Springs Mountains, Churchill County, Nevada.*

## **ABSTRACT**

A DOE-Industry cost-shared project is underway at Desert Peak East, located within the Hot Springs Mountains, northwestern Churchill County, approximately 50 miles (80.5 km) northeast of Reno, Nevada. The potential reservoir under investigation is contained within pre-Tertiary metamorphic and granitic rocks with temperatures exceeding 400°F (204°C). The purpose of the geologic study is to determine the lateral and vertical extent of basement lithologies, and the character and mineralogy of natural fracturing in the rocks to identify suitable targets for hydrofracturing and stimulation in subsequent phases of this enhanced geothermal system (EGS) project.

Petrographic and X-ray diffraction studies of rock samples from deep drill hole DP 23 1 and core hole 35 13 TCH characterize the pre-Tertiary stratigraphic section in the project area as a sequence of weakly metamorphosed marine sediments, tephra deposits, and dioritic rocks that have been intruded by a younger two-mica granodiorite. The metamorphic pre-Tertiary sequence can be divided into two distinctive subunits based on differences in texture, metamorphic grade, and lithology. Subunit 1 (pT1) is composed of non-foliated pelites, mudstones and fine-grained tephra deposits that have undergone low-grade regional greenschist metamorphism. Subunit 2 (pT2) underlies pT1, and is composed of foliated phyllites and biotite and chlorite schists that are interlayered with mafic to intermediate composition intrusive rocks. Contact metamorphism and hornfelsic recrystallization of metasedimentary rocks in subunit pT2 has occurred near the contact with the younger granodiorite intrusive. The pre-Tertiary stratigraphy can be correlated across the project area between wells DP 23 1 and 35 13 TCH, a distance of 1.5 miles (2.4 km). Several potential EGS target units have been identified. A laterally extensive but intensely altered and veined quartz monzodiorite unit with a thickness of more than 320 feet (98 m) is found at a depth of 5,060 feet (1,542 m) in well DP 23 1 and at 3,123 feet (951 m) in 35 13 TCH. A hornblende diorite with a thickness of about 220 feet is found at 6,800 feet (2,073 m) in DP 23 1. The younger granodiorite in DP 23 1 is at least 2,494 feet (760 m) thick and present at depths between 7,020 feet to TD at 9,641 feet (2,140 to 2,939 m). The uniform petrologic properties and the thickness of the granodiorite in well DP 23 1 indicate an excellent EGS target.

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