Status of geothermal energy exploration at Buranga geothermal prospect, Western Uganda

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Key words: geology, rift tectonics, geothermometry, resistivity anomalies

ABSTRACT

Exploration for geothermal energy in Uganda has been in progress since 1993. The studies have focused on three major geothermal areas namely Buranga, Katwe and Kibiro. The three areas are in advanced stages of surface exploration and will soon be subjected to exploratory drilling that will pave the way for a feasibility study.

The overall objective of the study is to develop geothermal energy to complement hydro and other sources of power to meet the energy demand of rural areas in sound environment. Recent studies in Buranga have used geological, geochemical, hydrological and geophysical methods to elucidate subsurface temperatures and the spatial extent of the geothermal system. The results indicate that the geothermal activity at Buranga is related to the volcanic and tectonic activities of the Rift Valley, which has a higher heat flow than the surrounding Precambrian crust. The geothermal surface manifestations include hot bubbling springs, water pools, gas vents, H_2S gas, solfatara, travertine tufa and geothermal grass. The main geological structure is the Bwamba escarpment that forms the western part of the Rwenzori horst mountain massif. This main rift fault is cut by numerous perpendicular and oblique striking faults which together with other faults/fractures contribute to the re-charge and up-flow permeability for the geothermal fluids at Buranga. Subsurface temperatures of 120 - 150˚C have been predicted by geothermometry. The results also indicate that hot springs show isotopic composition compatible with the local meteoric water line, confirming the meteoric origin of the water circulating in the geothermal system. Results from isotopes of hydrogen and oxygen (δ^2H_{H2O}, $\delta^{18}O_{H2O}$) suggest that the recharge is from high ground in the Rwenzori Mountains. Sulphur isotopes ($\delta^{34}S_{SO4}$) of hot water samples show magmatic contributions of sulphate, while strontium isotopes of water and rock samples ($^{87/86}Sr_{H2O}$, $^{87/86}Sr_{Rock}$) identify the rock type as granitic gneisses, suggesting that the major source of salinity is from water-rock interaction with a magmatic input. Micro-seismic surveys have located a subsurface anomaly within the vicinity of the thermal activity at Buranga, but is yet to be confirmed by additional geophysical surveys and drilling. Recently, TEM and MT surveys have been conducted at Buranga; the results indicate a low resistivity conductive bodies in the vicinity of thermal springs at Buranga and in south west at Ntandi which are interpreted to be magmatic intrusions and could be the source of geothermal heat for the system.