ASSESSING GEO-THERMAL ENERGY DEVELOPMENT POTENTIAL IN SOME THERMAL SPRING AREAS OF SRI LANKA

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Geothermal energy is the natural heat of the earth that can be used as a source of energy to develop the society and economy of any country. The overall objective of this research work is to assess the potential of thermal springs in Sri Lanka for energy production or to develop these as centers of economic value. In order to achieve the goals, detailed geological, hydrogeological, hydrochemical and geophysical investigations were carried out for assessing the governing hydrothermal mechanism of the springs. Four thermal springs Nelumwewa, Kapuralla, Mahaoya and Wahawa were selected for the present study.

According to hydrochemistry and isotope signature of these studied thermal springs, they can be described as belonging to non volcanic low mineralized geothermal systems while thermal groundwaters are of Na-K, Cl-SO_4 type. The non-thermal shallow groundwater of the area is of non dominant cation and anion type. Thus, Sri Lankan geothermal systems show characteristics of Hot Dry Rock (HDR) systems. The average reservoir temperature of the four thermal springs according to the Na–K–Mg, Na–K, K–Mg and SiO_2–temperature geothermometry is about 150 °C. Regional geological structures appear to be the dominant controlling factor for the formation of the geothermal fields in Sri Lanka. A noteworthy fact is that, seven out of ten thermal springs of Sri Lanka are situated closes to dolerite dykes. Deep circulation of ground waters through faults/fracture would mine heat from the dikes and up flow through the faults/fractures. Based on the results of the resistivity investigation, it can be suggested that thermal water flows to surface along the fault/fracture or axis of intersection of deep extending two fracture zones in the crystalline rock.

Sri Lankan geothermal systems are water dominated, dynamic and are low to medium enthalpy systems. According to volumetric assessment, it is most likely that the electrical power production capacity will lie between 4.38 and 8.61 MW for Nelumwewa, 460 and 461MW for Mahaoya and Kapuralla and 12.2 and 12.3 MW for Wahawa, if the recoverable heat is used for 30 years. It will be between 2.63 and 5.16 MW for Nelumwewa, 276 and 277 MW for Mahaoya and Kapuralla and 7.37 and 7.39 MW for Wahawa, if it is used for 50 years. Further, it was observed that the average power generation for 30 years is higher than the average power generation for 50 years. The most probable power generation outcome for 30 years is 6.20, 455 and 12.1 MW for Nelumwewa, Mahaoya-Kapuralla and Wahawa geothermal systems respectively while it will be 3.72 MW for Nelumwewa, 273 MW for Mahaoya and Kapuralla and 7.2 MW for Wahawa geothermal system for 50 years. Accessible economic geothermal resources in Sri Lanka are limited. However, these systems can be used for electrical power generation using binary power generating methods and direct heat applications which are cost effective and simple methods for utilization of Sri Lankan geothermal sources.