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Geothermal Energy Prospects in Brazil: A Preliminary Analysis

By V. M. HAMZA ¹⁾, S. M. ESTON ²⁾ and R. L. C. ARAUJO ¹⁾

Abstract – Results of geothermal gradient measurements in 44 localities in Brazil are presented. The Precambrian shield areas are found to be characterized by relatively low temperature gradients in the range 6 to 20°C/km while younger sedimentary basins are characterized by gradients in the range 15 to 35°C/km. An inverse correlation between geothermal gradient and tectonic age has been observed. This as well as the favourable hydrological conditions suggest that the best sites for extraction of geothermal energy in Brazil are the younger sedimentary basins. The Parana Basin is found to offer at present the best site for extraction of geothermal energy in Brazil. Preliminary examination of the temperature distributions in the major aquifer (Botucatu sandstone) suggest that this aquifer contains substantial quantities of warm waters in the temperature range 40 to 90°C. The water layer in this confined aquifer is in convective motion and can be considered as a low enthalpy geothermal system. Many of the routine uses to which geothermal waters are put, such as space heating and soil warming, are not applicable in Brazil mainly because of the favourable climatic conditions. Conversion of this geothermal energy into electrical energy is also unlikely to be economical. Hence we do not consider the Parana Basin geothermal system as an independent economically exploitable energy resource. However, a few other applications are pointed out where geothermal waters can be used as a supplementary or supporting energy source in increasing the efficiency of economically viable systems utilizing hot waters.

Key words: Precambrian shield; Parana sedimentary basin; Low enthalpy geothermal system; Geothermal gradients.

Introduction

Our objective is to present a preliminary analysis of the prospects for the utilization of geothermal energy in Brazil on the basis of existing geothermal data. The geothermal investigations that have been carried out so far in Brazil are of a preliminary character, and very little is known about the vertical distribution of temperature beneath major tectonic units. The picture is further complicated because of the highly uneven distribution of geothermal measurements. An appreciable number of temperature measurements have been made in southeastern Brazil, but vast areas in the western, central and northern parts are without any measurements at all. Thus the general conclusions reached in the present work should be considered as tentative and as applying only to the eastern parts of Brazil. A more complete picture can be obtained only after a sufficiently large number of geothermal measurements have been carried out in the remaining parts of Brazil.

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