ASSESSMENT OF THE GEOTHERMAL POTENTIAL FOR ENERGY GENERATION IN SRI LANKA

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(118352D)

Degree of Master of Engineering

Department of Mechanical Engineering

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Name : Dr. Himan Punchihewa

Signature: .... Date: ....

Name : Dr. Mahinsasa Narayana

Signature: .... Date: ....

ABSTRACT

Geothermal energy is the heat extracted from the subsurface of the earth. The heat loss of the earth is higher at plate boundaries compared in the tectonic plates. The global heat loss is about 44TW where volcanic eruptions in the range 2.4 – 4.0 TW.

Sri Lanka has not located geologically favor conditions for geothermal energy development it has nine hot water springs in the eastern and southern region of the country. Out of nine 7 were located in the Vijayan complex. Geochemical analysis of geothermal water of 6 selected hot water springs and the resistivity depth cross sections for few magnetotelluric tested traverses were used for the assessment of geothermal potential in southern and eastern regions of Sri Lanka.

Geothermal energy potential for 1 km^3 reservoir near the six hot springs in southern and eastern of Sri Lanka can be calculated around 5.76 MW in Mahapelessa to 34.86 MW in Marangala. Based on the geochemical analysis, average temperatures of the geothermal reservoirs are around 120-160°C for MP, KI, KP and NW and for Marangala, Maha Oya 390 and 230°C respectively. Also the water from Kapurella, Nelum wewa, Maha Oya has representing the characteristics of volcanic water and Marangala as steam heated water.

Available potentials according to the magnetotelluric studies were well beyond the economical depth of exploration so located deep in the available magnetotelluric cross sections. However according to the chemical analysing the presence of intermediate reservoirs in between the traverse can be expected in shallower.

Night time infrared photography can be used to explore the surface hot water accumulations hence can explore new hot springs. Other than the chemical concentrations, isotopes characterization is useful to detect the origin of the geothermal water. To identify the exact dimensions of the reservoirs three dimensional magnetotelluric testing should be done near the hot springs.

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LIST OF ABBREVIATIONS

CEB	Ceylon Electricity Board
EGEC	European Geothermal Energy Council
EGS	Enhanced Geothermal System
GE	Geothermal Energy
GHP	Geothermal Heat Pump
GSMB	Geological Survey and Mine Bureau
HC	Highland Complex
NIFS	National Institute of Fundamental Studies
IGA	International Geothermal Agency
INEEL	Idaho National Engineering and Environment Lab
KI	Kivulegama
KP	Kapurella
MA	Marangala
MO	Maha oya
MP	Mahapelessa
MT	Magnetotellurics
NW	Nelum Wewa
NWSDB	National Water Supply and Drainage Board
RE	Renewable Energy
SLSEA	Sri Lanka Sustainable Energy Authority
USA	United States of America
VC	Vijayan Complex
WEC	World Energy Council