

## Delineasi terpadu sistem panasbumi daerah "Z" dengan menggunakan inversi 3d data magnetotellurik dan data gravitasi = The intergrated delineation of geothermal system area "Z" using 3d inversion of magnetotelluric data and gravity data

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### Abstrak

Telah dilakukan penelitian guna delineasi zona prospek sistem panasbumi daerah "Z"; menggunakan permodelan tiga Dimensi magnetotellurik didukung data terpadu berupa geologi dan geokimia serta terintegrasi data gravitasi. Daerah panasbumi "Z" dalam tatanan tektoniknya termasuk pada jalur backarc Sumatera, tepat pada salah satu segmen sesar Sumatera bagian selatan, disusun oleh batuan vulkanik dan sedimen klastik yang berumur Tersier hingga Kuartar Andesit-Basalt. Gejala adanya sistem panasbumi pada daerah penelitian ditandai dengan kemunculan manifestasi permukaan berupa alterasi dan lima mata air panas bersuhu 44,4 - 92,5 oC, pH 8,19 - 9,43 dan bertipe bikarbonat, sulfat-bikarbonat, serta sulfat-klorida. Pembentukan sistem panasbumi dipengaruhi oleh aktivitas tektonik menyerong oblique antara lempeng Samudera India dan Lempeng Kontinen Eurasia searah dengan pola sesar Sumatera.

Berdasarkan analisis air panasbumi temperatur reservoir diambil melalui perhitungan geothermometer SiO<sub>2</sub> Fournier 1977, Na-K Giggenbach 1988, Na-K-Ca, diagram Na-K-Mg serta diagram Enthalpy - Chloride Mixing Model berkisar 145 - 155oC, termasuk dalam sistem panas bumi bertemperatur sedang. Berdasarkan inversi tiga dimensi data MT didapatkan kedalaman Top of Reservoir TOR sistem panasbumi daerah "Z" sekitar 400 m elevasi 50 mdpl sedangkan berdasarkan forward modeling data gravitasi lintasan 2 dimensi diperkirakan sumber panas berupa cooling intrusion diperkirakan batuan gabro; resistivitas ge; 450 ?m; densitas 2,95 - 3,15 gr/cc dan reservoir berupa batupasir resistivitas 50 - 250 ?m; densitas 2,60 gr/cc. Sistem panasbumi daerah penelitian termasuk jenis tektonik fracture zone dengan temperatur sedang dengan luas daerah prospek sekitar 7,5 km<sup>2</sup>.

A study for delineating geothermal system of prospect area "Z" has been done by using tree dimension modeling of magnetotelluric supported unified data just like geological and geochemical and integrated gravity data. Geothermal area "Z" in tectonic setting included in Sumatra volcanic backarc, right on one of the southern part of Sumatra fault segment. Composed by volcanic and clastic sedimentary rock are Tertiary to Quaternary Andesite Basalt. The existence of geothermal system in this area is indicated by the presence of thermal manifestation in form of alteration and five hot springs temperature in the ranges 44.4 ndash 92.5 oC, and pH 8.19 ndash 9.43 and type of fluids are bicarbonate, sulphate bicarbonate, and sulfate chloride. The development of geothermal system is affected by tectonic oblique between the Indian Ocean plate and the Eurasian Continent Plate direction of the Sumatra fault patterns.

Based on the analysis of geothermal water reservoir temperature are taken through the calculation geothermometer SiO<sub>2</sub> Fournier 1977, Na K Giggenbach 1988, Na K Ca, Na K Mg diagram and Enthalpy Mixing Chloride Model range 145 ndash 155 oC, classified as intermediate temperature. Based on a three dimensional inversion of the magnetotelluric data obtained depth Top of Reservoir TOR geothermal system area "Z" about 400 m elevation 50 meters above sea level, while based on the two dimensional

of the gravity data predicted heat sources such as cooling intrusion estimated gabbro density 2,95 ndash 3,15 gr cc and reservoir such as sandstone resistivity 50 ndash 250 m density 2,60 gr cc . The Geothermal systems of research area classified as the type of intermediate temperature tectonic fracture zone with prospect area about 7,5 km<sup>2</sup>.