Delineasi zona prospek sistem panasbumi daerah 'P' menggunakan pemodelan multi dimensi data magnetotelurik terintegrasi data geologi dan geokimia = Delineation of geothermal system at prospect area p by using multi dimensional modeling of magnetotelluric data integrated geological and geochemistry data / Puji Suharmanto

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Abstrak

[ABSTRAK

Telah diakukan penelitian guna mendelineasi zona prospek sistem panasbumi Daerah „P‟ menggunakan pemodelan multi dimensi data magnetotelurik terintegrasi data geologi dan geokimia. Daerah panasbumi „P‟ secara fisiografi termasuk pada Busur Banda Dalam tak bergunungapi disusun oleh komplek batuan malihan sekis berumur Perm-Trias. Gejala adanya sistem panasbumi pada daerah penelitian ditandai dengan kemunculan manifestasi permukaan berupa enam mata air panas bersuhu (37-67oC), pH (6-7) dan bertipe klorida-bikarbonat. Pembentukan sistem panasbumi diduga berkaitan dengan aktivitas tektonik kuat akibat tumbukan lempeng Pulau Seram dengan Lempeng Benua Australia (Plate Collision) yang memicu pembentukan batuan intrusi di kedalaman sebagai sumber panas. Guna mengetahui informasi subsurface daerah penelitian, dilakukan survei magnetotelurik. Selanjutnya hasil dari data MT akan diintegrasikan data geologi dan geokimia. Pengolahan data MT dimulai dari time-series data hingga mendapatkan kurva resistivitas-frekuensi dan fase, lalu dilakukan filtering noise, rotasi arah strike dan koreksi static shift untuk mendapatkan kualitas kurva MT baik. Selanjutnya dilakukan pemodelan inversi 1D, 2D dan 3D. Temperatur reservoir diduga sekitar 160-180oC termasuk temperatur sedang. Hasil penelitian ini memperlihatkan lapisan konduktif (<15 Ωm) dengan ketebalan ± 500-1000 m diindikasikan sebagai Clay Cap dari sistem panasbumi. Zona resistivitas tinggi (>300 Ωm) dan berbentuk updome, berada di bawah area kemunculan manifestasi (MAP1, MAP2, MAP3, MAP4, dan MAP5) mengindikasikan heat source berada di utara kemudian menerus ke arah tenggara membentuk updome. Model konseptual terpadu sistem panasbumi dibentuk dari integrasi data geologi, geokimia, dan geofisika. Sistem panasbumi daerah penelitian merupakan hidrotermal heat sweep plate collision dengan temperatur sedang, luas area prospek dan rekomendasi titik pemboran diperkirakan ± 3 km2 di sekitar zona Upflow, potensi sumber daya hipotetik dengan metode volume lump parameter menggunakan binary cycle ± 34 MWe.

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ABSTRACT

A study for delineating geothermal system of prospect area "P" has been done by using multi-dimensional modeling of magnetotelluric data. Physiographycally, geothermal prospect of "P" area is located at non-volcanic Banda inner arc hosted by Malihan Sekis rock complex with Perm-Trias age. The existance of geothermal system in this area is indicated by the presence of thermal manifestations in form of 6 chloride-bicarbonate hot springs with temperature in the the range of 37 – 67oC, and pH of 6-7. The development of geothermal system is most probably associated with strong tectonic activity caused by the collision between Seram island plate and Australian plate that ignite the occurence of intrussive body as heat source. In order

to know the subsurface information of prospect area, magnetotelluric (MT) survey has been done. The processing of MT data was started from time-series data, continued by noise filtering, rotation of strike orientation and static shift correction to obtain better MT curve. The data were then being inversed by means of 1-Dimensional, 2-Dimensional and 3-Dimensional inversion methods. Reservoir temperature is estimated to be around 160-180 oC and classified as moderate temperature. The result of MT data inversions shows the presence of conductive layer (<15 Ωm) with 500 – 1000 m thickness that is interpreted as clay cap og geothermal system. High resistivity zone (>300 Ωm) with updome shape appears underneath the manifestations occurence (MAP1, MAP2, MAP4, and MAP5), indicating that the heat source is located in northern part and elongate to souteast direction. The conceptual model of geothermal system was built based on integrated interpretation of geological, geochemical and geophysical data. The prospect area and recommendation of drilling location is estimated to be ± 5 km2 around upflow zone. Potential hypothetical resource with volume lump parameters method using binary cycle ± 34 MWe., A study for delineating geothermal system of prospect area "P" has been done by using multi-dimensional modeling of magnetotelluric data. Physiographycally, geothermal prospect of "P" area is located at non-volcanic Banda inner arc hosted by Malihan Sekis rock complex with Perm-Trias age. The existance of geothermal system in this area is indicated by the presence of thermal manifestations in form of 6 chloride-bicarbonate hot springs with temperature in the the range of 37 – 67oC, and pH of 6-7. The development of geothermal system is most probably associated with strong tectonic activity caused by the collision between Seram island plate and Australian plate that ignite the occurence of intrussive body as heat source. In order to know the subsurface information of prospect area, magnetotelluric (MT) survey has been done. The processing of MT data was started from time-series data, continued by noise filtering, rotation of strike orientation and static shift correction to obtain better MT curve. The data were then being inversed by means of 1-Dimensional, 2-Dimensional and 3-Dimensional inversion methods. Reservoir temperature is estimated to be around 160-180 oC and classified as moderate temperature. The result of MT data inversions shows the presence of conductive layer (<15 Ωm) with 500 – 1000 m thickness that is interpreted as clay cap og geothermal system. High resistivity zone (>300 Ωm) with updome shape appears underneath the manifestations occurence (MAP1, MAP2, MAP4, and MAP5), indicating that the heat source is located in northern part and elongate to souteast direction. The conceptual model of geothermal system was built based on integrated interpretation of geological, geochemical and geophysical data. The prospect area and recommendation of drilling location is estimated to be ± 5 km2 around upflow zone. Potential hypothetical resource with volume lump parameters method using binary cycle ± 34 MWe.]