The preliminary conceptual model of Tolehu geothermal resource based on geology, geochemistry and MT data

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The Tolehu Geothermal area Ambon (70 m asl.), which had initially been studied more than fifteen years ago was resurveyed by additionalMT-TDEM method and an exploration well in 2010 and 2011 to constrain a conceptual model for the prospect area. Based on those conceptual model that integrated the 1D and 2D MT inversion images with data from existing wells and geochemistry, six gradient thermal wells with the maximum depth 150 m and one exploration well of about 930 m depth had indicated over 200 degree Celsius resource. The deep well was drilled to confirm the elements of the model and extended the proven geothermal reservoir 1.5 km to 2.5 km to the south an old volcanic complex. Shallow cores and deeper cuttings were analyzed by using petrography and x-ray methods. They had confirmed that the low resistivity detected by MT and TDEM surveys closely correlated with the distribution of low temperature smectite and high temperature of illite and chlorite clay alteration. Due to the greater tendency of clay minerals (smectite, illite, phyrophlite, chlorite clay) to inhibit the formation of fracture permeability relative to more brittle clays, the top of the permeable reservoir generally conformed to the geometry of the base of the low resistivity clay alteration. The rough correlation of the 200 degree Celsius geothermometry with the 5 and 10 ohm-m contours below the transition from smectite,illite, illite to chlorite clay were used to predict the depth of cap rocks.The extreme temperature of thermal gradient is 123 degree Celsius at the depth of 150 m and the water dominated system with Chloride concentration lower than 5000 ppm at 930 m depth, indicate sea water uninvolved to the geothermal system.