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Submission date: 16-Mar-2020 04:16PM (UTC+0800)
Submission ID: 1276367387
File name: 12- Measurement_ICoSET_2017.pdf (860.17K)
Word count: 2537
Character count: 13478

ISBN: 978-979-3793-73-3

MEASUREMENT OF ELECTRIC GRID TRANSMISSION LINES AS THE SUPPORTING OF NATIONAL ENERGY PROGRAM IN WEST SUMATERA AREA, INDONESIA THROUGH GEOLOGICAL MAPPING AND ASSESSMENT

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Abstract

The need for energy in Indonesia continues to increase and the Indonesian government is keen to realize the development of electricity transmission network in Alam Pauh Duo, Alam Pauh Duo Subdistrict, Solok Selatan District. The topography of this region consists of Geomorphology Units of the Hills and High Geomorphological Units with an altitude of about 900-500m (meters) with lithology composed of volcanic rock lithology and breakthrough of granite and granodiorite. The method used in the review survey (reconnaissance) is road sweeping or tracking using a handheld GPS. The results of this mapping and assessment are the coordinate values of the markers or dividing marks that are already available and scattered in each location point. The final result is a map that has a description of the location of Land Power plantand Transmission Tower. There are 15 transmission towers planned for the builders as well as power plant (GI). The required land area of each transmission tower is about 15x15 m (meters) up to 20x20 m and the land area for 3ha (hectare) power plant (GI) development. Then the distance between each tower of transmission approximately 30 meters.

Keywords: *Power Plant, Transmission Line, Alam Pauh Duo, Geological Mapping, Geological Assessment*

1. INTRODUCTION

The need for energy in Indonesia increase continuously in line with the growth rate of the industry and the number of residents and the Indonesian government is currently keen to realize this infrastructure, one of which is to build electricity transmission network. One source of this electrical energy is geothermal. Regency of Solok Selatan is one of the areas in Indonesia that have the potential of natural resources that is geothermal energy because Solok Selatan region has a geological condition that supports the formation of hot springs, indirect utilization developed for geothermal power generation (Dickson et al., 2013). So with the existence of geothermal sources that can generate electricity is very potential to be built electric transmission lines that are around this area (Knott, 2012).

Geothermal energy is a relatively environment-friendly energy source because it comes from the inner heat of the earth. Water that is pumped into the earth by humans or natural causes (rain) is collected

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to the surface of the earth in the form of steam, which can be used to drive turbines to produce electricity. The cost of exploration, as well as the capital cost of geothermal power plants, is higher than other power plants that use fossil fuels. However, once it starts operating, its production costs are low compared to fossil fuel power plants. Power Transmission Is a process of distributing electricity (Ding et al., 2011, Gao et al., 2007, Huang et al., 2016) from power plant to power distribution lines (power plant distribution) so that it can be distributed up to consumer electric users (Sheng et al., 2013).

STUDY AREA

The Study site is located in Alam Pauh Duo, Kecamatan Alam Pauh Duo, DistrictSolok Selatan, Geographically at 01°36'17.635'' - 01°37'26.464'' S dan 101°8'37.704'' - 101°7'44.508'' N. Landform at the study site is an area of hills and there are also local community plantations (Figure 1).

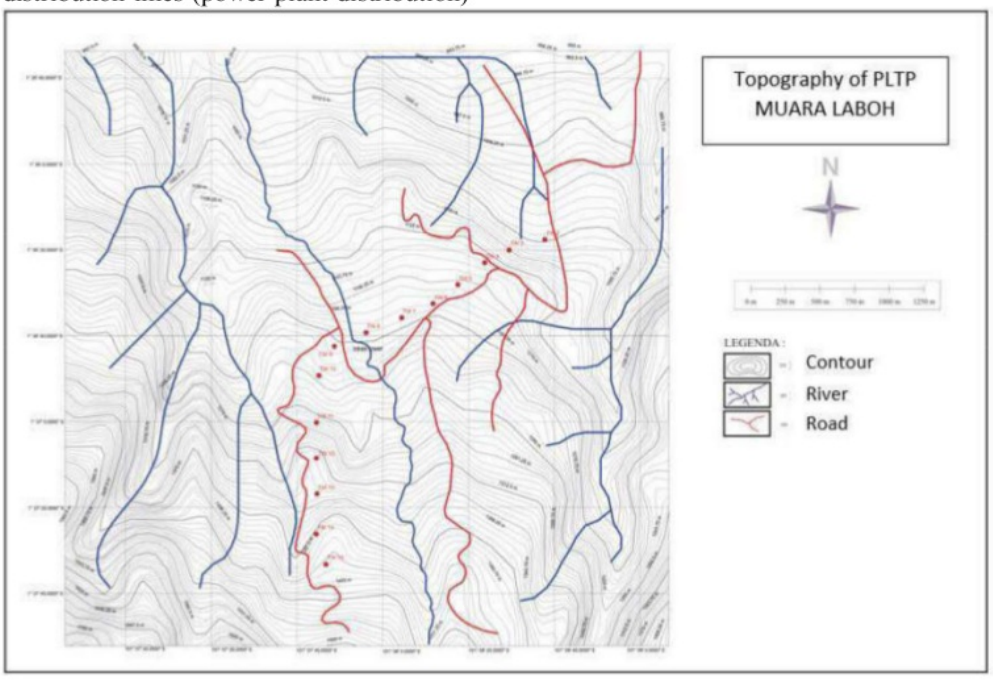

Figure 1. The map of survey line area.

Geothermal In the area of South Solok, or more precisely in the Muara Laboh, most of the hot springs associated with Muara Labuh located in a river valley Suliti, the basin tectonics (tectonic basin) along the 30 km and a width of 2-3 km at an altitude of 450 meters above the sea level. The tectonic basin in the North Muara Labuh. From the start of the southern end of the basin, topography continues to climb and the hot springs discovered at a distance of more than 3 km from the Mount Sikapa (656m) to Sapan Malulong (850m). Areas to the south are called Sikapa Hill South Muara Labuh.

The survey area has a landscape classified into Geomorphology Hills unit and Geomorphology High Hills Unit with a height of about 900-500m (meters). Lithology contained in the research area is volcanic rock and breakthroughs of granite and granodiorite. Potential energy in this area is geothermal energy because that area has many hot springs.

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In general, the survey area included in stratigraphic from young to old is composed of: Paleozoic metamorphic rocks (bedrock) (Perm-Carbon): composed by metamorphic rocks, metasediment and Pre-Tertiary volcanic rocks; Mesozoikum metasediment- rocks (Triassic-Jurassic): Members Batusabak and Shale (Formation Tuhur), Member of limestone's Kuantan Formation and sedimentary and volcanic rocks (Formation Sigunyur); Tertiary rocks consisting of: a group of sedimentary rocks and volcanic rocks group. Group volcanic rocks are divided into two age groups, namely groups of Eocene volcanic rocks (Formation Bandan) and Oligo-Miocene volcanic rocks (Formation Painan). Pre-Mesozoic rocks in the Mesozoic-break through the granite-diorite (Jura-Cretaceous). Tertiary rocks intruded by granodiorite and diabase rocks (Miocene). Quaternary volcanic precipitate mainly covered the top rock of the groups. Surface sediment consists of alluvium, lacustrine and swamp sediment (Resen)

Structures that affect this area is the Sumatra Fault: Dextral strike-slip fault and the normal fault has direction northwest-eastwest. Fault growing in this area: a normal fault and strike-slip fault. Normal faults generally the northwest-southeast direction of the Fault Semangko. While fault that has direction east-west allegedly closely associated with diabase intrusive rocks. Faults developed in the rock group Painan Oligo-Miocene formations. Fault limit there lithological contact between intrusive rocks diabase (Tdb) and integral volcanic rocks (Qou). Strike-slip Fault relative has north-south direction cut in several places on normal faults. In some locations, this fault is estimated as controlling the course of the hydrothermal solution and lithological contacts (figure 2).

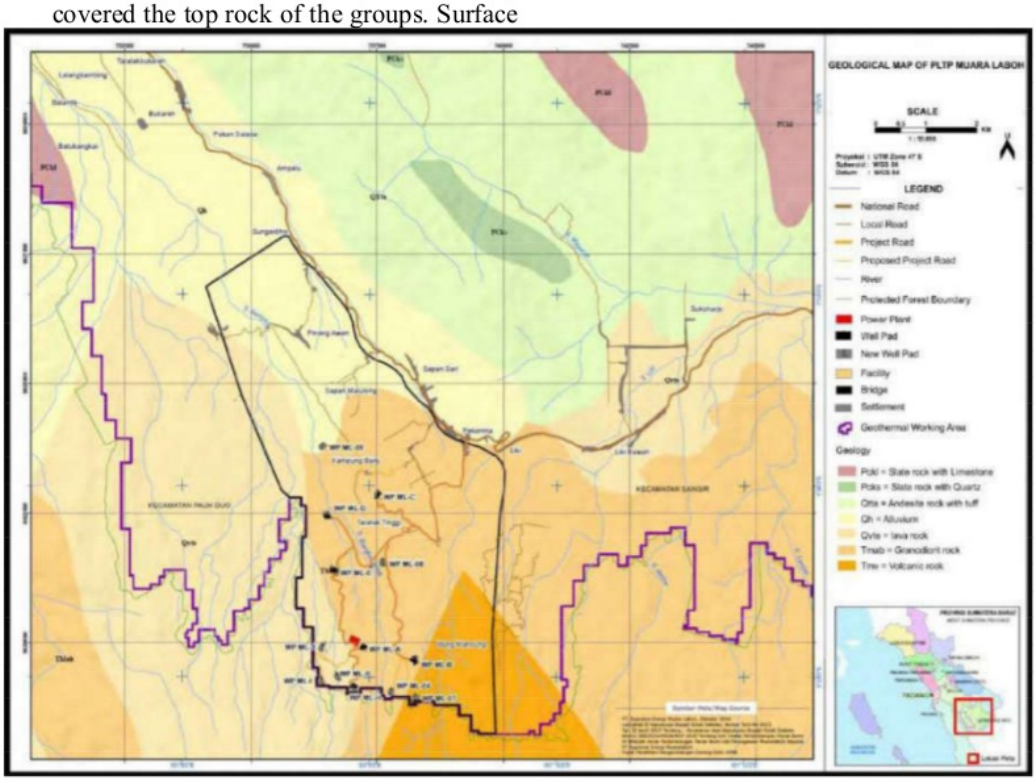

Figure 2. Geology Regional Map of Survey Area.

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METHODOLOGY

The survey (reconnaissance) used in Alam Pauh Duo, District Alam Pauh Duo, South Solok. The method used in reviewing survey (reconnaissance) is sweeping the street or track using GPS handheld (Kausarian et al., 2014, 2016, 2017, O'Rourke, 1996).

The goal in reviewing survey (reconnaissance) is looking for a peg or re-check the presence of the power plant and the transmission tower (Li et al., 2012, Mei et al., 2012) that based on reports from the initial survey. And to investigate the geological conditions in the field include lithological characteristics and access path between each power plant and the tower destination point (Svacina, 1992, Wheeler, 1964).

The transmission can be airways and underground conduits, but generally in the form of the airways. Electrical energy is channeled through aerial transmission line generally use bare wire that relies on air as the insulating medium between the wires. And to refute / stretching wires with the height and distance are safe for humans and the surrounding environment, the conductor wires mounted on a sturdy building construction, commonly called the tower. Inter/ electric tower and wires insulated by an insulator.

RESULT AND DISCUSSION

The form of the survey data taken in the form of the coordinate value of stakes or pins barrier already available and distributed at each site listed in Figure 1 are indicated by red dots. The existence of a limiting peg or mark to be close to the peak location of injection wells drilling geothermal power plant in Muara Laboh, up toward the power plant (GI) under adjacent to the Main Office PT.Supreme Energy (Figure 3).

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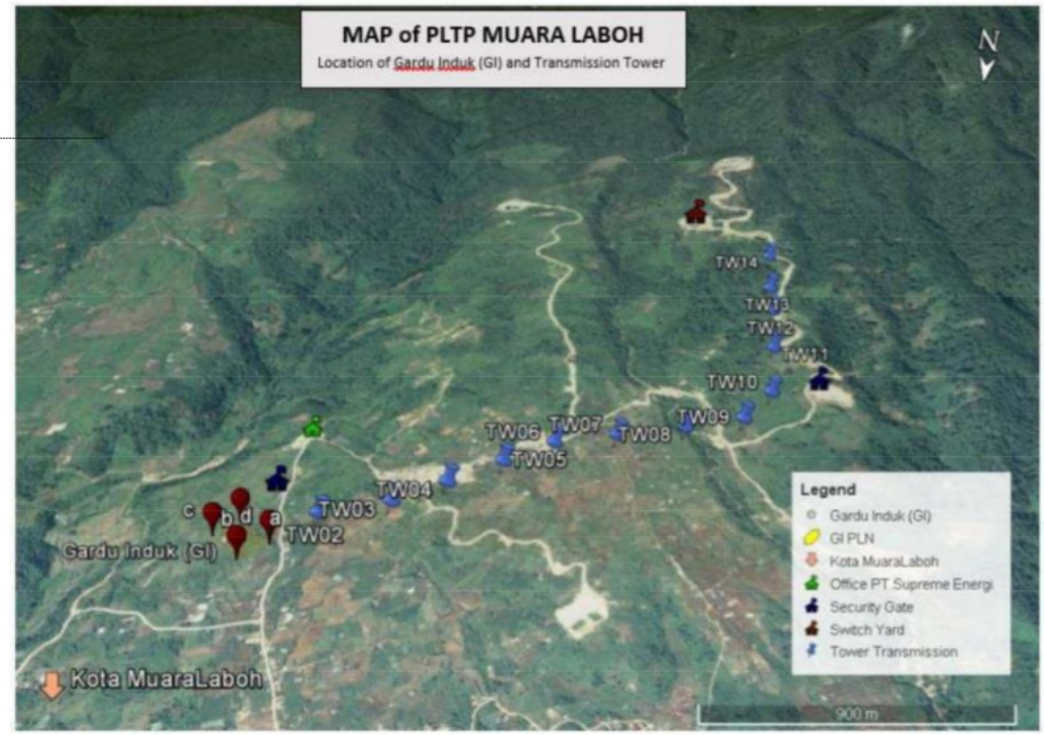

Figure 3. Locations of the power plant and the transmission tower (modified from googleearth).

Based on survey data that has been obtained then produced a map that has a description field site power plant and transmission tower. There are 15 planned develop transmission tower and Power plant (GI). The land area required for each transmission tower around 15x15 m (meters) up to 20x20 m and the area of land for the construction of the Power plant (GI) 3HA (hectares). Then the distance between each transmission towers approximately 230 meters.

Electrical energy is stream through aerial transmission lines rely on air as the insulating medium between the wire conductor with the surrounding objects. To refute / span wires with the height and distance are safe for humans and the surrounding environment, the conductor wires mounted on a sturdy building construction, commonly called the tower. There is a 15 point locations potential to build a transmission tower (Figure 3), marking the point of this site in the form of stakes barrier. Here are images of locations around the pegs of the transmission tower (Figure 4).

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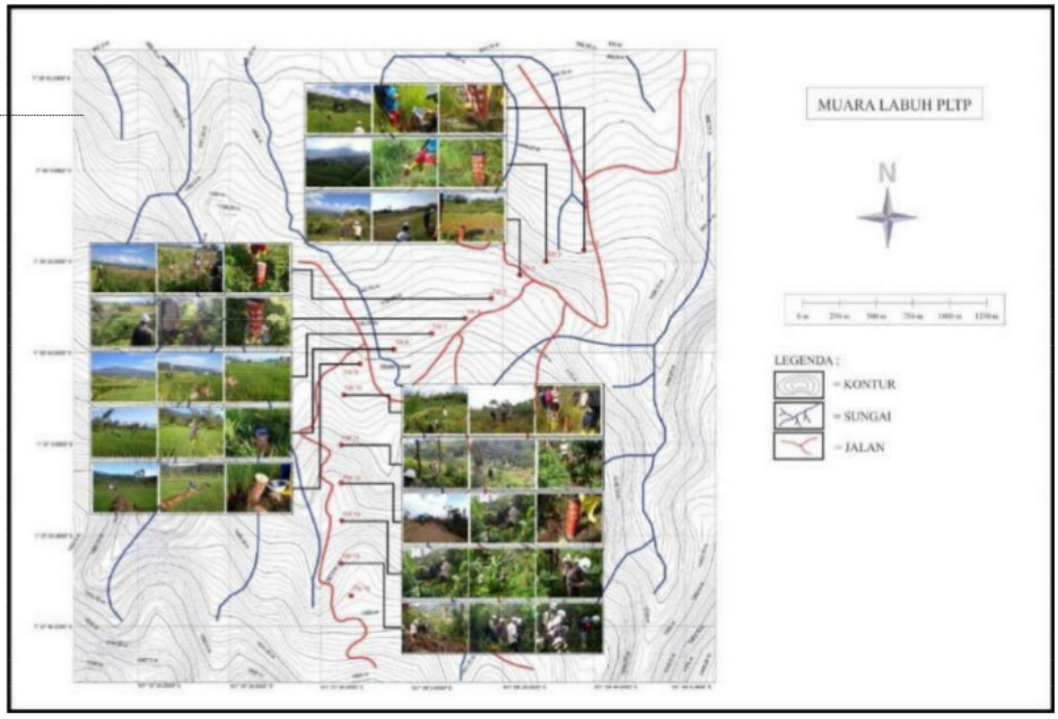

Figure 4. The Distribution Map Field Conditions in Every Transmission tower.

The results of field observations, field conditions are growing areas of local residents, the stakes are also several locations in the valley or the outskirts of the hill (see figure 3). Trails road is the only main access. For the location of transmission towers, peg 1 and 15 will be determined once the location of the power plant and Switchyard has been determined. Some points of the tower mounting location as a representation of the overall location shows this region in accordance become transmission lines.

There are 13 spots locations, including transmission 2 tower's locations is in the villagers' rice fields and access roads to get there a path that is usually passed by the farmers. Access from the main road leading to the location about 100 meters. Transmission 3 tower's locations are in villagers' rice fields and access roads to get there a path that is usually passed by the farmers. Access from peg 2 to the location of the tower is about 200 meters. Condition transmission 4 tower's locations are in the villagers' rice fields and access roads to get there a path that is usually passed by the farmers. Access from peg 3 to the location of the tower about 220 meters. transmission 5 tower's locations as well as in the villagers' rice fields there are shrubs and the access road to get there is a path that is usually passed by the farmers. Access tower peg 4 to a location about 210 meters. Transmission 6 tower's locations as well as in the villagers' rice fields there are shrubs and the access road to get there is a path that is usually passed by farmers and residents. Access peg 5 to the location of the tower about 210 meters.

transmission 7 tower's locations as well as in the villagers' rice fields and there are shrubs and the access road to get there is a path that is usually passed by farmers and residents. There was no stakes marker.

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Access tower peg 7 to a location approximately 180 meters. Transmission 8 tower's locations as well as in the villagers' rice fields and there are shrubs and the access road to get there is a path that is usually passed by farmers and residents. Access tower peg 7 to a location approximately 200 meters. Transmission 9 tower's locations are in the villagers' rice fields, there are shrubs and the access road to get there is a path that is usually passed by farmers and residents. The Access for peg 8 tower to a location approximately 200 meters. Transmission 10 tower's locations are in the villagers' rice fields, there are shrubs and the access road to get there is a path that is usually passed by farmers and residents. Access tower peg 9 to a location approximately 200 meters.

Transmission 11 tower's locations are in community garden and there's shrubs and the access road to get there is a path, and located alongside a hill. Access tower peg 10 to a location about 200 meters. transmission 12 tower's locations are in shrubs and the access road to get there is a path, and located alongside a road project. Access tower peg 11 to a location approximately 200 meters. transmission 13 tower's locations are in shrubs and the access road to get there is a path, and located alongside a road project. Access tower peg 12 to a location approximately 200 meters. transmission 14 tower's locations are shrubs and the access road to get there is a path, and located alongside a road project. Access tower peg 12 to a location approximately 200 meters.

In general, it can be described the appropriate location to build power transmission lines using the tower as in Figure 5.

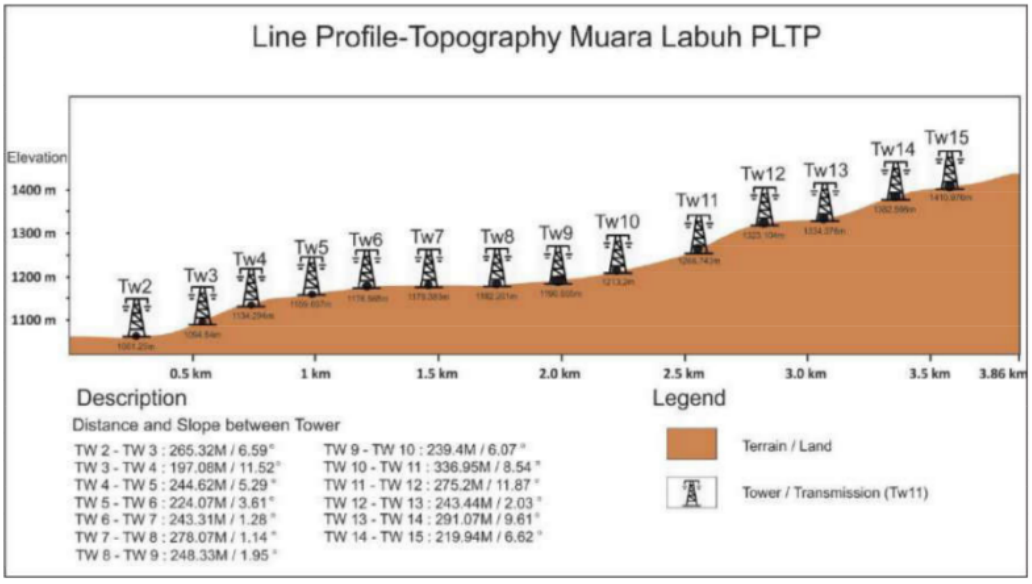

Figure 5. Final Result of the Profile of Topography Survey Location for the Transmission Tower Recommendation.

CONCLUSION

The development of Power Plant located on Alam Pauh Duo, Kecamatan Alam Pauh Duo, Solok Selatan is a potential area to build. This area has Geothermal In the area of South Solok, or more precisely in the Muara Laboh, most of the hot springs associated with Muara Labuh located in a river valley Suliti, the basin tectonics (tectonic basin) along the 30 km and a width

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of 2-3 km at an altitude of 450 meters above the sea level. The survey area has a landscape classified into Geomorphology Hills unit and Geomorphology High Hills Unit with a height of about 900-500m (meters). Based on survey data that has been obtained then produced a map that has a description field site power plant and transmission tower, this area has a potential to build 15 towers as the transmission line to distribute the electricity.

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