

A New Methode Safely Analyzing Of Energy Cost Plts System North Sumatera Indonesia

*Hamdani¹, Solly Aryza², Zuraidah Tharo³

^{1,2,3} Staff Lecture Faculty Engineering Program Study Electrical Engineering University Pembangunan
Pancabudi Medan North Sumatera, Indonesia
Corresponding Author: Hamdani

Abstract: The village of Sikabung Kabung located near the border between Deli Serdang and Medan city, in the village area of sikabung-kampung which still use Generator set (Genset) as electricity source because it has not received electrically from PT PLN. Utilization of renewable energies as a source of electricity for households in rural areas is the right solution to overcome the lack of electrical power sources. This research is about analyzing solar radiation data in Muara Langon village and total electrical load data and electric power requirement for PLTS planning for Muara Langon village house using HOMER software. Planning of semi centralized PLTS system can meet the growth of approximately ten-year load of 11,7% every year, and this system has the energy cost of USD 2.03 / kWh. The planned semi centralized PLTS system still has higher energy costs than existing diesel systems that have an energy cost of USD 1.02 / kWh.

Keywords: Renewable Energy, Homer, Plts

Date of Submission: 14-08-2017

Date of acceptance: 05-09-2017

I. Introduction

The national electrification ratio according to PLN static data in 2013 has reached 78.06%. Basically, for each province has different electrification rate depending on whether or not PLN electricity facilities in each region. When reviewed per region, the electrification ratios of each region will vary, particularly Eastern Indonesia (KTI) which has remote villages. The rural electrification program (Lisdes) has a significant contribution in increasing the electrification ratio in Indonesia.

The electrification rate in East Sumatera has reached 70.81% [1]. This paper discusses the design (sizing) of PLTS in Sikabung-kabung village near the border between North Sumatera - South Sumatera. Sikabung -Kabung village is a community that has not received PLN electricity facility until 2014. The village of sikabung- kabung, located in near Brastagi, North Sumatera Province is a community-based in the highlands that contain hills, meadows, and tropical forests. This village has \pm 47 heads of families, and the majority of the population is Karo tribe who livelihood as a rubber farmer. The house of the villagers Using Generator set (Genset) with capacity 500 - 3000 watts as a source of electricity to support daily needs such as lights, televisions, and mobile phone charges. Sikabung-kabung Village has a 10kW Community Genset that serves electricity for 17 houses from a total of 47 homes for 6 hours from 18.00 to 24.00 due to rural areas having high fuel prices. The solution to overcoming the absence of electricity is to use solar cells as solar energy converters into electrical energy known as Solar Power Generation (PLTS). PLTS planning for sikabung-kabung village in this paper is limited to 10 years to calculate load development and this planning using the simulation of software HOMER.



Fig 1. Location Of Vilage sikabung-kabung

III. Methodology Research.

Planning of PLTS semi centralized system is divided Into two parts, among others, the first part consists of 17 House of residents at the top of the map and the second part composed From 30 residents homes at the bottom of the map on the picture 4. The first part of this system has a total load capacity And total daily energy of 2792 Watt and 11627 Wh, While the second part of this system has a total capacity Load and total daily energy of 4648 Watt and 23085 Wh as in figure 4 below.

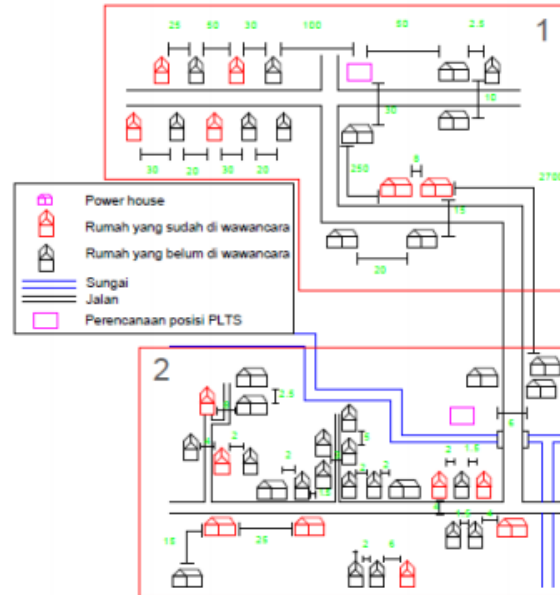


Fig 4. Map of the home grouping of PLTS system Semi centralized

3.1 Potential solar radiation

The use of homer simulations is important for know the amount of potential energy resources at the site the. the potential of solar radiation for sikabung-kabung village can be obtained through homer software or through the site official nasa. this paper uses radiation data sun through homer software by using data latitude and longitude of the village of muara langon. latitude from the village of muara langon is $1^{\circ} 40's$ and its longitude is $115^{\circ} 43'e$. sun radiation data of muara langon village for 10 years can be seen in figure 4 with an average of 4.75 kwh / m2.

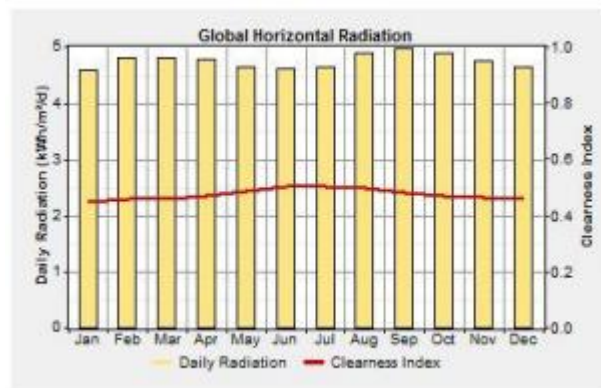


Fig 5. Potential Of Surya Energy.

3.2 Specification Inverter.

Inverter selection does by searching data prices on the internet and compare prices from solarbuzz inverter prices. price from solarbuzz inverter prices are around usd 0.711 per continuous watt. on this paper uses inverter capacity capacity 5kw at the cost of usd519 [8] cost replacement of usd 519 assuming all replaceable components and an 8kw with-inverter price of usd 799 [9] replacement cost of usd 799 assuming all parts are replaced. operating costs and maintenance per year around usd 15 [6]. description engineering and economics of the inverter can be seen in table 6 in under

Tables 1. Specification of Inverter

Inverter 5000 W	Deskripsi
Harga	USD 519
Replacement	USD 519
O&M (per tahun)	USD 13
Daya	5000 W
Tegangan	12 V DC
Efisiensi	> 90%
Inverter 8000 W	Deskripsi
Harga	USD 799
Replacement	USD 799
O&M (per tahun)	USD 13
Daya	8000 W
Tegangan	12 V DC
Efisiensi	> 90%

IV. Result Analysis.

4.1. Planning Of Semi Centralized PLTS System First Part

The first part semi-centered PLTS system has total load capacity and total daily energy of sums on 17 houses of 2792 Watt and 11627 Wh. The solar cell module used is Kyocera KD140GX-LFBS with 140 W peak power capacity, Battery used is Vision 6FM200D battery with 12 V voltage and 200Ah capacity, Inverter used for 5000 Watt.

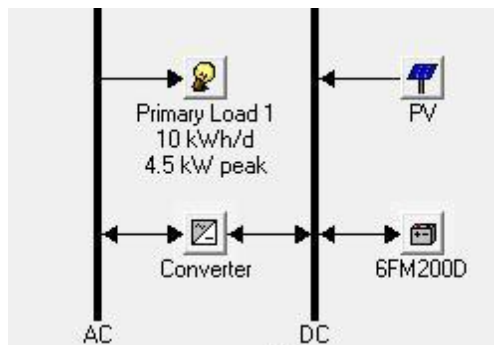


Fig 6. Modelling System PLTS once.

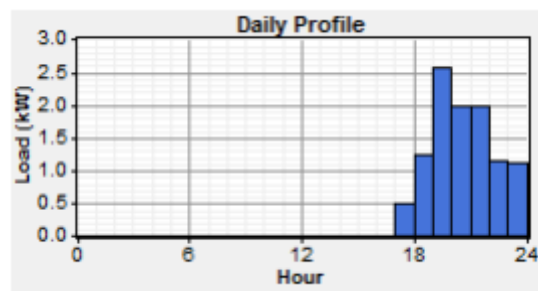


Fig 7. Kurve of Load

modeling of plts system semi centralized parts first after simulated using homer, it was found that the capacity of the solar cell module required of 6800 watt or about 49 solar modules and the required battery is 25 batteries for inverter using 4800 w inverter, as well as ic value, oc, total npc, and coe respectively usd 39,490 usd 2,263 / year, usd 55,819, and usd 2.03 / kwh.

PV (kW)	6FM200D	Conv. (kW)	Initial Capital	Operating Cost (\$/yr)	Total NPC	COE (\$/kWh)	Ren. Frac.
6.80	25	4.80	\$ 39,490	2,263	\$ 55,819	2.039	1.00

Fig 8. Value Of Simulation

On the simulation of semi centralized PLTS system section First, there is excess energy or excess electricity (KWh / year). The surplus energy is the difference between the total Electrical power generated by

the system for one year With the electric power consumed by the load for 1 year. In this simulation also produces capacity Shortage of 3.57 kWh / year or 0.1%. Planning semi centralized PLTS system has COE of USD 2.03 / kWh. This PLTS system can Meet the development needs of the load up to 9 years Forward, to achieve the development of the load Up to 10 years of 11.7% per year needs to be enlarged

Sizing system as follows:

- The first part system has excess electricity $Of = 4.218\text{kWh} / \text{year}$ or 44.8% so for Meet the needs for ten years need to be enlarged Sizing from 6.8kW to 7.5kW.
- The second part system has an excess of electricity = 8,095kWh / year or 44.3% so for Meet the needs for ten years need to be enlarged Sizing it from 13.2kW to 15kW. Analysis of energy cost in question is cost of Energy (USD / kWh). Simulation results show that The diesel system configuration has a COE of USD1,02 / kWh while the PLTS system configuration Has a COE of USD2.03 / kWh. System configuration PLTS still has higher energy costs Compared to diesel systems within ten years.

V. Conclusion

From this study it was found that semi-centralized PLTS system Which is planned to have energy costs (COE) = USD 2.03 / kWh and can meet the load development Up to 10 years, because:

- first excess electricity system PLTS = 4,218 kWh / year or 44.8% per annum.
- second excess electricity system PLTS = 8,095 kWh / year or 44.3%

Compared to diesel systems, the diesel system Still cheaper than semi-terpesarted PLTS system. The existing diesel network system has a COE of USD 1.02 / kWh while the PLTS system is semi centralized part First having existing networks have COE For USD 2.03 / kWh.

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Hamdani. "A New Methode Safely Analyzing Of Energy Cost Plts System North Sumatera Indonesia." IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE), vol. 12, no. 4, 2017, pp. 39–43.