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An Enhance of Renew Source for Homes

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Abstract

Implementation of a new source for residential homes, this study uses a baseline based on the availability of PV mini-grid equipment. The research method is carried out by direct measurement of PLTS devices. The solar power plant devices measured include a solar cell module, a solar charge controller (SCC) Inverter testing is done by connecting the battery to the inverter input, and the inverter output is connected to a 500-Watt load capacity. The inverter lasts for about 3 hours. It can be stated that the battery can provide energy of 3 days.

Keywords
solar power plant; energy; residential homes

I. Introduction

One of the renewable sources that are developing quite rapidly in the world, including in Indonesia, is solar energy. Development is a systematic and continuous effort made to realize something that is aspired. Development is a change towards improvement. Changes towards improvement require the mobilization of all human resources and reason to realize what is aspired. In addition, development is also very dependent on the availability of natural resource wealth. The availability of natural resources is one of the keys to economic growth in an area. (Shah, M. et al. 2020). Indonesia's position as a tropical country that gets sunlight all year round and the natural wealth of silica sand is a gift that must be optimized. The potential for developing solar energy is very large, it is noted that Indonesia has a solar energy potential of 207,898 MW (4.80 kWh/m2/day).

Currently, the utilization of solar energy in Indonesia has only reached 0.05% of the existing potential, and the installed capacity for solar power plants has only reached 100 MW, which must reach an increase of about 900 MW according to the national energy general plan target. The Government's target to build a solar power plant of 6.5 GW in 2025 is also being pursued. A solar power plant is part of an alternative energy solution, as well as to create better air quality (Bachtiar et al., 2008).

Based on the matter above, researchers feel the need to conduct research with the title of study on the implementation of solar power plants for residential homes. Solar thermal energy is very abundant in areas that have a tropical climate like Indonesia, which is always exposed to the sun throughout the year. It is a source of energy that has the potential to be developed. One example is the use of solar energy to produce electrical energy which is often referred to and better known by the community, namely solar cells. Solar cells in producing energy are still not too large. In Indonesia, there are already available Solar Power Plants (PLTS) which are commonly used for electricity in remote villages, such a system is commonly referred to as SHS (Solar Home System). Generally, SHS is a small-scale system, using a solar module of 50-100 Wp (Watt peak) and generating daily electricity of 150-300 Wh. Because the scale is small, it uses a DC (Direct Current) system, so as not to be exposed to losses and self consumption

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(Khairunnisa et al., 2017). Human Resources (HR) is the most important component in a company or organization to run the business it does. Organization must have a goal to be achieved by the organizational members (Niati et al., 2021). Development is a change towards improvement. Changes towards improvement require the mobilization of all human resources and reason to realize what is aspired (Shah et al, 2020). The development of human resources is a process of changing the human resources who belong to an organization, from one situation to another, which is better to prepare a future responsibility in achieving organizational goals (Werdhiastutie et al, 2020).

With this small system, it is installed in a decentralized manner (one house, one generator) so that it does not require a distribution network. SHS is ideally used for electricity in rural areas where houses are far from each other, and the electricity needs are relatively smaller, which is only to meet the basic household use, namely lights (Benoudjit et al., 2016).

So, the hybrid system means PLTS-micro-hydro, PLTS-Genset, PLTS-wind power. In Indonesia, hybrid systems have been widely used, such as PLTS-micro-hydro, PLTS-Genset, and PLTS-wind power. However, the PLTS-Genset hybrid is the most widely used. Generally used in captive generators / isolated grids (stand-alone generators), namely generators that are not interconnected. The purpose of the hybrid PV-Genset is to combine the advantages of each generator (Genset and PLTS) as well as to cover the weaknesses of each generator so that the system as a whole can operate more economically and efficiently (Aryza et al., 2018).

II. Review of Literature

2.1. Solar Cell

A solar cell is a device that converts the energy of sunlight directly into electricity by the photovoltaic effect. Sometimes the term solar cell is reserved for devices intended specifically to capture energy from sunlight, while the term photovoltaic cell is used when the light source is unspecified. Assemblies of cells are used to make solar panels, solar modules, or photovoltaic arrays. Photovoltaic is the field of technology and research related to the application of solar cells in producing electricity for practical use (Solly & Lubis, 2019).

Because a single photovoltaic module can only produce a limited amount of power, many installations contain several modules or panels and this is known as a photovoltaic array. A photovoltaic installation typically includes an array of photovoltaic modules or panels, an inverter, batterie, and interconnection wiring.

A. Photovoltaic cell Sunlight that shines on the earth can be converted into electrical energy through a process called photovoltaic (PV). Photo refers to light and voltaic refers to voltage. This term is used to describe electronic cells that produce direct current electrical energy from solar radiation. Photovoltaic cells are made of semiconductor materials, especially silicon which is coated by a special additive. If sunlight reaches the cell, the electrons will be released from the silicon atoms and flow to form an electrical circuit so that electrical energy can be generated. Solar cells are always designed to convert light into electrical energy as much as possible and can be combined in series or parallel to produce the desired voltage and current as stated by Chenni et. al.(2007).

2.2. Description Of The Proposed Pv System

The proposed PV system can operate in both modes of operation, grid-connected and stand-alone. It mainly includes the PV generator, block batteries, power conditioning units,

and control system. PV Generator. It consists of PV modules connected in series and parallel depending on the selected DC system voltage and power. The PV modules are selected to be monocrystalline or polycrystalline silicon because of their high efficiency and less degradation over the life time periods in comparison with other PV technologies. Storage Block Batteries. The battery block consists of stationary cells that can stand very deep discharge and have a high cycling rate exceeding 1000 times due to frequent grid blackouts. These battery cells have a high ampere-hour efficiency in the range of 80-90% andhave a long life time exceeding 10 years. Battery Charge Regulator. It is used to regulate the charging process of the battery block and to protect it against deep discharge and extreme overcharge (Isa Indrawan et al., 2019).

2.3. Solar Power Plant As The Future Alternative Energy

The success of national development will not be separated from the role of energy supply as a supporting facilitiy, as well as electricity. Given the potential of oil and gas energy are depleted, while coal which is abundant potential reserve but could bring a negative impact to the environment, the development of renewable energy resources for power generation is solution to achieve the national energy security. The utilization potential of solar power for electricity generation is a promising alternative, because a clean environment, unlimited resources and is available throughout the country. The tendency of diminishing the photovoltaic electricity generation cost as well as a variety of its applications to become a positive effect in the development of photovoltaic electricity generation. Integration of PLTS into the National Electrical system will require its own development strategy (Vora et al., n.d.).

III. Review of Literature

This research was conducted in stages:
Preparing the object of research, the research object used is shown in the following table

Table 1: the research objects

Device	Specification	Quantity
Solar cell module	Monocrystalline, 100 Wp,	6 unit
Solar charge controller	PWM, 45 Ampere	1 unit
Battery	12 Volt, 200 Ah	1 unit
Inverter	Pure Sine Wave, 1000 Watt	1 unit
Dummy load	Resistive, 500 Watt	1 set

Solar Cell Modules were placed in an open location that can receive maximum sunlight. The research objects were installed as the figure below

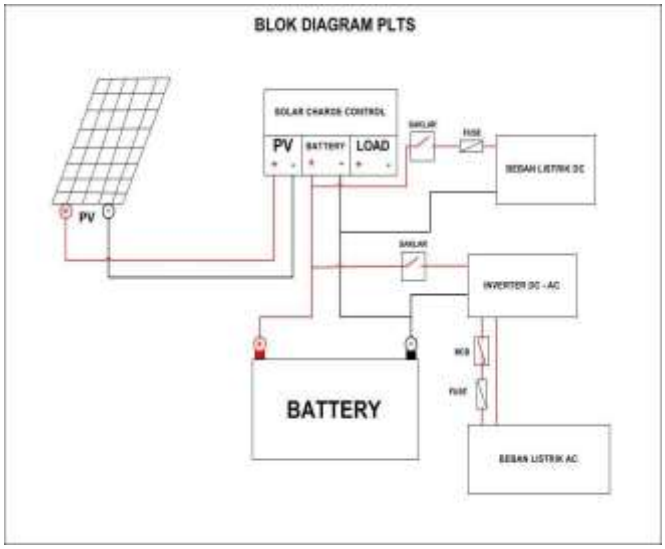

Figure 1. *Solar Power Plant Minimum System (Https://Solarcell978.Com/?P=180)*

The Solar charge Controller received the power, voltage, and current from the solar cell modules circuit. The battery received the power, voltage, and current from the Solar charge Controller. The inverter received the power, voltage, and current from the battery The dummy load received the power, voltage, and current from the inverter

IV. Result and Discussion

4.1 Population Policy During Turki Utsmani 1512-1566 M

Voltage, current, and power were produced by the solar cell modules circuit were shown in three figures below

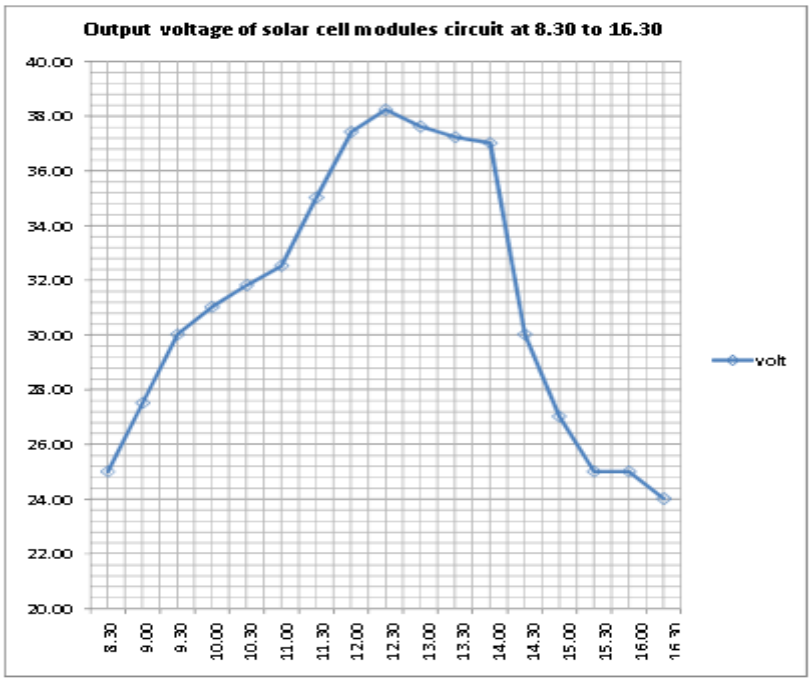

Figure 2. *Voltage output of solar cell modules*

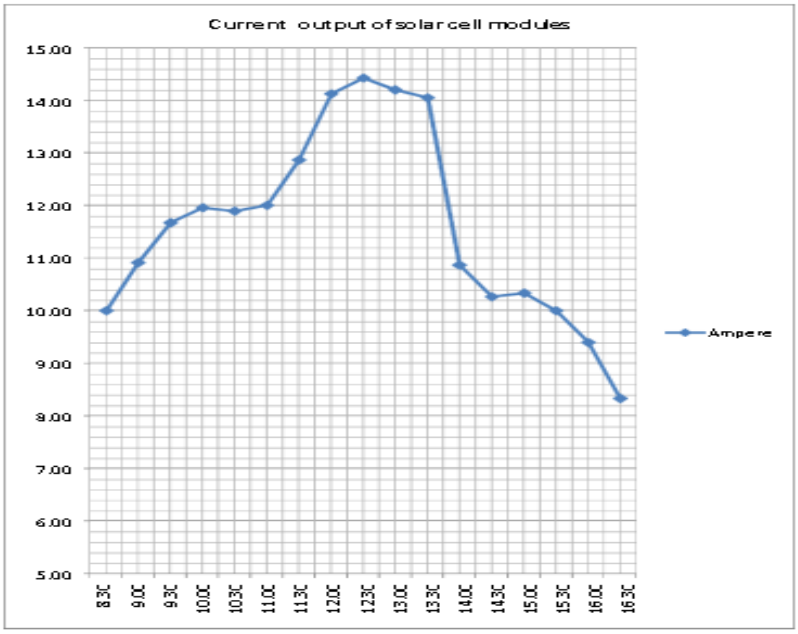

Figure 3. *Current output of solar cell modules*

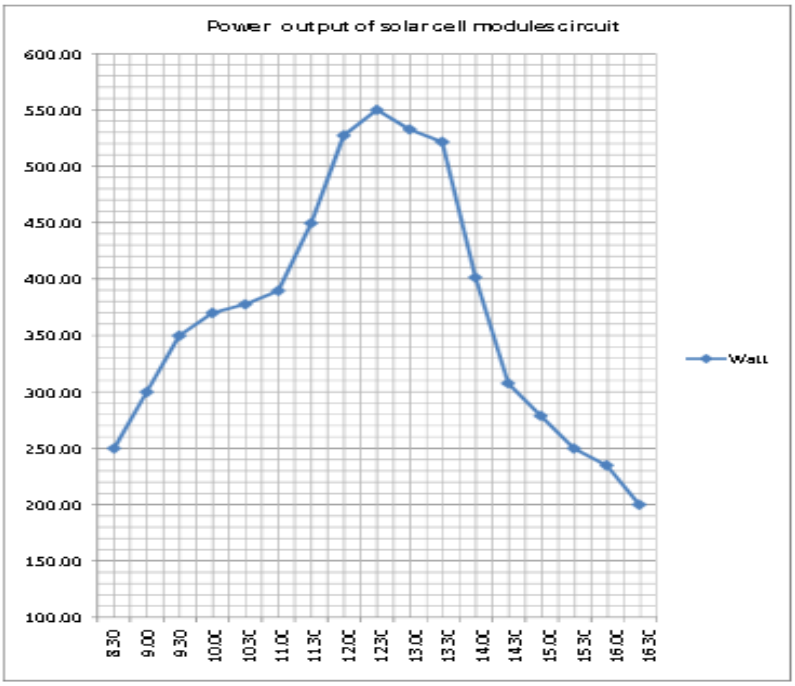

Figure 4. *Power output of solar cell modules*

Based on the measurement results above, the total amount of electrical energy produced by the circuit of solar cell modules as a result of conversion from solar energy was 3,04834 Kilo Watt Hour (KwH).

Table 2. Total management produce by the solar cell modules during 8 hours

start	Finish	Duration	Total energy was produced	
(WIB)	(WIB)	Hours	Watt hour (WH)	Kilowatt.Hour (KwH)
8.30	16.30	8	3048, 34	3,04834

The process of charging the battery in the PLTS system is carried out by the Solar Charge Controller (SCC) device. The SCC device obtains electrical energy from the circuit of solar cell modules as shown in the table above. The results of the measurement of SCC device is shown in the following table 3.

Table 3. Measurement of SCC

no	Time of data taken (WIB)	input SCC			output SCC		
		voltage	current	power	voltage	current	power
		measured	measured	counted	measured	measured	counted
		Volt	Ampere	Watt	Volt	Ampere	Watt
1	8.30	25	10	250	13.50	14.81	200.00
2	9.00	27.5	10.91	300	13.00	18.46	240.00
3	9.30	30	11.67	350	13.50	20.74	280.00
4	10.00	31	11.95	370.5	13.50	21.96	296.40
5	10.30	31.8	11.89	378	13.70	22.07	302.40
6	11.00	32.5	12	390	13.70	22.77	312.00
7	11.30	35	12.86	450	13.70	26.28	360.00
8	12.00	37.4	14.11	527.83	13.70	30.82	422.26
9	12.30	38.2	14.42	550.66	13.80	31.92	440.53
10	13.00	37.6	14.19	533.49	13.70	31.15	426.79
11	13.30	37.2	14.04	522.2	13.70	30.49	417.76
12	14.00	37	10.86	402	13.70	23.47	321.60
13	14.30	30	10.27	308	13.60	18.12	246.40
14	15.00	27	10.33	279	13.60	16.41	223.20
15	15.30	25	10	250	13.50	14.81	200.00
16	16.00	25	9.4	235	13.00	14.46	188.00
17	16.30	24	8.33	200	13.00	12.31	160.00
average		31.25	11.60	370.39	13.52	21.83	296.31

A graphical, comparison of power input to output SCC is shown in the figure below

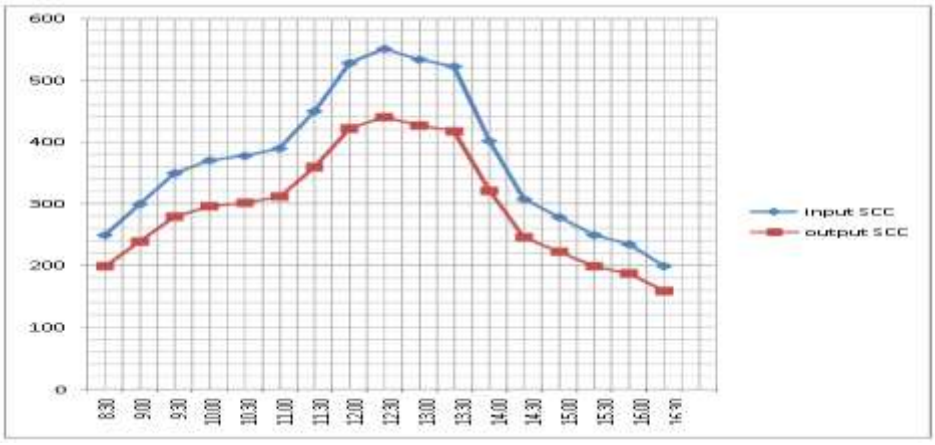

Figure 5. *Input and output power of SCC*

The energy was received and produced by the SCC for 8 hours and its efficiency is shown in the table below

Table 4. Input and output power of SCC and its efficiency

start	finish	Duration	input	output	efficiency
			From solar cell modules circuit	For battery charging	About / Ein
(WIB)	(WIB)	Hours	kilowatt Hours	kilowatt Hours	
8.30	16.30	8	3,04834	2.438672	0.79

The energy generated from the SCC is the charging energy for the PLTS system battery

The average charging voltage is 13.52 Volts, with energy supplied to the battery of 2,438672-kilowatt

After calculating the battery charging efficiency of 80%, the energy received by the battery is:1950,938 watt-hours or 1.95093 Kilowatt Hours (KwH). The battery charging capacity is shown in the following table.5.

Table 5. battery charging from SCC

duration	energy received	Battery voltage	Battery charging	Battery capacity	persentase battery charging
Hours	kilowatt Hours	(Volt)	AH	AH	%
8	1,9509	12	162,67	200	81,28

The energy received by the battery is 1.9509 KwH, the battery voltage used is 12 Volts, then the current capacity that can be generated by the battery is: 1950,9 WH/12 V = 162, 67 AH because the battery applied to the PLTS system is 12 volts 200 Ah, then the battery has been charged 81.28%

Inverter device measurement includes testing the performance of the inverter when it is given an electrical load and measuring the energy needed by the inverter from the PLTS battery inverter test results are shown in Table 6 below.

Table 6. inverter test results

no	Input power inverter			Output power inverter			efficiency	Duration in normal operation (minutes)
	Input voltage	Input current	Input power	Output voltage	Output current	Output power (load)		
	(Volt)	(Ampere)	(Watt)	(Volt)	(Ampere)	(Watt)		
1	12	52.08	625.00	217	2.30	500	0.8	180
2	12	50.81	609.76	218	2.29	500	0.82	185
3	12	51.44	617.28	218	2.29	500	0.81	175
4	12	52.74	632.91	220	2.27	500	0.79	180
5	12	52.08	625.00	220	2.27	500	0.8	181
6	12	51.44	617.28	219	2.28	500	0.81	183
7	12	50.81	609.76	217	2.30	500	0.82	180
8	12	52.74	632.91	218	2.29	500	0.79	180
9	12	53.42	641.03	219	2.28	500	0.78	176
10	12	50.81	609.76	219	2.28	500	0.82	180
average	12	51.84	622.07	218.50	2.29	500.00	0.80	180.00

The battery lasts to energize a normal 500-watt-hour load for:3 hours

In other words, it can be stated that the battery can provide energy of 1.5 kilowatt-hours (KwH)

V. Conclusion

The implementation of solar power plants as a source of energy for residential homes should go through a maximum planning process. Some factors to consider include: availability and suitability of devices, capacity and load characteristics, as well as user behavior. the suitability of each device will improve the performance of the solar power generation system. the implementation of a 600-watt solar cell module and a 200-ah battery capacity can provide 1.5 kilowatt hours of energy, but this is not absolute, because the sunlight factor also has a big influence on the performance of solar power plants.

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