Community Dedication on General Facilities Using Solar Cell System in Kalialo Village, Kupang, Jabon, Sidoarjo

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Abstract

In essence, road access to Kalialo Village is still complicated due to the dark terrain and street lighting (PJU); this is because the PJU electricity in the village has been cut off for the last six months. Kalialo Village has provided information to PLN regarding the cut off of public street lighting but has not received any response to date. To help and facilitate this access, we, as the Center for Engineering and Energy Studies, feel the need for a Solar Power Plant (PLTS) or Solar Cell, which will be installed at specific vital points or locations on the road access Kalialo Village

Keywords: Solar Power Plant, Kalialo Village, Street Lightening

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Introduction

Kalialo Village, which is part of the Jabon District in Sidoarjo Regency, is geographically located at the southern tip of Sidoarjo Regency, close to the mouth of the Porong tributary. Kalialo village has a distance of approximately 40 km to the south from the centre of Sidoarjo City and can be attained with boat or motorcycle [1]. If the rainy season, motorbikes have to go through rugged terrain, and it takes an extra-strong struggle to reach it because the roads are muddy and muddy. The population in Kalialo Village consists of approximately 100 people with 60 families and 45 houses [2]. The primary income of the residents is fishpond farmers and fishermen, and they can produce 500 tons of milkfish, 100 tons of tiger prawns, 1500 tons of seaweed annually; the majority of the people of Kali Alo Hamlet work as fishpond farmers and fishers [3]. Therefore, it deserves to be called, as one of the managers of the largest milkfish pond in Sidoarjo City is Kali Alo Hamlet.

The distance that is far enough and the rugged terrain makes this village seem isolated. PLN, which only entered in 2013, is not reliable enough to supply electricity to the Kalialo village community because the electricity network is drawn far enough and has a high risk of the existing field conditions. There is one primary school called SDN Kupang IV in this village, with about 20 students for grades 1 to 6, which is not enough, and it is having difficulty finding teachers [4].

In essence, road access to Kalialo Village is still complicated due to the dark terrain and street lighting (PJU); this is because the PJU electricity in the village has provided information to PLN regarding the cut off public street lighting but has not received any response to date.

To help and facilitate this access, we, as the Center for Engineering and Energy Studies, feel the need for a Solar Power Plant (PLTS) or Solar Cell, which will be installed at specific vital points or locations on the road access Kalialo Village.

From the explanation above, it can be concluded that the problems that exist in the Kalialo Community are:

1. There is damage to the electricity supply for PJU (Public Street Lighting) in Kalialo, problems often occur.
2. Public Street Lighting installed from PLN is currently not functioning (First year and second year.
3. The main water pump that supplies Kalialo's needs is also disrupted due to insufficient electricity capacity (Year Three)

Method

To implement this program, at the Pre-Implementation stage, what is done is:

1. Mapping the electricity installation path for PJU
2. Measure the power requirements of the PJU system and water pump.
3. Carry out the design of the PLTS installation location and system.
4. Planning the Solar Cell systemmaintenance material and light troubleshooting.

Implementation

At the implementation stage, do the following:

1. Making the PV mini-grid system.
2. Installing PLTS.
3. Installing the PJU system.
4. Installing PLTS for water pumps.
5.Conducting maintenance and maintenance training for Solar Cells in the community.

After Implementation

After the PLTS, installation is carried out, then:

1. Perform routine maintenance of the PV mini-grid system.
2. Perform routine maintenance of the PJU system.
3. Perform routine maintenance of the water pump system.
4. Routine maintenance training and minor trouble shooting were carried out.

Where the implementation will involve the community, so that they can carry out good maintenance so that the sustainability of the system is maintained, and troubleshooting is light. If there is a trouble on a large scale, our team will assist you.

Achieved Results and Outcomes

The community service implementation stages begin with designing tools, lighting system design using PLTS as follows:

Road logging system design using PV mini-grid. The design of the PLTS Street Lighting system in this Abdimas activity is as set out in Figure 1.

In Figure 1. It appears that Photovoltaic (PV) receives energy from the sun, converting light energy and heat into electrical energy. Then enter into the controller and divided the current on charging the battery and towards the load.

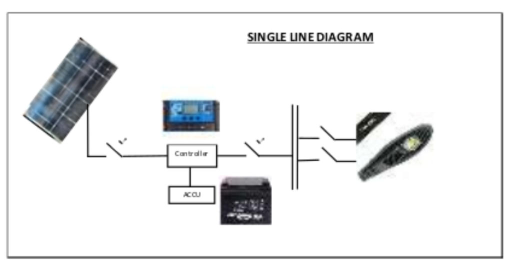

Figure 1. Single Line Diagram

Some of the devices installed are the panel box control system for the PLTS disinfectant pump, as shown in the picture

Figure 2. Inside Panel Box

Figure 3. Panel Box Outside

In Figure 2. You can see the panel box inside; there are several MCBs, terminals, and terminals for system operation. Meanwhile, on the outside of the panel box, as shown in Figure 3.

Before the tools are installed on-site, all components and devices to be installed must be assembled and tested first. The picture of the total system used in the implementation of this Abdimas is as set out in Figure 4.

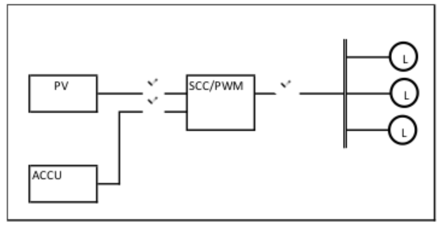

Figure 4. Total Equipment Series

In the circuit, as contained in Figure 4, the system starts with Photovoltaic (PV), which captures sunlight and converts it into electric waves with a voltage ranging from 12-14 Volts. The electric voltage has a direct current (DC) system. The output from this PV goes into the controller known as the Solar Charge Controller (SCC). In this SCC, the electric current that leaves the PV is regulated, what percentage goes to the ACCU and what percentage goes to the load.

The following function is to control the amount of output voltage and current that will enter the ACCU. If the sun is hot, the voltage will increase, and the current will increase, so the SCC will cut the voltage so that ACCU gets a small supply of voltage. Therefore, it is not dangerous for ACCU itself, in Figure 5. You can see the picture of the battery or ACCU used to store electricity. During the daytime, the load is limited; at night, many limitations operate, so the electricity during the day is stored in the battery / ACCU first. The ACCU system installed has a capacity of 14 AH. This means that he has the pressure to supply a load of 14 A within 1 hour. If the power load only 7 A, then it can provide for 2 hours. If the shipment is 3.5 A, the system can supply for 4 hours. While the installed load system is 9 A, and it will work from 17.00 to 22.00 WIB (for 5 hours), then the capacity of 14 AH will be sufficient to supply the load.

Figure 5. Battery

After entering the SCC, the output is divided into two directions: entering the ACCU and the other towards Load. To carry out remote monitoring, the Internet of Things is used, namely Android. Monitoring is carried out on the PV output voltage and the SCC output voltage towards the load. SCC can be seen in Figure 5.6. This monitoring monitors the voltage and current. This monitor is done by sending a signal to the Android, and checking can be done at any time on time. In this system, the SCC used is 10 A because the current calculation through it is not more than 10A.

Figure 6. Solar Charge Controller

Why is it necessary to monitor the PV output and the SCC output towards the load? This is because the PV output can be controlled whether the PV is problematic or not. The problem is on two sides, namely the PV unit itself or the intermediary. While the output is towards the load, this represents the position of the SCC system and the battery, whether there is a problem or not. If there is a problem, the officer must be there to do troubleshooting. Therefore, that people can still enjoy the Solar Power Plant.

Moreover, electricity costs for mosques will be reduced. Photovoltaic images can be seen in Figure 5.7. In the picture, you can see the colour of the PV material is black. This shows that the PV uses a Mono Crystallite (MC) type. This MC type has reliability when compared to the Poly.

Crystallite (PC) type. The obstacle referred to in capturing solar energy falling onto the PV surface will be more acceptable if using an MC system.

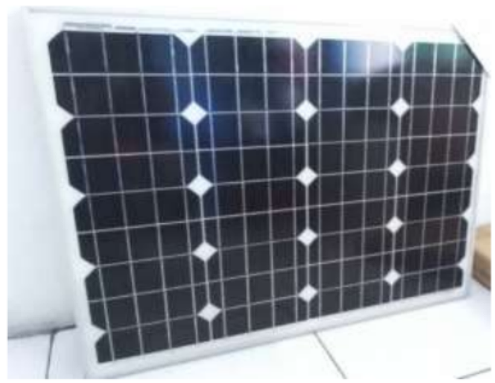

Figure 7. PV Monocrystalline

The PV system used in Abdimas is with a capacity of 100 WP. On the other hand, if the voltage that is the PV output is 12 V, then the current capability is 5 A.

In this picture when the PV system was given to Kalialo Village.

Figure 8. Handover the PV System to Kalialo Village

Conclusion

From the explanation above, it can be concluded that with the implementation of this Abdimas, then:

1. The community in Kalialo village has received assistance from the PLTS system.
2. The community will get the benefits of PJU for citizen activities that are driven by sources from PLTS
3. The community gets knowledge about PV mini-grid both in operation and in maintenance.

Suggestion

For the future steps, the people of Kalialo still need a lot, especially the problem of PJU facilities that need to be added, because the new PJU is only covered by 300 meters, even though the length of access to Kalialo village is approximately 3 Km.

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