

A Proposed Solar Panel to operate Computer Laboratory of Messiah's Angel Learning School

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Abstract

We are living in the world of technology where people are exposed to different technologies such as cell phone, computer, tablet and other gadgets as their personal use. In our community we can see various changes from primitive technology to high technology. In the hospital, technology is used to detect the result of one's illness, in the bank, technology is utilized to process one transaction after the other, in offices documents are kept in the computer or in the cloud, in schools - records are kept electronically and are stored in digital form, and most specially with the way communication is, it is done via computer and internet (IoT and VoIP). Solar Energy as one of the top Technology of the future is a technology that has been increasing its substance and significance in our community nowadays. According to the research of Siddiqui, he stated that Solar energy is a solar power that comes from the sun by means of solar panels. Active solar energy includes the adaptation of sunlight to electrical energy. Solar electricity depends upon artificial strategies such as solar panels or solar cells in order to deliver a source of clean, and low-cost renewable energy. Messiah's Learning Angel School is using Power Supply provided by the private company in the Philippines, and they are paying an incredibly high electricity fee monthly. One of the ways to lower their operational cost is through the avenue of embracing the use of solar energy. At first, the initial investment or setup cost is high but eventually after 5 years the complete benefits (based on cost benefit analysis and payback time) of solar energy will be experience by the school. This study is designed to have a Solar Panel to run the computer laboratory of the earlier mentioned learning institution, where the main objective is to provide power to their 30 computers by means of Solar Energy.

Article History

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I. OBJECTIVES

The project objectives are (1) to promote the solar panel as the source of electricity to run the computer laboratory (2) to design the structure of solar panels (3) and to optimize the cost-effectiveness of the electric power supply.

II. SCOPE

Scope are: (1) using the solar panel to operate the 30 computers in the computer laboratory and (2) to design the structure of the solar panels

III. LIMITATION

- (1) other devices are not included in the design such as aircon, fan, lighting and other devices.
- (2) Design of the computer network is not included.

IV. RELATED WORKS

According to a foreign researcher named Kathy Burns-Millyard that the total assistance of a solar source/ panel permits us to intensely lessen the amount that you're paying for from the resident electric company.

Based on a local researcher namely Clarudad, Duerme, Eduria, Fernando, and Ramos in their research stated that the operation costs of solar panel in the long run are minimal rather than the conventional streetlights. Since external wires are eliminated and risks of accidents are minimized.

V. METHODOLOGY

V.I DATA GATHERING

The proponents used data gathering procedures to collect specific data to accomplish this project proposal. The proponents used different research scheme and techniques in gathering information such as (a) Observation (b) Internet Research (c)

Survey (d) Library Research and (Testing). By means of these, proponents determined that the project needs to follow the specimen of electrical system: source, function, and output are needed. The source of energy will be the solar panels that optimized the solar tracking. The system will contain Micro Controller that includes DC (PV), charger controller isolation switches, battery bank (to control the flow of battery bank storage) and DC Breaker Panel to be connected to Inverter with AC Controller to Computers.

V.II SYSTEM DESIGN

The project will be needed to take energy from the sun, captured by solar panels and translate the energy to AC voltage, which will be able to power the desktop computer. The project must know the track of its solar effectiveness and be able to sustain the maximum amount of solar energy possible with different weather conditions. Gaining amount of sunlight throughout the day is needed for ideal output.

According to Mohd RizwanSirajuddinShaikh in his paper stated that there is a direct conversion of the sunlight as a power generator into solar energy by using the of negligible photovoltaic (PV) solar cells.

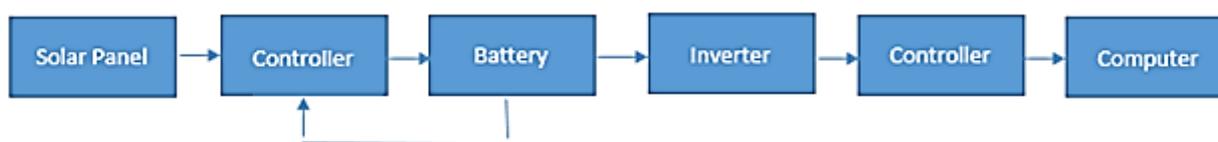


Figure 1 : Block Diagram of Circuit

The 500 watts solar panel will be used for every desktop computer wherein only 230 watts is needed for operation, which is based on the statement of Siddiqui in his research entitled "Solar Computing: Use of Solar Energy to Run Computer System", then the source of the solar panel will be stored in the battery, then same battery will supply the power using the inverter going the breaker then to the computers.

A. Solar Panel

According to the researchers namely: Kondracki, Collins, Habbab, that the Solar Panel Technology is a solar panel that is collection of electrically associated with photovoltaic cells complete of semiconductor supply, such as silicon that is common in a semiconductor. When sunlight smashes the cells, its energy is immersed into the semiconductor things. This energy exerts force to other electrons loose that are then forced to run in a

certain ways by an electric field produced within the cells. A pair of other mechanism of the cell moves these electrons into usable power. Strips of metal conductive on the sides of the cell collect the electrons and move them to wires. At that point, the electrons can move like any other source of electricity. According to Michael Dhar in his article How Do Solar Panels Work that there are other types of solar power technology — including solar thermal and concentrated solar power (CSP) — that activate in a different method than photovoltaic solar panels, but all control the power of sunlight to form electricity or heat, water or air.

B. Solar Tracker

The used of the solar tracker circuits as one of the solutions to the aforementioned constraints is to integrate a solar tracker circuit into the project is to raise the production of electricity by the solar panels. Solar trackers provide exact tracking of the sun by slanting the solar panels concerning the sunlight as it moves during the day. When sunlight assaults a solar panel, it derives in an angle, called the “angle of incidence”. The usual angle to the cell is vertical to a PV cell’s face that is to achieve the panel’s proper alignment towards the sun. A tracing system can keep the angle of occurrence within a certain margin and would be able to maximize the power generated.

C. Controller

The function of the Controller switch is to connect and disconnect the charger to the batteries; it as well controls the flow of the current over charging and to discontinue charging at the correct voltage. The batteries will protect from damaging from over-charging and control the power moving from the solar panels to the batteries.

D. Battery

The Solar batteries work by keeping energy provided by the solar panels and storing it to use in nearest time. Some solar batteries offer integrated energy conversion through its own inverter than the

other batteries. The more installed solar panel batteries the more it will have excess energy and can lead towards a higher battery capacity, which will result to more solar energy that it can store producing more electricity than what is needed, Later, when your solar panels aren’t yielding electricity, it can be use the stored energy from the batteries. It will then cast electricity back to the framework when the battery is totally charged, and it will only pull electricity from the framework when the battery is not in use.

E. Inverter

The Solar Inverter is an important device in solar power scheme; its basic role is to convert the Direct Current to alternating current of the solar panels. It helps the conversion of the different electrical and electronic components. The converted Alternating Current power will then be used to operate the 30 desktop computers. For other specific applications, we can directly use the Direct Current power from the solar panel such as LED night lights.

F. Switch

The Switch are the controller needed to produce power either a Direct Current (DC) provided by the MERALCO (a company that supplies electricity) and Alternative Current (AC) provided by the Solar Panel Batteries. It was design like this for alternative operation (fault tolerance) of the computer laboratory in cases where the solar panel batteries cannot provide the needed power the DC will be used as the source of electricity to run the computer laboratory.

G. Computers

The computer laboratory currently uses DC from MERALCO to power and operate 30 units of desktop computers. The room will need a switch which will connect the proposed solar panel system.

V.III Context Diagram

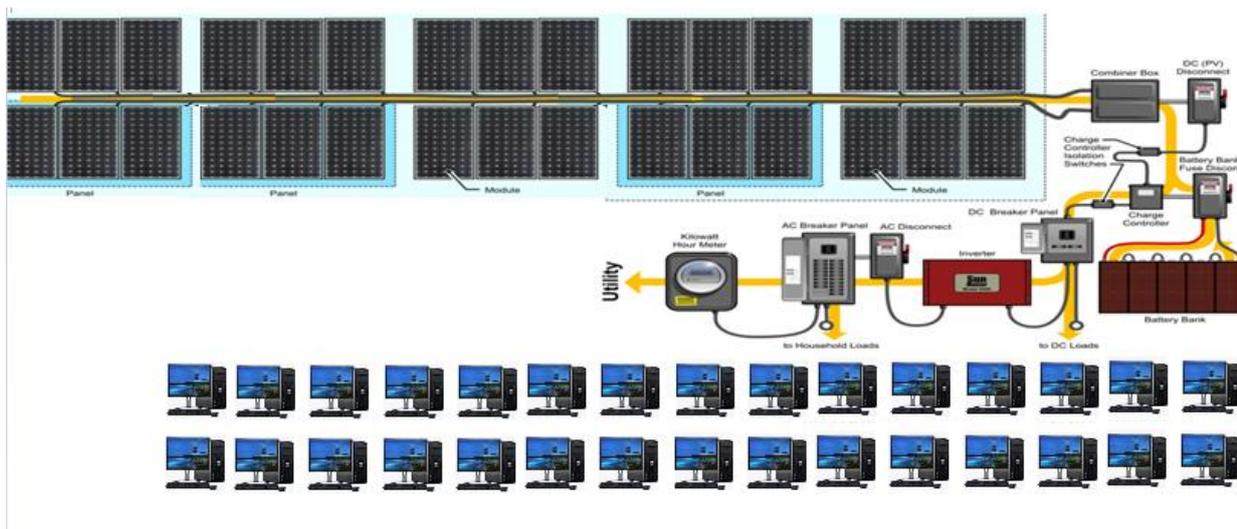


Figure 2 : Context Diagram of the Proposed

The source of energy will be the solar panels that are optimized by the solar tracking. The system will contain Micro Controller that includes DC/AC (PV), charger controller isolation switches, battery bank

(to control the flow of battery bank storage) and DC Breaker Panel to be connected to Inverter with AC Controller to Computers.

V.IV Cost Benefits and Analysis

Table 01: Price Estimate of solar panel set to operate 30 desktop computers
(Price estimate in Philippine Peso)

	Prize	quantity	amount
1) 500 watts of solar panel (for 30 units)	7395	30	221850
2) solar panel mounting	75000		75000
3) 2 inverters (1 inverter has 5000watts)	2,242	2	4484
4) Solar Panel Kits Battery Charge w/ Controller Caravan Boast	3500	30	105000
5) wirings estimation			10000
6) labor			100000
7) others that included the maintenance			50000
total			566334

- 1) To operate 1 desktop computer for 6hrs a day it needs 500watts of a solar panel depending on the weather.
- 2) In using battery (20,000 volts) or every 1 desktop computer must have 1 battery wherein 50,000watts/3Amps for desktop that is equal to

16,666.66Volts? Some other voltage will be reserved because of the weather condition.

- 3) In using inverters (1 inverter has 5000watts) that can support 15 computers to convert AC power.

Table 02: Five (5) Years Comparison (Cost Benefit Analysis) of using DC power from MERALCO and The Proposed Solar Panel Set (Prices are in Philippine Peso)

electricity bills using 30 computers			
month	1 yr	5 yrs	
11,000	132000	660000	
Difference			
5yrs electricity Provided by the Meralco			660000
solar panel			566334
total			93666

We can see the difference that the Meralco Bill for 5 years is Php66,000.00 and the solar panel estimation for creating this is Php56,6334.00. It can save as much as Php93,666.00 in 5 years time. It can still continue saving as time goes by because the solar panel can provide more energy in using the said computer laboratory.

VI. SUMMARY

The use of solar panel where energy is captured, produced, and converted to an Alternative Current which in turn used to operate and power the Computer Laboratory of the Messiah’s Angel Learning School implies that the designed proposed solar panel will be a good power or renewable energy source.

VII. CONCLUSION AND RECOMMENDATION

Based on the Cost Benefit Analysis (CBA) of the proposed Solar Panel System (refer to Table 02), and the utilization of a renewable energy source (environment friendly), Messiah’s Angel Learning School can adopt the design of the solar panel to operate their 30 units of desktop computer in their Computer Laboratory with relatively lower cost of electricity (operational cost).

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