

# A Proposed Structured Of Solar Panel with Logical/Computer Network for Jirehnet Software Company

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## Abstract

Solar Energy is a transformation of energy through sunlight to become a source of electricity. In this case, the structure of the solar panel will help a company to lesser the bills in their electricity. Logical and cabling of a computer network is very crucial to a company because it can easily detect and protect the network of the company. These are the two important matters in the project.

The Scope of the project is (1) to promote the solar panel as the source of electricity (2) to have a modern way of having a computer network cabling (3) and to use of servers as an internet connection in the company. The Value of Solar Methodology signifies a possibility for the condition and functionality of the project to assess the benefits of distributed energy investments and to provide a modern way of having a computer network cabling. This study is based on solar energy simulators and computer network simulator evaluating both structures utilizing effectiveness and efficiency. This study also suggests future researchers as an alternative way to produce electricity and computer network provision.

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## I. INTRODUCTION

Nowadays, Technology is a way of life, different types of electronic Internet of Things (IoT), sensors to collect information and then use awareness of data to manage resources and services effectively and efficiently. The technology integrates information and communication technology (ICT), and different physical devices linked to the IoT network to enhance the effectiveness of the technology operations and services. Solar energy is a technology that is increasing in the community nowadays. Solar energy is the conversion of heat energy that derives from the sun to become

electricity. It has been utilized for many years in different ways by the community all over the world. The absence of the direct current to supply the needs of the people in communicating, working in their work place is very crucial, so an alternative current through solar energy can be utilized. Structured cabling is important in a company either private or public it's supporting the performance of an organization's cabling system or a computer network wherein it binds all desktops of the workstation and other network devices that used within the business to provide a reliable and versatile solution for a wider range of communication requirements. It is

also needed for organizing the pathways of the cable in the company to have a smooth transmission of data in the network and prevent network congestion. Then the servers are significantly in managing the process of data into the main network up to alternative with the used of solar panels wherein cheaper expenses of electricity production.

The Jirehnet Software Company was established in June 2014, it was started as a small software company providing seminars, training, and website development located in Batasan hills Q. C. Philippines. As times go by the said company is becoming bigger in terms of client, so right now, they need to have a structured network and solar panel to operate the said company,

This proposal will help to understand the benefits of the exact usage of the Designed for both solar panel and structured cabling or computer network). The purpose of the said study is to limit the cost of the electricity bills by using the solar panel and to secure the use of computer topology by means of structure computer network.

## II. OBJECTIVES

The objectives of the project are (1) to promote the solar panel as the source of electricity to run the computer network (2) to minimize the cost-effectiveness of the electric power supply and (3) to have an effective, efficient, fast and secured computer network.

## III. SCOPE AND LIMITATION

The Scope of the project are (1) to promote the solar panel as the source of electricity (2) to have a modern way of having a computer network cabling (3) and to use of servers as an internet connection at the company

Limitations are (1) other devices are not included in the design such as air-con, fan, lighting, and other devices. (2) Servers will be operated with Direct Current to avoid disconnection of service.

## IV. RESEARCH REVIEW

The foreign research of IRENA Working Paper stated that the effectiveness of using solar panels to produce the energy needed was proven and the cost is lesser rather than the direct current.

In the local research of Clarudad, Duerme, Eduria, Fernando, and Ramos stated that the operation costs of solar panels, in the long run, are minimal rather than present energy used. Since external wires are eliminated and risks of accidents are minimized.

The foreign research under Micro Focus stated that computer networking is effective in the communication of devices and lesser cost in the long run. In the local research of Fatima

The local research under the University Research Journal stated that the computer network can provide good communication and no hassle for documentation.

## V. METHOD OF RESEARCH

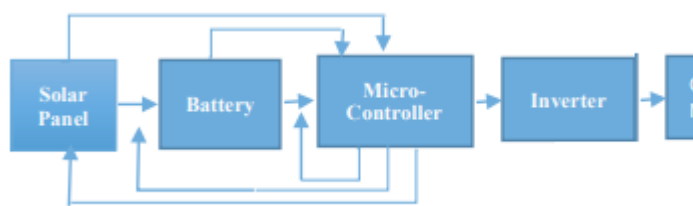
### V. I Data Gathering

The proponents used data gathering techniques to gather specific data to achieve this project proposal. The proponents used various research techniques in gathering data such as (a) Observation (b) Internet Research (c) Survey (d) Library Research and (Testing). In this case, proponents determined that the project needs to keep on the sampling of the electrical system: source, function, and output are needed. The source of energy will be the solar panels that optimized solar tracking. The various controllers will be the ones who will control the flow of the alternating current through the use of solar panels or energy to the computer network of the company.

### 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 operate the computer network except the servers to avoid in

convinces because of serving failure. 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 the amount of sunlight throughout the day is needed for ideal output. Figure 1. Illustrate how the Solar Energy will store and run the Computer Network. From the Foreign Research name, EfstratiosBatzelis stated that Solar Energy is the amount of energy form by heat and radiations from the sun directly converted into solar energy with the use of the smallest photovoltaic (PV) solar cells.



**Figure 1: Block Diagram of Solar Panel Circuit**



**Figure 2: Block Diagram of Computer Network**

The Structure of the Solar panel which produce an AC power that will run the 20 computers of the company but the Logical/Computer Network (Figure 2 ) the Server because there servers will serve as the brain and must be sure that the power to operate this will be in DC supply to avoid shortage of electricity. Computer can be run by 230 watts wherein the design 1 solar panel is 500watts that is according to the research of Siddiqui stating that the solar energy will be stored in the battery the battery will supply the power using the inverter going the breaker then to the computers.

#### A. Solar Panel

According to the definition of energypedia.info Solar energy is the energy that collects from the sun,

mainly as hidden light and other methods of electromagnetic radiation. The solar portal offers a summary of data on energypedia related to solar energy. 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 way by an electric field produced within the cells. A pair of other mechanisms 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.

#### B. Solar Tracker

According to Wikipedia.com that solar tracker is a machine that positions a load toward the Sun. Loads are usually solar panels, parabolic troughs, Fresnel reflectors, lenses or the mirrors of a heliostat. The function of the solar tracker circuits as one of the keys to the aforementioned limitations is to mix a solar tracker circuit into the project is to increase the construction of electricity by the solar panels. Solar trackers deliver the exact position of the sun by slanting the solar panels regarding the sunlight as it travels during the day. When sunlight strikes a solar panel, it comes 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

A controller switch controls the power going to the battery storage coming from the solar energy. It warrants that the deep routine batteries are not overcharged during daytime, and power doesn't run backwards to the solar arrays overnight and drain them. There are two different technologies of solar changer controller according to altE Store website, these are the PWM solar charge controller stands for "Pulse Width Modulation (PWM) a type of controller where the solar energy store into the

battery bank. Maximum Power Point Tracking(MPPT) a type of con controller that will measure the  $V_{mp}$  voltage of the panel, and down-converts the PV voltage to the battery voltage.

#### D. Battery

A solar battery is used to store solar energy and release power as and when wanted. A rechargeable solar battery is used in off-grid PV schemes to stock excess electricity. Other solar battery banks use wet cells, while some operate sealed or gel cell batteries. Each of these batteries has other temperatures, mounting, and ventilation requirements. 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 than it can store producing more electricity than what is needed, Later, when your solar panels aren't yielding electricity, it can use the stored energy from the batteries. It will then cast electricity back to the framework when the battery is charged, and it will only pull electricity from the framework when the battery is not in use.

#### E. Inverter

An inverter is a type of electrical converter which change the direct current (DC) output of a photovoltaic (PV) solar panel into a benefit frequency of alternating current (AC) that can be served into an electrical grid, off-grid electrical network. It is a crucial balance of system component in a photovoltaic system, letting the use of ordinary AC-powered materials. Solar inverters have special functions adjusted for the use of photovoltaic panels, including maximum power point tracking and anti-islanding protection.

#### F. Switch

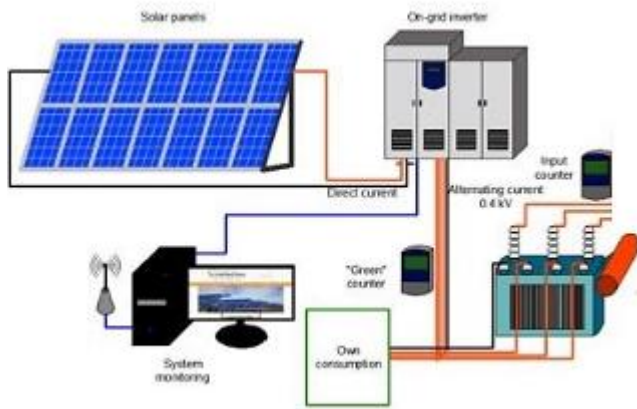
The Switch is the controller needed to produce power either a Direct Current (DC) provided by the MERALCO (a company that supplies electricity) or Alternative Current (AC) provided by the Solar Panel Batteries. It was designed like this for alternative operation (fault tolerance) of the

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. Computer Network

The Jirehnet Software Company design with 2 Cloud Services (PaaS): Azure as a platform for building and deploying applications. They create the code with tools provided by Azure, and then the virtual machines execute the rules of the application using Windows Server Full Mesh Topology compose with 6 servers such as (1) Print server, (2) FTP server, (3) Lumension server, (4) Web server, (5) Database server, and (6) DHCP server then it has 20 workstations mixed with desktop and laptop. Using mesh topology as a network design brings the capacity to deal with errors during the execution of the data transaction. According to Computer Hope website that the "Mesh Topology is an interconnected of computers allowing for most transmissions to be distributed even if one of the connections goes down. It is a topology commonly used for wireless networks". The physical architect of their building and they are using UTP cable CAT5e for workstation and CCTV Camera while for layer 3 network they are using fiber optic cable. To avoid threats for their network they have a firewall and they are using Symantec endpoint protection for virus protection. The internet speed is 20 Mbps inside the building but when going outside the range of the internet speed is 150 Mbps with the use of fiber optic cable. For the malicious sites domain policy was used. A firewall designed to prevent viruses and Symantec for protecting and blocking some malicious sites.

V.III Context Diagram

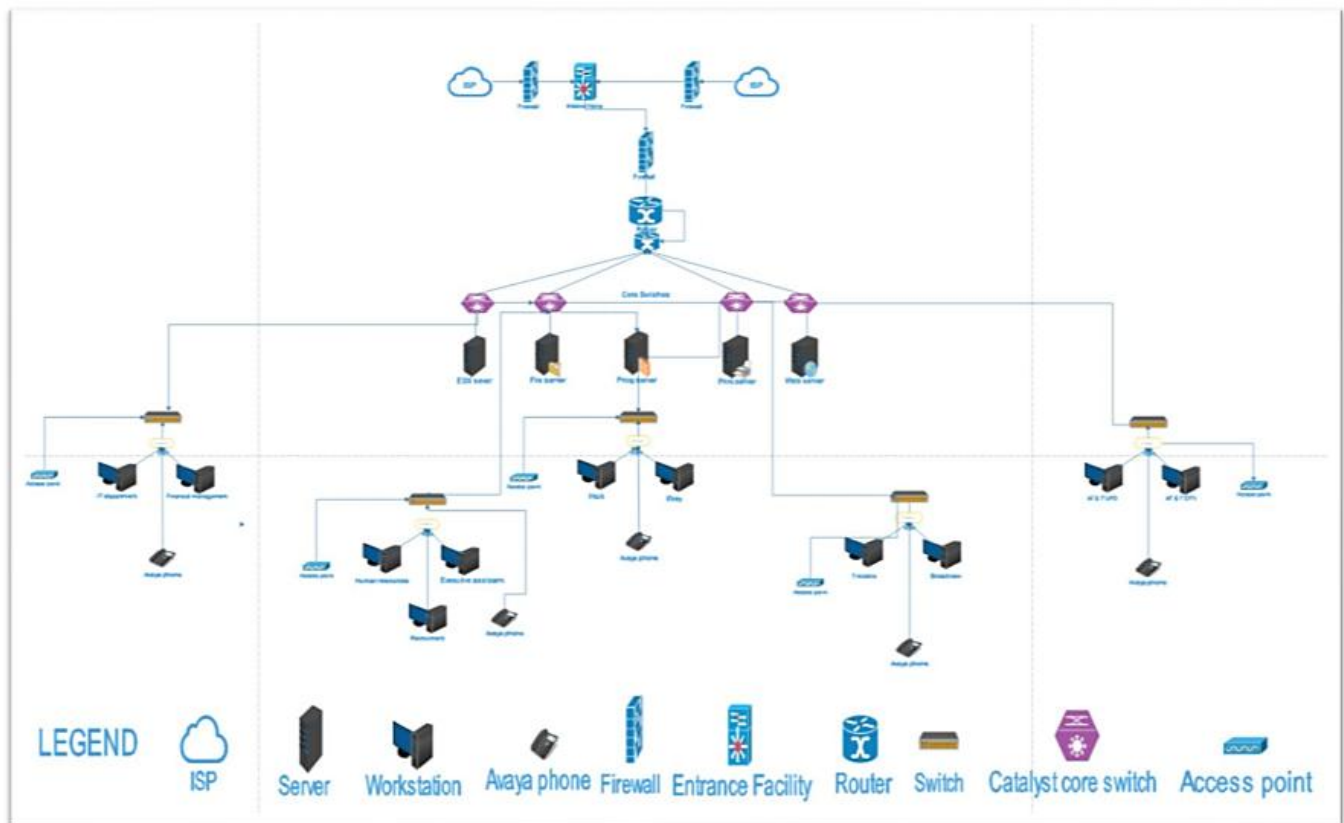


contain a Micro Controller that includes DC/AC (PV), charger controller isolation switches, battery bank (to control the flow of battery bank storage) and DC Breaker Panel to be connected to Inverter with AC Controller to Computer Network.

**Figure 3: Context Diagram of the Proposed Solar Panel**

The source of energy will be the solar panels that are optimized by the solar tracking. The system will

**LOGICAL LAYOUT**



**Figure 4: Context Diagram of the Proposed Computer Network**

The design is with 2 Cloud Services (PaaS): Azure as a platform for building and deploying applications. They create the code with tools

provided by Azure, and then the virtual machines execute the rules of the application using Windows Server Full Mesh Topology compose with 5 servers

such as (1) FTP server, (2) Printer and Lumenion server, (3) Web server, (4) Database server, and (5) DHCP server then it has 20 workstations mixed with desktop and laptop. Using mesh topology as a

network design brings the capacity to deal with errors during the execution of the data transaction.

#### V.IV Cost Benefits and Analysis

**Table 01: Price Estimate of solar panel set to operate 20 desktop computers and the computer network**  
(Price estimate in Philippine Peso)

Estimation Price for the complete set of solar panel using 20 desktop for computer laboratory			
	Prize	quantity	amount
1 desktop need to have 250 watts to operate for 6 hrs			
1) 500 watts of solar panel (for 30 units)	7395	12	88740
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	20	70000
5) wirings estimation			10000
6) labor			100000
7) others that included the maintenance			50000
<b>total</b>			<b>398224</b>
Estimation Price for the 20 desktop for computer networking			
8) 30 desktop	15000	30	450000
9) 5 servers	30000	5	150000
10) wiring	20000		2000
11) switches	7500	5	2000
12) routers	25000	5	2000
<b>total</b>			<b>1004224</b>

**Table 02: Design Computer network Total Cost**

electricity bills using 20 computers			
month	1 yr	5 yrs	
	8,000	96000	480000
Difference			
			480000
			398224
			<b>81776</b>

**Table 03: Five (5) Years Comparison (Cost-Benefit Analysis) of using DC power from MERALCO and The Proposed Solar Panel Set (Prices are in Philippine Peso)**

We can see the difference that the Meralco Bill for 5 years is Php408,000.00 and the solar panel estimation for creating this is Php398,224. It can save as much as Php93,6681776 in 5 years. As time

goes by, the used of the solar panel can provide more energy with a lower cost.

And regarding the computer network, It has proven using 1 server and 5 computers with an cloud connection that the connection are perfectly working well according to the owner of the company during the time of demonstration. There are policies in computer networking made.

#### VI. SUMMARY

In using the solar panels where energy is main source of electricity to operate the computer network/structure cabling of the Jirehnet Software Company implies that the designed proposed solar panel and structure cable as a computer network will be a good design to adapt and implement by the said company. Where in to lessen the cost of electricity bill is main purpose of the project and to secure and have a fast communication of computer networking.

## 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), Jirehnet Software Company can adopt the design of the solar panel to operate their 20 units of desktop computer in their Computer Laboratory with relatively lower cost of electricity (operational cost).

And Based on the Testing happen in a Computer Network design that computer communication are working well, has a fast sending of data with the use of computer network (Mesh topology), secure firewall in internet connectivity and distribution of data in different server is effective and efficient.

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