

# Installation of 50 Watts PV Streetlights located at Barangay Nabuclod, Floridablanca, Pampanga

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**Abstract:** The Sun Which is the ultimate source of all energy provides the earth with solar radiation usually used for drying meat, fish, fruit and grains. Technologies were developed to collect solar energy and convert it into electricity as an alternative to fuels. It is to provide heat inside homes and streets and in most advance cases to bring fluids to high temperatures for the use of solar thermal plants. The utilization of new and alternative energy sources, specifically solar energy, has been on the rise and will continue to grow as we attempt to diminish our use and dependency on older, non-renewable energy sources. One of the biggest challenges involved with the use of solar energy, or renewable energy in general, is how to provide this energy for general public use. Some of the limiting factors to this are the efficiency in which solar power can be harvested and converted into usable energy, and the cost of the technology to do this. Recent technological developments have included the micro inverter, which harvests dc solar power and converts it into usable ac power on a per-module basis, making the technology a viable option for those looking to benefit from solar power. However, problems arise with solar power such as photovoltaic (PV) intermittency. PV intermittency can affect the output power quality and reliability of a PV system. But, by better understanding PV intermittency, steps can be taken in order to enhance PV systems. But regardless of the effects that intermittency has on PV system output, the benefits a large scaled PV system can have on a distribution system can still be analyzed. This thesis details the work I have done as an undergraduate, which includes testing of a micro inverter, collecting irradiance data and analyzing the effects that a PV system can have on the voltage regulation of a distribution system. Solar energy comes from the sun's rays reaching the surface of the Earth that can be converted into heat and electricity which can be done through a process called photovoltaic, the science of harnessing solar energy and directly converting it to electricity with the use of solar arrays to capture sunlight's protons Solar arrays are made up of solar cells that are installed the best location that captures the most sunlight. The quantity and type of solar cells to be used will depend on the voltage requirement of the solar arrays.

**Key Words:** —*Utilization, Photovoltaic, Output Power Quality, Distribution System, Voltage Regulation.*

## I. INTRODUCTION

Solar energy is the most demanding energy source due to fact that it is the most abundant and most effective energy source on earth. Solar energy is derived from sun, and this energy is not only environment free but also cost less. Latest technology allows the harnessing of solar energy through cells known as solar cells or photovoltaic cells.

Photovoltaic cells are placed in direct sunlight, when the direct sunlight hits these cells, chemical reaction takes place which produce electric currents. These electric currents are later unconverted into electricity which are used to power everyday items like street lights, schools and households. In most of the area's street lights in Barangay Nabuclod receive electrical energy from national grid, so we need to look for another alternative source of electrical power which does not depend on national grid. For this purpose, we use solar energy. LED based lighting system is used which received charge from lead batteries charged by solar panels. Solar system and LED lighting combination enables its interest in governing authorities to lighten street lights and schools in remote areas

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without setting up any external infrastructure in a meager traditional way. Standalone solar street lighting solutions are popular and usually built with customized PV panels and design. Solar energy systems are also used in schools for lighting purpose, internet installing equipment and laptop charging. This system includes photovoltaic cell, batteries and other connectivity equipment's. Photovoltaic street lighting systems are in three different lamps namely low-pressure sodium lamp, high pressure sodium lamp and fluorescent lamp to determine suitable system in rural areas of the country. The three different lamps are mounted in the same unit and wattage in different areas. The analysis of Lighting systems with fluorescent lamp is suitable system for installation in rural areas. An experiment is conducted using the PV panel to supply electricity in each building in the schools like classrooms, guard house etc. Since we know that energy especially electricity is the basic requirement for the social and economic development of a country. Therefore, these of electricity is increasing day by day in every field or department of a country e.g., industries and streets lights require continuous and uninterrupted supply of electrical-energy.

The main aim for installing solar systems was to promote different solar energy projects in terms of photovoltaic systems based on energy policy of the country. These projects are supported by government budget, involves PV systems such as pumping system, street lighting, school lighting, solar home system (SHM) and board of faculty map. Different energy sources like coal, oil and natural gas are presented in the country in which the author pointed out that these sources are limited in the country and if they are used at the current rate, it will finish quickly in the upcoming decades. The standalone photovoltaic systems sustainability passes through the complement of the systems installed in the field. This standalone PV system is implanted by the research center in schools of isolated communities and inside solar lighting program. The need of electrical energy is the crucial part of life and increase with each passing day parallel to the developments in technology. But the fact is that cost rises after meeting these needs and damage was done to nature. So, energy is being obtained from clean energy sources such as wind and solar energies. Solar energy gives direct solution for grid to cutoff some loads for stability. One of these loads is street lighting, school lighting especially during summer. This energy provides energy free system where there 2 is less or no power from grid. In this paper, we present installation of streetlights in barangay Nabuclod, Floridablanca, Pampanga.

### 1.1 Statement of the Problem

This research aims to assess the efficiency of using solar in Barangay Nabuclod. This will be further assessed by answering the following specific objectives:

- How will the benefits from the technology compensate the amount of investment?
- What will be the benefits in using solar street lights in terms of natural environment?
- How long would it take to replace and install the proposed solar street lights in Barangay Nabuclod?

### 1.2 Hypotheses

As far as price is concerned, traditional street lights are a lot cheaper than their solar counterparts. However solar street lights turn out to be a better investment at a cheaper cost if the total money shelled out is considerations money spent on installation and maintenance to the lamp or light replacements etc. Solar-driven Street lights have no pernicious impacts whatsoever on the environment. The use of solar energy to drive street lights is extremely innocuous and, in fact, far better than the use of traditional street lights driven by electricity which is generated from non-replenish able sources.

### 1.3 Conceptual Framework

Table.1. Conceptual Framework

Input	Process	Output
<b>Materials:</b> a. Cement b. Schedule 20 Steel Pipe c. 50W PV Solar Street Light d. Lux Meter	- Digging hole for foundation. - Putting Cement on the hole where the Steel pipe will build. - Fix the Solar light in the Steel pipe. - Collection of data based on the experimentation. - Interpretation of data	<b>Installation of 50 Watts PV Streetlights located at Barangay Nabuclod, Floridablanca, Pampanga</b>

## II. LITERATURE REVIEW

The researchers conducted an interview with Captain, the barangay chairman of Nabuclod Florida Blanca Pampanga. Anita Casupanan and Dandoy Mallari, one of their barangay officials. During this interview, the researchers gathered

information that could be relevant and useful to our research study. The data we collected that day was focused on locating areas in Nabuclod that completely lacks solar lighting. Nabuclod is divided into six sitios, with a total population of nearly 1500 people. Many people in Nabuclod do not even have electricity at home; the researcher observed every sitio in Nabuclod, and every street we passed had no light at all. Nearly 60% of the population is without electricity, with only 40% getting access to it. Two factors were considered in this presentation data; the first is that many accidents occur in every location, especially when it comes to motorcycle accidents. Second, several of the houses all along street had no electricity at all. These two elements are critical in carrying out our research study in Nabuclod. After the researchers have identified the real problem in Nabuclod, they can start moving on to their main goal, which is to install a streetlight in every sitio not only to provide light on the road, but also to assist the people who live nearby on the street in having reliable electricity.

### III. METHODS

#### 3.1 Research Design

The researchers conducted their interview at Barangay Nabuclod, Floridablanca, Pampanga since it's where they get their data that they are going to need. The researchers used both convenience and purpose sampling methods in gathering the respondents. The researchers used convenience sampling in order to maximize the time allotted to finish the research. The purpose sampling was for choosing who to interview for the individual interview.

#### 3.2 Instrument

The instrument used to collect the data and information utilized in this research, preparing for the tools and equipment that we need and was done with the help of our family, community of Nabuclod and the barangay official.

#### 3.3 Data Procedure

The researchers will have gathered data from the following sources. The researchers' primary source of data will be the questionnaire-checklist as the major instrument in gathering data. Also, they will use secondary sources of data such as foreign literature and studies to supplement primary data contain of 2 parts.

The first part contains the profile of the respondents in terms in terms of Population of Barangay, Number of family on

every Purok or Sitio, Percentage of people with electricity and lack of electricity.

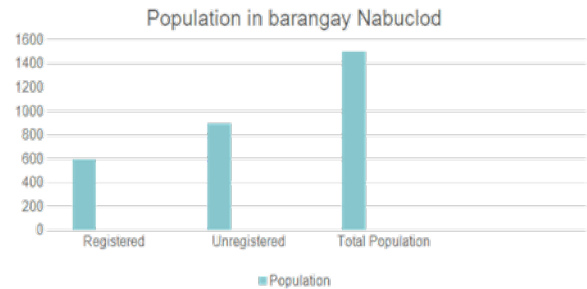


Fig.1. Population Graph

The second part is the perception of respondents on Barangay Nabuclod, in terms of Family every Purok or Sitio's

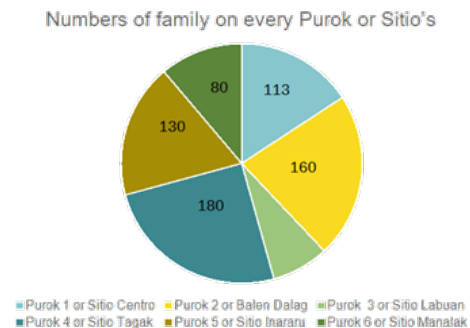


Fig.2. Percentage of every Sitio's

An analysis was done in order to find out the specific variables and measures which allowed the researchers understand the functions and efficiency of the normal street lights with solar powered street lights.

#### 3.4 Data Analysis

This study was conducted to identify the precise characteristics and metrics that helped researchers better understand how solar-powered street lights compare to conventional street lights in terms of functionality and effectiveness.

Table.2. Materials

Materials	Description
Lux Meter	a device for determining illuminance.
Ecolumb 50 watts Streetlight	by artificially prolonging the hours of daylight so that activities may occur, one can improve their quality of life.

### 3.5 Streetlight

A Ecolumb 50 watts streetlight used in this project to enlighten some part of Nabuclod, this streetlight has a charging time 5-6 hours and lighting up to 12 hours. A motion sensor is build-in within the solar streetlight. When a pedestrian or any moving object is in proximity with the sensor, the streetlight will automatically switch on. After about 10 seconds, when the pedestrian has crossed the road, the street light will go back to its off position.



Fig.3. Model of Streetlight



Fig.4. Preparing for the Materials



Fig.5. Constructing the poles that will use to hold the streetlight



Fig.6. Installation of the streetlight

## IV. RESULT AND DISCUSSION

Table.3. 1st Streetlight

HEIGHT	WATTAGE	ILLUMINANCE
Ground	50 WATTS	011.9 lux
1 ft.	50 WATTS	014.0 lux

2 ft.	50 WATTS	017.4 lux
3 ft.	50 WATTS	022.5 lux
4 ft.	50 WATTS	028.7 lux
5 ft.	50 WATTS	028.8 lux
6 ft.	50 WATTS	033.4 lux
7 ft.	50 WATTS	040.4 lux
8 ft.	50 WATTS	042.3 lux

Table.4. 2<sup>nd</sup> Streetlight

HEIGHT	WATTAGE	ILLUMINANCE
Ground	50 WATTS	011.2 lux
1 ft.	50 WATTS	014.0 lux
2 ft.	50 WATTS	018.3 lux
3 ft.	50 WATTS	023.8 lux
4 ft.	50 WATTS	031.5 lux
5 ft.	50 WATTS	042.6 lux
6 ft.	50 WATTS	070.4 lux
7 ft.	50 WATTS	084.4 lux
8 ft.	50 WATTS	093.1 lux

Table.5. 3<sup>rd</sup> Streetlight

HEIGHT	WATTAGE	ILLUMINANCE
Ground	50 WATTS	007.8 lux
1 ft.	50 WATTS	011.1 lux
2 ft.	50 WATTS	014.6 lux
3 ft.	50 WATTS	019.7 lux
4 ft.	50 WATTS	025.3 lux
5 ft.	50 WATTS	033.1 lux

6 ft.	50 WATTS	053.5 lux
7 ft.	50 WATTS	073.0 lux
8 ft.	50 WATTS	096.1 lux

Table.6. 4<sup>th</sup> Streetlight

HEIGHT	WATTAGE	ILLUMINANCE
Ground	50 WATTS	008.3 lux
1 ft.	50 WATTS	011.1 lux
2 ft.	50 WATTS	014.6 lux
3 ft.	50 WATTS	019.7 lux
4 ft.	50 WATTS	025.3 lux
5 ft.	50 WATTS	033.1 lux
6 ft.	50 WATTS	053.5 lux
7 ft.	50 WATTS	073.0 lux
8 ft.	50 WATTS	096.1 lux

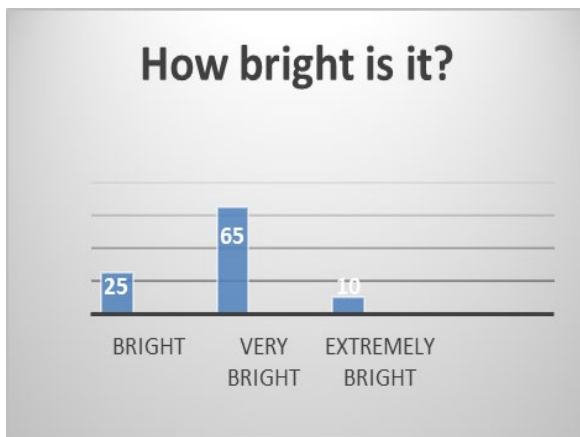


Fig.7. Final Working Model of Streetlight

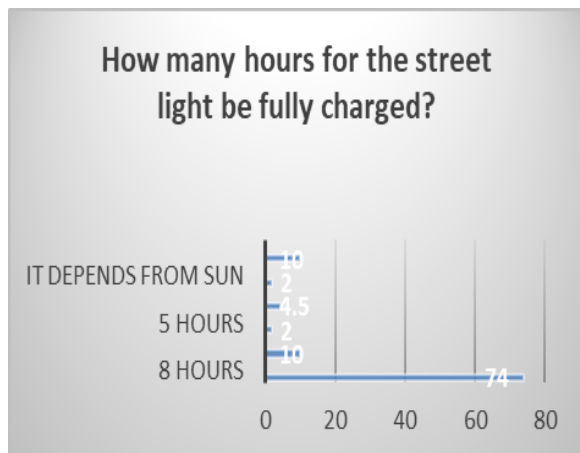
**V. SURVEY**



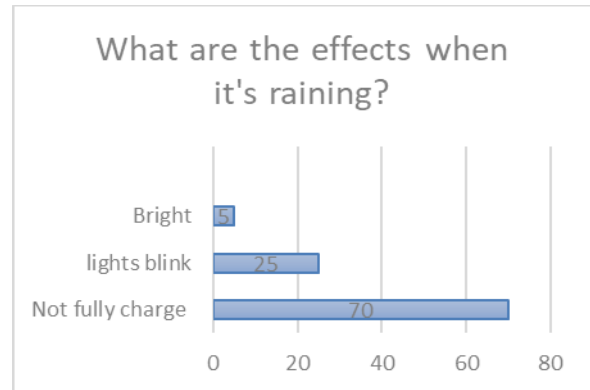
**Question 1:** How long can it last?



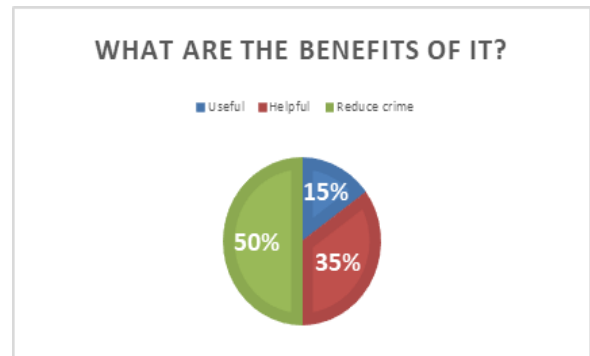
**Question 2:** How bright is it?



**Question 3:** How many hours for the street light be fully charged?



**Question 4:** What are the effects when it's raining?



**Question 5:** What are the Benefits of it?

**VI. CONCLUSION**

This study shows that the significance of building solar systems was primarily done with the intention of promoting various solar energy efforts, especially those involving photovoltaic systems. The researchers examine the lighting installation in the Pampanga area of Nabuclod in Floridablanca. It is true that there is an everlasting need for educators who can efficiently coordinate efforts to address the concerns of a society that is changing quickly. Through this study, the researchers found out what will happen to the Nabuclod people when night fell. Not all lacks enough electricity to have a light in the middle of darkness. Only candles or called Gasera they used to have a light and also, it was also the only way to protect from the dangers of the time. The researchers conducted a research study to find a solution to help those communities. The Researchers installed a 50-watt PV Street light in Barangay Nabuclod, Floridablanca, Pampanga, once enlightened greatly helps the community in crime deterrence and prevention, to share a light of life and to give the most comfortable night through the help of the street lights.

Base on the roadway guidelines, the researchers measured the luminance of the 50 Watts PV Street lights for the local roadway lightning the results are within the guidelines of the roadway lightning parameters. Therefore, this paper exactly meets the minimum wattage luminage for the installation of streetlight 50 Watts. And all of the result was found on the data of this study. The people of Nabuclod expressed their heartfelt gratitude to the researchers of the Don Honorio Ventura State University taking up a Bachelor of Science in Electrical Engineering for their studies on installing a streetlight to the community as part of their fulfilment on their course. Also, the Barangay Captain and officials give their thanks in continuing support on their Barangay. On the social media accounts of her Barangay express their thanks giving saying "We the Indigenous People (Aeta's) tribe of the Brgy. Nabuclod, Florida Blanca Pampanga giving our sincerest gratitude to the students of Don Honorio Ventura State University who's conducted their research study entitled as Installation of "50 Watts PV Streetlights" that has been donated to us. This study will make a big different and a huge help because of the light given to us, we can walk through the night having a guide going to their respective homes. It is also considered as beneficial because it is installed to the area of tourist spot/attraction." Also, a warm thanks to the aeta member of Citizen Armed Forces Geographical Unit (CAFGU) who's assisted us and help us in installing our project.

*Recommendation:*

Researchers especially the Electrical Engineering students should build a more to encourage every researcher to conduct a study to the people who are in need.

Incorporate more various methods to promote a critical thinking, self-efficiency and analytical skills.

It is recommended that the future researchers should take this study as a future reference to further increase their knowledge about the topic.

To future researchers, the information presented in this study is enough to aid the needs, that is why they should maximize the ideas in this research.

## REFERENCES

- [1]. Hiranvarodom, S. (2004, June 08). academia.
- [2]. Nigatu, S. (n.d.). academia.
- [3]. Raven, R. (2017, March 17). Academia.
- [4]. Yoshiura, iee.org, 2013.