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DEVELOPMENT OF DISASTER POWER STATION USING SOLAR PANEL

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ABSTRACT

Power outage is one of the problems when calamity occurs. It causes delay in search and rescue operation because of the lack in communication. It takes much time for the power to be restored after the rescuers damage is done after the disaster struck. The developed study is a possible solution to in averting power shortage during the natural calamity or disaster strike. The Disaster Power Station was developed through the fabrication of stainless-steel base and enclosure. It is controlled by a microcontroller, it is capable of detecting movement on the ground and send signal to alarm that there is an earthquake and it will activate the charging station as soon as the earthquake detected. Lamp is also provided in case earthquakes occur at night. Charging system will function and will be monitored to what was intended for the project. It is concluded that based on the evaluations, the prototype will be used in case of disaster. It is evaluated by It is evaluated by 1 professionals and 15 students using the TUP Evaluation Instrument and rated with an overall mean of 4.38 with the descriptive rating of "Very Good". The system developed performs the operation needed and was rated objectively. A manual is also implemented for the instructions.

Keywords: *Power Outrage, Solar Panel, Power Station, Microcontroller, Disaster*

1. INTRODUCTION

According to Stewart (2016), the natural disaster can occur instantly without any signs or warnings. One example of this is an earthquake, Scientists know where earthquakes are likely to strike for years. However, predicting when will it going happen, and their magnitude is proving a lot more difficult for them. Velasquez (2015) said that a potential earthquake is not a prediction over a specified time, but for sure it will happen. No one knows when and how strong it will be. Between two different subduction zones, the Philippine is the Eurasian plate subduing Luzon along the Manila trench and the Philippine sea plate subduing westward along the eastern Luzon trench. These zones explain high seismic activity in Luzon (Sabillo, 2015). Philippine Institute of Volcanology and Seismology (2016) stated that, the valley fault system showed that a big earthquake will strike through the dense of Metro Manila area and can shake the neighboring provinces in Luzon.

The Power outage is one of the common problems that people face after an earthquake strike, or due to natural calamity occurrences. Electric power network tends to fail, that can cause severe and widespread societal and economic disruption, in this kind of disaster Emergency rescue teams will ensure the safety and assistance of their people through communication according to Manoukian, (2016). Emergency response unit will be active to respond in this situation, but power services took hours or days to be restored depending on the onslaught caused by this disaster.

Large parts of the Philippines remained without electricity days after a 6.5 magnitude quake shook the Visayas region, according to Fuentabella, (2017) part of the Leyte and the surrounding islands of Samar and Bohol were affected of power outage repairs were still being conducted. He also added, "In three to ten days, we will see a tremendous improvement in ensuring that there will be basic electrical service available in the region."

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Developing a Disaster Power Station is intended to provide emergency power supply in case of disaster especially earthquake that disrupts electricity. This study offers to charge phone and charge portable emergency flashlights. To increase community resilience and support effective, efficient response and recovery from natural hazard situation the project will provide warning and alarm for the evacuees to be informed to go to the nearest evacuation area for safety.

2. MATERIALS AND METHODS

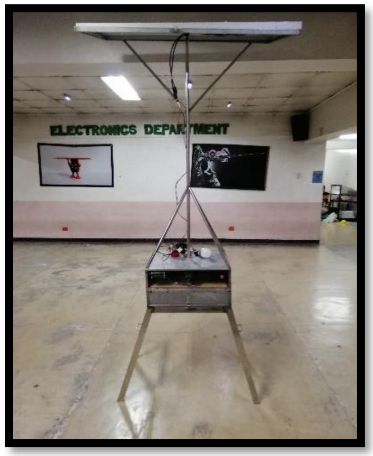

Figure 1 The design, this is an emergency power supply for cellphone that is programmed to be used in case of a power shortage after a calamity occur particularly earthquake. The casing was made out of stainless plate and stainless bar that has a body dimension of 274 cm height, 51.5 cm width and 51.5 cm length and an iron steel frame for the frame of the solar panel. The microcontroller used was an Arduino Uno, this sends and receives data through GSM and drive a relay array that control the two (2) USB port, a siren and a lamp. For the sensor an accelerometer is mounted inside the project to distinguish the change of axis, this component is used for the detection of an earthquake. A solar panel was used for the charging of the battery, which is used to supply the whole circuitry of the project.

3. RESULTS AND DISCUSSION

The evaluation procedure was conducted in a questionnaire type of process and testing. The project is assessed base on seven criteria, specifically, Functionality, Aesthetic, Workability, Durability, Economy, Safety, and Salability.

Table 2 Summary of Evaluation Results

Criteria	Mean	Descriptive Rating
Functionality	4.48	Very Good
Aesthetic	4.22	Very Good
Workability	4.25	Very Good
Durability	4.44	Very Good
Economy	4.31	Very Good
Safety	4.46	Very Good
Salability	4.50	Very Good
Overall Mean	**4.38**	**Very Good**

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Table above shows the summary of the evaluation results: Functionality gain a mean rating of 4.48 and described as "Very Good". Aesthetic results with a mean of 4.22 and described as "Very Good" it means that the project is attractive. Workability results a mean of 4.25 and described as "Very Good", it means that project is working efficiently. Durability scored a mean of 4.44 and described as "Very Good", this shows that the project is sturdy enough to last a long time. Economy scored a mean 4.31 and being described as "Very Good", it shows that the project does not require large amount of money in the fabricating. Safety scored a mean of 4.46 and described as "Very Good", this proves that the project is safe in operating. Salability mean result is 4.50 and described as "Very Good", that means the project was marketable and in demand. Results shows that the overall mean is 4.38 and falls in the descriptive rating "Very Good". It proves that the project is acceptable and is capable to perform what it is designed to do.

4. CONCLUSION

The following conclusions where derived based on the concerns stated by the objective of the study and results of the evaluation: (1) The project was designed based on the objective given by the research adviser: a) enclosure and its base have a square body made out of stainless steel and fully welded to prevent rusting, b) bypass door on the right side, is also made out of stainless steel sheet that holds the Maximum Power Point Tracker, c) charging station door panel in front side, holds the mobile phones and other portable devices, d) adjustable pole for solar panel can reach up to 6 ft. and can be rotate 360 degrees, e) front side has acrylic sheet for monitoring devices, a liquid crystal display and a voltmeter, f) detects movements from the ground by using accelerometer; (2) The battery bank is fabricated as preferred by the thesis adviser; (3)The disaster power station undergoes testing in order to prove the functionality, aesthetic, workability, durability, Economy and Safety; and *4)An average numerical rating of 4.38, with an equivalent descriptive rating of "Very Good," was given by the evaluators to the project most likely because safety is one of the important objectives of this project.

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