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Procurement of Simple Street Lighting Based on Solar Panels in the Limo Area to Enhance Energy Resilience

Teuku Rifath Abizar

Universitas Pembangunan Nasional Veteran Jakarta

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ABSTRACT

This research aims to develop a street lighting solution in the Limo area using solar panel-based lighting technology. Using thin-film solar panels with an efficiency of 7-13% and a maximum power of 200WP, solar energy is converted into electricity and stored in batteries. Simulations show that the solar panels can produce 1 KWh of energy, allowing storage of approximately 312.3Ah in the batteries. LED lights, which consume 22.94 Ah, can provide illumination for 13.613 hours. Motion sensors activate the lights only when movement is detected, optimizing energy use. The evaluation indicates that this research contributes positively to increasing public understanding of Renewable Energy (EBT), encourages the adoption of solar technology, and raises awareness about the importance of energy and water resilience. The findings highlight the potential for sustainable lighting with renewable energy and its social impact on the community.

Keywords: *Solar Panels, Renewable Energy, Energy Resilience*

1. INTRODUCTION

The enhancement of solar energy utilization in street lighting infrastructure in remote areas of Indonesia is a key focus of this research. The use of solar panels as an innovative alternative is being explored extensively. This study involves a technical exploration of the implementation of solar panels in street lighting, as well as an understanding of the economic, environmental, and social potential of this technology.

Advancements in solar energy-based street lighting demonstrate significant potential in improving energy efficiency, reducing greenhouse gas emissions, and lowering long-term operational costs. It is hoped that this research will provide valuable insights into the role of renewable energy technology in supporting Indonesia's energy resilience.

Through a holistic approach, the development of street lighting infrastructure utilizing solar energy is expected to make a substantial contribution to sustainable economic development. It is also anticipated to strengthen the country's energy resilience, promote

positive changes in energy resource utilization, and accelerate progress towards economic sustainability.

2. METHOD

2.1. Problems and Proposed Solutions

This section presents the issue of inadequate street lighting in the Limo area as the background. The proposed solution, which is the development of solar panel-based street lighting, and the underlying principles are explained in detail.

2.2. Design and Concept of Street Lighting

A detailed explanation of the design of street lighting intended to utilize solar panels as the energy source. This includes an explanation of how light sensors work as automatic switches, and the mechanisms for energy conversion and storage in batteries.

2.3. Implementation Stages

2.3.1. Preparation

Details of the steps taken during the preparation phase, including site surveys, discussions with relevant parties, and the design of the equipment schematic.

2.3.2. Implementation

Explanation of the implementation phase of the plan, including the purchase of components, assembly of equipment, and installation at the designated locations.

2.3.3. Evaluation

Explanation of the checks, performance testing, and durability of the equipment under various weather conditions after the installation of the street lighting.

2.4. Monitoring and Evaluation

Explanation of the periodic monitoring process conducted during the research to ensure smooth progress and the evaluation process conducted alongside monitoring.

2.5. Results Testing

Explanation of the evaluation of research results, including the performance and effectiveness testing of the solar panel-based street lighting that has been developed.

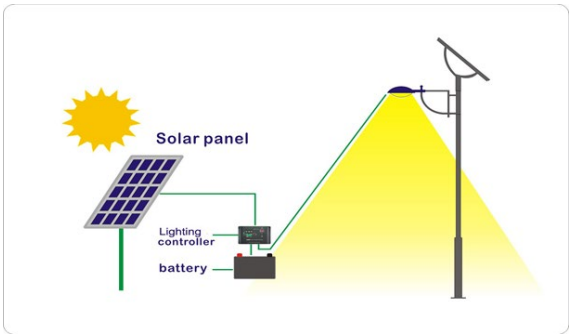
3. RESULT AND DISCUSSION

The research results show that the street lighting can be activated at night and charge the batteries when exposed to sunlight during the day through energy conversion from thin-film solar panels. The solar panels used have characteristics with an efficiency of about 7-13%,

a maximum power of around 200WP, an average output voltage of 12V, and receive sunlight for approximately 8 hours. Based on calculations, the energy produced by the solar panels reaches 1 KWh or equivalent to 83.3Ah when stored in the batteries.

The battery capacity obtained with a Deep of Discharge (DOD) of 80% is around 312.3 Ah, while the energy consumed by the LED lights is 22.94 Ah, allowing the lights to operate for approximately 13.613 hours. The lighting is controlled by motion sensors, which ensure the lights are fully on only when detecting movement such as people or vehicles passing by. If no movement is detected, the light intensity will decrease, resulting in less intensive lighting at a distance.

Figure 3.1 Solar Panel



4. CONCLUSION

This research activity has a positive impact on the community, including:

1. Enhancing public understanding of Renewable Energy (EBT).
2. Allowing the community to apply solar energy technology in daily life.
3. Increasing awareness of the importance of energy resilience.

5. REFERENCES

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