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Improved Solar Cell Energy Backup Supply Protection System in Households

Firza Ardana[1], Arya Pratama[2], Supri Ananda[3], Yovie Ade Alvian Barus[4], Solly Aryza[5]
Email: ardanafirza0@gmail.com
Universitas Pembangunan Panca Budi

ABSTRACT
Utilization of solar energy through Solar Power Plants (SPP) is an alternative technology that is usually used at home. In this context, the journal "Security System with Solar Panel Energy Backup for Households". In this study, it discusses the increase in protection that is implemented as a household security system that uses solar panel energy backup. The research methods used include literature study, system design, system implementation, system testing, and result analysis. It is hoped that this journal can contribute to the development of household security technology that is environmentally friendly and energy efficient.

Keywords **:** ***SPP, Security System, Energy Backup, House.***

INTRODUCTION

Nowadays, household security is one of the top priorities for the community. With the existence of a household security system, people can feel safer and more comfortable at home. However, the existence of a household security system not only helps the community in protecting themselves from fire, but also helps in reducing electricity costs which are often a problem for the community (Nurjaman, 2022).

Solar panels are one technology that has been widely used in various fields, including use for domestic purposes. By using solar panels, we can reduce electricity costs which are often a problem for society. In addition, solar panels can also be used as energy backup in household security systems. In this journal, we will discuss how to implement a household security system that uses solar panel energy backup. We will discuss about how to install solar panels, how to set up a household security system, and how to set up solar panel energy backups.

In addition, we will also discuss the advantages that can be obtained by using a household security system that uses solar panel energy backup (Napitupulu, 2023). With this journal, we can gain deeper knowledge about household security systems that use solar panel energy backups. With better knowledge, we can help communities protect themselves from fires and reduce electricity costs.

LITERATURE REVIEW

Solar Power Plant

Solar power plants (PLTS) are one form of application of environmentally friendly technology. PLTS is a generation system that is classified as easy, cheap, environmentally friendly, and renewable. The PLTS implementation process includes important steps, such as evaluating energy needs, determining solar panel capacity, selecting optimal sites, consulting with renewable energy experts, equipment selection, installation, performance monitoring, and routine maintenance. These measures aim to ensure operational efficiency and long-term benefits in terms of energy and environmental savings. Several journals also discuss the implementation of current and voltage characteristics of PLTS on new renewable energy

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trainer equipment, which is an important part of the PLTS implementation process.

Figure 1. Home Solar Plant

METHODS

The research method used in this study consists of literature studies and descriptive studies. Literature studies are conducted by looking for references that can be accounted for such as journals and reference books to obtain information about the concept of control systems for electrical energy backup in integrated building security system applications PLTS in educational building applications. Meanwhile, the descriptive study involves interviews with building users related to the Education building, this section aims to find out more about the condition of the security system in the education building. In determining the design system of the control system concept, the determination is carried out with scenarios of possible system conditions. The determination of the number of scenarios is done with mathematical theory through the theory of probability relations and mapping.

RESULTS AND DISCUSSION

The Importance of Energy Reserve Control System in PLTS Integrated Home Security System.

In the context of a home security system integrated with Solar Panels (PLTS), the reliability of electrical energy supply is very crucial. Stability of the power supply is necessary for the security system to function optimally. The role of solar power as an environmentally friendly alternative energy source highlights the urgency of the control system concept to ensure the continuity of energy supply in such applications. The importance of reliable supply of electrical energy also occurs in educational buildings, where security systems play an important role in protecting occupants and vital assets. The stability of the electricity supply is a key factor in maintaining the operation of the security system, because such instability can cause vulnerabilities and disruptions to the security of residents.

The concept of a control system for electrical energy backup in home security system applications integrated with PLTS involves important components such as energy storage batteries (batteries), inverters, controllers, and sensors. Through the use of intelligent sensors and precise controllers, this control system can monitor and control the supply of electrical

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energy from the solar power plant as well as automatically switch to a backup power source when needed. This provides operational sustainability of the security system with a stable energy supply. The electrical energy backup control system has key functions, including monitoring and supervising energy supply, efficient power management, and controlling resource switching in the event of a disruption. The existence of a good control system allows real-time monitoring of energy supply from PLTS, early identification of potential problems, and optimizing energy use.

The application of electrical energy backup control systems in integrated home security system applications with solar power plants requires attention to appropriate battery capacity planning and efficient power management. Integration between control systems and home security systems is also an important aspect to maintain the integrity and optimal performance of the two systems, including aspects of communication, interoperability, and priority setting.

Home Security Facilities

Home security facilities are various systems and devices designed to protect the home and its occupants from potential security risks or threats. Some of the security facilities commonly found in homes include:

a. Home Security System:
   - Security alarm to detect intrusion.
   - Surveillance cameras (CCTV) for visual monitoring.
   - Door and window sensors to detect unauthorized openings.
   - Motion sensors to detect activity in specific areas.
   - Security Lock and Access Control:

b. Safety Lighting:
   - Outdoor and inner lighting associated with motion sensors.
   - Auto exposure to warn of activity at night.

c. Remote Monitoring:
   - Security systems that can be accessed remotely by CCTV through mobile applications or the internet.

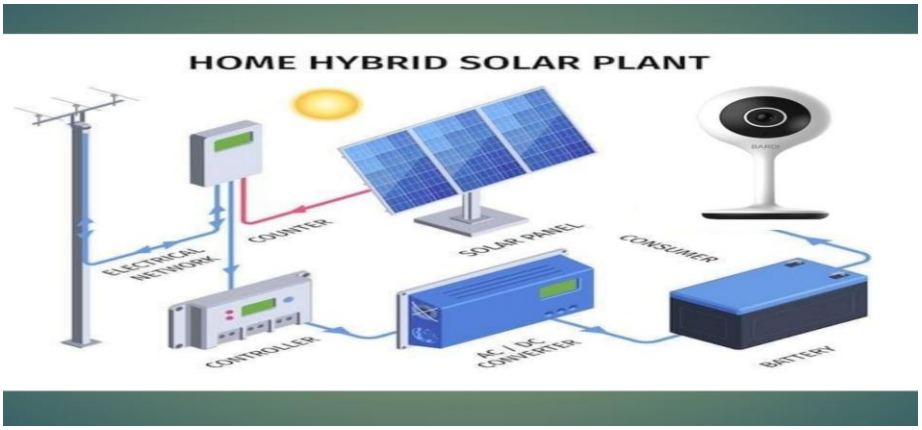

Figure 2. Home Hybrid Solar Plant For Energy Backup With CCTV

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Control System Scenarios

To design a control system scenario, the first step is to perform mathematical calculations by establishing a relationship between the "energy source" and the "energy availability condition". The results of these calculations are then explained in the form of mapping. In this context, the focus is on the production of electrical power by solar systems that have been adapted to the energy consumption needs for security systems. The main energy source that has been established is the battery.

Control Scenarios and Condition Settings:

- Variation 1:
  Energy Source: PLN Grid (good), Battery (good), Solar Lighting (good)
  Condition: All energy sources operate properly
- Variation 2:
  Energy Source: PLN Grid (good), Battery (bad), Solar Lighting (good)
  Condition: Using PLN Grid due to bad battery.
- Variation 3:
  Energy Source: PLN Grid (good), Battery (poor), Solar Lighting (bad)
  Condition: Using PLN Grid because of bad battery and low sunlight.
- Variation 4:
  Energy Source: PLN Grid (good), Battery (good), Solar Lighting (bad)
  Condition: Using batteries due to poor solar lighting.
- Variation 5:
  Energy Source: PLN Grid (not operating), Battery (poor), Solar Lighting (bad)
  Condition: The system shuts down because there is no good energy source.
- Variation 6:
  Energy Source: PLN Grid (not operating), Battery (good), Solar Lighting (bad)
  Condition: Using batteries due to poor solar lighting.
- Variation 7:
  Energy Source: PLN Grid (not operating), Battery (good), Solar Lighting (good)
  Condition: Using battery because PLN Grid is not operating.
- Variation 8:
  Energy Source: PLN Grid (not operating), Battery (bad), Solar Lighting (good)
  Condition: The system shuts down because there is no good energy source.

Energy resources are divided into three types, namely PLN Grid, Battery, and Solar Lighting, with codomains in the form of "good condition or operating" and "poor condition or inoperable" for each energy source. When talking about the condition of the battery, its good or bad judgment can be configured taking into account the percentage of the amount of energy available on it. Through mapping this condition, using 3 (three) domains and 2 (two) codomains, 8 (eight) different variations were produced. Of the total 8 (eight) variations, an operating system scenario design was carried out which can be seen in the description above.

Substitute Comparison

When comparing security systems with backup energy to systems without backup energy, there are several factors to consider. Security systems with backup energy can provide a more reliable and safe solution in the event of a power outage or emergency. Here are some key differences between the two: Security System with Backup Energy.

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- Reliability: Security systems with backup energy can continue to function during power outages, ensuring that security measures remain active and effective.
- Emergency Response: In an emergency, such as a robbery or fire, a security system with backup energy can still communicate with emergency services and respond to the situation.
- Power Consumption: A security system with backup energy can consume less power during normal operation, as it can rely on the stored energy of the backup system.
- Cost Effectiveness: Although the initial cost of installing a backup energy system may be higher, the savings in energy consumption in the long run and the peace of mind it provides can make it a cost-effective solution.

Security System without Backup Energy:

- Vulnerabilities: Security systems without backup energy may not function during power outages, leaving property and its occupants vulnerable to potential threats.
- Emergency Response: In an emergency, security systems without backup energy may not be able to communicate with emergency services or respond effectively to situations.
- Power Consumption: Security systems without backup energy may consume more power during normal operation, as these systems depend only on the main power source.
- Cost Effectiveness: Although the initial cost of installing a backup energy system may be higher, the savings in energy consumption in the long run and the peace of mind it provides can make it a cost-effective solution.

In conclusion, security systems with backup energy offer a more reliable and safe solution in the event of a power outage or emergency. While the initial cost may be higher, the savings in energy consumption in the long run and the peace of mind it provides can make it a cost-effective solution.

CONCLUSION

Based on the discussion above, it can be concluded that:

1. Improved protection system with integrated backup supply of solar cell energy can improve household security.
2. Solar cell integration can be an efficient and environmentally friendly alternative energy source.
3. Improved protection system with backup solar cell energy supply can be a solution for households that do not have limited access to the electricity system.

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