Internet of Things-based Monitoring on Hybrid Technology

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ABSTRACT
In Hybrid integrated control equipment as an energy source will be combined to the advantage of each wind and solar energy source in order to produce electrical energy effectively for various electrical loads for green open spaces. Electrical loading as lighting and indicators to control during the day and at night as a power supply of electrical energy from wind and solar energy to control the electrical system.

The aim of this research is to create Internet of Things-based monitoring on hybrid technology, a combination of natural resources, wind and solar power, with a combination of the advantages of each generator and can cover the weaknesses of each generator for certain conditions and circumstances so that the total system can operate more cheaply and effectively. and is able to produce electrical energy in various loading conditions. Manufacture of wind turbine systems, propellers, batteries, inverters and natural source controllers as well as integrated control equipment. This research uses a system implementation method with stages of literature study, field study, data collection and the next stage is software design by creating system performance algorithms and designing system hardware requirements. At the design stage, a program is created according to the hardware manufacturing system algorithm. The testing stage is to determine the performance test of the implementation of the design system.

Keywords
IOT, Monitoring, hybrid technology

1. INTRODUCTION
We Wind Hybrid Technology and PLTS (Solar Power Plants) have become important topics in the field of renewable energy. Hybrid renewable energy can improve the availability of stable, efficient and cost-effective energy. As demand for energy increases, this hybrid technology can be a solution to meet increasing energy needs. Hybrid Wind and PLTS technology combines the advantages of Wind and PLTS technology. Solar Power Plants (PLTS) utilize solar energy to produce electricity, while Wind technology uses wind power to produce electricity. In Hybrid Wind and PLTS technology, these two technologies are combined to maximize the use of renewable energy.

One of the advantages of Hybrid Wind and PLTS technology is that this system can produce electrical energy all the time. Although wind and solar energy vary throughout the day, the advantages of each technology can be used to offset the disadvantages of the other technology. For example, when the sun sets, wind turbines can still produce electricity. On the other hand, when the wind is weak, PLTS can cover the shortfall by generating electricity from sunlight.

Apart from that, Hybrid Wind and PLTS technology can also help reduce greenhouse gas emissions. In a study, Hybrid Wind and PLTS technology was found to reduce greenhouse gas emissions by 20-30% compared to conventional energy use. This makes Hybrid Wind and PLTS technology an environmentally friendly and more sustainable choice.

However, Hybrid Wind and PLTS technology also has several challenges. One of them is the initial investment costs which are quite high. Although the operational costs of this hybrid technology are lower compared to conventional technology, the initial investment costs required to build infrastructure and installation can be an obstacle for some regions. Another challenge is the problem of system integration. Hybrid Wind and PLTS technology requires complex integration of Wind and PLTS systems. Poor integration can result in significant problems such as network instability and power outages. Therefore, it is necessary to carry out further research and development to improve the integration of Hybrid Wind and PLTS systems.

Overall, Hybrid Wind and PLTS technology offers many advantages in meeting sustainable and environmentally friendly energy needs. Although there are several challenges that need to be overcome, this technology has great potential for future use and helps reduce the negative impacts of conventional energy use. The roadmap for the development of Hybrid Wind and PLTS technology is: Research and Development Phase (2023-2025): This phase includes further research on system integration, hardware and software development needed to optimize the performance of Hybrid Wind and PLTS technology. This research involves experts in the fields of renewable energy and information technology. Prototype Stage (2025-2028): At this stage, prototypes of Wind Hybrid and PLTS technology will be developed and tested in the field. This prototype will help in testing the performance of the technology and evaluating the feasibility of this technology on a larger scale. Demonstration Phase (2028-2030): In this phase, Hybrid Wind and PLTS technology will be implemented on a larger scale and tested in various conditions. This technology will be implemented in several countries or regions that need renewable energy and have sufficient natural resources. Commercialization Stage (2030-2035): At this stage, Hybrid Wind and PLTS technology will become commercial and available for widespread use. This technology will help meet increasing energy needs in a sustainable and environmentally friendly manner. Performance Improvement Stage (2035-2040): At this stage, Wind Hybrid and PLTS technology will continue to be improved to increase its performance. Research and development will continue to be carried out to increase technological efficiency and reduce production costs. Integrated with the Electric Grid Stage (2040-2050): At this stage, Hybrid Wind and PLTS technology will be integrated with the larger electricity network and become part of an integrated electricity network system. This technology will help in increasing the availability of stable and efficient energy. With this roadmap, it is hoped that the development of Hybrid Wind and PLTS technology can

continue and become a renewable energy solution that is sustainable and environmentally friendly in the future.

2. METHODOLOGY

The research method used in this research is the implementation method, with stages such as literature study, field study and data collection. The next stage is designing both software design in the form of creating algorithms for the work of the Internet of Things system and hardware design for system requirements. Next is the manufacturing stage, where at this stage the system algorithm is created and the hardware manufacturing stage is carried out. The next stage is the system testing stage to test the working of the system created.

2.1 Location

The author conducted research in the Department of Electrical Engineering and the author also conducted research at the Manado State Polytechnic Campus. We placed the all components at the cliff on the highland. So, the block diagram of the system is like this:

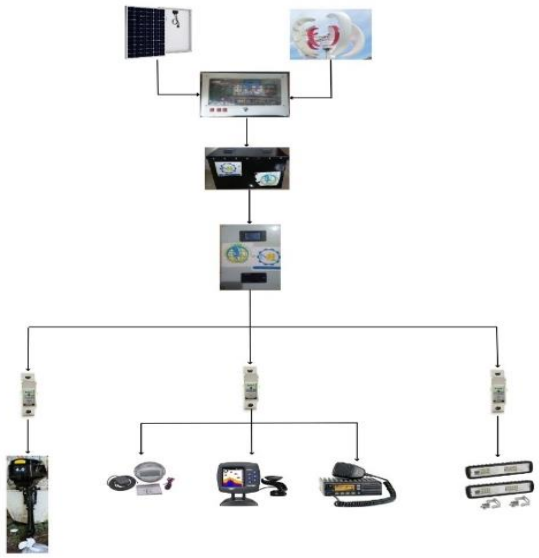

Fig 1: Blok Diagram of the Hybrid Power System

2.2 Method

The research method is a process of solving logical problems, where data is needed to support the needs. Before starting built the system, we try from collection the data of wind speed, solar irradiation and then we do a little simulation of it. So, we use primary and secondary data to get the appropriate size of our hybrid system

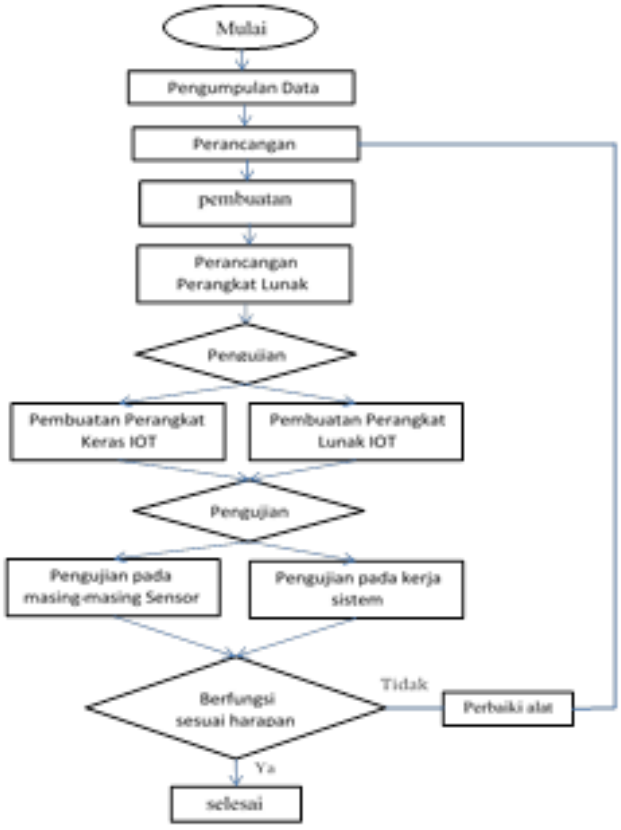

Fig 2: Flowchart System

3. IMPLEMENTATION AND RESULT

The implantation of the system are the software and hardware design to the real hybrid power plant. So the method will apply to the concept design of the components into the system by using a power management system. The result is implementation the design system to the real system at Electrical Engineering Department of Manado State Polytechnic Hybrid Power System.

3.1 The design procedure:

The steps procedure used in this research is as follows:

1. Preparation Stage

In this section the author aims to prepare all the processes of writing and making tools.

2. Design Stage

At this stage the author plans the design process for tool design needs.

3. Implementation Stage

This stage is a writing process for collecting field data and monitoring using the tools that have been designed.

4. Analysis Stage

This stage is an important part for the author to present data on the results of the creation along with an evaluation of the results of the tool design and implementation.

3.2 The design concept

Below is the design concept of the hybrid power control system with the power load:

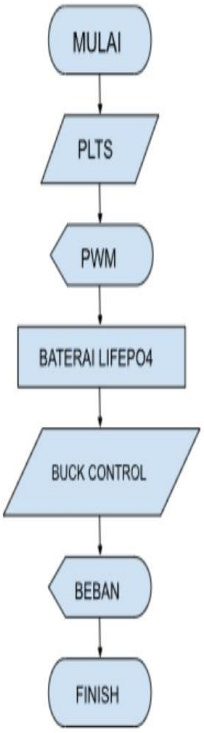

Fig 3: The Flow Chart System

The design of hybrid power system by using Solar Panel Plants is converted to Pulse Wide Modulation (PWM) to have a digital control. This PWM control the supply to battery to save the energy. Then the controller supply it to power demand as the load.

The flow chart system:

1. Turn on wifi.

2. If the WiFi connection does not work then the WiFi connection will occur repeatedly and if the WiFi connection is successful then it will go to the next stage.

3. After the WiFi connection is successful, a reading will be taken by the pzem sensor, where this sensor reads the current and voltage.

4. After the pzem sensor takes current and voltage readings, the results from the pzem sensor are displayed on the Blynk application on the cellphone.

5. Done.

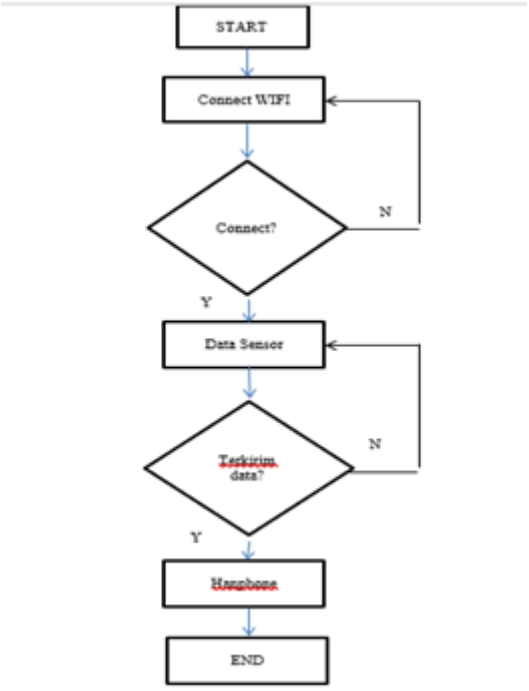

Fig 4: The flow chart design concept

3.3 The Hardware Design:

The main components are::

1. Panel Box
2. Relay
3. Power Suply
4. Terminal block
5. ESP-32 Development Board Ultra-Low Power
6. NYAF Cable 1,5mm
7. Current Sensor PZEM 004T
8. Arduino Uno

The block diagram system is a simplified system of a series of tools that shows the components of the tool that serve as the purpose of making the tool, so that we can determine what kind of design to make for analysis. Below is a block diagram of the detection tool:

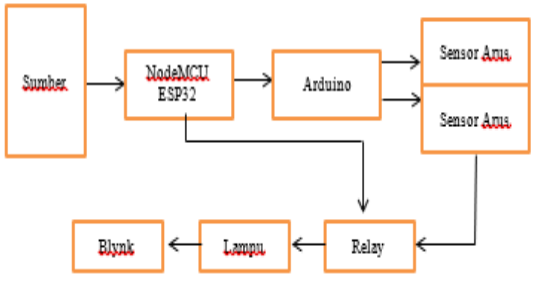

Fig.5: Hardware Block Diagram

3.4 The Control Block Diagram:

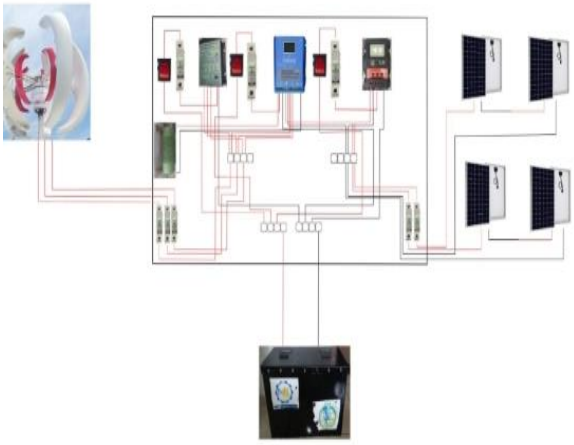

Fig 6: Control Block Diagram

The wiring diagram below is the wiring of the NodeMCU ESP32 microcontroller, Current and Voltage Sensor, Relay and Arduino.

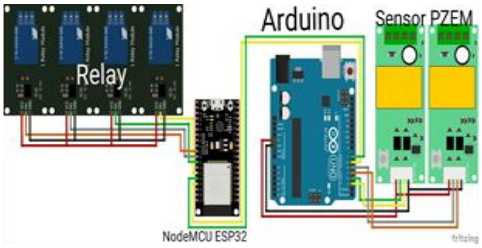

Fig 7: Wiring Diagram

4. CONCLUSSION

This hybrid system produces around 200 Watt by the solar panel and 100 Watt by the wind turbine. The system produces the power at the day by the solar panel and at the night the lack of power supply by the wind turbine. So, the average output of the system is about 120 Watt continuously. It can fulfill the power demand of the LED Light around the Electrical Engineering Department of Manado State Polytechnic. The light can be controlled by phone based the buttons or the speaker. IT equipment can control the system to on-off by the remote system of IoT.

5. ACKNOWLEDGMENTS

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6. REFERENCES

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