ABSTRAK

DWI IWAN SETIAWAN Pemanfaatan PLTS 100 Wp Sebagai Sumber Energi Pada Sistem *Monitoring* Pendeteksi Kebocoran Pipa Air Berbasis IoT. Dibimbing oleh MUCHAMAD NUR QOSIM, S.T., M.T.

Ketersediaan sumber energi listrik menjadi kebutuhan penting dalam mendukung operasional sistem *monitoring* pendeteksi kebocoran pipa air berbasis *Internet of Things* (IoT). Pemanfaatan Pembangkit Listrik Tenaga Surya (PLTS) sebagai sumber energi terbarukan dapat menjadi solusi untuk menyediakan suplai energi listrik. Penelitian ini bertujuan untuk merancang sistem suplai energi berbasis PLTS, mengimplementasikan PLTS sebagai sumber energi listrik pada sistem *monitoring* pendeteksi kebocoran pipa air, serta mengetahui kinerja sistem PLTS dalam memenuhi kebutuhan energi beban. Penelitian ini menggunakan pendekatan kuantitatif dengan metode eksperimen. Parameter yang diukur meliputi iradiasi matahari, tegangan, arus, daya, energi keluaran panel surya, energi pengisian baterai $LiFePO_4$ 12 V 27 Ah serta konsumsi energi beban. Data hasil pengukuran dianalisis untuk mengetahui kinerja sistem suplai energi dengan menggunakan sistem PLTS 100 Wp serta mengetahui kesesuaian kapasitas sistem PLTS terhadap kebutuhan energi. Hasil penelitian menunjukkan panel surya menghasilkan energi sebesar 312,14 Wh yang dipengaruhi oleh intensitas matahari, sedangkan energi yang disalurkan pada baterai sebesar 272,72 Wh dengan efisiensi pengisian 87,37%. Pada pengujian operasional sistem *monitoring* pendeteksi kebocoran pipa air, PLTS dapat menyuplai kebutuhan energi beban sebesar 59 Wh sehingga energi yang dihasilkan PLTS mampu memenuhi kebutuhan daya *Prototipe*. Pada pengujian operasi kontinu baterai dapat menyuplai beban selama 3 jam 45 menit dengan konsumsi energi 271,01 Wh hingga batas tegangan pada SCC yang diatur. Berdasarkan hasil tersebut, kapasitas panel surya 100 Wp dan baterai $LiFePO_4$ 12 V 27 Ah mampu mendukung operasional sistem *monitoring* pendeteksi kebocoran pipa air, namun diperlukan peningkatan kapasitas apabila sistem dioperasikan secara kontinu selama 24 jam.

Kata Kunci: Energi Terbarukan, Pembangkit Listrik Tenaga Surya, Baterai, Sistem *Monitoring*, Kebocoran Pipa Air

ABSTRACT

DWI IWAN SETIAWAN Utilization of a 100 Wp Solar Power System as an Energy Source for an IoT-Based Water Pipe Leak Detection Monitoring System. Supervised by MUCHAMAD NUR QOSIM, S.T., M.T.

The availability of electrical energy sources is an important need to support the operation of the Internet of Things (IoT) water leak detection monitoring system. The use of Solar Power Plants (PLTS) as a source of renewable energy can be a solution to provide electrical energy supply. This research aims to design a solar PV-based energy supply system, implement solar power as a source of electrical energy in the monitoring system for detecting water pipe leaks, and determine the performance of the solar power system in meeting load energy needs. This study uses a quantitative approach with an experimental method. The parameters measured include solar irradiation, voltage, current, power, solar panel output energy, 12 V 27 Ah $LiFePO_4$ battery charging energy and load energy consumption. The measurement data was analyzed to determine the performance of the energy supply system using the 100 Wp solar power plant system and to determine the suitability of the solar power system capacity to energy needs. The results showed that solar panels produced 312.14 Wh of energy which was influenced by the intensity of the sun, while the energy channeled to the battery was 272.72 Wh with a charging efficiency of 87.37%. In the operational testing of the monitoring system for detecting water pipe leaks, solar power plants can supply load energy needs of 59 Wh so that the energy produced by solar power plants is able to meet the power needs of the prototype. In continuous operation testing, the battery can supply a load for 3 hours and 45 minutes with an energy consumption of 271.01 Wh up to the voltage limit on the set SCC. Based on these results, the 100 Wp solar panel and 12 V 27 Ah $LiFePO_4$ battery were able to support the operation of the monitoring system during the testing period for detecting water pipe leaks, but an increase in capacity is needed if the system is operated continuously for 24 hours.

Keywords: Renewable Energy, Solar Power Plants, Batteries, Monitoring Systems, Water Pipe Leaks