Analisis Kinerja PLTS Sistem *OFF-GRID* Sebagai Penggerak Pompa Air DC Untuk Sirkulasi Air Akuaponik

(Performance Analysis of PLTS OFF-GRID System as a DC Water Pump Driver for Aquaponic Water Circulation).

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ABSTRACT

Electricity generated from Photovoltaic Solar Power Systems (PLTS) is stored in batteries for use in powering water pumps. Akuaponik is a system that cultivates fish and plants, utilizing natural bacteria to convert fish waste into plant nutrients. Akuaponik systems are environmentally friendly and contribute to reducing waste disposal into the environment. In this study, the focus is on the performance testing of *Off-grid* PLTS as a driver for DC water pumps in the context of akuaponik. The aim of this research is to analyze the performance of PLTS in powering DC water pumps for water circulation in akuaponik systems. Using IEC 61724 standard performance test method The results obtained from the performance testing of PLTS show an average energy generation of 503.8 Wh, which is sufficient to support the DC water pump for 20 hours of operation per day. The energy demand of the water pump is only 382.6 Wh, indicating that the *Off-grid* PLTS is able to meet the energy requirements of the pump for 20 hours. In terms of efficiency, the *Off-grid* PLTS exhibits an average solar panel efficiency of 4.97%, Solar Charge Controller (SCC) efficiency of 60.51%, and pump efficiency of 36.18%. The energy loss in the solar panels has an average value of 5.29 kWh/kWp, compared to a daily solar irradiation of 7.8 kWh/m2. The Performance Ratio value is 30.98%, indicating the less efficient conversion of solar irradiation by the panels. However, the energy loss in the system has an average value of 0.10 kWh/kWp.

Keywords: *Off-grid*, PLTS, Performance Testing, Akuaponik.