Potential Study and Planning of Micro-Hydro Power Plant in Tegalgondo Village, Kalibaru District, Banyuwangi Regency

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ABSTRACT

The demand for electrical energy continues to increase along with technological development and population growth. The utilization of water energy through Micro-hydro Power Plants (MHPPs) is one of the renewable energy alternatives with great potential for development in Indonesia. This study aims to analyze the potential and design an MHPP system in the river located in Tegalgondo Village, Kalibaru District, Banyuwangi Regency. The research method used was a quantitative approach by conducting direct field measurements including water discharge, flow velocity, and head. Measurements were carried out for seven days with three measurements each day (morning, afternoon, and evening). The results showed that the average river discharge was 0.24 m³/s with an average flow velocity of 0.41 m/s. The discharge used as the design discharge was 80% of the main discharge, resulting in a value of 0.192 m³/s. The effective head obtained was 15.38 m after considering head losses due to pipe friction. Based on the design discharge, the electrical power generated was 18.251 kW using a crossflow turbine and a 25 kW three-phase synchronous generator. The MHPP components designed include a weir, headrace channel, forebay, 16-inch PVC penstock, and powerhouse. The total estimated construction cost was Rp368,460,050. The results indicate that the river in Tegalgondo Village has sufficient potential to be developed into an MHPP as an environmentally friendly and sustainable alternative energy source.

Keywords: *Head, Micro-hydro Power Plant, Renewable Energy, Water Discharge.*