

ABSTRACT

Nusa Penida Island is located in the southeast of Bali with an area of 202.84 km² located in Nusa Penida District, Klungkung Regency. Nusa Penida Island is one of the tourism destinations in Bali. Nusa Penida Island electricity is supplied from the Kutampi PLTD with a capacity of 11.9 MW with a net capacity of 9.2 MW. PLTD Kutampi requires 12,000 liters of diesel fuel to run the power plant with a fairly expensive MFO diesel fuel cost of 19,600 IDR/liter. In 2007 a PLTB with a capacity of 80kW was built, only operating for 1 year due to project failures including maintenance costs, lack of spare parts, and incompatibility of wind turbines. The solution to reduce electricity costs is by utilizing one of the renewable energy sources, namely wind energy on the island of Nusa Penida. The design of wind energy utilization in Grid 3 Nusa is in the form of PLTB modeling as an option for developing renewable energy.

The PLTB model will be obtained through the modeling method using QBlade and HOMER software. The QBlade software simulation produces a wind turbine capacity design and the HOMER simulation produces a suitable PLTB option for Nusa Penida Island.

This research produces a wind turbine model with a capacity of 50kW with a blade length of 18 meters using a NACA 4412 airfoil on the QBlade software simulation. In the HOMER simulation, a comparison of the LCOE values of the wind turbine types WES34/100 100kW, MG-H100 100kW, MGH-50 50kW, and Blade-Custom 50kW was carried out. The results and optimization of HOMER obtained PLTB with a capacity of 100 kW with a total laying of 40 PLTB from the WES34/100 model with the lowest LCOE value of 0.162 USD. The LCOE value decreased after PLTB was simulated on HOMER with a value of 0.19 USD to 0.162 USD.

Keywords: *Airfoil, Blade, Wind Energy, Capacity, Wind Power Generation.*