

ABSTRACT

Karimunjawa Island is separated from Java Island, where the electricity system on this island uses an off-grid system. Currently, Karimunjawa Island uses PLTD as the main generator with an installed capacity of 2 x 1.8 MW. PLTD on Karimunjawa Island is operated with a load of 20% of its installed capacity. The main fuel used by PLTD is currently in the form of high-speed diesel, where the current fuel cost is IDR 27,550/L. The increase in fuel prices since September 1, 2022, has had an impact on a fairly high increase in fuel delivery costs. The increase in the price of fuel oil is one of the factors for the current high cost of generation on Karimunjawa Island. To reduce the current high cost of generation, a hybrid system can be developed.

A hybrid system or PLTH is a combined power plant consisting of two or more types of generators with different energy sources. The development of a hybrid system or PLTH can take advantage of new renewable energy which has quite high energy potential on Karimunjawa Island at this time. One of the energies that has a quite high potential is wind energy. Where wind energy is an alternative generation system that is appropriate for its use, especially in areas that are difficult to reach by on-grid generators from PLN. This is supported by the high wind potential of Karimunjawa Island, which is 3.99 m/s. With the development of new renewable energy on Karimunjawa Island, this is expected to be an option for reducing the current cost of generating electricity.

The current cost of generating PLTD is 1,326 IDR/kWh . Optimizing the cost of generating a PLTD by utilizing wind energy on Karimunjawa Island produces an economically feasible hybrid system which shows that the cost of generating a hybrid system is lower, namely 1,231 IDR/kWh, and applies for the same year range. By testing the hybrid system using the DigSILENT Software, the system is declared safe when simulating short circuit currents and remains stable when there is an intermittent disturbance in the system.

Keywords: PLTD, PLTH, PLTB, BPP