

ABSTRACT

As technology develops, we depend on electricity for almost all aspects of our lives. However, with increasing demand for electricity, power generation faces increasingly complex challenges. One of the main challenges is the high operational costs. To keep power plants running, significant running costs are required to run each generator. The higher the demand for electricity, the greater the costs that must be borne by the plant operators. Not only that, the operation of conventional power plants also has an impact on the environment. Greenhouse gas emissions and air pollution from the burning of fossil fuels can damage ecosystems and human health. Therefore, a more efficient and sustainable approach is needed in optimizing the Java-Madura-Bali power generation.

To optimize the Java-Madura-Bali power plant to produce the best operational cost and emission results that meet power demand, a Particle Swarm Optimization (PSO) algorithm is used to perform the optimization. The PSO algorithm is used to calculate Economic Dispatch, Emission Dispatch and Combined Economic and Emission Dispatch from 42 power plants in Java Madura Bali (Jamali) with an electrical system consisting of thermal and hydroelectric power.

After testing with several cases, the Particle Swarm Optimization (PSO) algorithm succeeded in finding the minimum operational cost (Economic Dispatch) in the load case of 8378.972 MW and obtained an operational cost of IDR 2,000,808,617. Then when carrying out the minimum emissions (Emission Dispatch), NO₂ emissions of 116.256 kg/hour were obtained and to optimize operational costs and emissions (Combined Economic Emission Dispatch), operational costs were obtained: IDR 2,751,082,882 and NO₂ emissions: 178.28 tons / hour.

Keywords: Economic Dispatch, Emissions Dispatch, Combined Economic Emissions Dispatch, Particle Swarm Optimization (PSO).