ABSTRACT

Solar power plants as a renewable energy generator are growing rapidly due to its advantages of cost-effectiveness, environmental friendliness, and unlimited availability of energy sources. However, to maxime the efficiency of solar power plants, solar irradiation forecasting is necessary. In this case, deep learning Algorithms provide a means to forecast solar irradiation, using LSTM is proven to get a high proportion of forecast outcomes. LSTM is a type of deep learning that has 3 gates so it is suitable in this research that uses a lot of data. This research uses solar irradiation data for a year which will make a forecast from the data. To improve the model's performance, the study specifically investigated the effects of adding a convolution layer before the LSTM layer and a dense layer after it. According to the findings, a model with three layers of LSTM and one layer of dense, achieved the highest forecasting achieving an MSE of 602.13 W/m², RMSE of 24.53 W/m², MAE of 13.32 W/m² and an MAPE 5.13%. The most frequent reduction value, as determined by statistical calculations based on the forecast using 3-layer LSTM and 1-layer dense, was 6.97 W/m². The most frequent percentage decrease, however, was from 100% to 99%. Subsequently, a significant drop in irradiance was observed, decreasing from 748 W/m² to 282 W/m², which corresponds to a reduction from 100% to 37.7%. The dataset was then simulated using DIgSILENT with the West Kalimantan grid model. The results indicated that during extreme dips, the system frequency declined to 49.998 Hz before eventually returning to a steady-state condition. In contrast, the average frequency remained stable at approximately 50 Hz throughout the observation period.