

# ANALISIS PERFORMA ARIMA DAN LSTM UNTUK PREDIKSI TREN PEMANFAATAN LIMBAH FABA DI PLTU INDONESIA

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## ABSTRAK

Pengelolaan limbah *Fly Ash* dan *Bottom Ash* (FABA) di Pembangkit Listrik Tenaga Uap (PLTU) PT PLN (Persero) berpotensi sebagai sumber pendapatan tambahan di luar penjualan listrik, namun nilainya sering berfluktuasi, sehingga menyulitkan perencanaan. Penelitian ini bertujuan meramalkan pendapatan FABA, membandingkan metode ARIMA dan *Long Short-Term Memory* (LSTM), serta menentukan model terbaik untuk integrasi ke sistem MAPP. Data transaksi FABA dari Januari 2022 hingga September 2025 digunakan dengan pendekatan peramalan bergulir pada data asli dan yang dihaluskan via *Gaussian smoothing*. Evaluasi model menggunakan MAE, RMSE, dan MAPE. Pada data asli, ARIMA(0,1,0) menghasilkan MAE 338,990608 juta Rupiah, RMSE 405,603628 juta Rupiah, MAPE 44,505369%, sementara LSTM: MAE 220,062 juta Rupiah, RMSE 350,062 juta Rupiah, MAPE 18,66%. Setelah *smoothing*, ARIMA(1,1,1) unggul dengan MAE 69,88, RMSE 85,48, MAPE 8,80%, versus LSTM MAE 154,821 juta Rupiah, RMSE 173,1 juta Rupiah, MAPE 18,26%. Kesimpulannya, ARIMA dengan *Gaussian smoothing* paling efektif, mendukung pengambilan keputusan strategis PLN dan perencanaan pendapatan FABA yang lebih baik.

Kata Kunci: ARIMA, *Bottom Ash*, *Fly Ash*, LSTM, Prediksi Pendapatan.

**PERFORMANCE ANALYSIS OF ARIMA AND LSTM MODELS FOR  
FORECASTING FABA WASTE UTILIZATION TRENDS IN INDONESIAN  
POWER PLANTS**

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**ABSTRACT**

*The management of Fly Ash and Bottom Ash (FABA) at coal-fired power plants of PT PLN (Persero) has the potential to generate additional revenue beyond electricity sales; however, its value tends to fluctuate, making planning more challenging. This study aims to forecast FABA revenue, compare the performance of ARIMA and Long Short-Term Memory (LSTM) methods, and determine the most suitable model for integration into the MAPP system. FABA transaction data from January 2022 to September 2025 were analyzed using a rolling forecasting approach on both original data and data smoothed using Gaussian smoothing. Model performance was evaluated using Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and Mean Absolute Percentage Error (MAPE). For the original data, the ARIMA(0,1,0) model produced an MAE 338,990608 juta Rupiah, RMSE 405,603628 juta Rupiah, MAPE 44,505369%, while the LSTM model achieved an MAE 220,062 juta Rupiah, RMSE 350,062 juta Rupiah, MAPE 18,66%. After applying Gaussian smoothing, the ARIMA(1,1,1) model showed superior performance with an MAE 69,88, RMSE 85,48, MAPE 8,80%, compared to the LSTM model, which resulted in an MAE 154,821 juta Rupiah, RMSE 173,1 juta Rupiah, MAPE 18,26%. These results indicate that ARIMA combined with Gaussian smoothing is the most effective approach, supporting strategic decision-making at PLN and improving FABA revenue planning.*

*Keywords: ARIMA, Bottom Ash, Fly Ash, LSTM, Revenue Predict.*