PREDICTION OF ELECTRICITY DEMAND IN WEST NUSA TENGGARA USING SIMPLE AND MULTIPLE LINEAR REGRESSION TO MITIGATE THE RISK OF POWER SUPPLY SHORTAGES

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ABSTRACT

West Nusa Tenggara Province has experienced a consistent increase in electricity consumption each year, driven by the expansion of household, commercial, industrial, and social sectors. In response to the potential risk of electricity supply shortages, this study focuses on designing and developing a predictive model for electricity demand using simple and multiple linear regression methods. The dataset spans from 2014 to 2024 and includes variables such as Gross Regional Domestic Product (GRDP), number of customers, and connected power capacity. The multiple linear regression model is applied to forecast electricity demand through the year 2035. Prediction outcomes reveal that the simple linear regression model yields a Mean Absolute Percentage Error (MAPE) of 16.33% for the GRDP variable—classified as good—while the MAPE values for the number of customers and connected power are below 20% and 10%, respectively, categorized as good to very good. In the multiple linear regression model, the household, commercial, industrial, social, and building sectors each demonstrate a coefficient of determination (R^2) exceeding 80%, indicating a very strong correlation with electricity demand. In contrast, the public street lighting sector shows a moderately strong relationship with an R^2 above 40%. The electricity production capacity in West Nusa Tenggara stands at 3,141.18 GWh. When compared with the forecasted demand, it is evident that in 2025 and 2026, electricity requirements remain below supply capacity at 2,858.75 GWh and 2,999.74 GWh, respectively. However, beginning in 2027, demand is expected to reach 3,140.74 GWh, nearly equal to the available capacity. From 2028 onward, electricity demand is projected to surpass existing supply levels, suggesting that the province may face an energy shortage unless new generation capacity is added or energy efficiency strategies are implemented.

Keywords: Electricity Demand Prediction, Multiple Linear Regression, Mean Absolute Percentage Error (MAPE), Peak Load Demand, Energy Supply Shortage