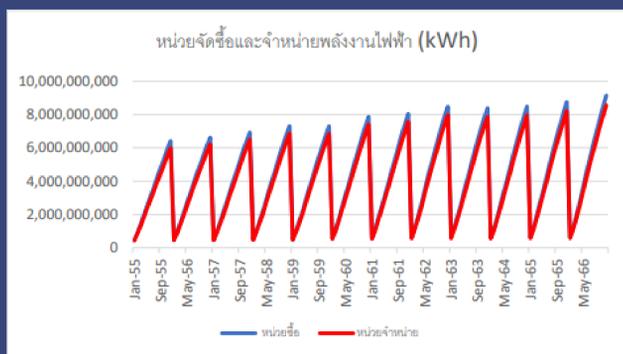


SUITABLE FORECASTING MODEL FOR CUMULATIVE UNIT LOSS PERCENTAGE DATA ELECTRICITY OF THE PROVINCIAL ELECTRICITY AUTHORITY (NORTHERN)



WHAT IS UNIT LOSS?

Energy losses that occur in the process of transmitting and distributing electrical energy, which can be caused by resistance in transmission lines, electrical conversion devices or improper energy management, resulting in electrical energy being lost in the form of heat or other forms. - Loss units The amount of electrical energy lost in the process of transmitting and distributing energy, usually measured in kilowatt hours (kWh).

ORIGIN AND SIGNIFICANCE OF THE PROBLEM

Electrical power loss in the transmission and distribution process is a major problem affecting the efficiency of the power system. The loss occurs from resistance in the transmission line, loss in the transformer, and errors in energy management. The Provincial Electricity Authority (North) needs to forecast the percentage of accumulated loss in order to be able to manage energy efficiently, reduce costs, and increase the stability of the power system.



OBJECTIVE OF THE RESEARCH

- To compare the appropriate forecasting model for the percentage of accumulated electrical loss units
- To forecast the monthly and annual percentage of accumulated electrical loss units of PEA (Northern Region)



Scope of the research

Data used:
Accumulated percentage of loss units from January 2012 to December 2023

The data is divided into 2 sets:

Set 1: 132 months of data (Jan 2012 – Dec 2022) used to create the model
Set 2: 12 months of data (Jan – Dec 2023) used to compare forecast values

Forecasting techniques used in the study:

- 1 Winter's Exponential Smoothing (Holt-Winters Method)
- 2 SARIMA (Seasonal Autoregressive Integrated Moving Average)

Evaluation criteria:

MAPE (Mean Absolute Percentage Error) → Measures the model error

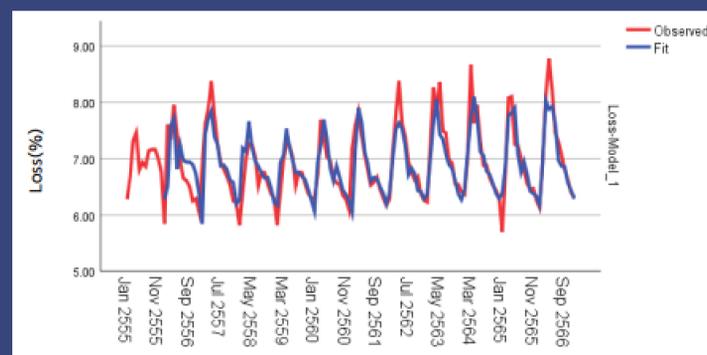
RMSE (Root Mean Squared Error) → Measures the root mean square error

RESEARCH RESULTS

- ◆ The SARIMA model has the highest accuracy in forecasting the percentage of accumulated losses in the power system.
- ◆ The lowest MAPE value compared to other models.
- ◆ The forecast value is closest to the actual value, which can be used to plan for reducing energy losses in the future.



Method/Model	MAPE (%)	RMSE
Box-Jenkins	3.303	0.338
SARIMA(0, 0, 2)(0, 1, 1)	Lowest	Lowest



Graph comparing actual values to forecast values for percentage of cumulative loss units
With SARIMA model(0, 0, 2)(0, 1, 1)

