ABSTRACT

The accurate forecasting of electricity demand is crucial for global energy security, cost reduction, and grid stability. Disrupted situations such as the COVID-19 pandemic lead to unpredictable shifts in demand, posing challenges for short-term forecasting. Understanding demand patterns during such crises is essential for managing current circumstances and preparing for future disruptions.

This research aims to develop a precise model for predicting electricity demand, with the primary goal of effectively managing potential future disruptions. The proposed hybrid forecasting model is intended to address scenarios both with and without government intervention during disrupted situations, utilizing Thailand's electricity demand during the COVID-19 pandemic as a case study. The proposed forecasting model integrates various techniques, including stepwise regression, similar day selection-based day type criteria, variational mode decomposition, empirical mode decomposition, fast Fourier transform, neural networks, long short-term memory, and grid search optimization. To enhance the model's flexibility and adaptability, this study introduces new criteria for dataset segmentation and the selection of similar days, facilitating one-day-ahead forecasting with the utilization of rolling datasets.

The study assessed the practicality and effectiveness of the proposed forecasting model through real-world implementation. Comparative analysis against existing models demonstrated the superiority of the proposed model in enhancing flexibility and accuracy, particularly in dynamic and uncertain environments. The model exhibited improved performance with efficient computational processes and independence from input variables dependent on prior forecasts. Furthermore, the study examined the impact of disruptions on the model's accuracy, revealing its robustness and adaptability. Overall, the findings provide valuable insights for decision-making across diverse scenarios.

Keywords: : hybrid approach; daily peak load forecasting; disrupted situation; VMD; EDM; FFT; similar day selection method; stepwise regression; artificial neural network; long short-term memory; COVID-19