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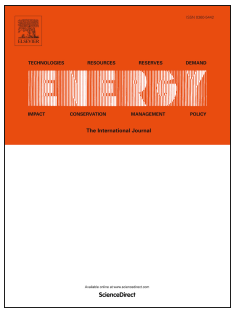

Clustering-based short-term load forecasting for residential electricity under the increasing-block pricing tariffs in China

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Clustering-based short-term load forecasting for residential electricity under the increasing-block pricing tariffs in China

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Abstract

The introduction of a new pricing mechanism, the increasing-block tariff (IBT), will not only affect electricity bills for residents, but also lead to a change in residential electricity consumption behaviours. Understanding these consumption patterns will help create more accurate load forecasting and increase the efficiency of the IBT. This study proposes an innovative clustering-based approach for short-term load forecasting under the IBT in China. The new approach initially partitions households into homogeneous groups each of which has distinctive consumption patterns under the IBT, each consumer segment can then select the most appropriate model for load forecasting, and the predicted load demands of different clusters are aggregated to derive the total usage. In particular, the IBT-related attributes are newly introduced into the clustering analysis. The utility and effectiveness of the proposed model is confirmed through a realistic dataset that contains the daily household-level consumption data of 533 households from April 2014 to February 2015. Consequently, the households are classified into five clusters with distinctive consumption patterns, including low-demand and insensitivity to high temperature ($Cluster_1$), ordinary users and sensitivity to high temperature ($Cluster_2$), ordinary users and sensitivity to the IBT ($Cluster_3$), high-demand consumers and sensitivity to high temperature ($Cluster_4$), and luxury consumers ($Cluster_5$). In addition, the obtained experimental results demonstrate that the proposed approach can not only achieve better prediction accuracy (e.g., the mean absolute

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