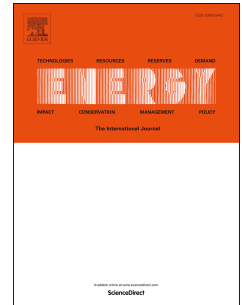


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# Detection of Non-Technical Losses in Smart Meter Data based on Load Curve Profiling and Time Series Analysis

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## Abstract

The advent and progressive deployment of the so-called Smart Grid has unleashed a profitable portfolio of new possibilities for an efficient management of the low-voltage distribution network supported by the introduction of information and communication technologies to exploit its digitalization. Among all such possibilities this work focuses on the detection of anomalous energy consumption traces: disregarding whether they are due to malfunctioning metering equipment or fraudulent purposes, strong efforts are invested by utilities to detect such outlying events and address them to optimize the power distribution and avoid significant income costs. In this context this manuscript introduce a novel algorithmic approach for the identification of consumption outliers in Smart Grids that relies on concepts from probabilistic data mining and time series analysis. A key ingredient of the proposed technique is its ability to accommodate time irregularities – shifts and warps – in the consumption habits of the user by concentrating on the shape of the consumption rather than on its temporal properties. Simulation results over real data from a Spanish utility are presented and discussed, from where it is concluded that the proposed approach excels at detecting different outlier cases emulated on the aforementioned consumption traces.

*Keywords:* Smart Grids; Smart Meter Data; Non-Technical Losses; Outlier Detection.

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