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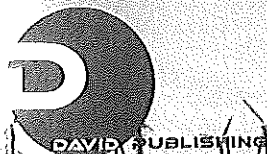
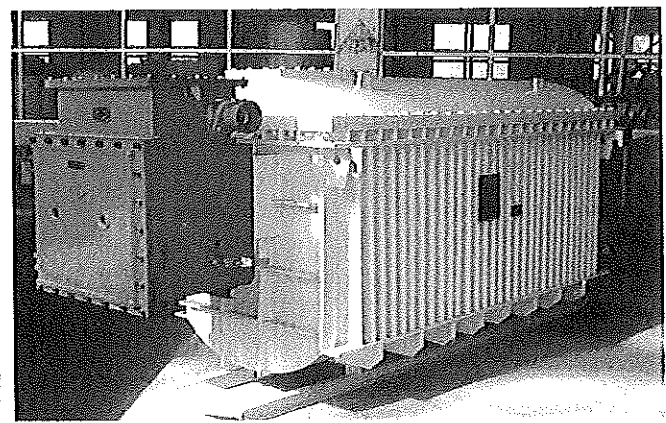
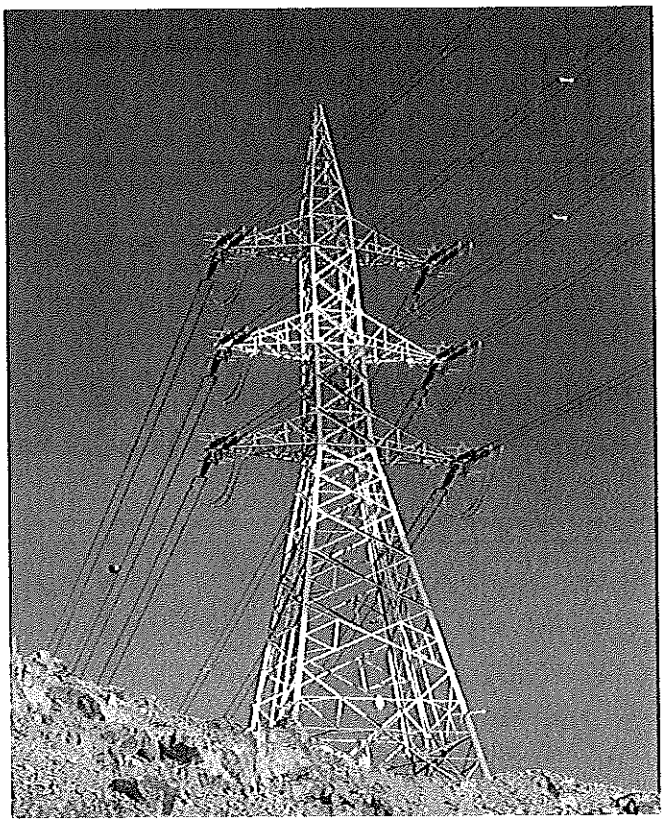
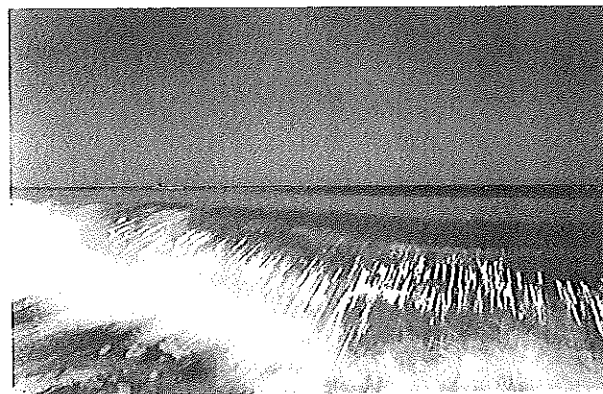
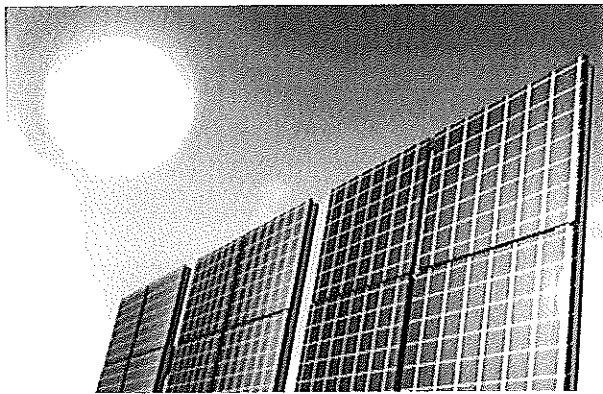
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Methodology for Obtaining Electricity-Price Patterns in Customer Response Programs

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Abstract: The main objective of electricity regulators when establishing electricity markets is to decrease the cost of electricity through competition. However, this scenario cannot be achieved without a full participation of the electricity demand by reacting against electricity prices. The aim of this research is to develop tools for helping customers and aggregators to join price and demand response programs, while helping them to hedge against the risk of short-term price volatility. In this way, the capacity of and hybrid methodology (Self-Organizing Maps and Statistical Ward's Linkage) to classify high electricity market prices is analysed. Besides, with the help of Non-Parametric Estimation, some price-patterns were found in the abovementioned clusters. The contained knowledge within these patterns supplies customer market-based information on which to base its energy use decisions. The interest for this participation of customers in markets is growing in developed countries to obtain a higher elasticity in demand. Results show the capability of this approach to improve data management and select coherent policies to accomplish cleared demand offers amongst different price scenarios in a more flexible way.

Key words: Clustering, customer demand response, customer price response, demand elasticity, electricity markets.

1. Introduction

The participation of customers in electricity markets is a basic concern for achieving a better market operation. The market will not be complete until demand and supply sides could compete on an equal footing and have "similar" possibilities and products to participate both in energy and ancillary markets [1].

U.S. Department of Energy reported in 2006 [2] that "the most important benefit of demand response is improved resource-efficiency of electricity generation and transmission due to closer alignment between customer electricity prices and the value they place on electricity". This increased efficiency should create a

variety of benefits, for example, participant benefits (the bill savings and costs earned by customers that adjust their electricity demand in response to time-varying prices), market-wide financial benefits (demand response helps to drive production costs, to reduce peak spikes and mitigate the ability to exercise market power by raising supply power prices) and reliability benefits (demand response lowers the likelihood and consequences of outages, both for customers and utilities).

Obviously, small and medium sized customers face serious barriers to participate in electricity markets. For example, one of these barriers is the price. Without price information, customers do not have any reason to make investments or changes in energy patterns [3] (they do not have well-developed price response capabilities). Other barriers are: the minimum size of

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