



Technical and economical tools to assess customer demand response in the commercial sector

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ABSTRACT

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The authors present a methodology to evaluate and quantify the economic parameters (costs and benefits) attached to customer electricity consumption by analyzing the service provided by the different “pieces” of absorbed electricity. The first step of this methodology is to perform a process oriented market segmentation to identify segments according to their flexibility potential. After that, a procedure based on comprehensive simulations to identify and quantify the actual demand that can be managed in the short term is presented and, finally, the required economic analysis is performed. The methodology, which is demonstrated with some applications to the commercial sector, not only helps the customers to integrate in flexible distribution systems but also offers the necessary economical parameters for them to integrate in electricity markets.

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1. Introduction

The use of the flexibility in energy consumption by the customers is basic for the effective integration of other distributed energy resources. To achieve this demand response capability, the customers must identify what they are using the energy for and assign prices to both the benefits they obtain by consuming electricity and the costs they may incur by giving up some of the electricity consumption in the short term. Significant research has been recently implemented worldwide to identify the demand response resources in the electricity market.

Competition has acquired a major role in electricity industry due to power markets restructuring. A desired market performance requires the demand to be flexible [1] in the sense that the electricity consumption changes according to electricity prices. Active Demand-Side participation can decrease supply side agents’ market power and help these markets to achieve a better operation [2,3]. In order to maintain market efficiency, demand response should be considered as a service that consumers give to the grid, and consequently, it should be financed through market mechanisms and not through subsidies. In this sense, electricity customers should be prepared to take advantage of its flexibility for the energy and power trading either in open markets (wholesale, retail, balancing, etc.) or by forcing the energy supplier to trade tailored bilateral contracts that account for this flexibility. They may also use their

flexibility to participate in either regulated or deregulated demand response programs as those being developed around the world [4,5] and where the consumers do not participate directly in the market but interact with an aggregator or other agents.

Up to now, demand participation in electricity markets has not occurred spontaneously and new tools are required for encourage it. This paper proposes a methodology to ease the identification and assessment of demand response resources with market participation purposes.

Large electricity customers and energy traders may participate by buying energy through demand bids in forward markets (day ahead and/or intra-day). After this energy transaction is somehow firm, they may participate in shorter term markets just as generators do, selling some of the energy previously bought by offering reductions in balancing or other ancillary services markets. It is important to reinforce that, for selling energy reductions it is required that the energy has been previously bought in other markets. If not, the customers would be selling energy that they do not own [6]. For practical reasons small and residential consumers are usually not allowed to participate directly in markets, but could participate by managed aggregators in a similar way.

It is necessary that customers willing to exploit their flexibility in the energy consumption have to identify their demand response potential by organizing their demand according to the flexibility of their loads and identify the prices they are willing to pay for consuming electricity or to be paid for reducing those loads. Therefore, the evaluation of the customer demand response potential requires the evaluation of two components: technical and economical potential.

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