

Willingness to participate in demand-response programmes among residential consumers: a case of Slovenia

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Overview

Demand-response (DR) is seen as the most suitable tool to balance demand with an intermittent distributed renewable resources and to improve energy efficiency (Hesser & Succar, 2012). Thus system operators are starting to upgrade the present grid with information-communication technology (ICT) that will enable two-way communication between all participants, namely producers, suppliers and consumers. On consumers side this includes installing smart meters and eventually smart appliances that will be able to respond to electricity supplier's signals. The European Commission set the claim for the member countries to equip at least 80% of consumers with smart meters ("Directive 2009/72/EC," 2009).

Besides hardware upgrades demand-response includes implementation of several price-based (dynamic pricing) and incentive-based DR programs (Faria & Vale, 2011). Dynamic pricing introduces a number of new concepts and price signals in the selling of electricity. With these plans, when customers use energy, not only the quantity consumed but also the time of use influences the amount of the energy portion of the bill (Harper-Slaboszewicz, McGregor, & Sunderhauf, 2012). According to Hamilton et al. (2012) the largest driving factor for the future of DR is the development of dynamic pricing and coupling of dynamic pricing with technology as technology greatly improves customer responsiveness.

Utilities and policy makers have been discussing the ideas and opportunities that the smart grid brings to electricity distributors, suppliers and customers for quite some time. But in order to successfully implement new technologies and demand-response programmes, besides system operators, customers as well need to perceive their benefits and be comfortable with them. There may be different factors motivating users to participate in dynamic pricing and demand-response programs such as money savings, financial incentives, protecting environment (Lakota Jeriček et al., 2010; Mert, Suschek-Berger, & Tritthart, 2008), or value-added services accompanied with demand-response programs that increase comfort levels and enhance convenience (Chamberlin & Herman, 1996). However, until recently customers were not a part of this conversation (Hamilton, et al., 2012).

Comprehensive literature review reveals that consumers' response to dynamic pricing schemes has been explored by several papers from theoretical perspective (Hung-po, 2010), through simulation model of demand-response programs in combination with dynamic pricing schemes for residential consumers (Gottwalt, Ketter, Block, Collins, & Weinhardt, 2011) or through several pilot projects (Formby, 2005a, 2005b; Kiesling; *PowerCentsDC™ Program Final Report*, 2010). Another set of researches has been focusing on household preferences for electricity service attributes and willingness to pay for different pricing schemes (Goett, Hudson, & Train, 2000). Pilot projects mostly focus only on small group of consumers that are willing to take part in a project and often in return for monetary compensation. Successfulness of the project thus cannot be easily applicable to the wider population. Though many studies have been focusing on one part of DR concept, none has covered it as a whole. Having in mind that demand-response concept involves much more than just dynamic pricing schemes but also incentive-based DR programs, smart appliances that are able to respond to price signals and may be complemented with other services that attract consumers, a question about overall acceptance of DR among residential consumers has remained so far unanswered.

The objective of this paper is to analyse preferences of Slovenian residential consumers for participating in various DR programmes with innovative pricing schemes and to establish the willingness to pay for electricity services under various demand-response programmes. In addition, the paper aims to establish the scope for offering supplementary services relevant to dynamic demand to consumers along with electricity supply.

Methods

To obtain the data, a survey on factors influencing the choice of service packages consisting of different DR programs, pricing schemes and supplementary services was carried out among residential consumers in Slovenia. We obtained the representative sample with respect to the age, gender and education consisting of 1000 households in Slovenia via internet questionnaire. The questionnaire was carried out in March 2013. Stated choice experiment is used to explore residential customers' preferences for electricity services under various demand-response programmes. In the choice experiment each respondent faced five choice sets, where in each choice set he or she was asked to choose between four alternatives. The first alternative always included the current choice of electricity bundle (i.e., *status quo* option). Each bundle or set of service attributes consists of six attributes with different attribute levels relating to different demand-response programs, pricing schemes and combined with supplementary services. The conditional logit model is employed to estimate willingness to pay for different service attributes (Greene, 2003). The hypothesis tested is that the WTP is related to electricity bill, technological progressiveness, satisfaction with the current services and socio-economic characteristics of households such as education, age and household size.

Results

Residential consumers will decide to participate in DR programs if they are able to lower their electricity bill or if the program is combined with some supplementary services that increase convenience. We found that households have positive attitude towards some proposed demand response programs, though majority prefers present simple time-of-use tariff system. The results provide a valuable insight into consumers' preferences in Slovenia as one of fairly developed ex-transition EU member states.

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