Bidirectional Energy Management Interfaces in Households: A Study on Perception, Evaluation and Impacts on Behavior.

J. Steinhorst[1], J. Brensing[2], & P. Schweizer-Ries[1]

[1] *Saarland University, Saarbrücken, Germany*
[2] *University of Luxembourg, Luxembourg City, Luxembourg*

Introduction

Demand-side management is an important element in optimizing the integration of electricity from renewable energy sources into the national grids. The bidirectional energy management interface (BEMI) is a technical device, developed to communicate with the grid and to automatically switch appliances on whenever demand is low and supply is high (Bendel, Nestle, & Ringelstein, 2008). However, such demand response systems are being tested in German households for the first time (Paar et al., 2009).

Existing studies exploring their user acceptance and the willingness of load shifting on the German market (Paar et al., 2009; Mert, Suschek-Berger, & Tritthart, 2008; Brensing, Schulte, & Schweizer-Ries, in preparation) have referred only to the hypothetical usage of demand response systems. Therefore, participants had little understanding of how the grid and demand response systems work (Mert et al., 2008).

Aim of the study

In the present study1, 46 households in a rural German region will be investigated while participating in a one year field test of the BEMI, starting in September 2011. During that time they will be offered flexible energy tariffs in order to stimulate load shifting. Psychological investigations will be based on the Technology Acceptance Model (TAM) from Venkatesh and Davis (2000), which states that individual´s behavioural intention to use a system is determined by perceived usefulness and ease of use. The perception and evaluation of the BEMI as well as impact factors on energy consumption behavior will be explored.

Methods

Each household member responsible for energy matters will fill out a semi-standardized questionnaire before and at the end of the BEMI field test.

Expected results and discussion

Unlike previous studies, the presented results of the first investigation will refer to an actually expected usage of the BEMI. Findings will be compared to a preliminary 424 household survey, in which participants answered questions on demand side managment only hypothetically (Brensing et al., in preparation). Furthermore the relation between energy demand, monitored one year before the BEMI implementation, and willingness of load shifting will be explored.

References

Bendel, C., Nestle D., & Ringelstein, J. (2008). *Bidirektionales Energiemanagement im Niederspannungsnetz: Strategie, Umsetzung und Anwendungen*. Elektrotechnik und Informationstechnik, Vol. 125 (12).

Brensing, J., Schulte, E., & Schweizer-Ries, P. (in preparation). *Washing when the wind blows – A Survey on Load Management in Households*.

Mert, W., Suschek-Berger, J., & Tritthart, W. (2008). *Consumer acceptance of smart appliances. D 5.5 of WP 5 report from Smart-A project*. Graz: Inter-university Research Centre for Technology, Work and Culture.

Paar, A. et al. (2009). *Studie Anreizsysteme (AS 1.03)*. Mannheim: Modellstadt Mannheim.

Venkatesh, V., & Davis, F. D. (2000). *Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies*. Management Science, Vol. 46 (2).

[1] Accompanying the project regenerative model region Harz (RegModHarz) and funded by the German federal ministry for environment, nature conservation and nuclear safety, FKZ: 0325090P