

## “Are People as smart as their smart meters are?”

### – Iranian experience of statistics feedback to households

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#### ABSTRACT

*The main goal of this paper is to investigate the influence of improved energy feedback (Internet-based energy statistics services) on electricity savings and the potential of changing electricity use patterns in Iranian peoples. The three case studies are conducted in collaboration with respective grid companies.*

*The analysis integrated both quantitative and qualitative methods in order to investigate different aspects of customers' electricity consumption, energy behaviour, values and attitudes.*

#### Introduction

The smart grid vision [1] heavily depends on the increased energy data acquisition granularity for understanding better how energy is produced, consumed and where fine-grained and timely adjustments can be done. Hence, monitoring and control will increasingly play a key role for the future smart grid infrastructure and the applications that will depend on it [2]. It is also expected that the future energy monitoring and management systems will be in close cooperation with enterprise systems and heavily depend on IT technologies [3]. Monitoring and timely management becomes even more important as dynamic entities such as the prosumers i.e. users that can fit into the roles of both producer and consumer, are interacting with other traditional stakeholders.

Districts and neighbourhoods will also increasingly play a key role in the smart cities, as they are expected to be able to autonomously manage their energy resources e.g. a public lighting system, a shopping mall, a PV or wind farm etc. By offering a way to enable business oriented interaction among the stakeholders, one may achieve better energy management as well as enhance the procurement of energy from external providers. To achieve this, appropriate energy services must be in place, that will integrate information coming from highly distributed smart metering points in near real-time, process it, and provide an insight upon which appropriate decisions can be taken.

A platform providing several Internet-accessible services has been designed and implemented which, in turn, can be used to create mash-up

applications that deliver customized functionality and additionally let the stakeholders interact in a market-based way [4]. Information coming from highly distributed smart metering points has been integrated, and made available in near real-time via various services. Decision making applications rely on them to provide sophisticated functionalities both on the consumer as well as the energy provider side.

A smart meter is a new kind of electricity meter that can digitally send meter readings to the energy supplier. This can ensure more accurate energy bills. Smart meters also come with monitors, so consumer can better understand energy usage. Every home in the Iran will have a smart meter installed by 2020.

A smart meter works by communicating directly with energy supplier, so the company will always have an accurate meter reading and there's no need for consumer to take a meter reading himself.

Smart meters can work in a variety of different ways, including using wireless mobile phone type technology to send data.

There are two main benefits to smart meters:

- More accurate bills - smart meters mean the end of estimated bills, and the end of overpaying (or underpaying) for energy
- No one has to come to consumer's home to read the meter; he does not have to submit meter readings himself
- Better oversight and management of energy use with a real-time data display in home

#### Methodology

As all the Khorasan grid companies have installed new electric meters for remote reading of electricity consumption (Automatic Meter Reading), the measurements for sufficiently long periods “before” and “after” a specific implemented measure are available. This has allowed us to examine the way in which electricity customers' behaviour might change when introducing a certain kind of energy feedback.

The three cases included in this study were conducted in collaboration with grid companies:

- Case 1 – Neyshabur electricity distribution management with an Internet-based statistics service,
- Case 2 – Sabzevar electricity distribution

management with its Internet-based service,

- Case 3 – Torbat electricity distribution management, with Internet-service.

The companies supplied customer lists, data from their measurement and billing system and facts about login and usage frequency of the Internet services. The customers who used these companies' statistics (in all cases, Internet-based) were the experimental groups (called Users) and were compared with customers who have not used the service (control group, called Non-users). The customers were not informed about their participation in the study during the periods of ongoing energy use measurements, so the level of energy savings might be affected by the observation itself, was avoided.

### Conclusions

The results of this study can be summarized in the following conclusions:

- The users of the statistics service have shown either reduced or increased electricity use in the households.
- The explanation why the households using the statistics service often have had increasing electricity usage could be that their rising power consumption caused a need to have better control over electricity needs and energy bills, and households started to use the statistics services for this reason.
- The results did not confirm that users of statistics services have had significantly better energy use and conservation behaviour than non-users.
- Households that have received the highest grades in the energy use profile belonged often to the user groups "elderly (65 +)" and "home owners".
- Several customers would like to have more information and energy advice, as part of the statistics service, as a tool for achieving better energy efficiency.
- Lack of time, problems with the service and lack of contact with the company were the main reasons why the customers did not use the statistics service.
- It requires a lot of interest and commitment among households if the target is to lower electricity consumption. The statistics service can give residents a good basis for decisions on energy conservation and energy efficiency and provide good information to improve knowledge, attitudes and behaviour.

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