Case Study S3C

HiT – Buildings as interactive smart grid participants

S3C related keywords:

- Persuasive technology
- Smart Buildings
- Home Automation

SMART CONSUMER
SMART CUSTOMER
SMART CITIZEN

"Interaction of end users, buildings and the grid"

Project Summary

HiT is a Smart Grid housing project located in the City of Salzburg. The abbreviation HiT stands for "**H**äuser als **i**nteraktive **T**eilnehmer im Smart Grid" ("Buildings as interactive smart grid participants") and refers to the smart integration of houses into the energy grid.

It seeks to deploy and investigate a broad range of Smart Grid technologies within a housing complex. The project is trying to find the optimal interaction between a smart home in a smart complex and its inhabitants. The main research aspects of the project are user-interaction and energy feedback (persuasive technologies), the integration of home automation technologies, the use of dynamic fake tariffs and the combination of different Smart Grid appliances. Additionally to these aspects, the project integrates social aspects with a cross generational living concept and a sustainable mobility concept with e-car sharing.

HiT is the flagship project of the "SmartGrids Modellregion Salzburg" and consist of two projects: the "HiT - planning and construction"-project and the "HiT - accompanying research". While the first one builds the housing complex, the later investigates:

- the potentials of smart housing for Smart Grids
- the optimization and development of interaction and building technologies,
- the influence of persuasive strategies on behaviour,
- the barriers for behavioural changes,
- the acceptance and usage of new technologies,
- and the optimization of housing technologies and interaction technologies.

The result of the accompanying research will be a guideline for the implementation of Smart Grid capable housing estates.

What sets this project apart from other Smart Grid projects?

The project differs from other Smart Grid projects, because it does not only pick up one aspect of Smart Grids, but builds a whole new housing area from scratch equipped with

Smart Grid technology. HiT is a whole Smart Housing system with energy production. The aim of the project is the evaluation and optimization of this housing complex regarding the building technology, the energy consumers and the energy grid within a one year trial.

The newly built housing complex in Salzburg, with about 130 flats, produces its own heat and electricity with photovoltaic panels, a block heat and power plant (fired with biogas) and a heat pump. The building is equipped with a 90m³ heat storage buffer and a charging station for the electric vehicles. For an active integration of the housing complex into the load management of the grid, the whole system is connected to the district heating system and the electricity grid. Furthermore, it is equipped with an energy management unit which coordinates the consumption and production of energy and enables the integration of renewable energy. The heat pump and the e-car charging stations are automated demand response enabled.

Interaction technologies like the Energy Cockpit (feedback and consumption statistics) and a monthly newsletter (email or mail) with feedback and consumption data were offered to the residents. These technologies were used to enable a permanent feedback and interaction with the residents of the housing complex. Feedback is given on the electricity, water and heat consumption.

35 so called “monitoring flats” are highly energy efficient and offer different technical home automation solutions to gain energy efficiency and demand response. They are equipped with an Eco-Button (that allows to switch off many standby devices by pressing just one button), sensors for the room temperature, humidity and CO_2 concentration. An ambient temperature controller enables a central control for the heating of the separate rooms. These features can be controlled remotely via a web-login or with a tablet app. Furthermore the flats are equipped with a Wattson. This is a commercially marketed in-house display that gives the customer a real time feedback (Watt and Euro) of their electricity consumption and enables identifying the electricity consumption of individual devices.

A Smart Center App for tablet PC, which integrates many of the described functionalities into one app was handed out to the participating households in the monitoring flats. The app on the tablet combines different functionalities. It shows the forecast for the upcoming energy prices[1], statistical and graphical feedback about the previous energy consumption. Furthermore the application offers access to the home automation features, to the Energy Cockpit and to the car sharing booking system. With the home automation features the residents can define the desired values for the room ambient temperature of the living room and the bed room. Furthermore the humidity and CO_2 concentration of the rooms can be requested. The tablet PC will also be used as an in-house display (“ambient screen”). With a display holder it can be fixed to a table. This should result in a permanent confrontation of the inhabitants with the topics energy and energy savings.

[1] It is a fake tariff with three different pricings, which are displayed in different colours (red, yellow, green).

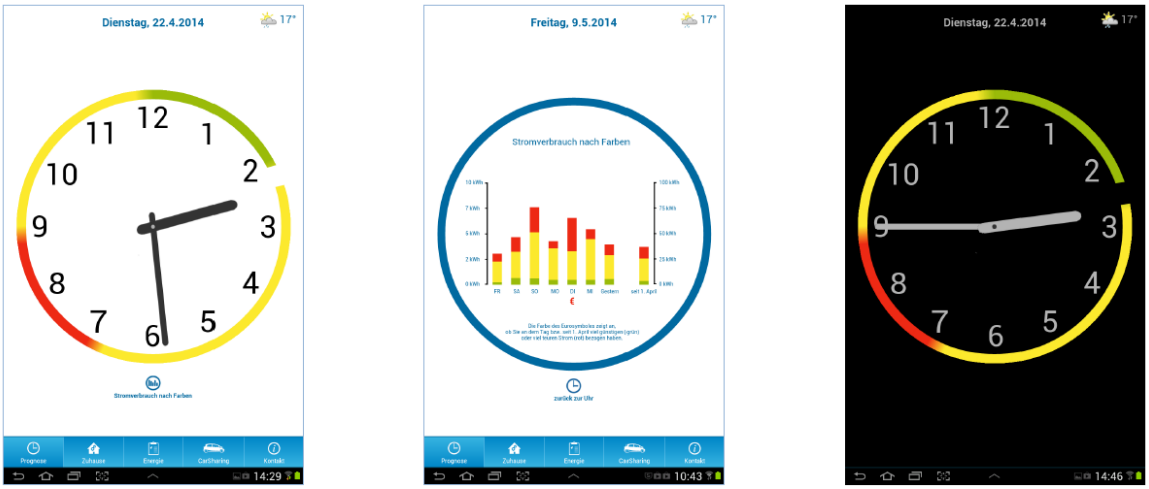

Figure 1: multi-functional tablet app to promote shifting energy consumption for balancing loads in smart grids. Provides energy load prognosis, energy shift and consumption feedback, home automation, weather info and is also a sleek clock in the living room. Image courtesy of Salzburg AG.

But instead of just giving all the technologies to the customer, there is a combination with many social techniques. In the beginning of the project not only informational material was handed out to the participants, but there were also energy consultants who came to every household and explained the functionalities of the installed devices. For the social interaction of the inhabitants the local Christian social welfare organization is organizing meet-ups and round tables for the new neighbourhood.

What happened?

The project is integrated into the regional project “Modellregion Salzburg” which aims to develop and test future energy systems with many Smart Grid components. Hence, the results of former research and technology projects like Consumer2Grid and Persuasive end-user energy management are integrated into the framework of the project. These findings were used to improve the interaction and feedback technologies. HiT, as the flagship project of the “Smart Grid Modellregion Salzburg” started in January 2011 and the housing complex, built by different partners[2], was finished in autumn 2013. The first residents moved in autumn 2013.The field study – executed by a consortium of different partners[3] – started in April 2014 and will be finished in May 2015.

Within a one year field test and the optimization of the housing complex, there will be a one year lasting evaluation of the relation to the energy grids, the housing technology and the residents. The result of this evaluation will be a guideline for further projects in that technology area. The project can hence be seen as a living lab for future Smart Grid projects.

For the evaluation of the project, different kinds of data sources will be used. On the one hand quantitative data – like consumption statistics, etc. – will be used to analyse the impact

[2] Salzburg Gemeinnützige Wohn- und Siedlungsgenossenschaft; Salzburger Siedlungswerk / Salzburg Wohnbau; Lebenswelt Wohnen GmbH (Myslik und Diakoniewerk); Baumeister Steiner – Ing. W. Steiner Baugesellschaft mbH

[3] Salzburg AG für Energie, Verkehr und Telekommunikation; Salzburg Wohnbau; Siemens AG Austria; AIT – Austrian Institute for Technology; CURE - Center for Usability, Research Engineering

on the user behaviour. Quantitative methods like standardized surveys are used to gain insights into topics like the subjective behaviour, attitudes and values of the participants. And, of course, socio-demographic characteristics and the data-usage of the Energy Cockpit are collected and analysed. For the qualitative analysis of the project, semi structured interviews, focus groups and energy diaries are used to learn about the end user. These data are compared for different groups: The participants living in the monitoring flats, equipped with all described technologies, will be compared with those participants who only have access to the Energy Cockpit web interface.

Further information / Contact

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