TESTING APPLICATIONS FOR HOME ENERGY MANAGEMENT IN THE FIELD

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INTRODUCTION

Expansion of household energy systems in Europe (2015-2020):

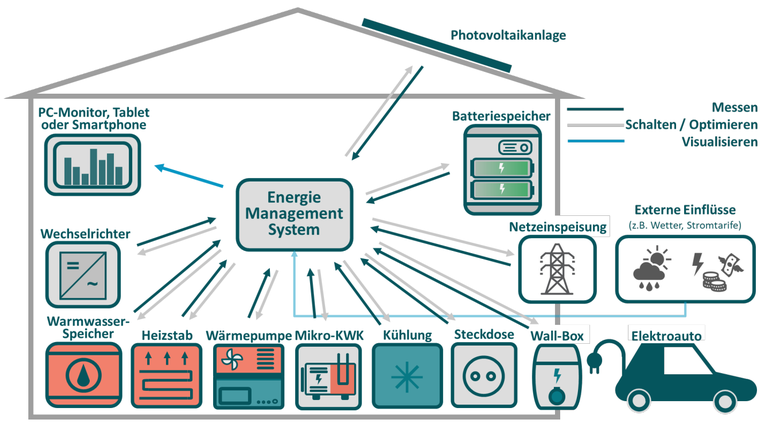
- Heat pumps +81 % [1]
- Photovoltaic systems +313 % [2]
- Electric vehicles +1,170 % [3]

The home will become the most important link between **heat**, **electricity** and **mobility**

HEMS FUNCTIONS

Home Energy Management Systems (**HEMS**) are beneficial technologies that help the user to:

- **View**
- **Manage** or **control**
- **Automate** and **optimize**



OBJECTIVES AND FOCUSED KEY TOPICS

Current Research

- Studies show effective savings of between 5% and 14% through the use of differently applied **feedback systems** on energy consumption [4]
- Saving potential of **smart home thermostats** is up to 16% or over 30%, but only if they are used as specified to save energy [5,6]

HEMS-Applications

Input Project

User Interfaces
(Energy visualization & Feedbacks)

Points to consider
- Thermal and electric consumption
- Smart Metering aspects
- Direct & indirect feedback types

Home Applications
(Smart Thermostats)

Points to consider
- Based on findings from a smart home field-test and other scientific publications
- Possible energy savings

Home Assets
(Integration of large consumer devices)

Points to consider
- Compatibility challenges
- Automation options
- Networking potentials
- Bidirectional charge/discharge

Research Questions

- *"What **self-sufficiency** [%] can a modern house achieve with the help of an energy management system?"*
- *„What is the contribution of **smart home thermostats** in residential units and how can they be used efficiently through specific **energy feedback**?"*

FIELD-TEST CONCEPT

Collected data

- **Building information** (area, energy source etc.)
- **Smart home data** (temperature, presence, settings etc.)
- **User data** (user log book, heating and ventilation behavior)
- **Energy consumption data** (comparison with reference values for feedback)

Evaluation of ~20 residential units

Smart functions

- **Adapted room temperatures** (reduced)
- **Heating according to demand** (during absence)
- **Remote control and visualisation** (notification in case of errors)
- **Automations** (geofencing and schedules)

OUTLOOK

Goals of the field-test

- Usable statements about the benefit of smart thermostats
- Conclusions for the design of customized HEMS interfaces
- Create of load profiles for digital households

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