

CELSIUS Talk: IT solutions for demand side management

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SmartHome Systems – For increasing energy efficiency of heating in residential buildings



Thorsten Schneiders
Dr. –Ing
Technische Hochschule, Köln



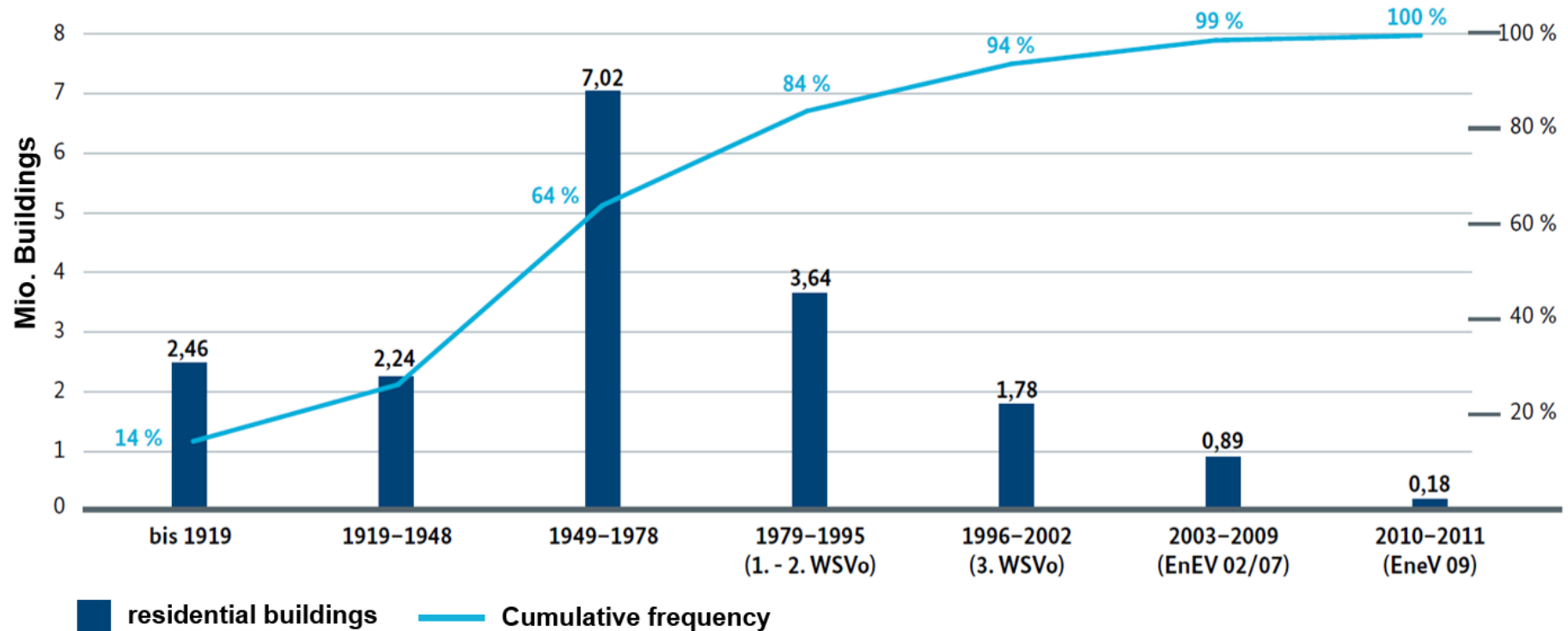
Today we would like to give you an overview of...

- Status quo residential building stock in Germany
- Components and functioning of SmartHome systems
- Objectives and structure of the research study “SmartHome Rösrath”, and its first results

Underlying research question of the project „Smart Home Rösrath“

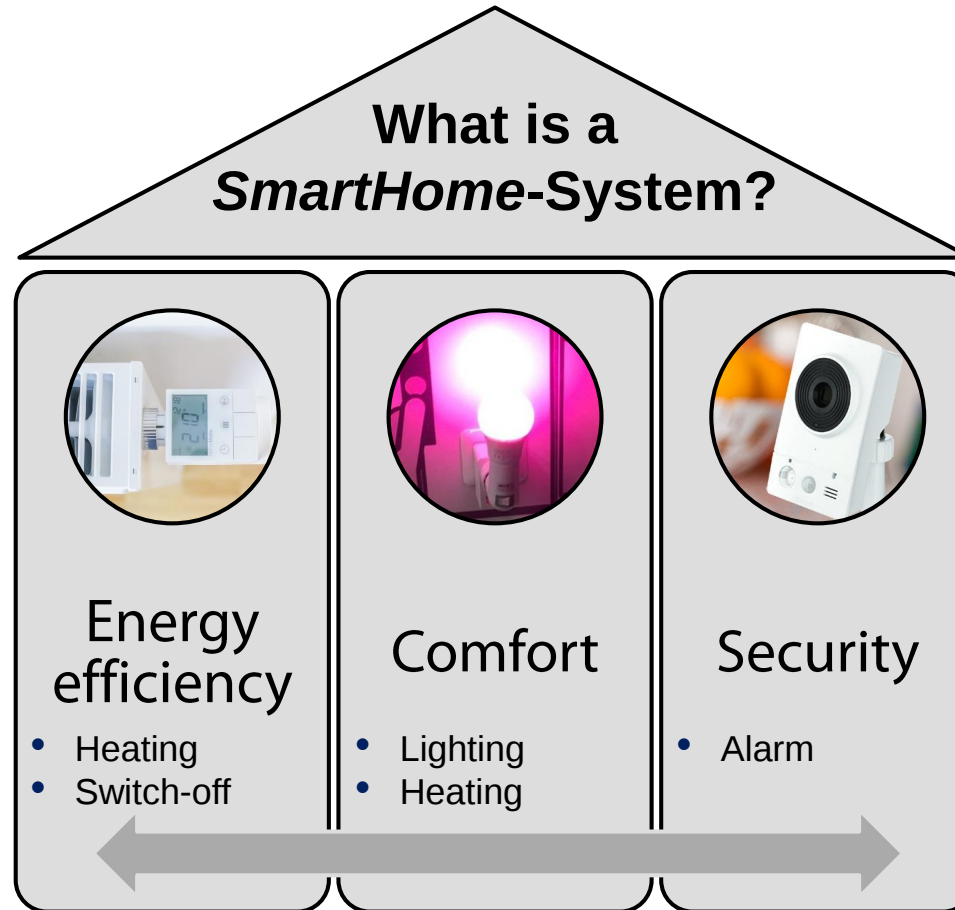
How can we increase energy efficiency of heating in residential buildings in a new and alternative way by using smart home technology?

Age of residential building stock in Germany



Source: *Wohnen und Bauen in Zahlen*; own diagram

More than two thirds of the German houses are older than 40 years with a low energy efficiency in residential buildings*



A Smart home system allows the controls of heating and electricity consuming devices and provides the main functionalities energy efficiency, comfort and security to the user

SmartHome – System used in the project



- A QIVICON-based smart home system is used in the research project, which represents a representative and typical market-available smart home solution
- A home base is connected to the internet and is controlling the smart home components via radio signals (860 Mhz)
- QIVICON can communicate with different component and suppliers via different radio signals, e.g. HomeMatic, ZigBee, Z-Wave...

SmartHome – Components

1. Smart-Plugs (dimmer, consumption measurement)
2. Smoke detector (alarm siren)
3. Window-/ Door contact
4. Heat thermostat
5. Motion detector



SmartHome – Control-Application

RheinEnergie App – User interface allows control and ...

One click to...

- activate devices
- switch on/off light(s)
- configure automations, timetables

Check out...

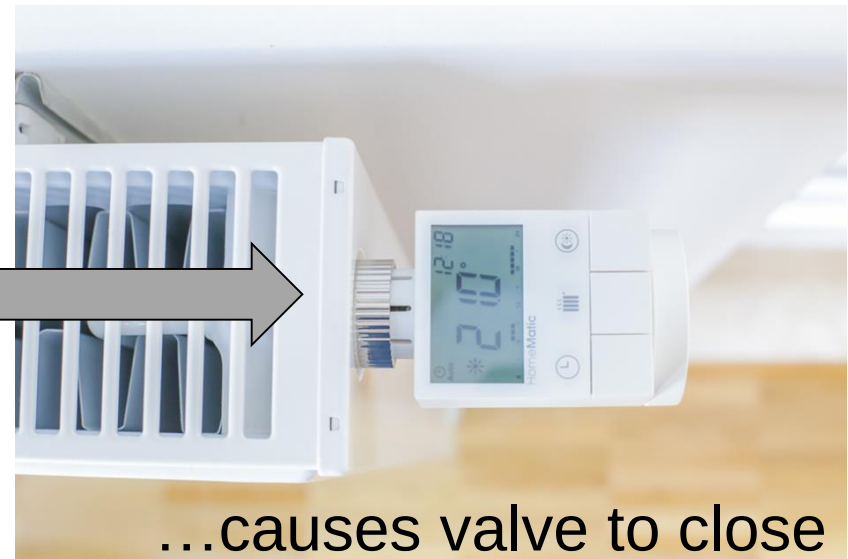
- Temperatures in rooms
- Energy consumption
- Security cameras



Using rules for automation of the heating system

Basic rule used to improve energy efficiency

- **If** the Door/Window is opened, **then** control valve of heating radiator shall lower temperature (for the duration while it is opened)
- Each degree Celsius can save 6 % of energy consumption per year



Communication within the SmartHome-system



Command: „Close valve“



Information: „Window open“



Signals are communicated via Home Base which runs the program for exercising the automation rules

Automations – Rules

Security

- **If** the Door/Window is opened during absence, **then** turn on the alarm siren of the fire detector & send an email & send a push message on your Smart-phone



Alarm-signal



E-Mail



Push-Message



Field study “SmartHome Rösrath”

Field study – “SmartHome Rösrath”



About the Project:

- Project start: September 2015
- More than 120 households equipped with SmartHome-systems
- Plug-in components for existing residential buildings, no additional cabling required

Goals of the project:

- Identify energy savings
- Investigate usability and acceptance of SmartHome for energy savings
- Participants represent German building stock
- Final report: December 2017

Partners:

- Local energy supply company – RheinEnergie AG
- Funded by the European CELSIUS project



Communication with participants

Regular communication and online surveys

- **Starting questionnaire (after installation of smart home system):**
 - Energy using habits and knowledge about energy efficiency
- **Monthly questionnaire:**
 - Energy consumption (gas & electricity) and comments (if any)
- **Quarterly questionnaire:**

More detailed interview on energy use, energy data, and user experience with smart home system
- **Final questionnaire:**

Repeating the questions of the starting questionnaire plus reflection on changes in energy using behavior, the study itself etc.

Hotline and email address

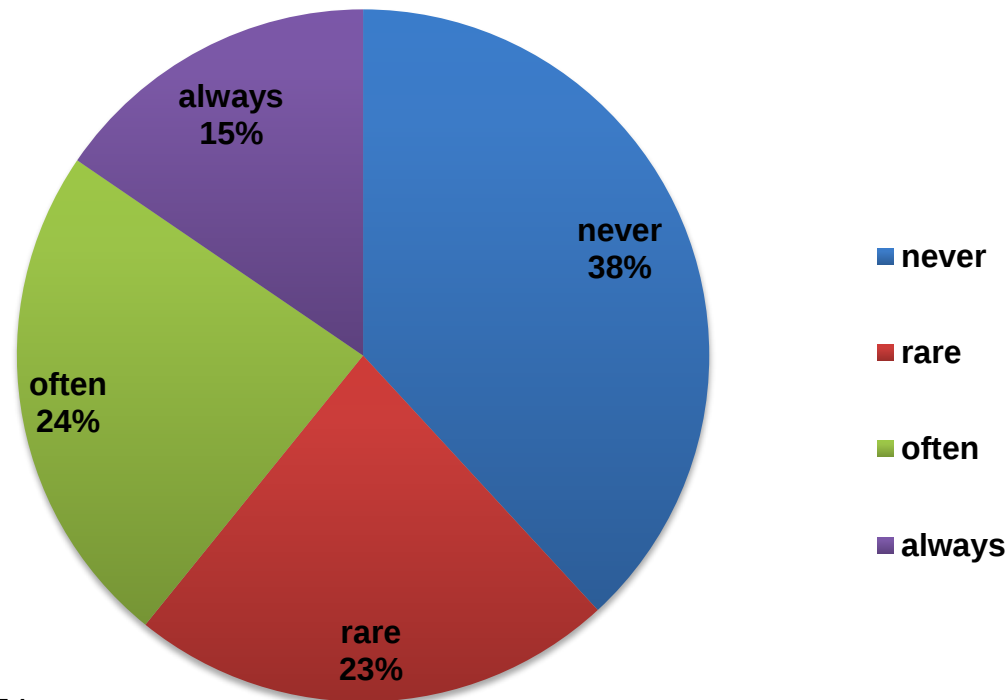
Workshops with participants

- Interactive learning with *SmartHome “Wall”*

First results – “energy habits” at the beginning of the study prior to installation

- Interrogation of user behavior regarding heating and ventilation
- Potential for energy savings

Close heating valves while open a window

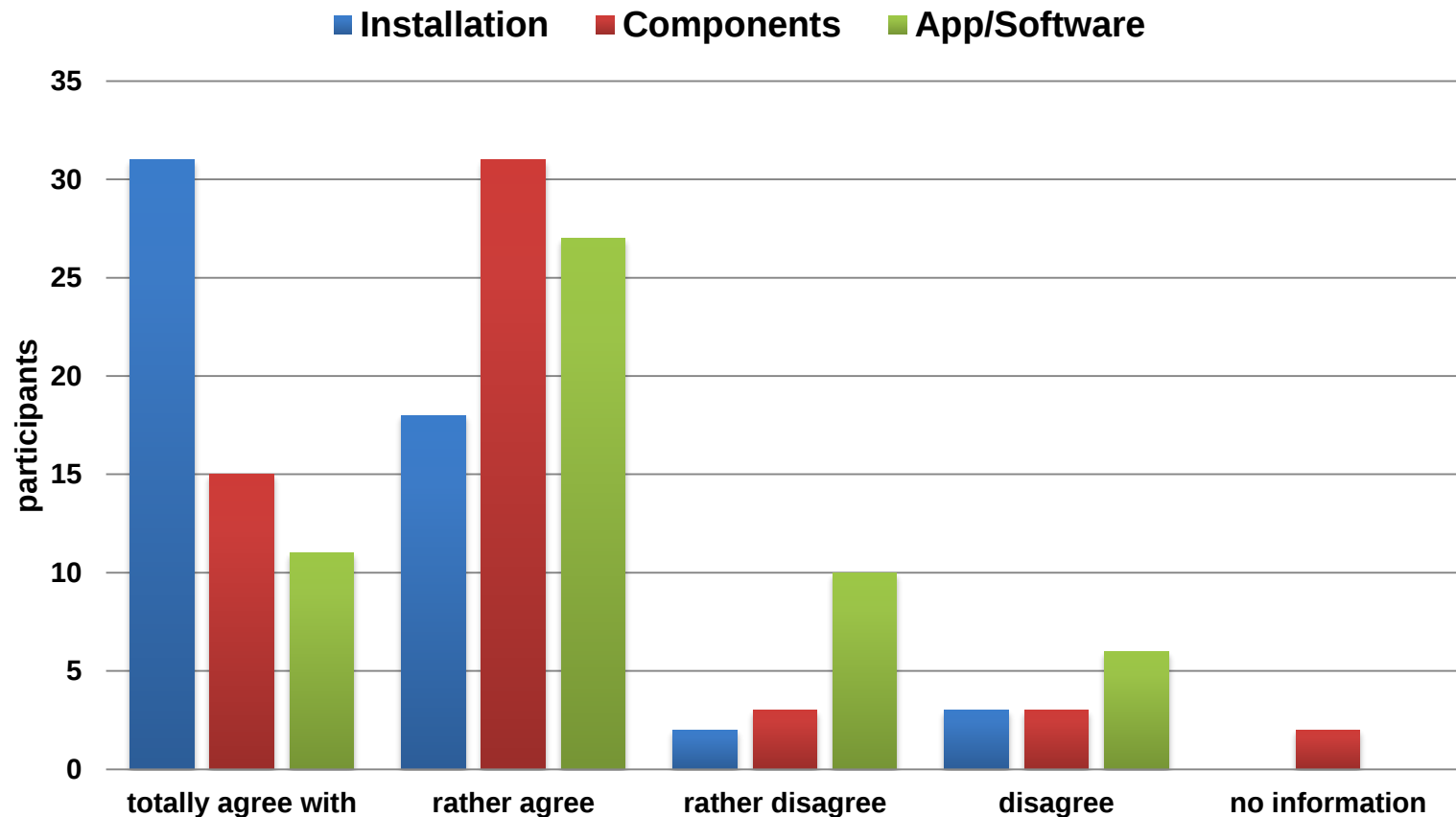


Number of participants: 54

Interrogation after installation of SmartHome system

- Participants have problems using the App and Software

“I am overall satisfied with...”

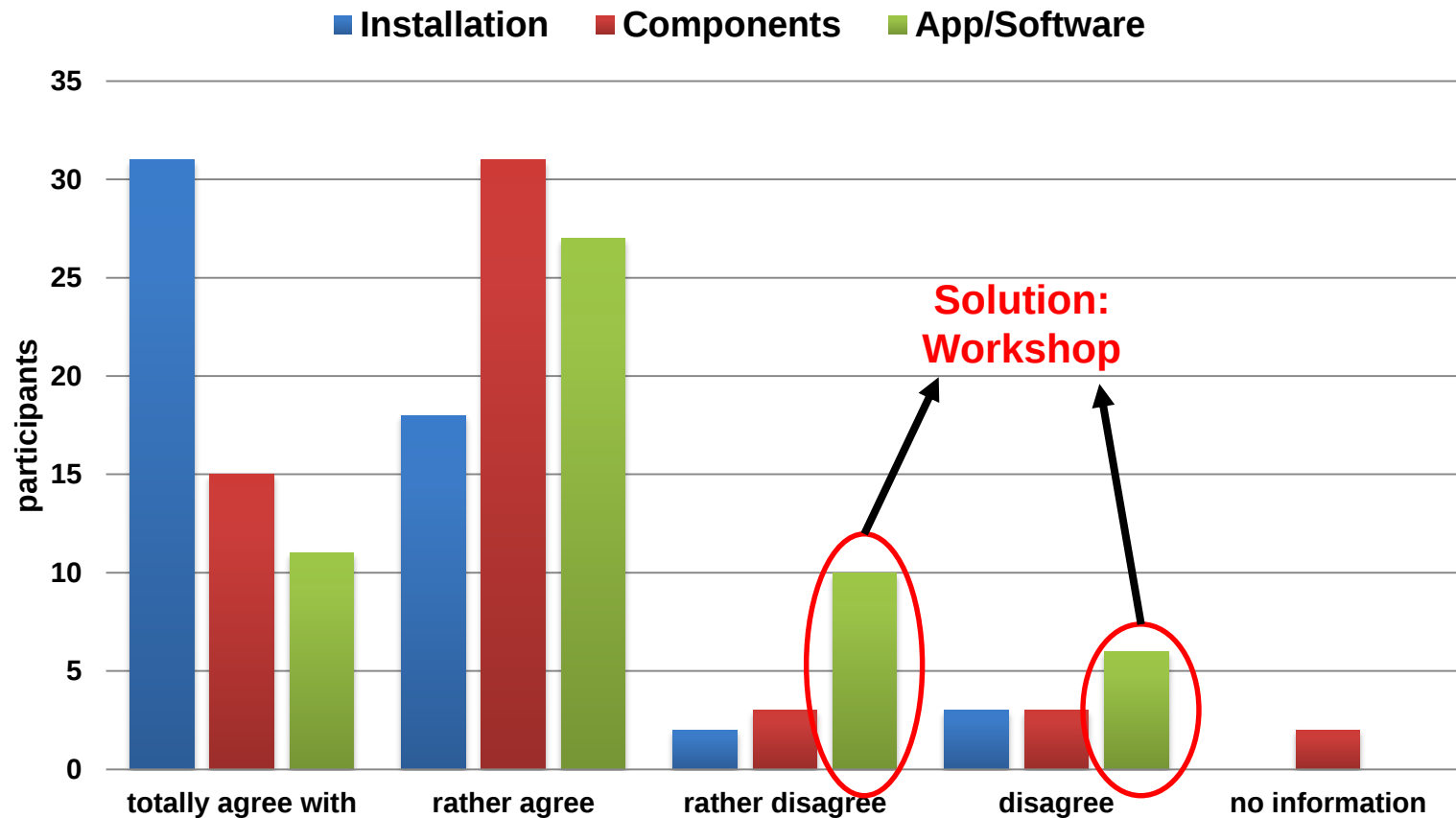


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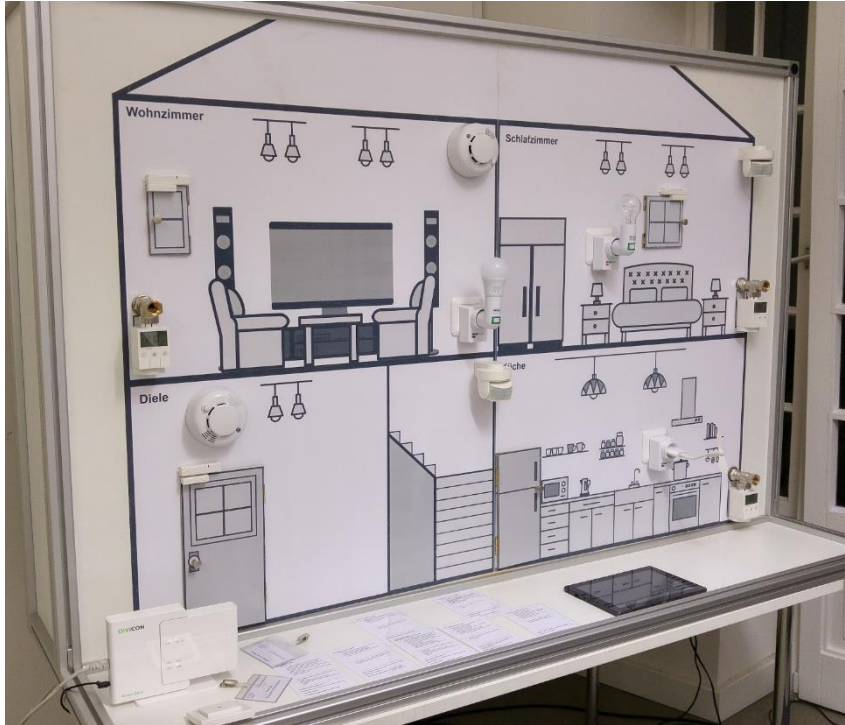
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“I am overall satisfied with...”



Number of participants: 54

Workshop with mobile SmartHome-System



Due to the requests of the participants, a workshop was carried out.. The structure, functionality and programming of a QIVICON-based SmartHome-System were demonstrated and taught using a mobile SmartHome “Wall”, that represents a model house. Skilled coaches from the project team were teaching and available for individual questions.

Conclusions

- SmartHome can be an instrument for Demand-Side-Management in the building sector, as addition or alternative to renovations which require a much higher budget than the home automation
 - By making energy use “tangible and automaticable”, smart home represents a new access to the energy user and a new motivation to save energy
- The research project “SmartHome Rösrath” is a unique field test with 120 participants investigating the use and usability of smart home systems in typical households to achieve more energy efficiency in heating (duration until end of 2017)
 - Participants are interviewed regularly to track energy consumption and the way they use the smart home system
- Due to the statistical distribution of the building stock participating, results can be transferred to similar building stock all over Europe

Any questions about our SmartHome project?

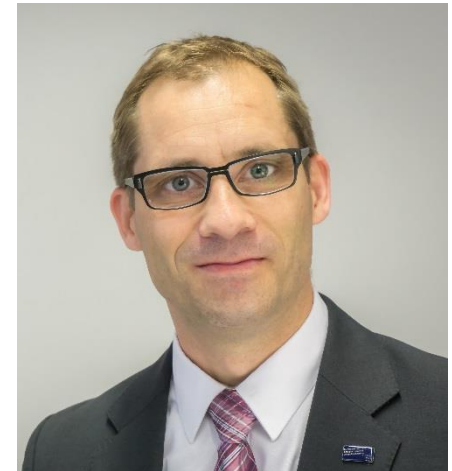
Please do not hesitate to contact us...

SmartHome Team

Prof. Dr.-Ing. Thorsten Schneiders
Director of the research project „SmartHome Rösrath“

Cologne Institute for Renewable Energy
Technische Hochschule Köln

Tel.: +49 221 8275 2335
Mobil: +49 1573 320 5572
E-Mail: thorsten.schneiders@th-koeln.de



Tobias Rehm

Research Assistant

Tel.: +49 221 8275 2417
Mobil: +49 162 7725 071
E-Mail: tobias.rehm@th-koeln.de



Project Office „SmartHome Rösrath“

E-Mail: smarthome.thkoeln@gmail.com

smarthomerösrath