

Abstract

a) Five-line summary (**synopsis**) in **English**

The flagship project “SC Demo Aspern” intends a large-scale implementation of a system optimizing approach between buildings, power grids, users and comprehensive ICT solutions. This innovative combination is integrated into testbeds in the development area aspern Vienna's Urban Lakeside consisting of three construction sites (residential building blocks, student's dormitory, kindergarden and school building). Findings from the demonstration are utilized to improve operation and control strategies of buildings and power grids as well as to innovate the interaction with users for optimal usage of energy and CO₂ reductions.

b) Summary in **English**

Problem statement and initial situation

Future cities will be supplied by renewable energy sources not only from generation within but also from volatile sources outside the city. A consequence of the growing integration of renewable energy sources leads to volatile energy price developments as well as additional investments in electricity grids. Congestion management in terms of market and grid perspective therefore becomes increasingly necessary. Correspondingly, the need for flexible generation as well as demand side management drastically increases to achieve a stable system and market operation in the future. In order to avoid extensive backup capacities, cities as significant consumers will have to provide load flexibility.

The development area aspern Vienna's Urban Lakeside offers excellent preconditions for testbeds of smart city technologies. In total a planning area of 240 hectares is going to be shaped until 2030 and 8 500 housing units for 20 000 residents and 20 000 workplaces will be created.

Planned approach of the project

The flagship project “SC Demo Aspern” intends a first-time large-scale implementation of a smart city district applying an integrative, system optimizing approach in the domains buildings, energy grids and ICT-based integration of these domains at three different construction sites with mixed use (student's dormitory - 300 rooms, residential building blocks - 216 flats, school building with an elementary school and a kindergarden). Additionally, new concepts for user involvement will be developed and innovative concepts for an active user participation in energy management within smart cities explored.

“SC Demo Aspern” is based on the project “Sondierung Aspern”, in which the technical concepts were developed. While the previous project ended with a description of the concepts for smart city interactions, this project takes these results and specifies them in detail in order to realize them.

Goals and intended results

In order to structure the complex relations of the testbeds the goals and results are organised in three solution layers. The basis of these layers is the testbed infrastructure. On top of this



technical smart city interactions between smart buildings and smart grids by means of novel ICT system are evaluated. “SC Demo Aspern” aims at a successful implementation and operation of the planned testbed infrastructure. As a final result the efficient communication of the implemented technical components should be achieved. Main R&D activities include the flexible automation of buildings considering volatile renewable energy supply, the operation of autonomous control algorithm in the LV grid, and the design of a data warehouse to ensure a flexible communication between these domains. Coupling buildings with the grid and additional storages energy and price related optimization targets should finally be fulfilled and also, in the long run, infrastructure investment costs reduced.

The smart user and its interfaces to the technical systems are subject to the third solution layer. “SC Demo Aspern” aims at the development of new approaches of user involvement beyond mere energy feedback. Different communication designs of time-variable tariffs are compared to each other in a field study with around 100 to 150 participants to collect realistic and long term feedback. Therefore the project lays the open foundation for future R&D cooperation in the envisaged domains.