SmartCoDe: Smart Control of Energy Demand for Buildings and Neighbourhoods

EU-Strep-Project SmartCoDe to Develop Local Energy Management Infrastructure with Minimal Consumer Cost

Future buildings and neighbourhoods are expected to combine a manifold of Energy using Products ("EuP") ranging from electrical lighting to heating, ventilation and air condition (HVAC) with locally available renewable energies (e. g. solar, wind) and with locally available storages (e. g. car batteries). An intelligent management of energy in such a local grid would enable customers to participate in the energy market and even contribute to the stability of the power grid. The problem is that such an energy management requires fine grained infrastructure and expensive hardware. Today, this limits applicability of energy management to large consumers in the industrial and commercial sector.

The objective of SmartCoDe is to enable the application of demand side management and smart metering in private and small commercial buildings and neighbourhoods by

» Developing new methods for automated energy management that specifically consider the requirements of Energy using Products in homes/offices and local renewable energy providers as well as information security and dependability.
» Developing an inexpensive (< 3 €) hardware/software implementation that can be integrated into arbitrary Energy using Products, providing them with the ability to communicate and to remotely control its use of power.
» Demonstrating the technical and economic feasibility and the benefits of intelligent energy management in buildings and neighbourhoods with an initial focus on electric lighting.

If successful, the project will allow all manufacturers of EuP to add energy management functionality (and maybe additional features such as remote control, etc.) for very little additional cost, and thereby address a new and huge market in homes and offices. The local energy management will enable local entities to participate in the energy market as an intelligently, managed "sub-grid" that can – if necessary – even contribute to a demand side management and thereby reduce the required "spinning reserve" (i. e. peak-power reserve provided by additional power plants).

Concept and Objectives

Until now, advanced techniques for energy management are not yet applicable in the small scale like energy-positive buildings and neighbourhoods. This is a major issue for grid-connected regenerative energies whose capacity factor (ratio average power/peak power) is typically in the range of 0.2–0.3. The existing grid is required to guarantee reliable operation of such energy-positive buildings and neighbourhoods at one hand. On the other hand, stochastic energy sold back to the grid is of little (also financial) value because its availability cannot be guaranteed or predicted. This is a serious problem for both, the participation of energy-positive buildings in future energy markets because the "predictable" energy achieves much higher prices, and for the power network operators which have to deal with rising peak demands.

The overall approach of the project SmartCoDe is to timely schedule the use of energy or switch energy using products (EuP) into standby if the customer process currently allows that. To enable the application of advanced energy management techniques in energy-positive buildings and neighbourhoods, infrastructure and methods are needed that specifically fulfill the requirements of such entities:

» Low additional cost. Most households are not willing to spend money for energy management features of their HVAC, electric lighting or white goods. According to internal market studies, an acceptable price for an embedded system that provides an additional feature is in the range of $3 to $10. This is also a price that is economically reasonable considering cost and savings. However, existing hardware for demand response management is by far more expensive.
» Small size. To allow for the integration of energy management solutions in almost all kinds of house-