A European urban transition project towards more sustainable cities through innovative solutions, in the fields of mobility, energy and digitality.

Smart City

Global Project

Coordination: CARTIF
European grant: 18M €
30 partners, 6 countries

Period: Dec. 2016 - Nov. 2021
Demonstrators:
Hamburg, Helsinki, Nantes

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Helsinki Demonstrator Site

Coordination:
The City of Helsinki
European grant: 5,6M €
7 partners

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Energy
Retrofitting

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ACTION OVERVIEW

Helsinki

Retrofitting Of The Residential Construction In Merihaka

This action was implemented by Helen Oy, Salusfin Oy, The City of Helsinki and VTT Oy. A full report (D 4.2), written in English, November 2017, is available on https://mysmartlife.eu/publications-media/public-deliverables/

▶ OBJECTIVES

› To improve the energy efficiency of condominiums and reduce greenhouse gas emissions
› To encourage apartment house companies to improve energy efficiency by demonstrating replicability and impact of renovations
› To increase knowledge and awareness of major retrofits
› To demonstrate heat demand response at apartment level
› To study the needs of housing companies in energy renovations

▶ IMPLEMENTATION

CHALLENGE / CONTEXT

According to the estimates, the energy consumption of Helsinki's current building stock must decrease by about 30% so that the City of Helsinki can become carbon neutral in the targeted year of 2035.

In Merihaka's package of actions, the installation of smart controls for the management of apartment level heat demand is the key for a retrofitting intervention. The primary target area, Merihaka, consists of 12 residential condominium buildings: 1323 flats, 115955 total sqm with 71450 living sqm. The buildings in the area are connected to the district heating. In the condominiums, many renovations have already been done and U-values (a measure of insulation performance of building elements) are relatively good compared to European averages.

The buildings of the area are from the 1970s. The condominiums from the era spanning from the 1960s to the 1980s represent a vast building stock in Helsinki, having relatively high energy consumption. Out of the 10,262 residential high-rise buildings in Helsinki (22.28M sqm), 4,427 are from the 1960-1980s (9M sqm). Thus, there is a potential to scale up the project actions.

PROGRESS

In Merihaka, a total number of 167 apartments in a condominium was equipped with Salusfin Oy system that includes smart thermostats connected to the district heating through IoT and cloud-based intelligence to load the balance of the network. This system was responsible for managing room level temperatures. The inhabitant's user interface for the service is a Mobile APP. The app was localized for the task to include thermostat control in addition to the smart home logic offering. The end-user support was organized into three tiers. The service company takes care of an inhabitant and provides the first point of contact, installation and maintenance of the equipment (Tier 1), while Salusfin has the responsibility for software support (Tier 2 & 3).

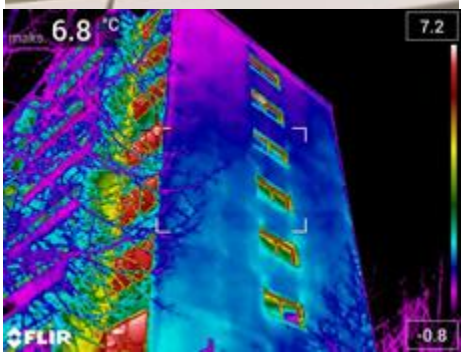
Energy savings result from the implementation of the technical solution and user behaviour. Smart thermostats measure and adjust the temperature with quicker and better precision than conventional thermostats. Thermostats contain machine learning capabilities and ventilation/window open features. Energy savings can range from 10% to 25% depending on user's activity and motivation. In the pilot building, the savings converted to CO2 emissions can be up to 80 tons of CO_2 per year.

In 4 voluntary apartments, Helen Oy also tested heat demand response (see the info sheet on Heat demand response). The heat demand response increases or decreases the smart thermostat setpoint. This means that the amount of heat per time used by the home can be shifted to low peak hours. In parallel with the technical test, the thermal comfort of the occupants was analysed through feedback questionnaires. No correlation between the heat demand response activities and the thermal comfort was detected.

In addition to the smart thermostat intervention, knowledge about energy renovation options was offered to the apartment house companies by the City of Helsinki. A multi-objective building performance optimization (MOBO) was done to find out the most impactful and cost-efficient renovation options for two apartment house companies and for the whole area. The optimization results were delivered via workshops. These activities provided insight for developing a new energy advisory service within the city (see the info sheet on Energy Renaissance strategy).

LESSONS LEARNT

Customer feedback was collected 2-5 weeks after the installation phase. Frequent feedback sessions with maintenance and onsite support were arranged for residents during the month after the installation of the system. The onsite support was helpful for the apartment owners and many elderly residents got assisted to take the thermostats into use. There is a noticeable decreasing trend in the heating energy consumption since the smart control system was commissioned in the whole apartment building.



The lesson from the heat demand response is that the method is more profitable to implement on a larger scale than at the level of individual apartments. This is an important finding for Helen Oy in the further development and use of load balancing methods.

Finally, long-term support from the city is needed for the apartment house companies to engage in energy renovation projects. The support can entail, for example, provision of knowledge about suitable renovations (for example, multi-objective building performance optimizations) and help with city planning considerations and permissions. These lessons from Merihaka have been used in the City of Helsinki's Energy Renaissance strategy, which aims to improve the energy efficiency of the private building stock (see the info sheet on Energy Renaissance strategy).

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