



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

@mysmartlife\_EU  
<https://mysmartlife.eu/>

### Helsinki demonstrator site

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

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## Energy

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Helsinki

## ACTION OVERVIEW

### Smart Office Building Demonstrations

This action was implemented by The City of Helsinki in collaboration with Fourdeg, VTT Oy, Helen Oy and Forum Virium Helsinki. A full report (D 4.2) is available on

<https://mysmartlife.eu/publications-media/public-deliverables/>

### ▶ OBJECTIVES

- › To implement and study smart energy efficiency solutions for an already efficient office building
- › To develop tools to communicate about office building's energy efficiency solutions to users and motivate them to complement individual energy efficiency measures

### ▶ IMPLEMENTATION



Environment house building in Viikki, Helsinki.

### CHALLENGE / CONTEXT

The Environment House was built in 2011 and has the best energy performance of an office building ever built in Finland. The measured total primary energy use is 85 kWh/m<sup>2</sup> year, which is below the Finnish nearly zero energy building (nZEB) requirements. A typical office building's energy efficiency rate is approximately 150kWh/m<sup>2</sup>. The low energy consumption of the building has been achieved by combining several commonly used technical solutions. These include, for example, the production uses electricity storage (installed in 2015), energy-efficient structures, bedrock-based cooling, the south façade is designed for the efficient utilisation of solar panels, the panels also provide shade to the façade preventing an excessive heat load in the summer, and natural daylight is utilised by means of light shafts.

The aim of the demonstrations is to find out how this kind of office building can be even more energy efficient by applying the latest smart solutions and participation of the users.

## PROGRESS AND KEY RESULTS

The Environment House Building demonstrations of smart energy efficiency solutions included implementing and testing several features that utilise new smart thermostats, an upgrade to the building automation system, and the development of communicative tools about building energy saving features.

### Smart thermostats, heat demand response and human thermal model

The office building was equipped with smart thermostats by Fourdeg. The heating programme of the building includes night and weekend drops and is synchronised with the ventilation. Together with the local weather forecast and the room's individual heating resistance, the programme learns the heating schedule of each room. Smart heating control decreased energy consumption by 8% during the year 2018 compared to the previous year's weather corrected value.

The smart thermostats and service by Fourdeg allow also the energy company, Helen, to perform heat demand response at room level. In heat demand response, the building is used as the thermal storage by pre-heating it before heat consumption peaks and, in this way, optimises district heating (See info sheet on Heat Demand Response).

Another experiment done with the smart thermostats was the Human Thermal Model (HTM) developed by VTT. The goal was to define the most comfortable inside conditions for the room's user since people's thermal preferences can vary several degrees due to body composition. The HTM was applied in five rooms. The HTM based control improved satisfaction up to 44%.

### Smart automation system, energy data and energy storage

As part of the comprehensive optimisation of the building's entire energy system, the Siemens system monitors and controls the local solar production, electrical storage and large loads such as the elevators and EV charging. It can call for power decrease from both Heating Ventilation and Air Conditioning (HVAC) system and electrical system. Smart lights controls have been enhanced by reprogramming the existing KNX system to support power consumption decrease on lighting.

### Renewable energy systems

In the demonstration, possible improvements to the building's renewable energy systems were studied. The building utilises geothermal energy for cooling, therefore a study was conducted on the usage of wells for heating as well. Even though the result turned out to be positive, the implementation for this didn't go forward as the city is in the process of finding new users for the building after the Environmental Unit was relocated in 2019. However, to facilitate the wider use of geothermal solutions in the city's buildings, directions for geothermal heat projects were created.

### Visualisations of energy consumption and indoor climate

Service design was employed as a method to create concepts for visualisations of the energy consumption and indoor climate data of the Viikki Environment House. The goal of the visualisations is to motivate the building users and visitors to behave in a more sustainable way as well as to showcase what progress is being made by the city buildings in saving energy. The outcome of the service design consists of three main elements. One of the main elements is a lobby screen showing simple infographics generated by the energy and indoor climate data system. Up to date tips for saving energy and cutting down emissions can also be shown on the screen. Another main element is a touch screen application with navigation including information on energy consumption, renewable production and emissions from the level of building up to the whole city region. Finally, the third element consists of physical components for public spaces or showrooms. Those can be a collection of various size boxes as pieces of furniture showing physically the relative proportions of each source in the city's yearly energy consumption.



The main elements of the energy visualisation concept.



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