

 Content archived on 2024-06-18



Simulation based control for Energy Efficiency building operation and maintenance

Results in Brief

Simulation-based control tool improves energy efficiency in buildings

A team of EU researchers developed a simulation-based control tool that increases energy efficiency during building operations and maintenance. They validated this tool in non-residential buildings at different European locations as ‘proof of concept’ under varying conditions and user behaviour.



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ENERGY



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Up to 90 % of a building’s life cycle carbon emissions and 50 % of its life cycle costs occur during its operational phase. This is mostly a result of heating, ventilation, air conditioning (HVAC) and lighting, and the use of appliances. Therefore, energy and cost saving strategies make a significant difference to a building’s carbon footprint and life cycle costs.

The EU-funded [ENERGY IN TIME](#)  project went beyond existing building control techniques to develop a smart energy simulation-based control method. This system can reduce energy consumption in the operational stage of existing non-residential buildings. ‘State of the art modelling techniques were combined with the development of an innovative simulation-based control method, which focused on automating the generation of optimal operational

plans tailored to the actual building and users' requirements,' says project coordinator Belén Gómez-Uribarri Serrano.

An energy management platform for buildings

The consortium comprised 12 partners from 8 countries, who created a range of tools and integrated them into the entire ENERGY IN TIME platform. These tools were developed and tested in the project's four building demonstrators, which represented different types of buildings under a range of climatic conditions across Europe. Each building was unique, with different uses and different energy systems installed. In each case, the implementation was adapted to the building's needs and to the manager's or owner's requirements.

Faro Airport in Portugal, the Levi Hotel in Finland, the Sanomatalo Building, also in Finland and an office building in Romania were used to test the platform. 'The deployment and execution of the platform at the demonstration sites allowed us to learn more about the barriers to and benefits of the innovative technologies involved,' explains Gómez-Uribarri Serrano.

Researchers created a control tool for the building energy management systems, which could be automatically and remotely operated. According to Gómez-Uribarri Serrano: 'This will enable the buildings' energy consumption to be reduced by optimising the use of resources. Furthermore, the tool's strength lies in the fact that the building is monitored continuously and controlled according to the inputs received by the system.'

Better predictions save money

The powerful control tool for managing the energy systems in the building was based on predictive control techniques supported by advanced modelling. This gives a highly accurate representation of the building and users behavior, enabling predictions for energy use and more reliable information about requested energy consumption.

'Using the advanced modelling tool, which is constantly self-calibrated gives a real picture of the building and allows better management,' claims Gómez-Uribarri Serrano. 'The use of these control methods to operate existing building energy systems will result in 20 % saving over previous energy consumption', she adds.


ENERGY IN TIME will mainly benefit the users of buildings via reduced energy costs and help mitigate the effects of climate change by reducing carbon dioxide emissions. It also represents an important technology for improving the energy service companies' business model. 'ENERGY IN TIME provides a tool with which a number of different buildings can be remotely managed simultaneously, thereby

reducing costs and at the same time improving energy savings, which are the basis of the business model,’ concludes Gómez-Uribarri Serrano.’

Keywords



- ENERGY IN TIME
- energy_efficiency.
- control_tool
- building_operations
- life_cycle


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Project Information

ENERGY IN TIME

Grant agreement ID: 608981

Project closed

Start date

1 October 2013

End date

30 September 2017

Funded under

Specific Programme "Cooperation": Nanosciences, Nanotechnologies, Materials and new Production Technologies

Total cost

€ 7 691 454,80

EU contribution

€ 5 099 973,00

Coordinated by

ACCIONA CONSTRUCCION SA



Spain

Last update: 13 February 2018

Permalink: <https://cordis.europa.eu/article/id/218653-simulationbased-control-tool-improves-energy-efficiency-in-buildings>

European Union, 2025