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“Self-Correcting Intelligent Building Energy Management System (SCI-BEMS)”

Heat4Cool Online Training
Introduction

• The SCI-BEMS is a real-time monitoring and smart-home enabled energy management system array.

• It encompasses the monitoring and control
  – from one side of the centralized heating/cooling energy generation system,
  – and on the other side on the comfort-based energy efficient automation of the end-user demand.
Objective and novelty

• The main objectives when designing the SCI-BEMS system are
  
  – Enable the detailed monitoring of the heating/cooling system in its entirety, as well as its constituent components, in terms of operational status and performance.

  – Allow the remote and automated application of control strategies.
Control Principles

• The control logic implemented is distinguished among the optimal management of the energy supply system and the demand of the occupants.

  – The rules of optimal use for the central systems were defined through rigorous testing and simulations by the technical partners, taking into account the environmental conditions and setups of the pilot sites.

  – On the demand side, an automated comfort-based control of the emission system is deployed.
Control Principles
Infrastructure

• Centralized system
  – Due to the specificities of each one, the solution was tailored according to each pilot site’s needs. In common, a plethora of metering and monitoring devices, along with communication servers are deployed in all pilot sites.

• In-apartment system
  – A common approach was adopted, based on a solution comprising a gateway device and various z-wave enables sensors and thermostats.
The critical part of the SCI-BEMS automation algorithm focuses on the efficient management of the apartments’ demand for heating and cooling.

Through the real-time monitoring of environmental conditions and HVAC data, the comfort preferences of the occupants are identified in an automated and consistent manner.

These constraints are used in a model predictive optimization of the system’s emission setpoints. The optimal signals are applied to the fan coil or radiator units remotely.
Functional Pipeline

Automated Control

Real-time monitoring and communication Infrastructure

Optimization Strategy

SCI-BEMS

Demand Flexibility Estimation

Personalized Comfort Profiling