GENTE

D5.3 COMMUNITY DIGITAL TWIN

SUMMARY

This deliverable describes the development of the HSB living lab digital twin using the TEASER and AixLib in Modelon Impact. The digital twin is used to assess the thermal comfort and energy consumption in the building at different levels (rooms, floor and whole building).

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Impressum

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Abstract

The ERANET GENTE project aims to develop a distributed governance toolbox for local energy communities (LECs). This toolbox includes advanced digital technologies such as the internet of things (IoT), distributed ledger technology (DLT), edge processing and artificial intelligence (AI) for autonomous energy resource management within and across LECs and for flexibility provision to energy networks.

This document focuses on the development of a digital twin for the HSB Living Lab pilot, an experimental facility in Gothenburg, Sweden. The aim is to create a comprehensive digital representation of a building's physical and operational parameters to monitor, simulate, and optimise energy use and indoor environmental quality within Local Energy Communities (LECs).

The tools selected to build the digital twin were the TEASER combined with AixLib, and all implemented through Modelon Impact. TEASER enables defining in detail the building geometry, HVAC system configuration, energy use, occupancy patterns, location and other relevant information. Then, TEASER uses the models from AixLib to build a detailed dynamic simulation model of the building, which can be simulated in Modelon Impact. For this process, the HSB living lab's real layout, material properties, internal heat gain patterns and HVAC configuration were used.

Once the digital twin was built, it was simulated at three levels of detail—room, floor, and building levels—to verify energy dynamics accurately. The most critical and representative rooms were chosen and simulated for a week with relevant climate (HVAC) demand. The HVAC operation was verified by addressing the thermal discomfort and the energy consumption.

The resulting digital twin is envisioned as a tool to identify energy efficiency measures for the building, understand its operation in detail and serve as a bridge between preliminary simulations and real-world application, enhancing the development and deployment of sustainable building solutions within LECs.

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