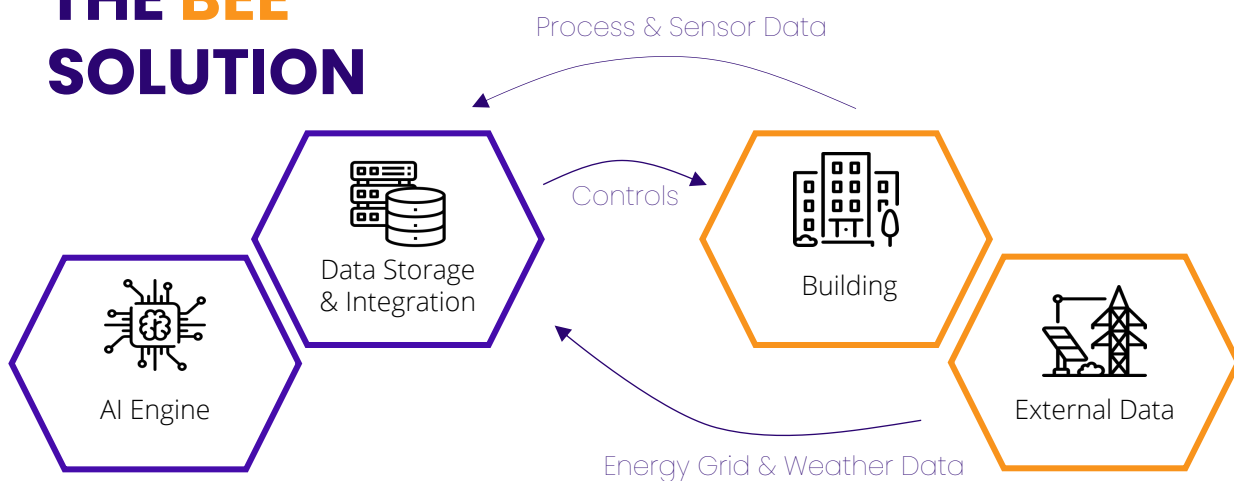


# SMART BUILDINGS USING RENEWABLE ENERGY

Most of today's buildings are dumb – they do not know how the weather is going to be tomorrow or which rooms will be occupied. Controlled by fixed routines they waste a lot of energy for heating, cooling and lighting. By connecting buildings with their environment and the energy grid BEE offers an innovative solution, that not only saves energy and emissions, but also makes buildings available as a storing capacity for renewable energy.

## THE BEE SOLUTION



### The BUILDING ENERGY EFFICIENCY Consortium

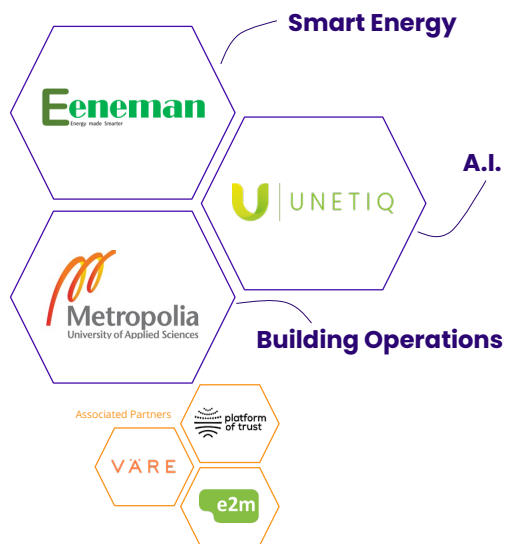
To realize BEE two companies and one university have joined forces to become a true European consortium with a broad skillset in AI and building operations.

**Eeneman** – a Finnish Smart Energy company offering a solution for sensing, metering and controlling buildings

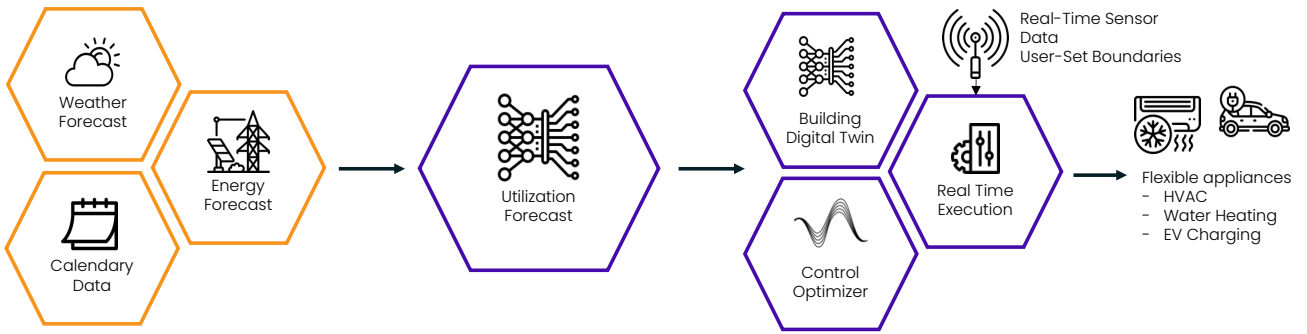
**UnetiQ** – a German AI agency developing sustainable software applications

**Metropolia** – University of Applied Sciences operating a large smart building campus

With the help of our associated partners we also offer Virtual Power Plant functionalities, like FCR-N.



# THE BEE AI



Using a combination of different AI technologies, BEE ensures to adapt automatically to your building and control all flexible appliances in an optimal way.

**Utilization Forecast:** predicts the occupancy and utilization of all rooms and appliances

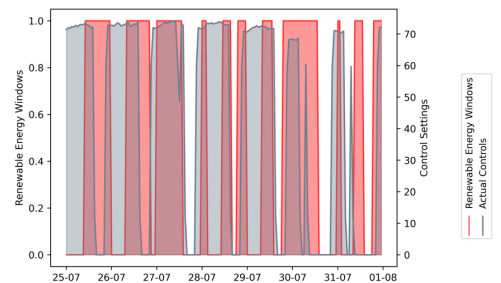
**Building Digital Twin:** models the behavior of appliances and their effect on the buildings climate

**Control Optimizer:** a model predictive control deriving optimal control parameters for the next 24 hours

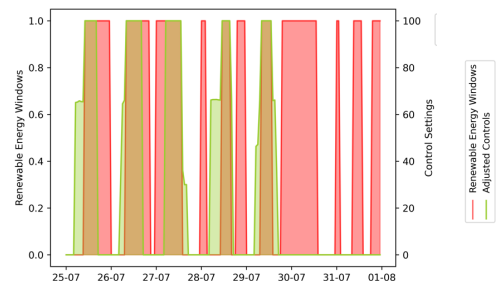
## AN INNOVATIVE ARTIFICIAL INTELLIGENCE CORE

## SHIFTING TO RENEWABLES

The generation of renewable energy is increasing year after year, yet our consumption is not aligned with the fluctuation in the production - putting a lot of stress on our energy grids. To make buildings accessible as a storing capacity in the energy grid, we have developed an intelligent energy shifting control. This makes sure to use as much renewable energy as possible - saving emissions and supporting the energy grid.



↓ Energy Shifting ↓



# REDUCING COSTS AND CARBON

## Pro-Active Control

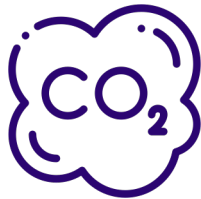
Using weather forecasts our system acts even before a weather change occurs

- + **Energy Shifting**  
By predicting the energy grid composition BEE shifts energy usage in times with a high availability of renewables
- + **Peak Shaving**  
BEE helps to stabilize the energy grid by providing a frequency containment reserve
- = **up to 25% Energy Consumption and CO<sub>2</sub> Reduction**



**20%**

Energy Consumption  
Reduction



**25%**

Emission Reduction



**20%**

Energy Cost Savings

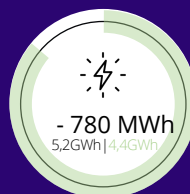


**100%**

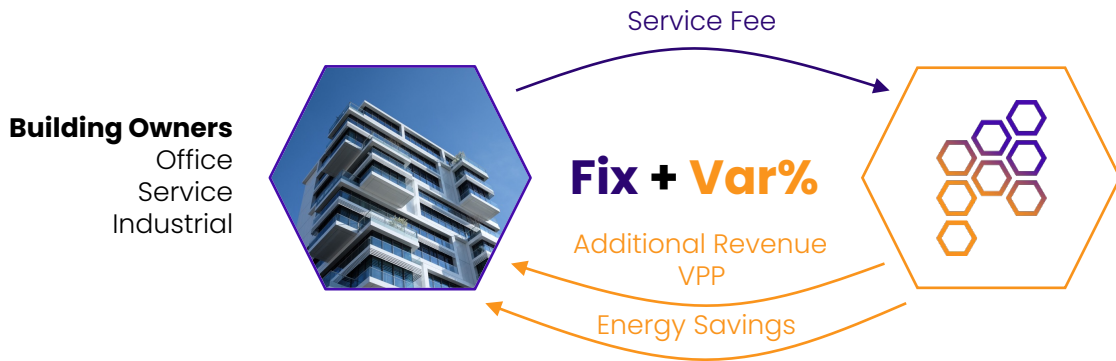
User Comfort



The following savings are based on simulation results of a test building at the Metropolia University. The building has 55.000 m<sup>2</sup>, 27 ventilation machines and district heating.



# OUR SAVINGS SHARING MODEL



BEE comes without upfront investment, since it integrates with already existing hardware in your building. A fixed monthly service fee is charged based on your building size. The savings, that are achieved through our system, as well as the additional revenue through Virtual Power Plant functionalities is shared between BEE and the building owner.



Pricing Example – Public Office Building:

- Energy consumption: 2800 MWh
- Savings: 30.500€/year + 72t CO<sub>2</sub>
- Costs: 600€ service fee + 630€ variable/month

Contact us for more information and for your individual savings opportunities

## Your Contact

Tapio Toivanen  
 CEO Eeneman  
 tapio.toivanen@eeneman.com

# THE AI4CITIES PROJECT

BEE has been developed within the AI4Cities project – aiming to make Europe’s cities more sustainable and supporting them to become climate neutral. Our solution has been developed with and tested within the cities of Helsinki and Stavanger.



The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871914.

**Duration:** 36 months  
 (1.1.2020 – 31.12.2022)

**Funding instrument:**  
 Pre-commercial procurement (PCP)

**PCP Budget:**  
 4.670.000€

**Total Budget:**  
 6.600.000€

