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A research project on serial renovation with three demonstrators

Demo 1 - Arenberggasse



RENVELOPE – Energy Adaptive Shell



The RENVELOPE-Project is coordinated by AEE INTEC and funded by Climate- und Energyfund under the „Model Energy Region“ program“, in cooperation mit Green Energy Lab.

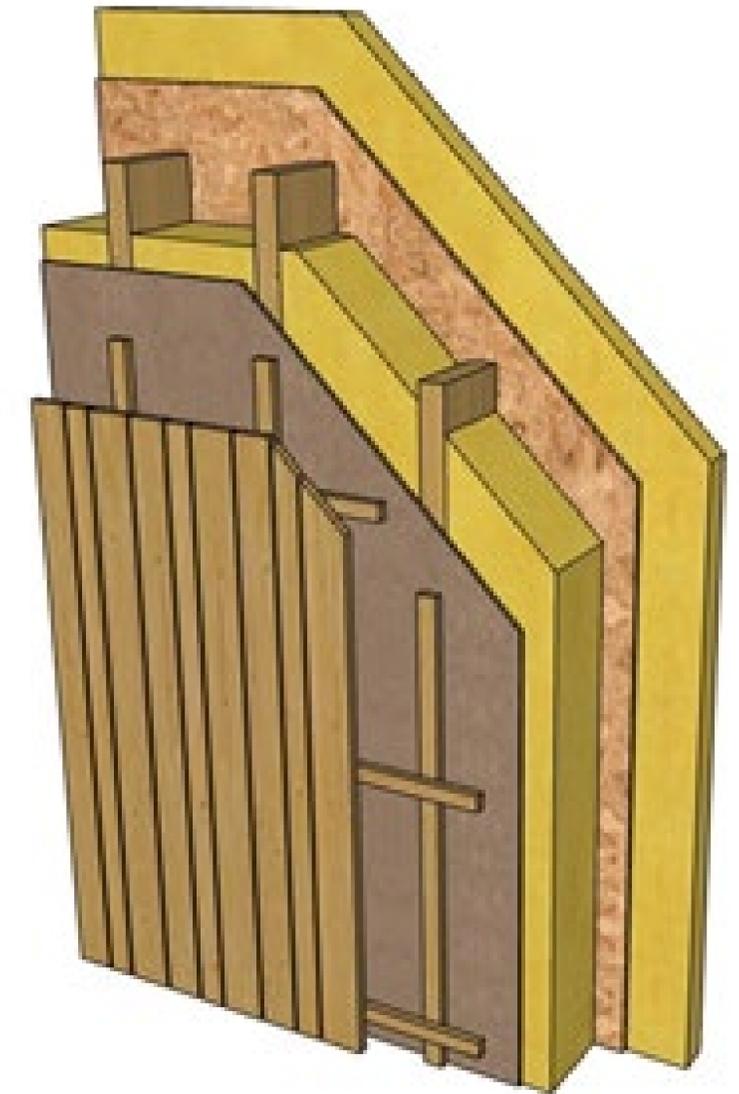
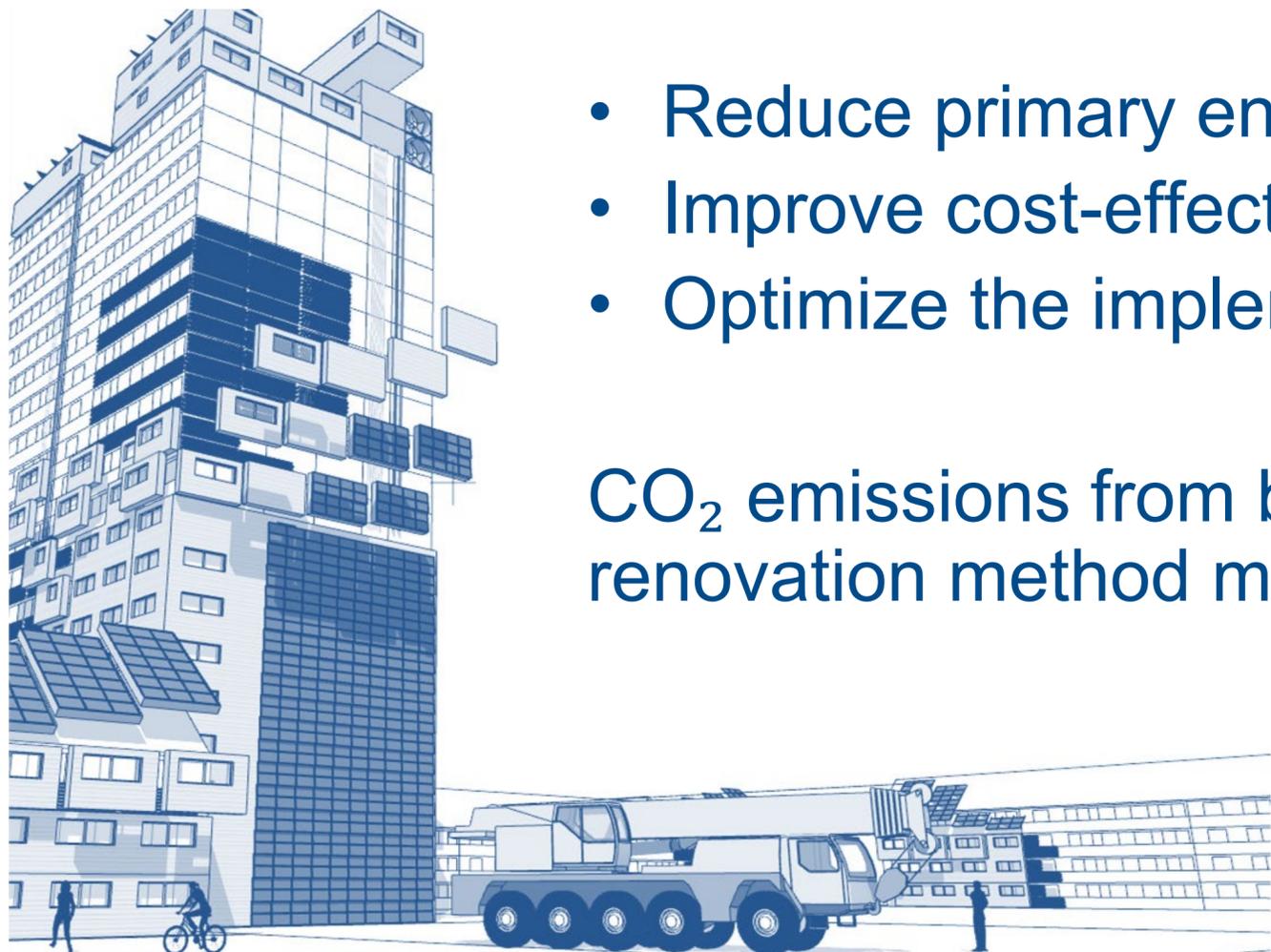


RENVELOPE – Energy Adaptive Shell

Aim of the project: **Renovation through serial renovation, including integrated building technology and renewable energy.**

- Reduce primary energy consumption
- Improve cost-effectiveness
- Optimize the implementation process

CO₂ emissions from both the building and the renovation method must be reduced.



Reference: Neubauer/AEE INTEC

DEMO 1: Residential Building in Vienna

DEMO 1 Arenberggasse



Reference: Nussmüller.Architekten

DEMO 1: Residential Building in Vienna

Building Data and Facts

Owner: Sozialbau AG

Location: 3rd district Vienna

Year of construction: 1977

Zones:

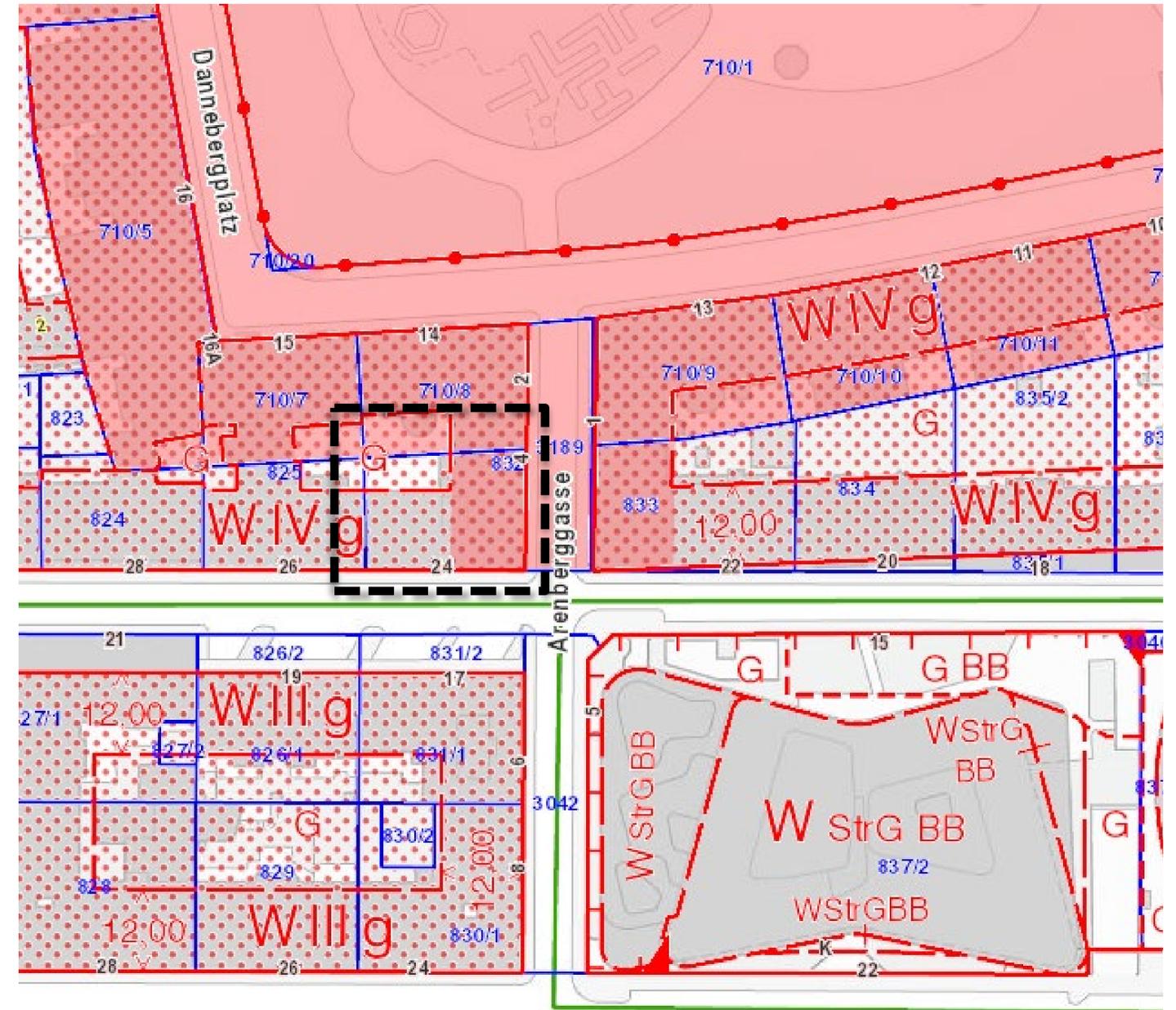
- Partly residential zones
- Partly protection zone (§7 & §7a Wiener BO)

Building size:

- 7 above-ground floors
- 1 underground floor
- Building class 5 (due to height)

Apartments & Area:

- 24 apartments
- Total living area: 1.628,30 m²



Reference: Ausschnitt aus dem Flächenwidmungsplan – Arenberggasse 4
<https://www.wien.gv.at/flaechenwidmung/public/>

Reference: AEE INTEC

DEMO 1: Residential Building in Vienna

Construction:

- Mantle concrete construction, plastered, no insulation
- Not insulated: attic, ground floor
- Roof: Shallow pitched gable roof with fiber cement corrugated sheets

Infrastructure:

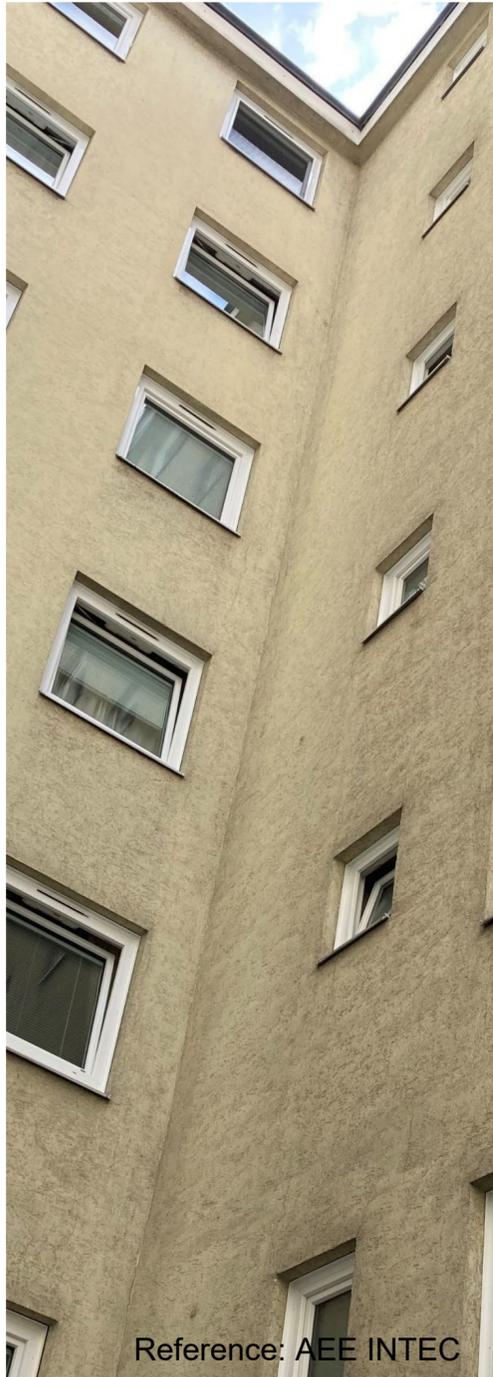
- Access to inner court yard
- Parking spaces at ground floor level

Windows:

- Replaced in 2015/16 with triple-glazed plastic windows (will be retained)

Heating and Energy Supply:

- Decentralized gas boilers in each apartment (also for hot water)
- Gas stoves in kitchen



Reference: AEE INTEC



Reference: Nussmüller.Architekten

DEMO 1: Residential building in Vienna

Renovation Concept:

Aim: Minimal-invasive thermal and energy efficient, serial renovation with component activation

(Part1)

Facade:

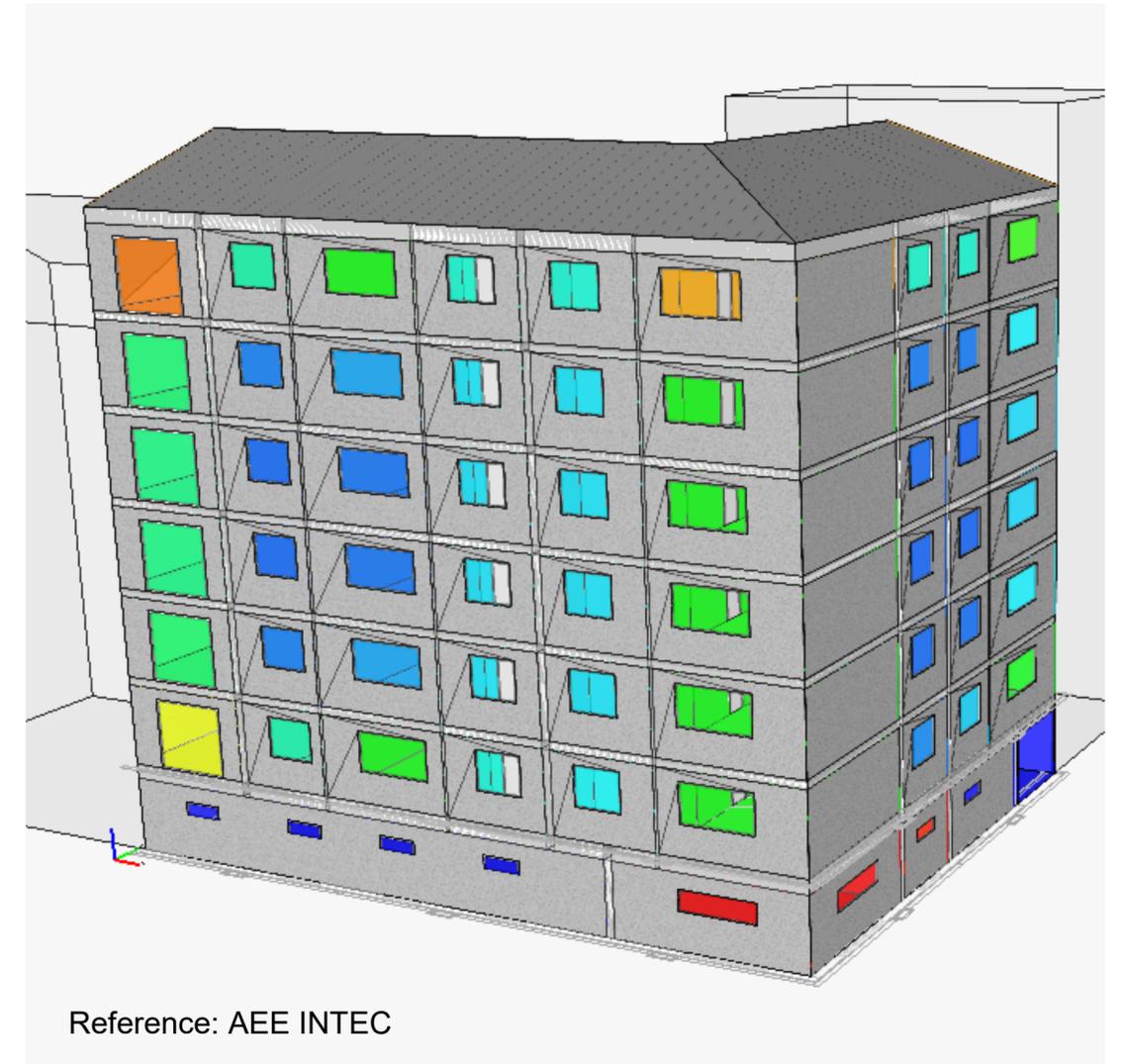
- Insulation of the building envelope with serial pre-fabricated modules
- Component activation for heating via the existing exterior walls
- Sun protection

Energy System:

- Combination of deep bore holes mit heat pump and air-source heat pumps

Building Control System:

- XAM Control (Evon)
- Intelligent building control: Model predictive control for energy optimization (uses building data & weather forecast)



DEMO 1: Residential building in Vienna

Renovation concept:

(Part 2)

Roof renovation:

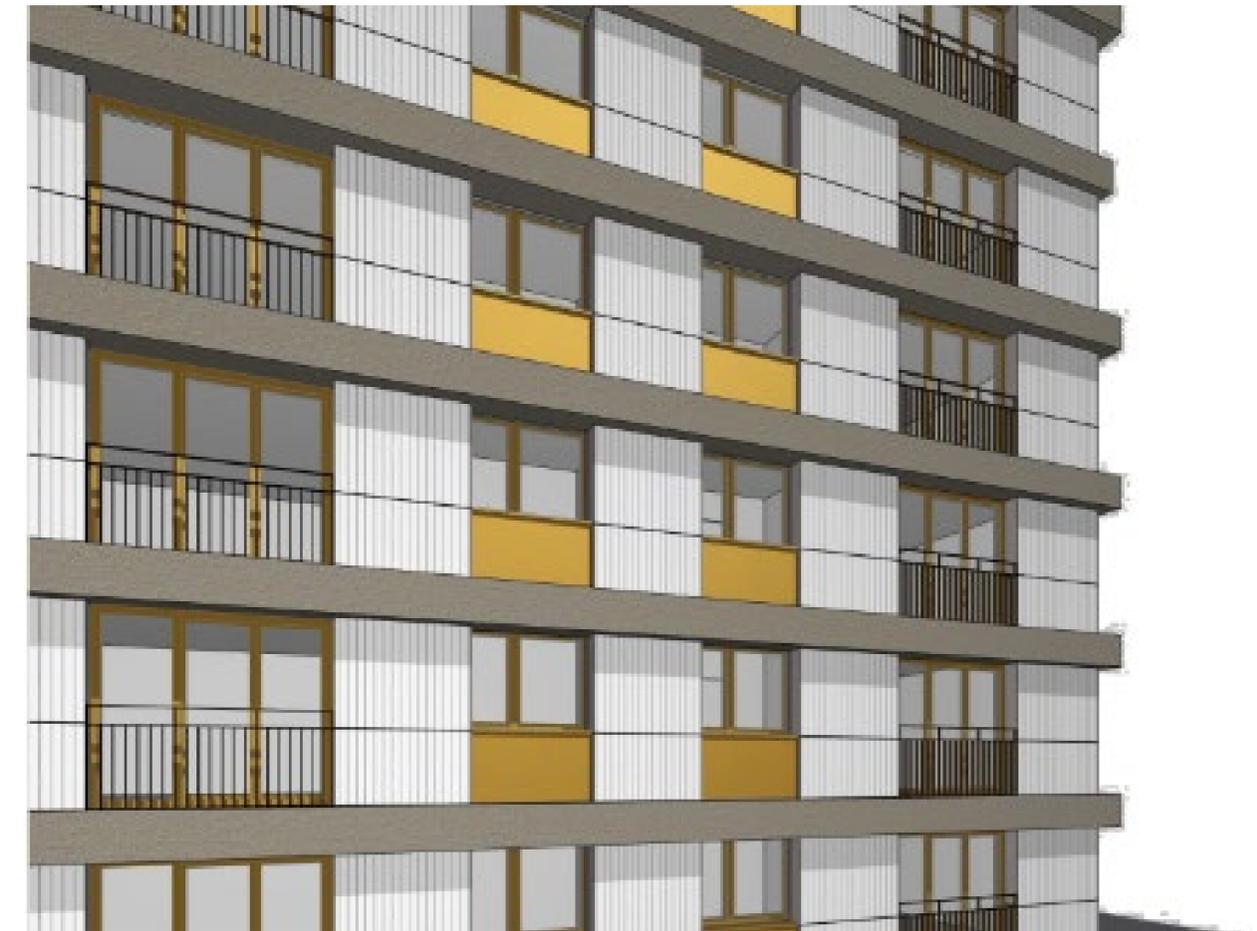
- Reinforcement of the roof structure
- Replacement of fiber cement corrugated sheets with metal roofing (Prefalz)
- Installation of photovoltaic system (south and east roof) with total capacity of about 10,6 kWp

Living comfort:

- In 75 % of the apartments: Living room windows replaced with floor-to-ceiling french doors and balconies

Timeplan:

- Start: Summer/Autumn 2025; Completion: End of 2025



Reference: Nussmüller.Architekten

Component Activation and MPC Control

Component Activation

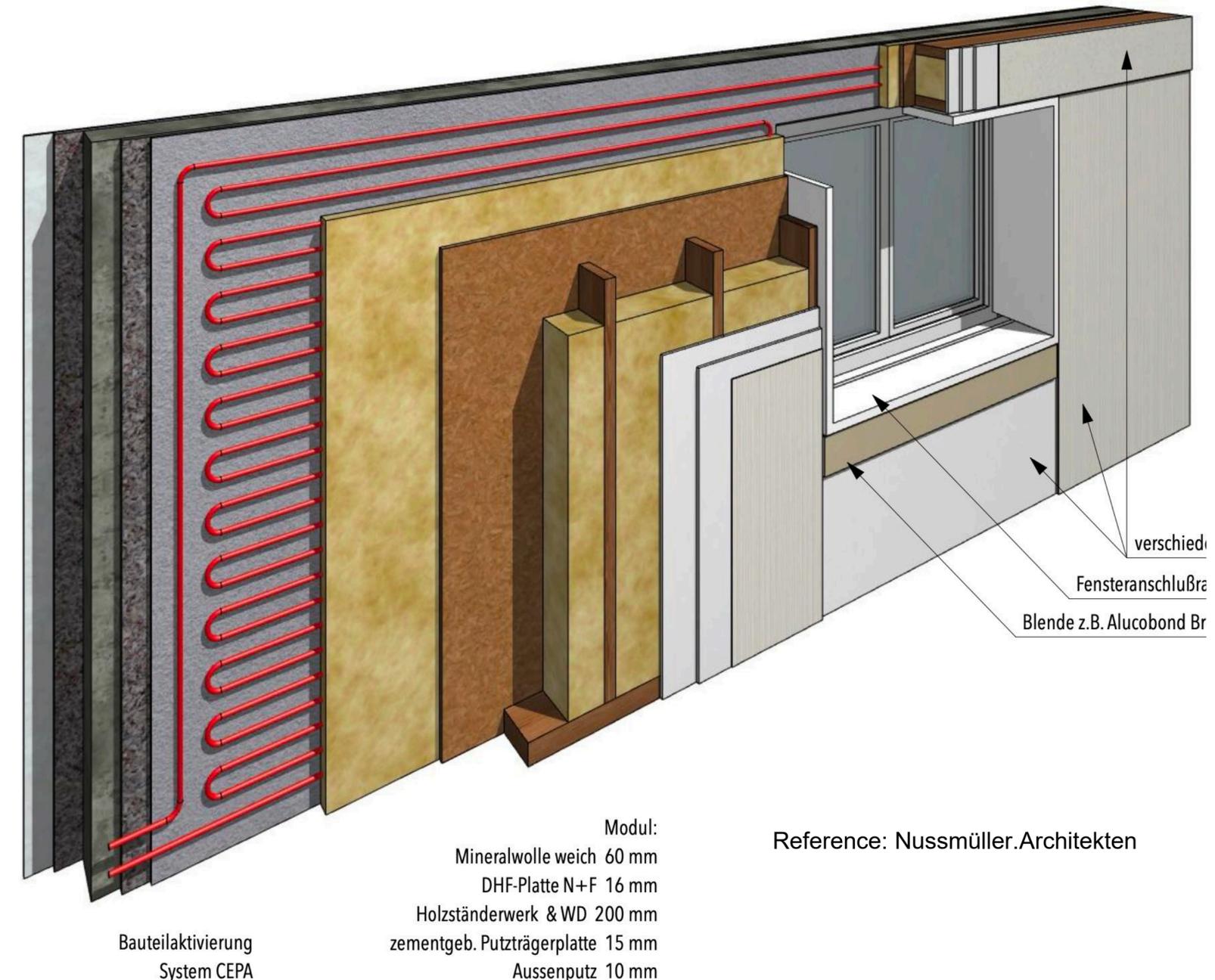
is an energy-efficient heating and cooling technology where thermal energy is stored in massive building elements such as ceilings or walls to evenly temper the entire building.

=> Slow temperature changes within the building

Model Predictive Control (MPC)

is software for controlling energy input into the building, based on information such as building geometry, predicted weather, and temperature

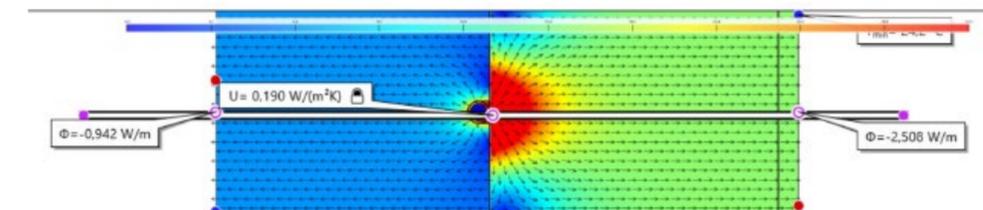
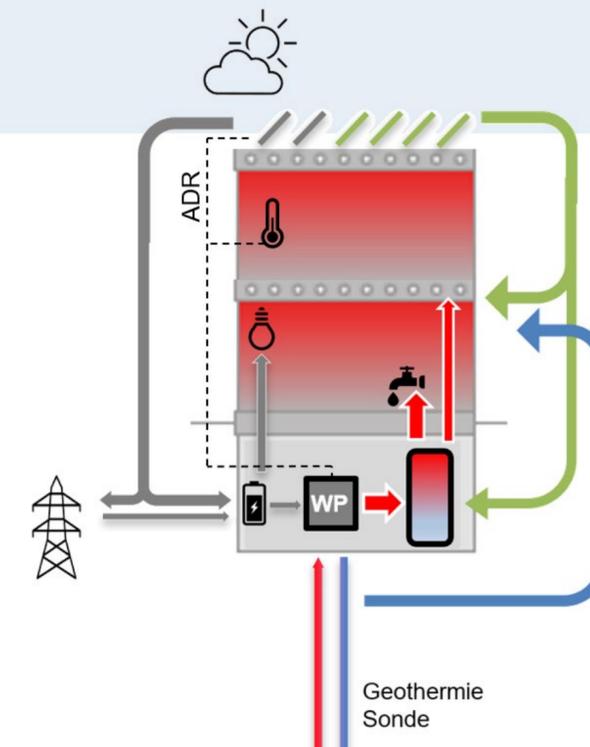
=> optimized use of available energy



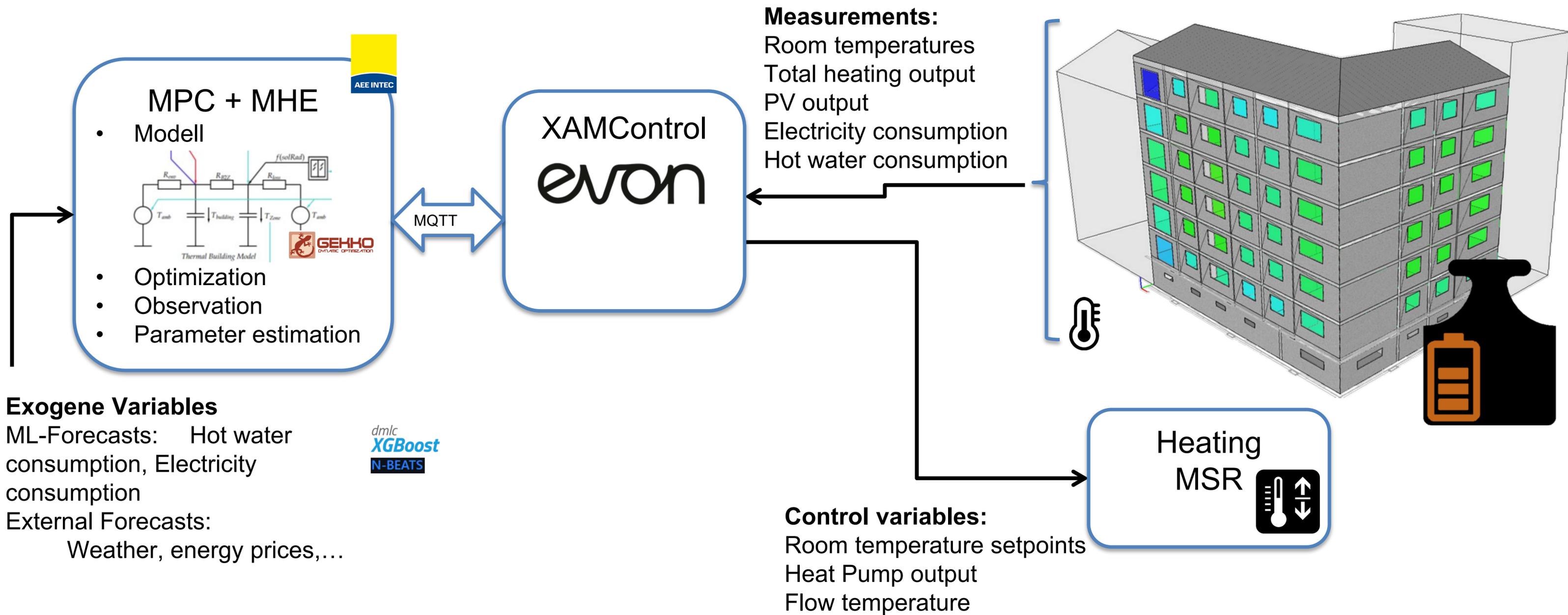
Exkurs: Model predictive control

Aims for RENVELOPE Demo Buildings

- Demand Side Management in combination with renewable energy sources
 - Minimize energy consumption
 - Increase solar coverage rates
 - Minimize grid load
 - Minimize energy costs
-
- Active use of the building mass without compromising comfort



Exkurs: Modell predictive control Implementation





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IDEA TO ACTION

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