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 **RENVELOPE**

Serial renovation of large buildings

With a focus on fassade-integratable technologies

Dr. Florine Leighton-Hiersemenzel
AEE Institut für Nachhaltige Technologien
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Motivation and Innovation

“40 % of the total energy consumption in the European Union is attributed to buildings.”

Reference: Statistik Austria



Serial Renovation methods can:

- **reduce total energy consumption, and**
- **enable heat and energy transition**

Content

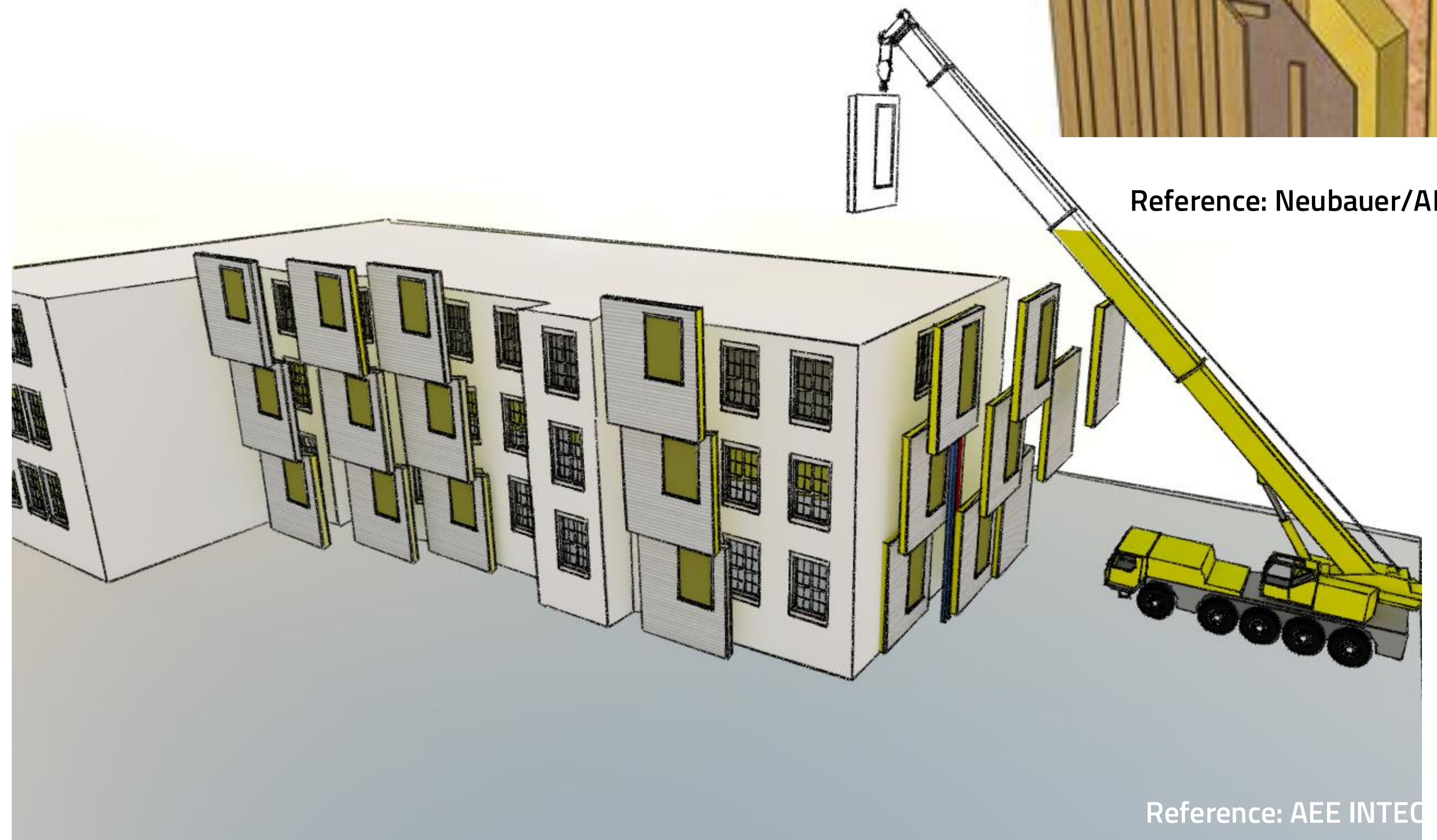
I. What is serial renovation?

II. How is serial renovation connected to heat and energy transition?

III. Which localised energy sources can be used for serial renovation?

Serial Renovation

- **Façade elements** are mounted to the outside of a building.
- **Prefabrication** of elements allows for short construction time and minimal-intervention inside the building.
- Significant reduction of energy consumption (80%) and CO₂.
- Possibility for inclusion of technology for heating and energy generation.



Example of a „simple“ Serial Renovation



Reference: ecoworks

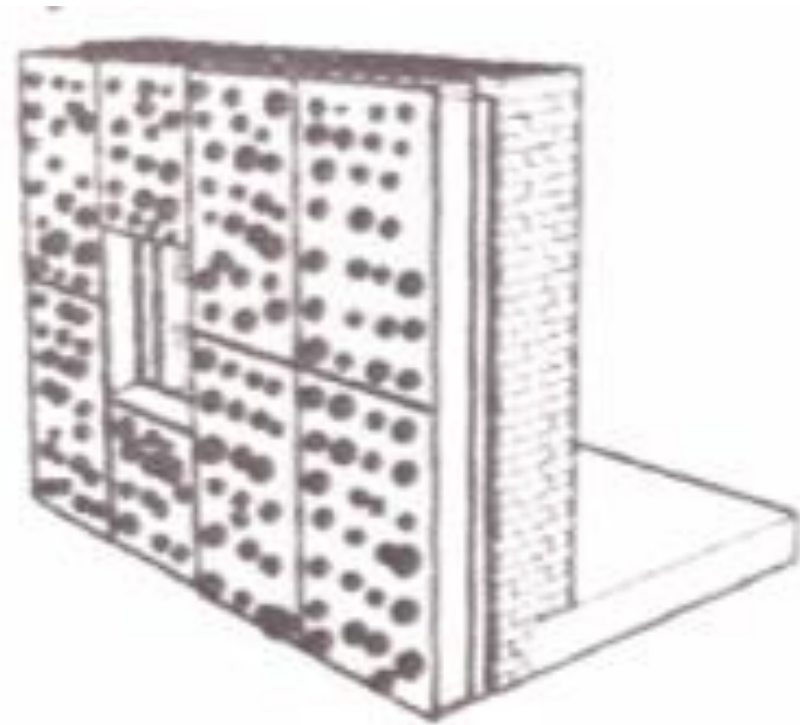
Ecoworks:

serial renovation in Mönchengladbach

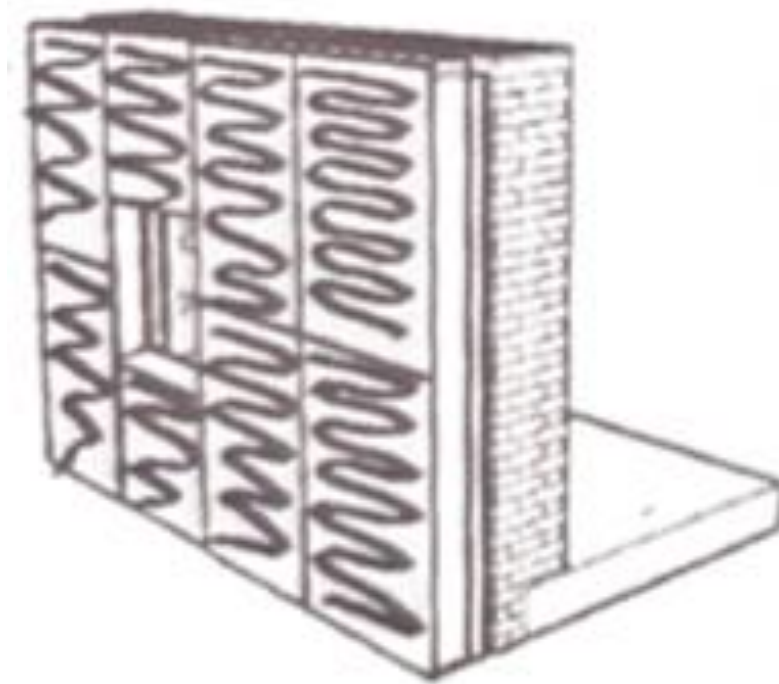
- New roof,
- Photovoltaics,
- New facade with insulation.
- New windows with shutters,
- Ventilation system,
- Air-source heat pump.

Facade-Integrated Technologies

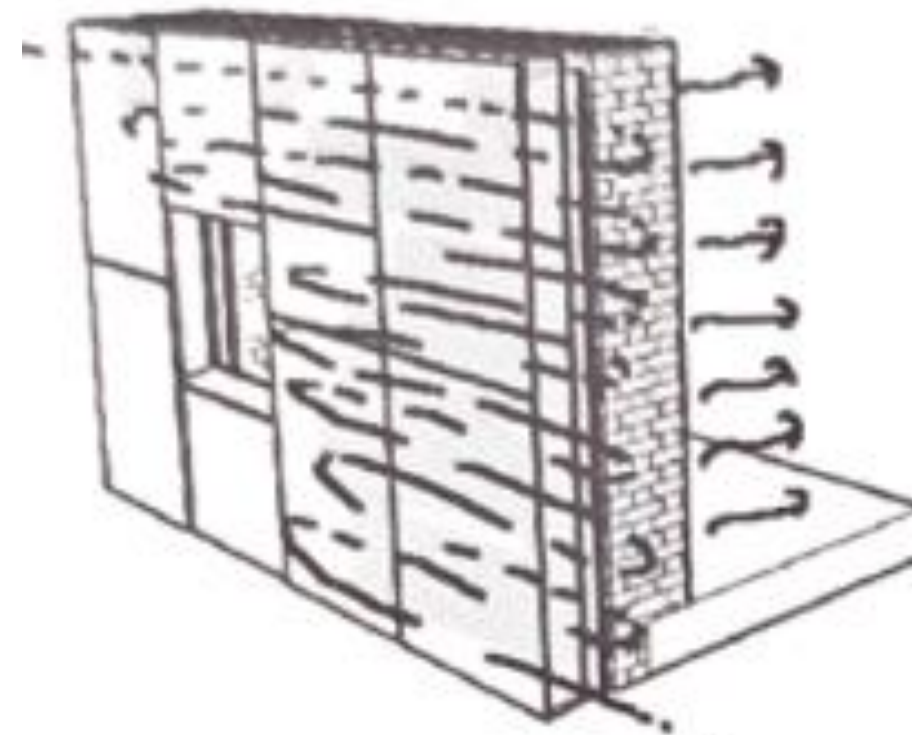
*Enabling heat and energy transition



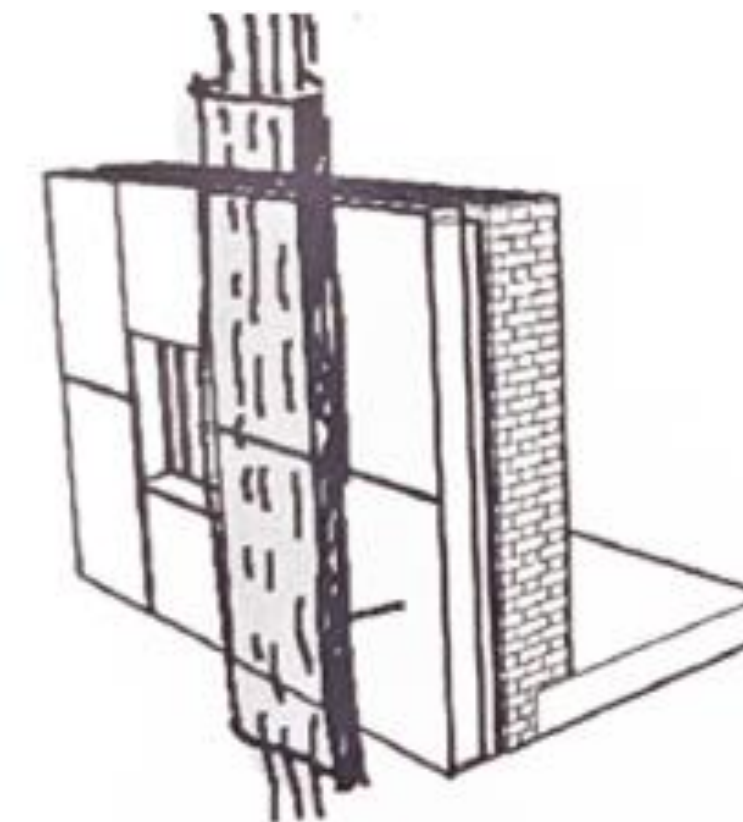
*Photovoltaic



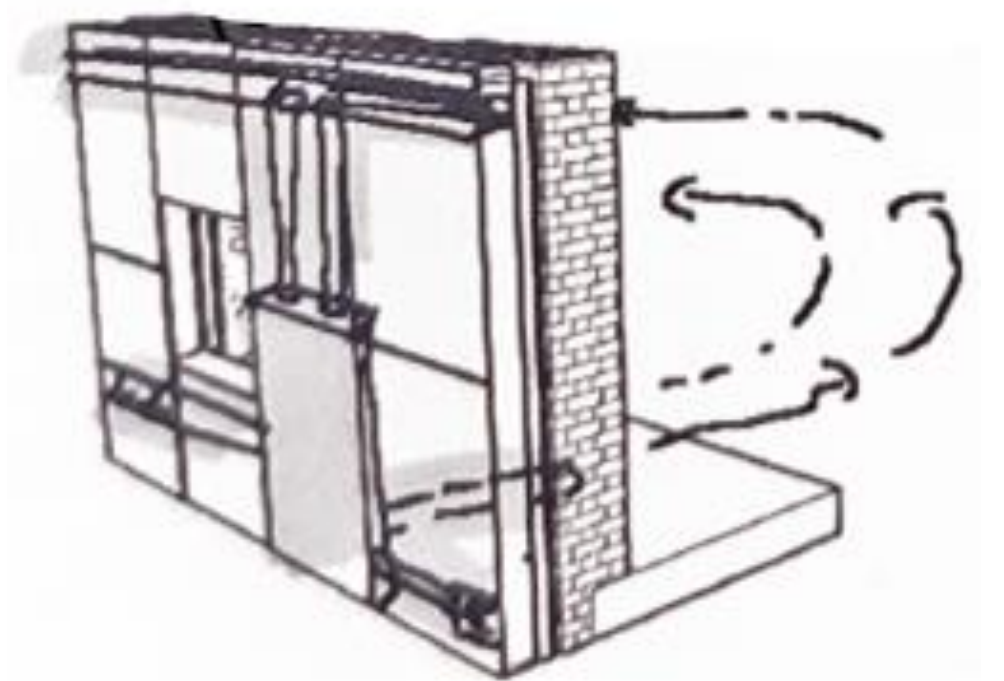
*Solarthermal



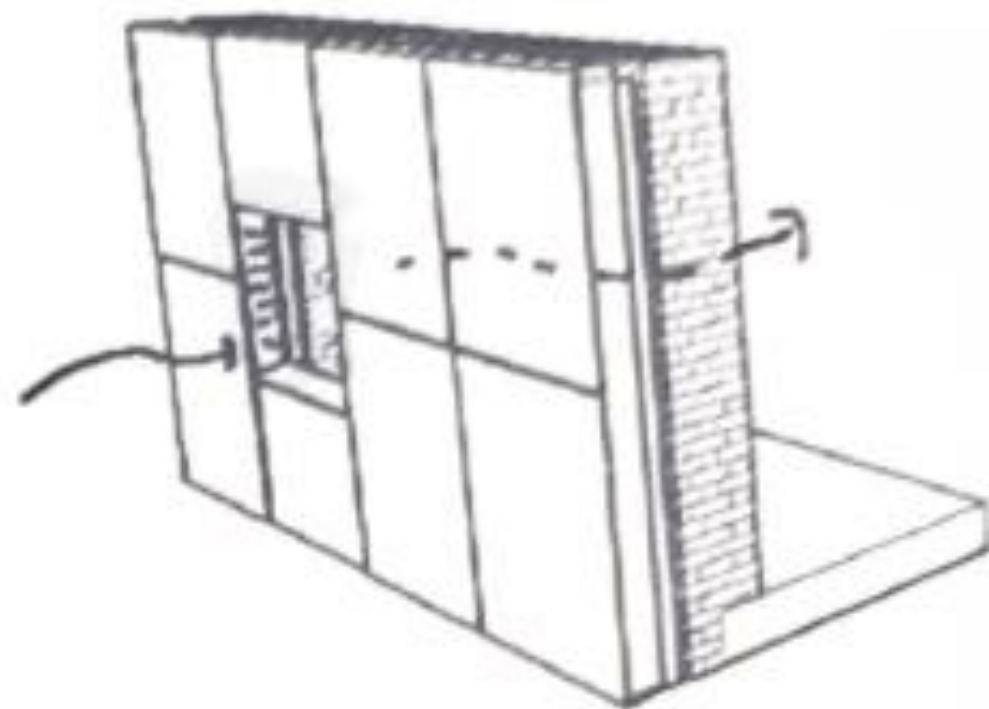
*Building activation



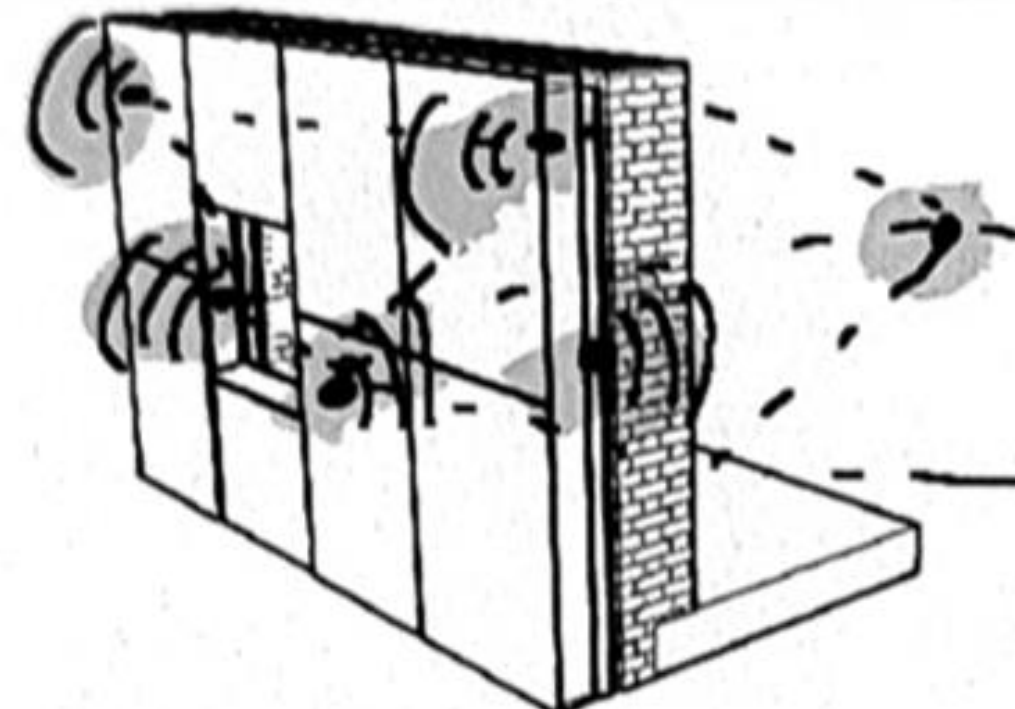
Pipes in external shafts



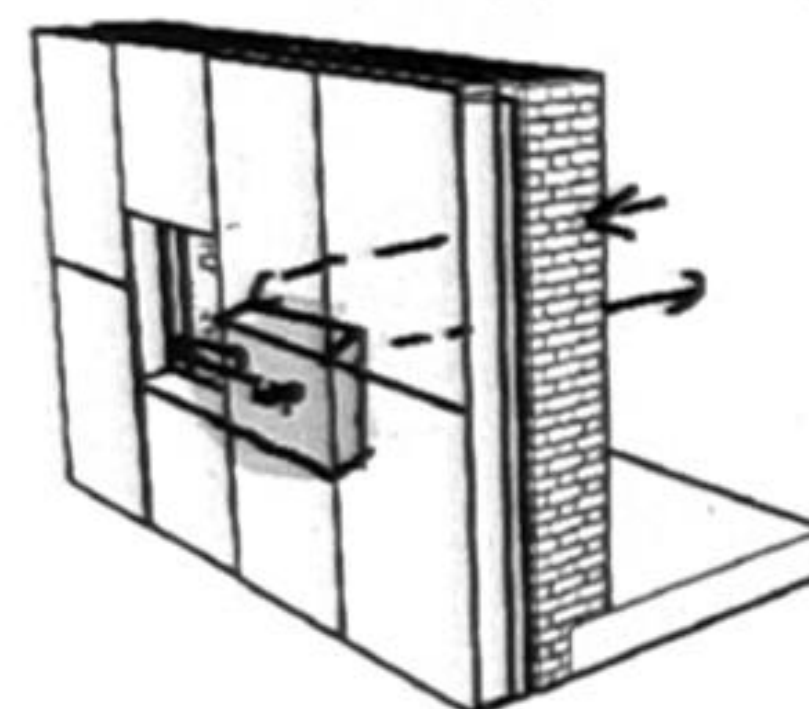
Controlled ventilation



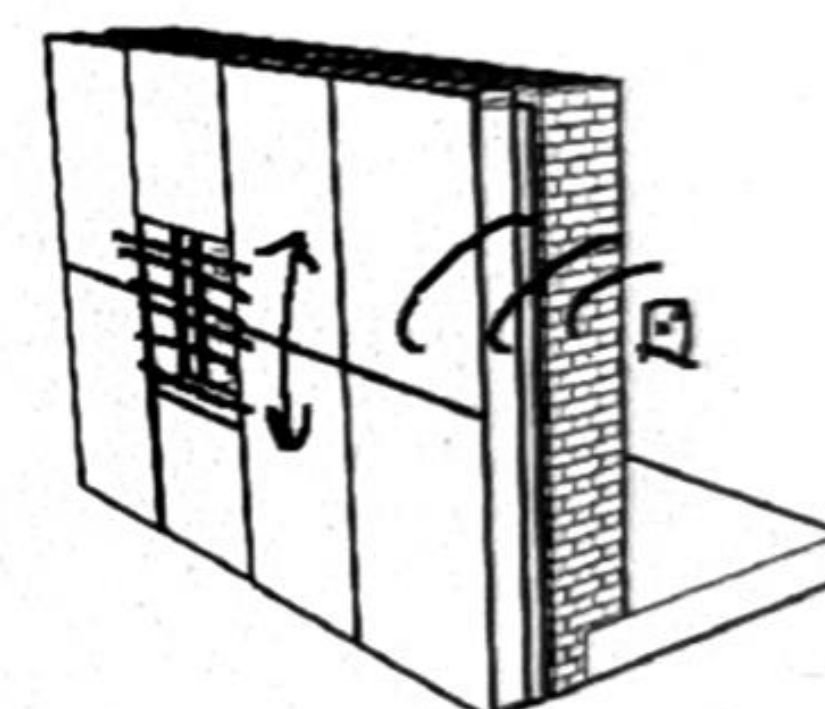
Dezentralised window ventilation



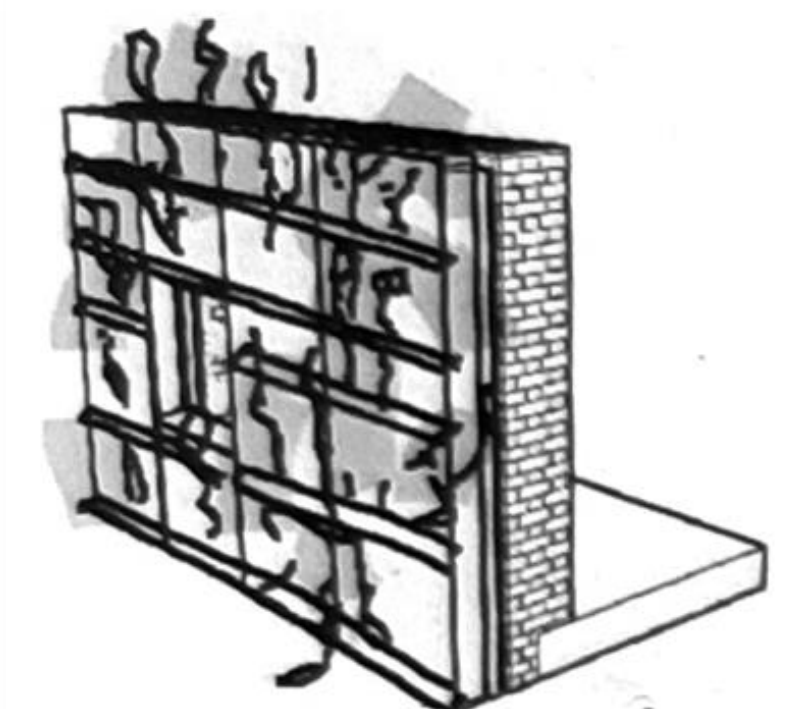
*Sensors (Energy management)



*Dezentralised Heatpumps



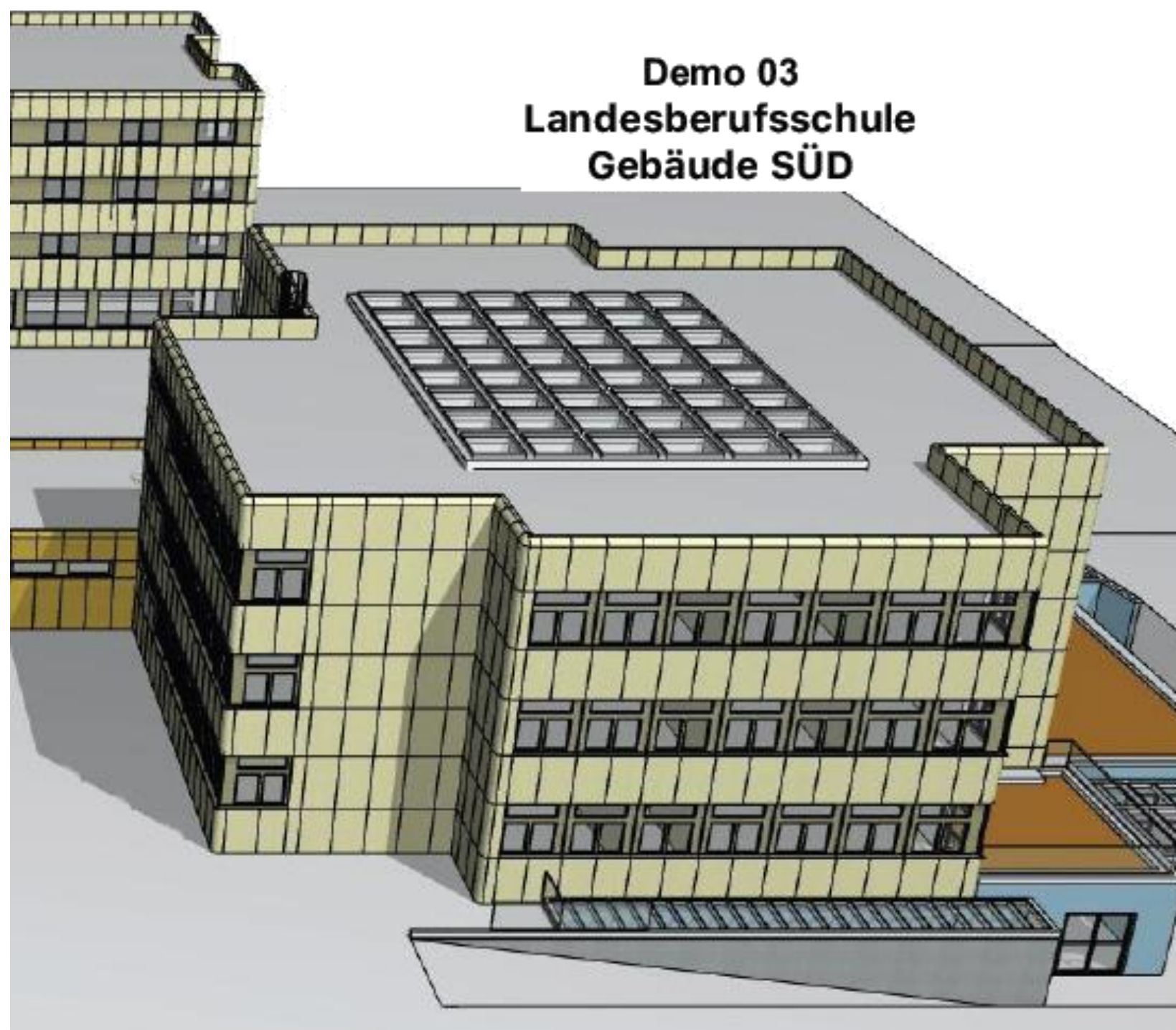
Intelligent shutters



„Facade greening“

Example of Technology-Integrated Serial Renovation

Renovation of a school in Knittelfeld

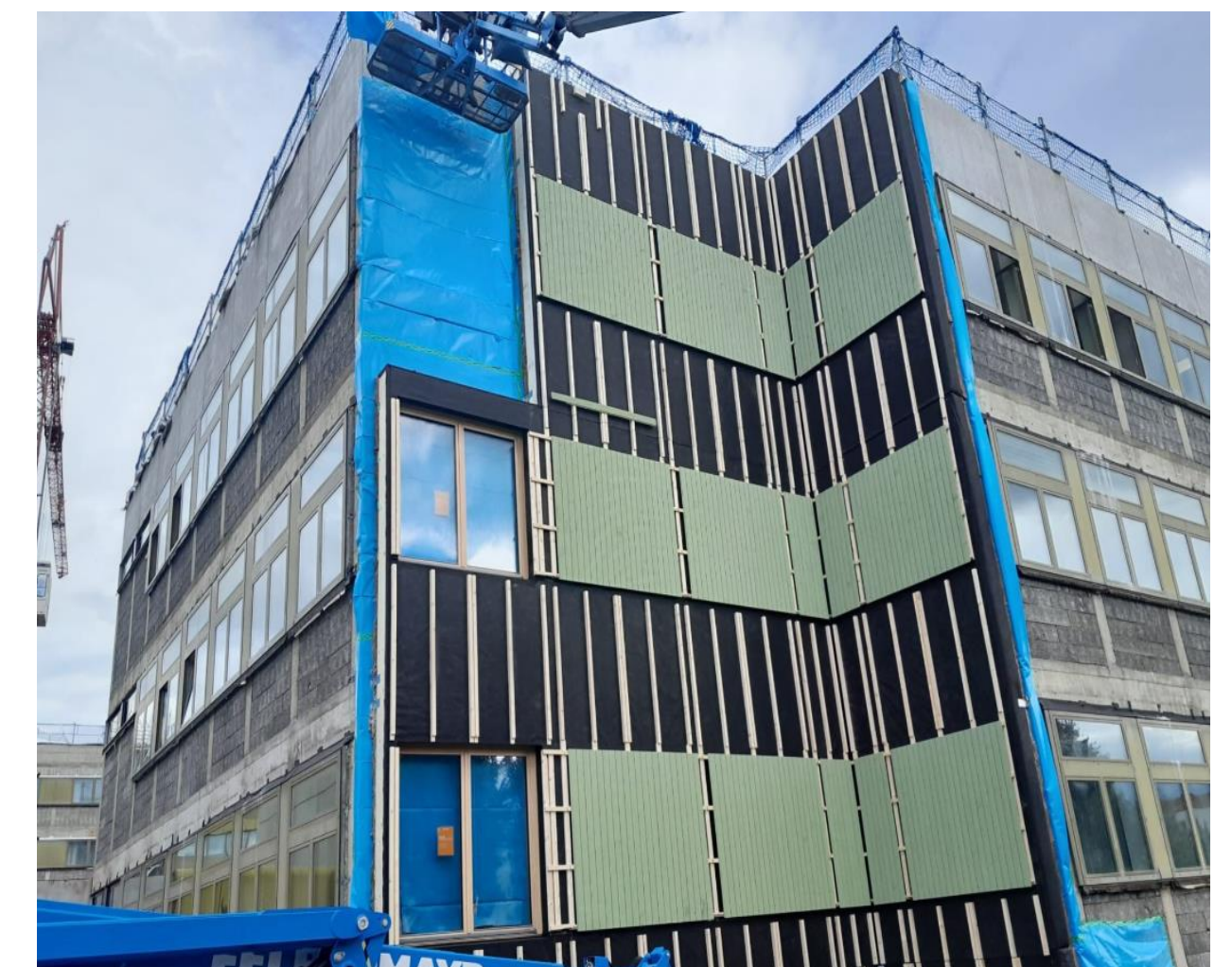


Reference: Nussmüller Architekten

- New glass roof
- Heat-recovery system with air-source heat pump
- Roof-mounted photovoltaics
- Facade-integrated photovoltaics
- New facade with insulation
- New windows with shutters
- Facade integrated ventilation system

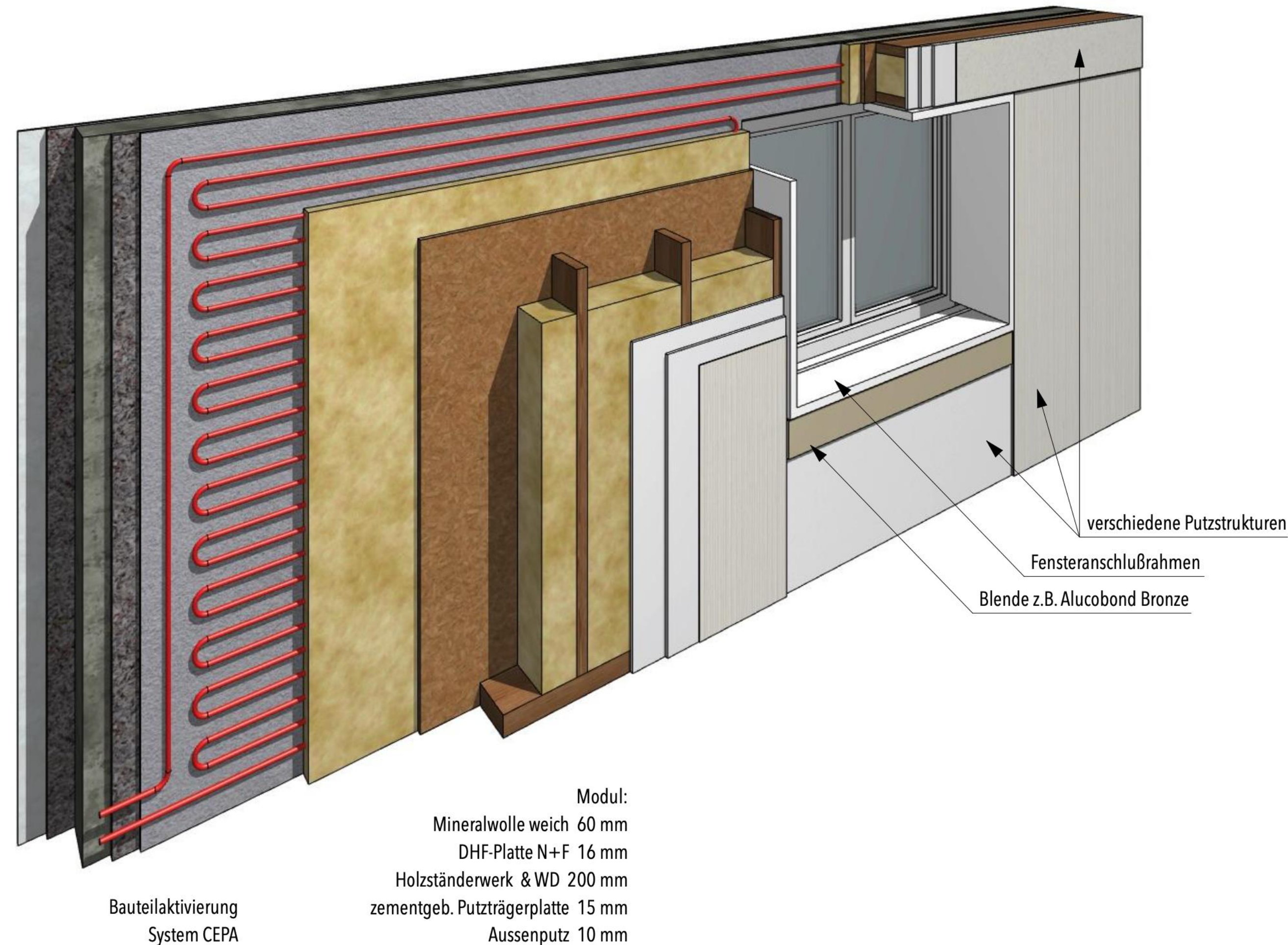


Reference: AEE INTEC



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Buildings utilised as Thermal Storage

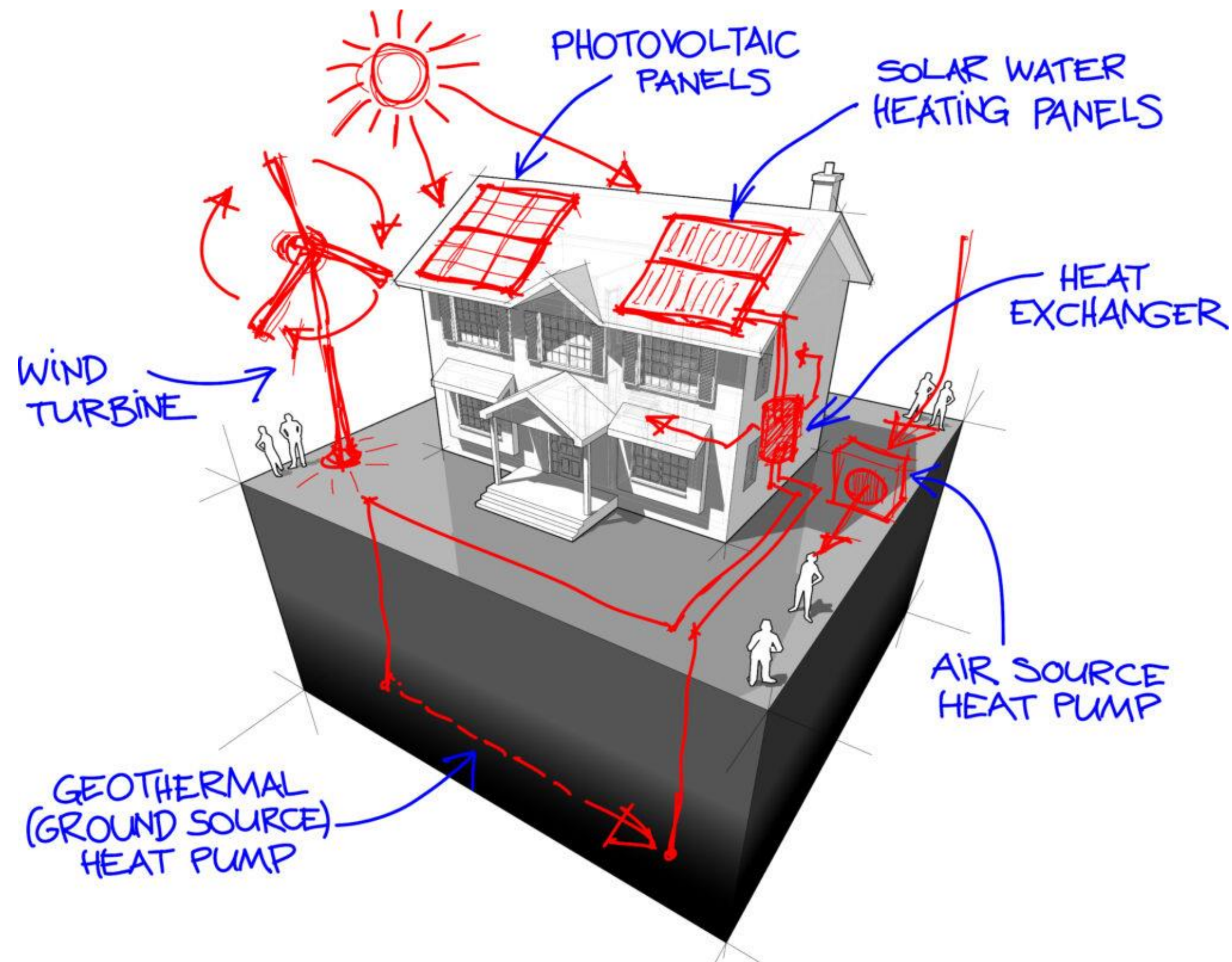


Building component activation
 = used to heat the entire mass of the building
 => slow heat variation inside the building

Model Predictive Control
 = Software to control the energy input into the building, based on information e.g. building geometry, predicted weather and temperature
 => optimised use of available energy

Localised Energy Systems

For single houses...



Reference: [freen](#)



Reference: [AIT](#)

For communities...

- Larger pool of energy systems and technologies
- Collective energy generation throughout the day
- Energy consumption can be spread over the day, if energy community consists of buildings with different purposes
- Less energy storage required because it can be used „on the spot“.
- Energy storage can be optimised (for efficiency)

=> **KEY: Energy Management System**

The potential of serial renovation

“No-frills”-buildings from the post-war era are ideal for serial renovation.

In Austria, there are *at least* 10 000 “no-frills”-buildings that are ideally suited for serial renovation.

IF these buildings are to be renovated until 2050, then we must complete **one renovation per day** starting from 2025!



Reference: [NDR](#)



This project is funded by the Austrian Climate and Energy Fund and implemented within the framework of the FTI initiative "Energy Showcase Region" in collaboration with the Green Energy Lab.





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Thank you for your attention.

Dr. Florine Leighton
AEE Institut für Nachhaltige Technologien