

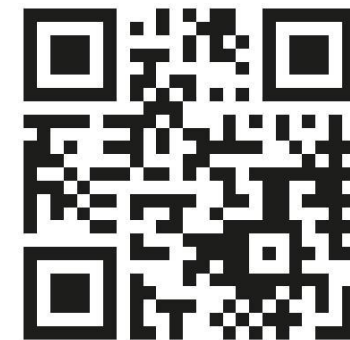
Activating existing buildings mass energy storage in refurbishment



IEA Technology Collaboration Programme



Thomas Ramschak
Head of R&D / Product Management



www.towern3000.at

- **EU power system is evolving rapidly**

Climate neutrality by 2050 will require increased energy system flexibility, as a result of **increasing share of renewables** (RES) – new business models related to flexibility

- **Energy and emission trends in the building sector which specifically drive flexibility needs**

Energy efficiency, electrification and behavior changes are main drivers of decarbonization of the building sector

- **Renovation backlog**

85-95% of the buildings that exist today will still be standing in 2050

“The objective is to **at least double** the annual energy renovation rate of residential and non-residential buildings by 2030 and to foster deep energy renovations.”

Energy-Active Façade Concept

Overcome barriers

- duration of refurbishment, burden on occupants during refurbishment, avoidance of relocation, elimination of scaffolding, quality assurance, etc.

Energy active components

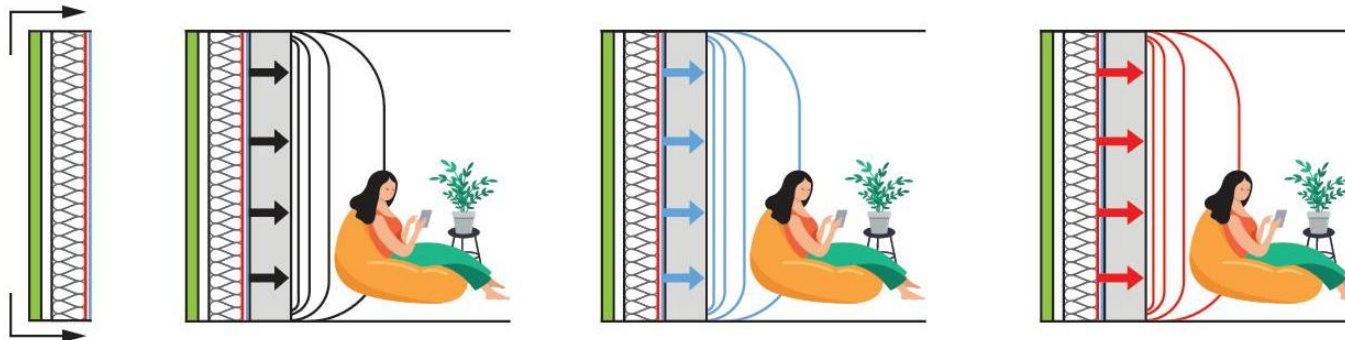
- **Thermal activation layer** as part of the façade for heating and cooling

Renovation concept

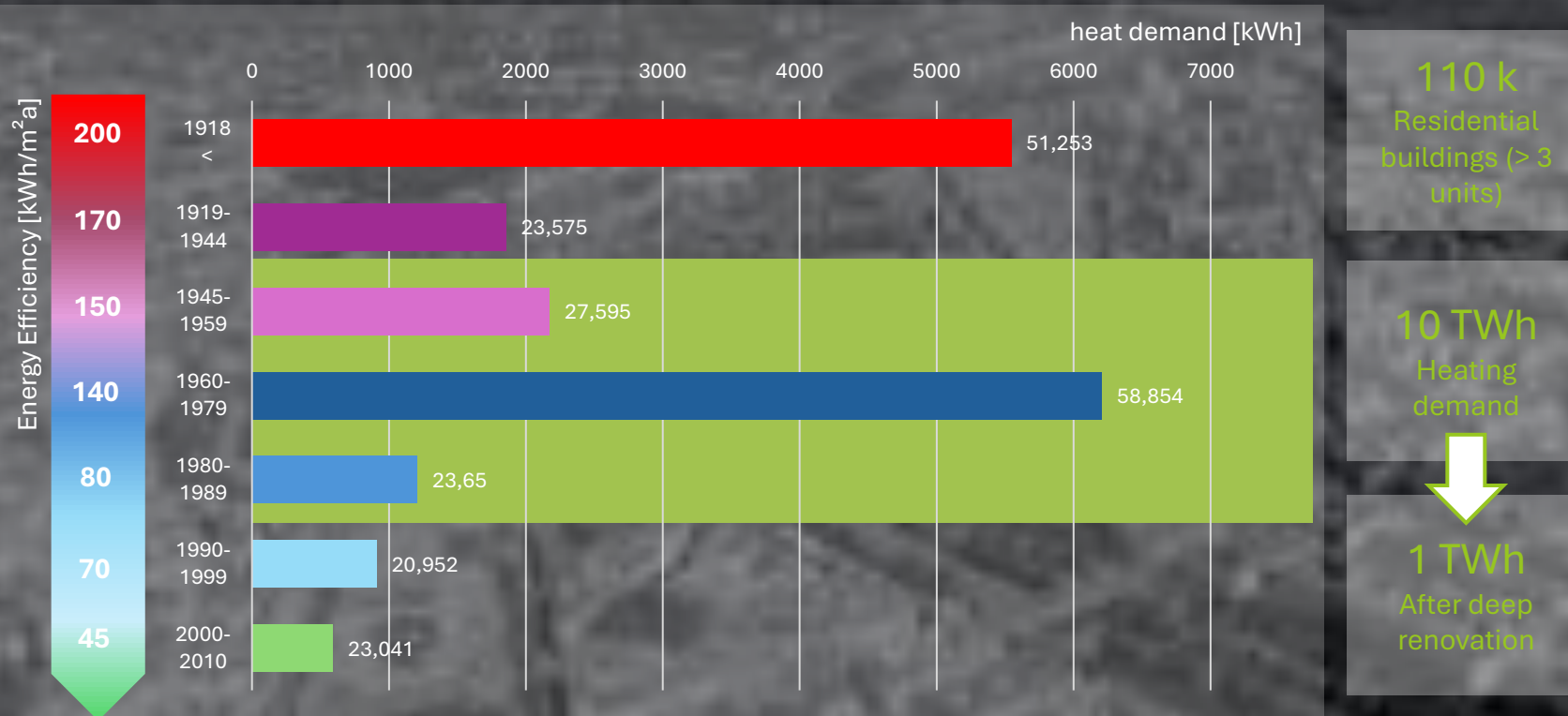
- **Modularity, Prefabrication and Industrialisation are key strategies** in production and resource efficiency in retrofitting of buildings

Match production and demand

- Using the **existing building structure for heat/cold storage** and as the heating/cooling dissipation system



CEPA: Huge Challenge / Huge Market Size



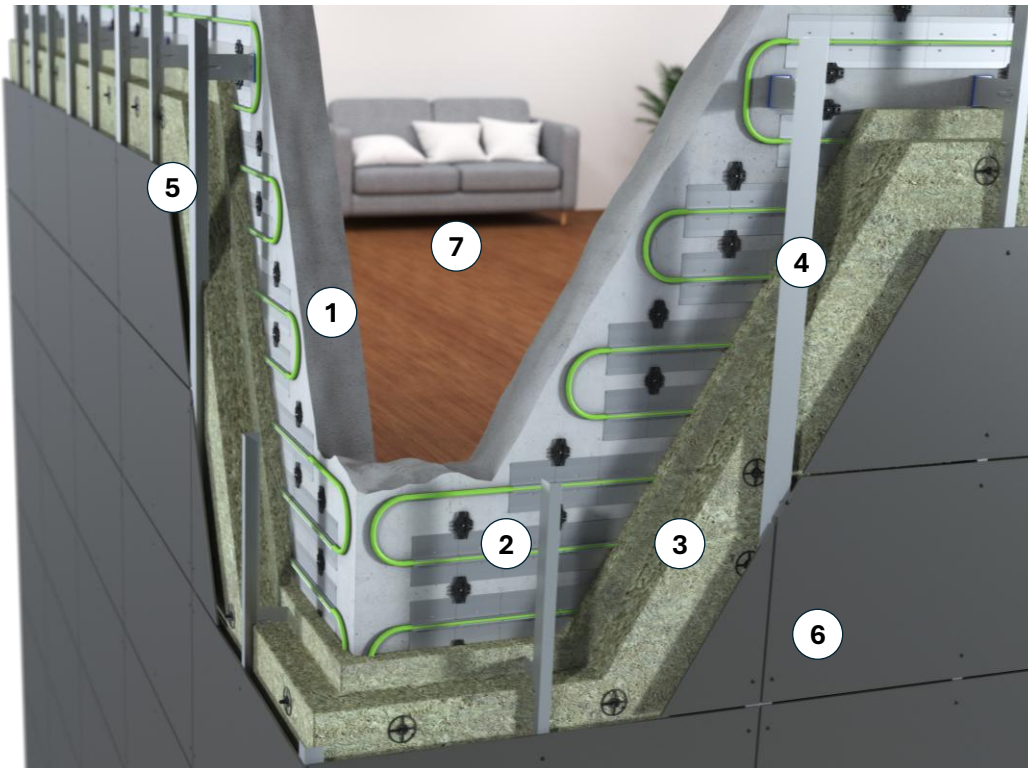
1 Million
residential units with **90 Mio m² Façade area** in Austria waiting for deep renovation with the **CEPA®** solution.

Factor 10
reduction in energy demand with renovation package (building envelope, efficient heat production, storage and emission system)

CEPA® SYSTEM LAYERS

INSULATE / HEAT / COOL while simultaneously
STORING ENERGY in the existing wall.

Applicable for both old and new buildings!

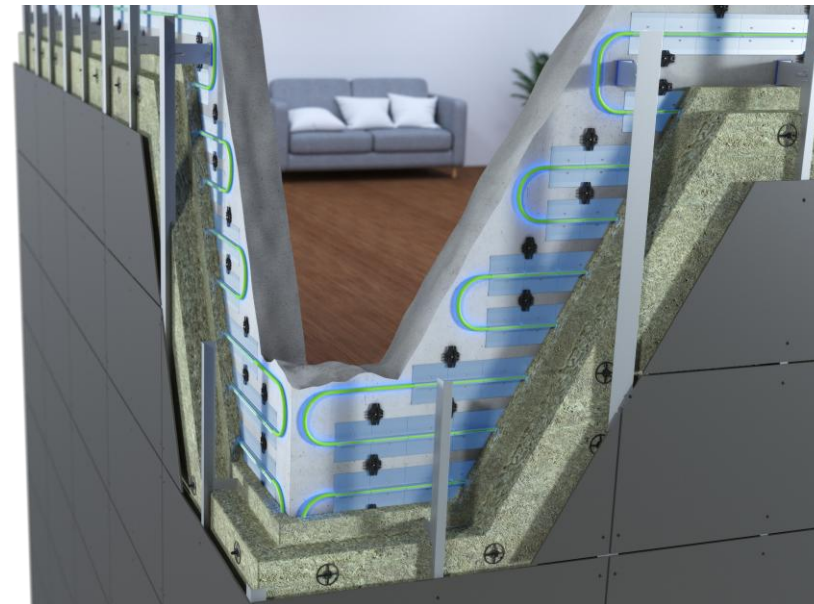
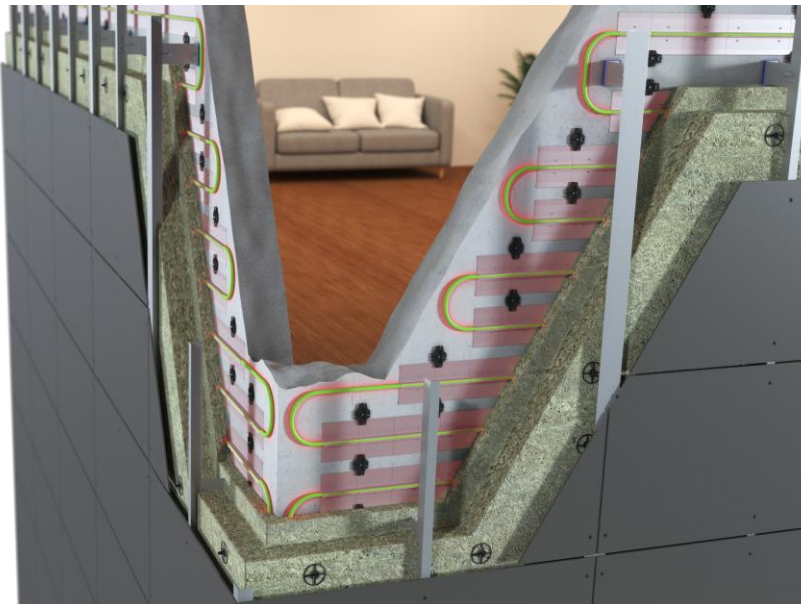
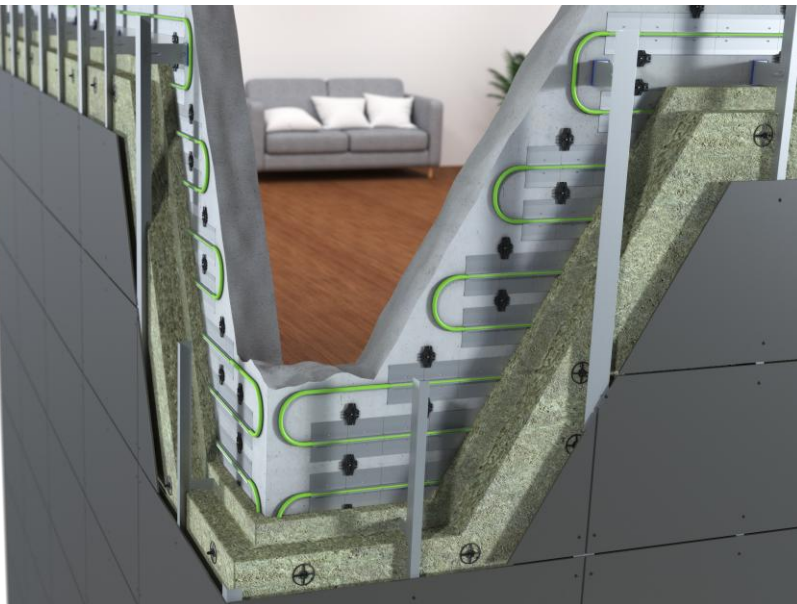
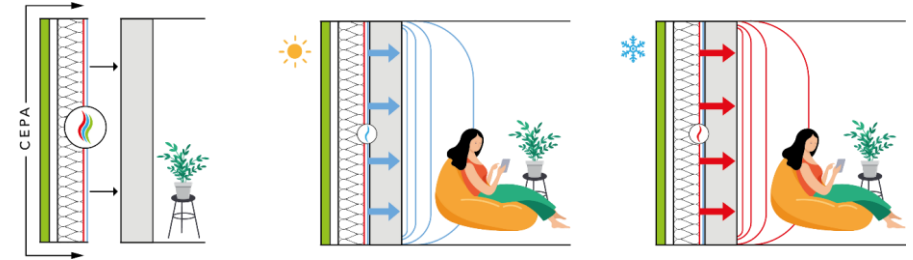


1. Existing wall - thermal mass (concrete, brick...)
2. Energy distribution system (heating/cooling)
3. Thermal insulation
4. Supporting structures
5. Ventilated cavities
6. Facade cladding
7. Living space

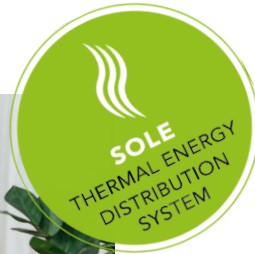
CEPA® ENERGY FASSADE

INSULATE / HEAT / COOL while simultaneously
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Applicable for both old and new buildings!



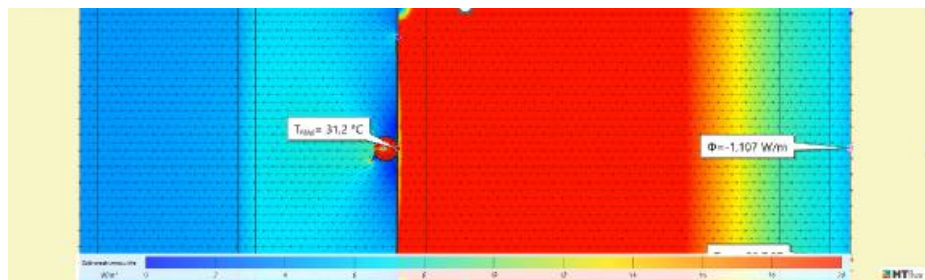
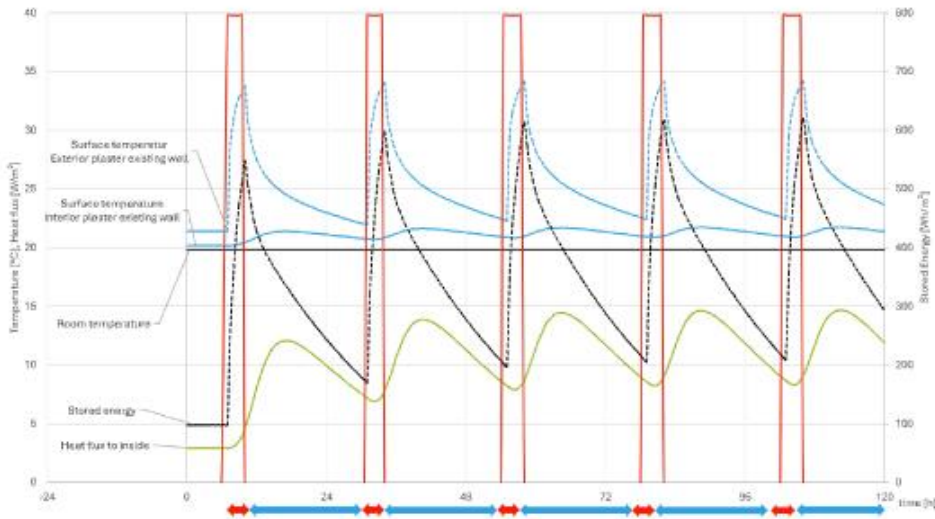
Minimally Invasive Building Renovation Through the Building Envelope



The figure consists of two parts. The top part is a color-coded cross-section diagram of a building facade showing temperature distribution from -10°C to 30°C. It includes labels for internal surface temperatures (T_{int}) at various points and dimensions ($d=0.195 \text{ m}$, $d=0.071 \text{ m}$). The bottom part is a graph plotting Heat flux [$T_{\text{amb}} = 12^\circ\text{C}, T_{\text{room}} 22^\circ\text{C}$] against U-value existing wall [$\text{W}/\text{m}^2\text{K}$]. The graph shows four horizontal bands representing different construction types: Wood chip concrete 1960-1980, Aerated concrete hollow block 1980-1990, Perforated bricks 1950-1990, Concrete sandwich 1970, Brick / Klinker 1920-1960, lime stone / natural stone -1920, and concrete. Four diagonal lines represent target heat flux levels of 30, 35, 40, and 45 W/m^2 . A vertical dashed line indicates the current average U-value of 2.45.

CEPA®: Energy flexible buildings

CEPA ideal application for renewable energies »



outside ← new facade → existing wall → inside



- Day-Ahead prices
- photovoltaic
- district heating
- solar thermal
- Local communities
- And other energy carriers

» The average daily value of used structural storage capacity within the heating season is 0,12 kWhth/m²Wall

» This represents a factor of 10 compared to radiator heating

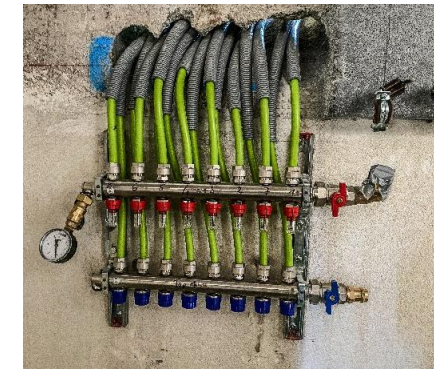
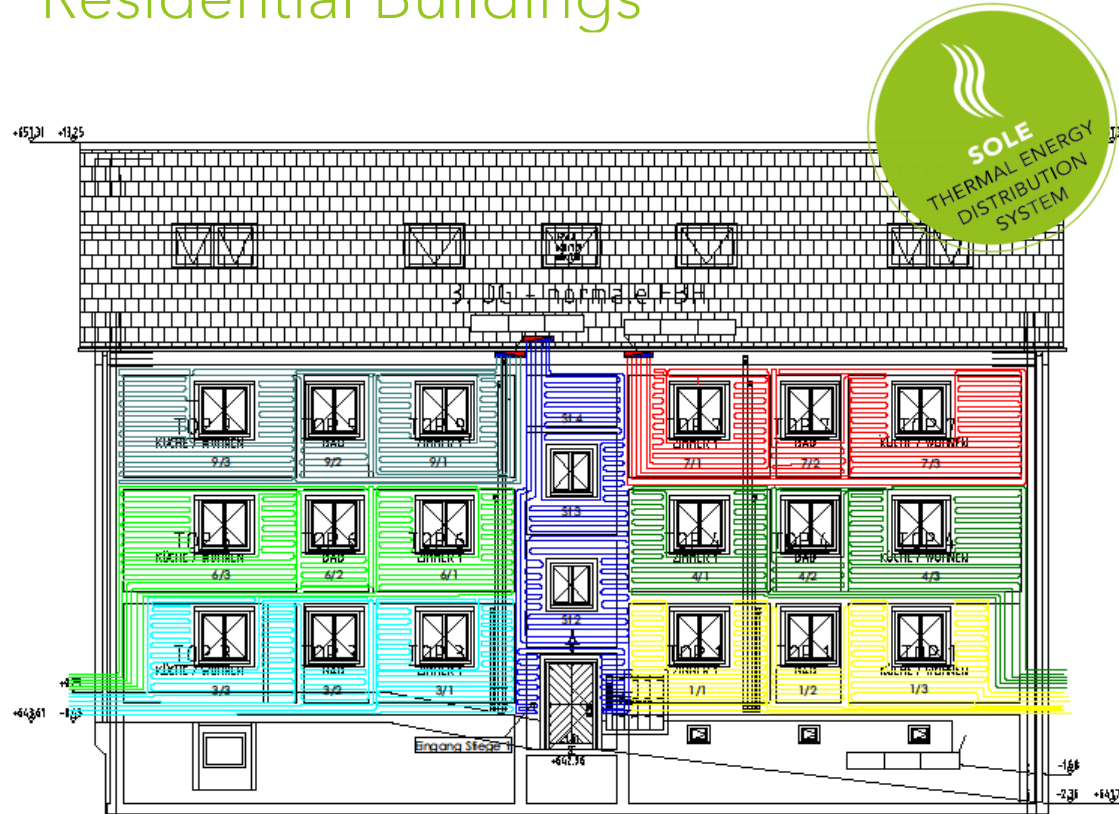
Source Paper: Participation Potential for Energy-Active Facades in Future Flexibility Markets



CEPA® Applications Residential Buildings

INSULATE / HEAT / COOL while simultaneously
STORING ENERGY in the existing wall.

Minimal invasive building renovation allows residents to remain in their
apartments during the renovation–no relocation required!

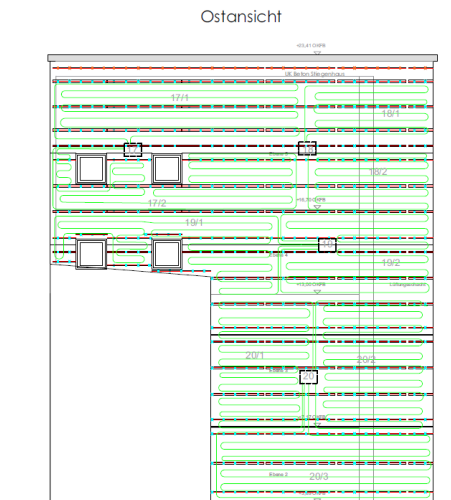
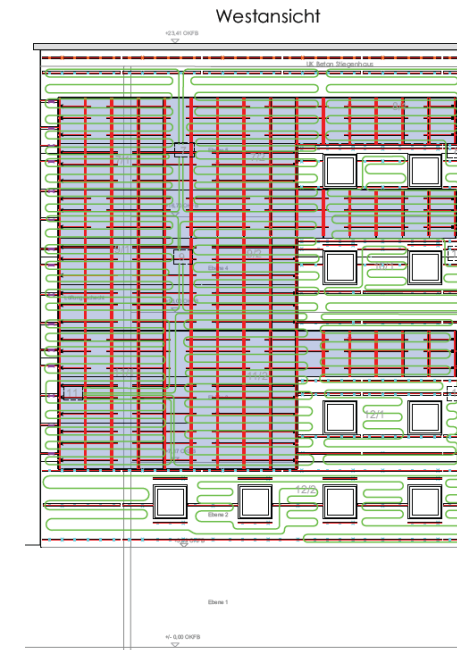
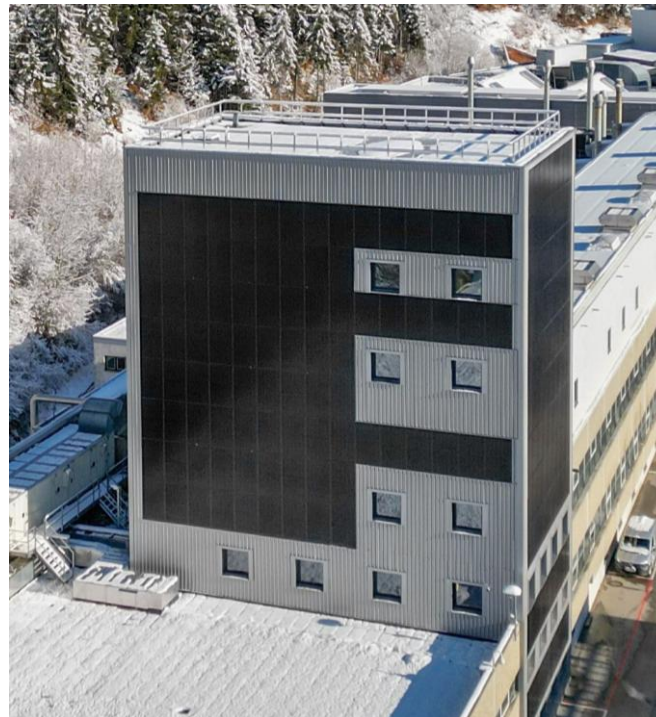
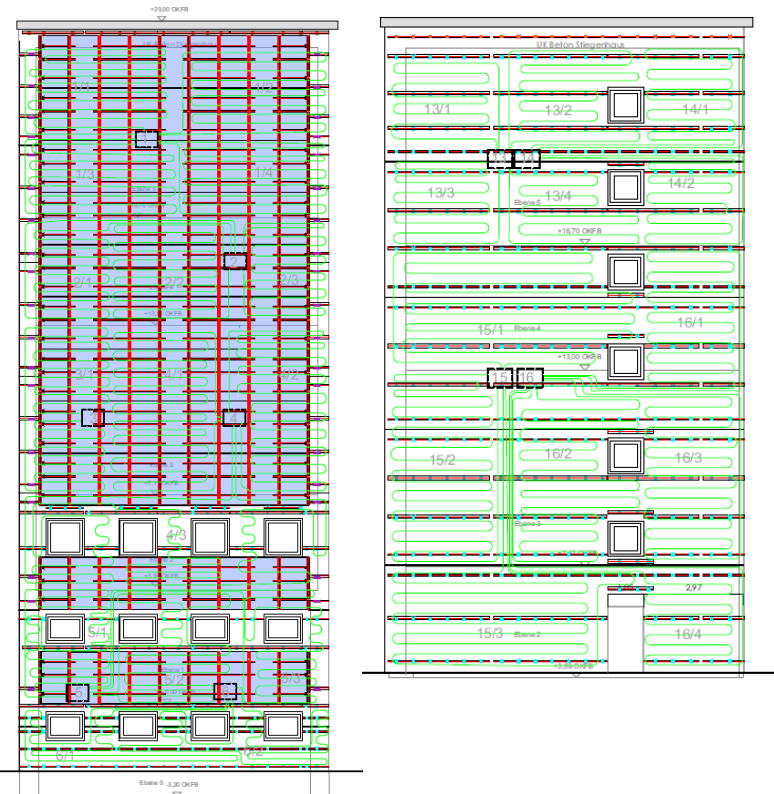


CEPA® Applications Industrial Facilities

Nordansicht

INSULATE / HEAT / COOL while simultaneously
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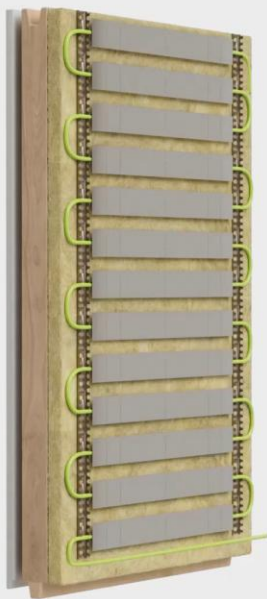
Minimally invasive building refurbishment, production can continue during the renovation, i.e. no interruption to production!



CEPA® Applications Residential Buildings

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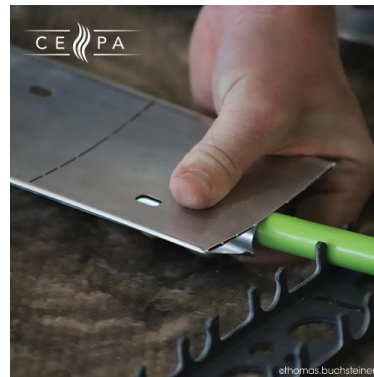
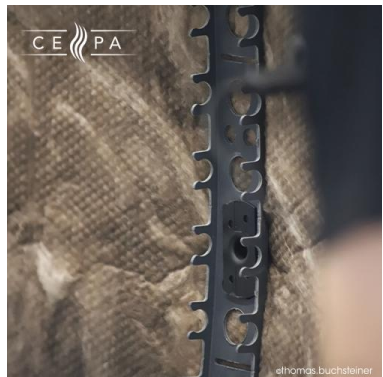
Minimal invasive building renovation allows residents to remain in their
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CEPA® Applications: Serial renovation

DÄMMEN / HEIZEN / KÜHLEN und
gleichzeitig ENERGIE im Mauerwerk
der Fassade SPEICHERN.

Fast / Efficient / Safe
The intelligent all-in-one solution



ADVANTAGES & BENEFITS WITH CEPA®

ADVANTAGES

WITH CEPA TECHNOLOGY

- 1 One stop shop (for the energy renovations of buildings)
- 2 Quality (high degree of prefabrication)
- 3 High energy efficiency (envelope & heating)
- 4 Tenant-friendly (non-invasive procedure, no relocation)
- 5 Heating and Cooling (adaption to climate change)
- 6 Energy flexibility (load management)
- 7 Life cycle costs (cheaper in invest and operation)



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