

AEE INTEC



IEA Technology Collaboration Programme



Task 43 – Unlocking the hidden potential of TAB energy storage

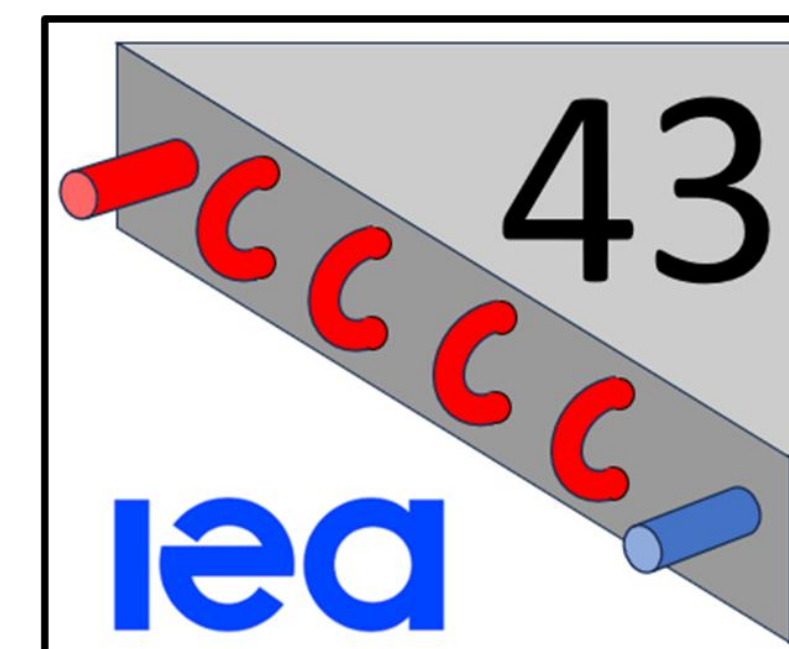
Federal Ministry
Innovation, Mobility
and Infrastructure
Republic of Austria



IEA Forschungsk Kooperation
im Rahmen von open4innovation



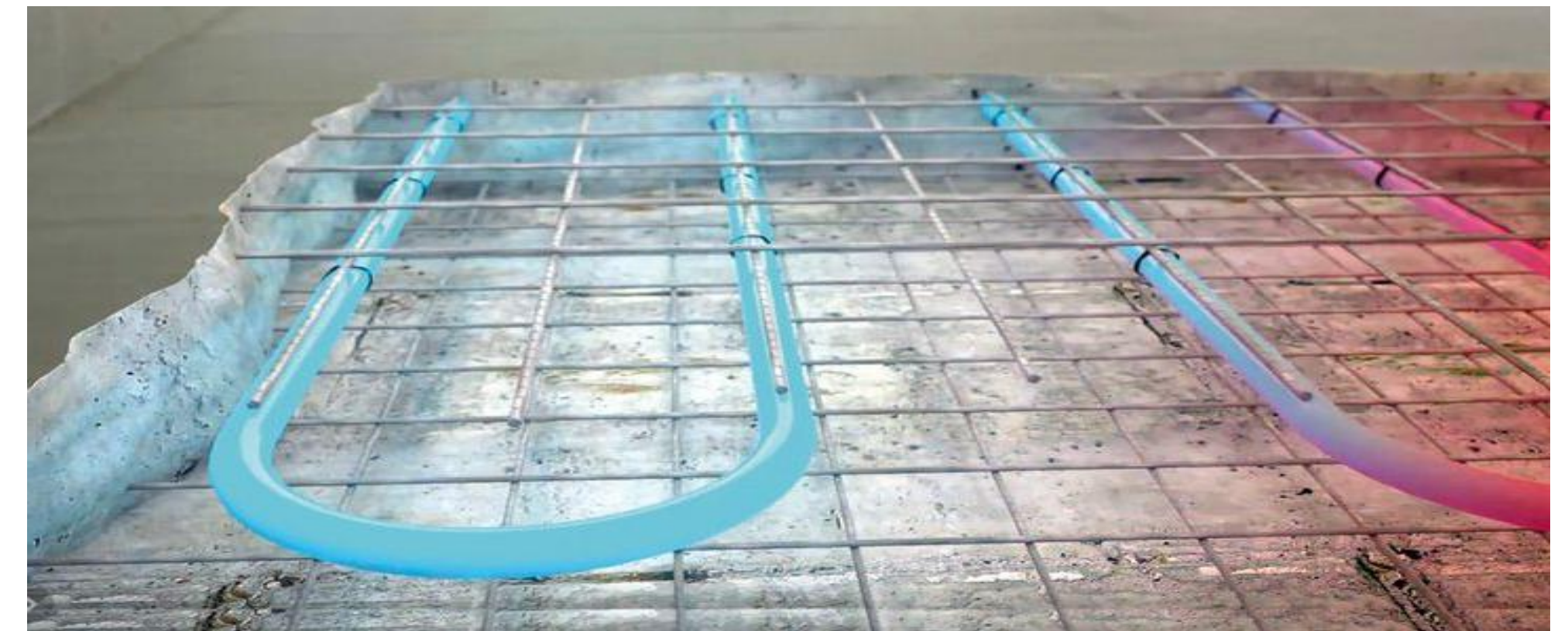
Christoph Rohringer, c.rohringer@aee.at



Thermal building mass storage – the technology

Thermal component activation ... refers to systems that use the building masses to **regulate temperature**. These systems are used for the sole or supplementary **cooling** of a building and, to a lesser extent, in some cases also for **heating**¹.

→ This allows also for the use of the building masses as abundantly available energy storage



Source: AEE INTEC



¹Wikipedia page on thermal building mass activation, 23.11.2021

Task 43 structure - Goals

Prepare thermal activated building mass energy storage for widespread, standardized and economically attractive integration.



A) How can such storages be **built** in new construction and refurbishment?



B) How can they be **operated** and **integrated** into systems?



C) How to do **business** and satisfy (end) **customers** and **residents**?



D) How to increase **reliability** and **trust** in the technology?

Task 43 structure - Subtasks

Subtask A



Construction & Materials

Subtask B



System Integration & Control

Subtask C



Non-technical Challenges

Scientifically oriented



KPIs and boundary conditions



Research findings

Subtask D

Standardisation and KPIs



Towards generalization and market interaction



Subtask A: Construction and Materials



Subtask A Leader: TU Dresden, DE

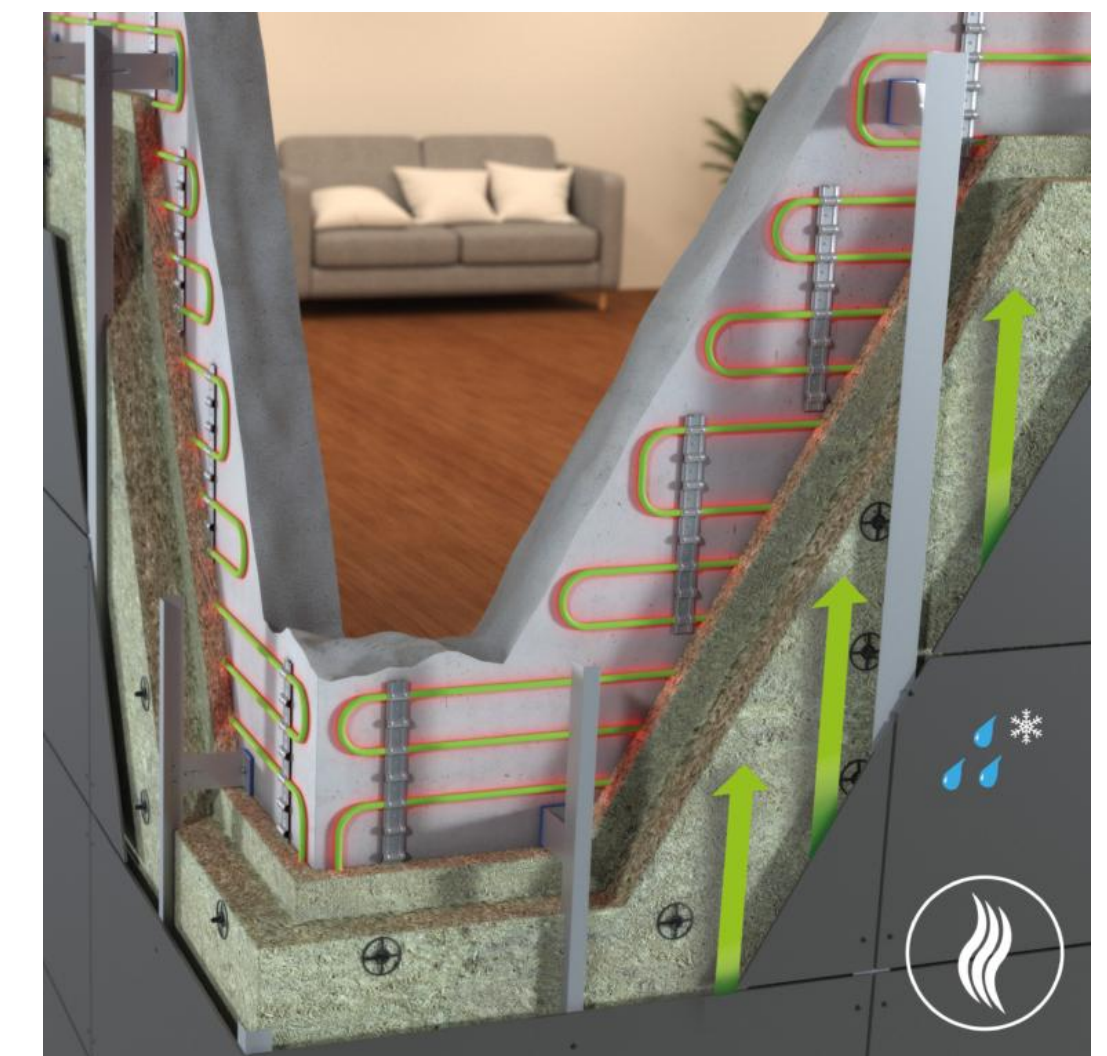
- Materials and material combinations (concrete, wood, clay, hybrid structures)
- Construction and manufacturing strategies in new buildings
- Construction and manufacturing strategies for refurbishment
- Strategies for zoning and repurposing of buildings



source: Fachhochschule Salzburg



source: Innogration GmbH



source: <https://www.cepa-solutions.com/>

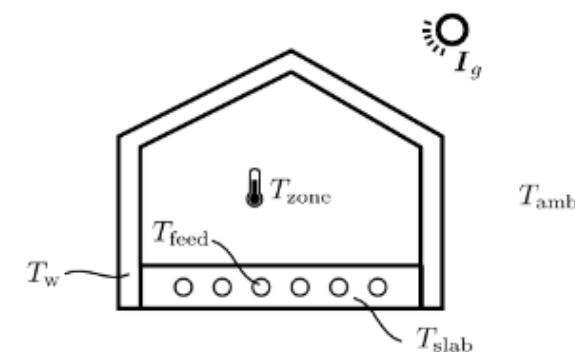
Subtask B: System Integration and Control



Subtask B Leader: BEST Research, AT

- Different approaches to modelling and simulating thermally activated buildings
- System concepts for activated building mass storage at building, district and grid level
- Control strategies at building and district level including load prediction
- Guidelines for digital interfacing, cyber security and personal data protection

Model of the thermal zones used in optimization



- RC-based model (grey-box)
- Three **states**:
 T_z ...zone, T_w ...wall, T_{slab} ...TABS
- **External Influences**:
 I_g ...solar (projected),
 T_{amb} ...ambient temp.,
 T_{feed} ...feed temp., d ...mean internal load
- **Control inputs**:
 u_h and u_c ... valve positions for heating and cooling

$$\begin{aligned}\frac{dT_z}{dt} &= k_{w,z}(T_w - T_z) + k_{slab,z}(T_{slab} - T_z) + k_{sol}^T I_g + d \\ \frac{dT_w}{dt} &= k_{z,slab}(T_z - T_w) + k_{amb,w}(T_{amb} - T_w) \\ \frac{dT_{slab}}{dt} &= k_{z,slab}(T_z - T_{slab}) + k_h(T_{feed} - T_{slab})u_h + k_c(T_{feed} - T_{slab})u_c\end{aligned}$$

Measurements

- Zone temperature
- (optional) Slab temp.

How to determine the coefficients?
How to obtain missing states?

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2.10.2023

source: BEST Bioenergy and Sustainable Technologies

Smart control improved user comfort and energy consumption

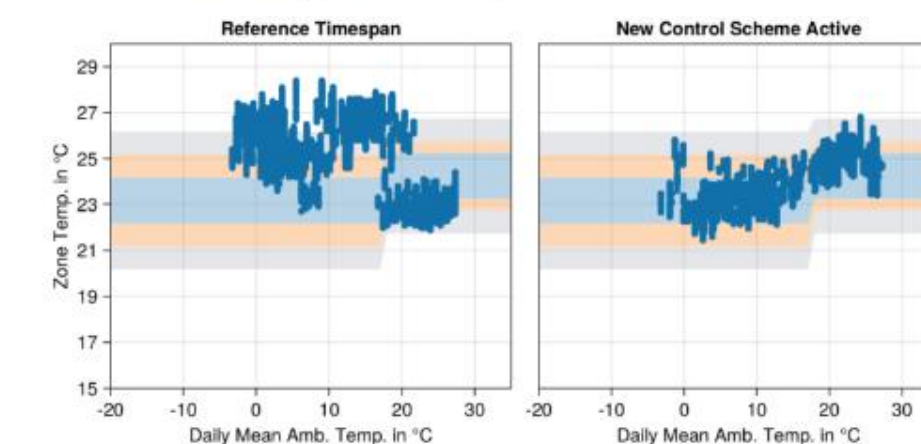


Forecast of the zone temperatures



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Improved comfort and energy savings



Less overheating in winter and undercooling in summer (over 250 days)

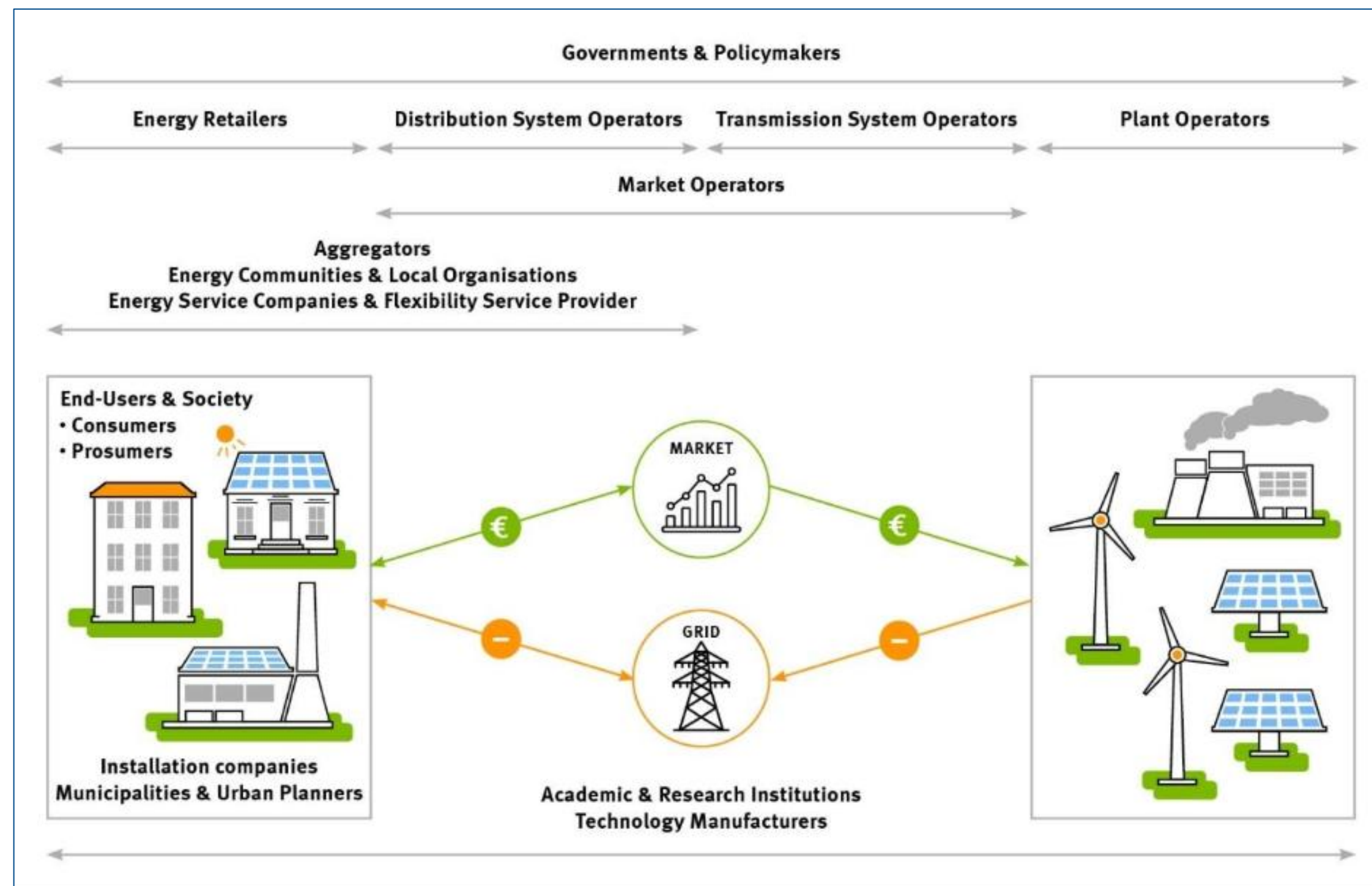
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Subtask C: Non-technical Challenges

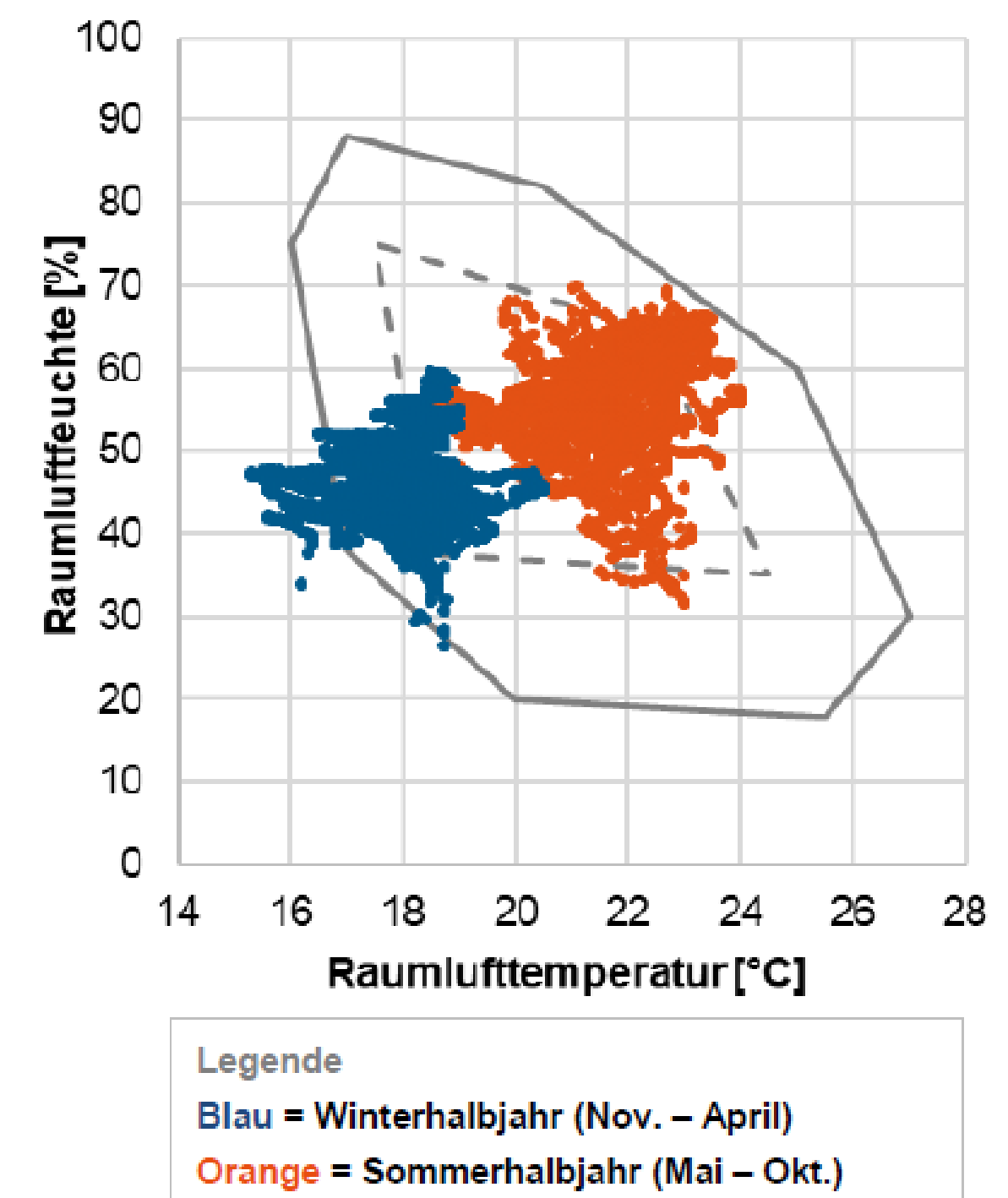


Subtask C Leader: Aalborg University, DK

- Regional boundary conditions (economic, legal, social) on local and grid level
- Successful business models, end user incentives and best practices examples
- Guidelines for indoor climate



source: Ritter et.al. Paper pre-print available <https://dx.doi.org/10.2139/ssrn.5365294>



source: e7 energy innovation & engineering, final workshop of BTTAB

Subtask D: Standardisation und KPIs



Subtask D Leader: TU Darmstadt, DE

- KPIs for TABs as basis for characterization and future standardization
- Design guidelines for TAB construction
- Design guidelines for automation and control
- Demo factsheets



source: AEE INTEC



Contents of the 35th ES-OnSeminar on Task 43



DI Walter Becke
AEE INTEC
Austria

Austrian initiatives and study "BTTAB" on TAB energy storage



DI Thomas Friedrich
Innograti on GmbH
Germany

TAB as energy storage in new construction with prefabricated panels



DI Thomas Ramschak
Towern3000
Austria

Activating existing buildings mass energy storage in refurbishment



Prof. Shady Attia
University of Liège
Belgium

Enabling Thermal Building Mass Flexibility: EU rules, barriers, and policy pathways



Contents of the 35th ES-OnSeminar on Task 43

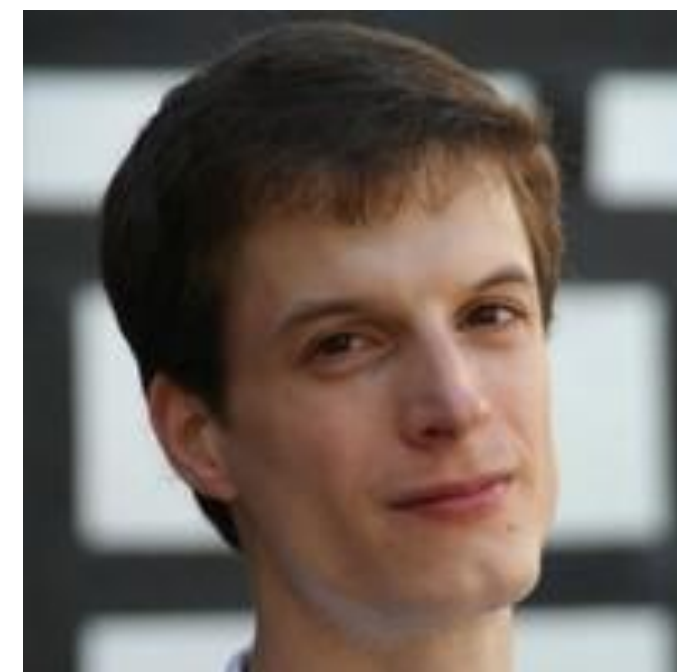


DI Christoph Rohringer
AEE INTEC
Task Manager

- Task 43 will be concluded end of 2025
- Publishable international report expected in summer 2026
- Use today to discuss with Subtask Leaders and experts



Prof. John Grunewald
TU Dresden
Subtask A



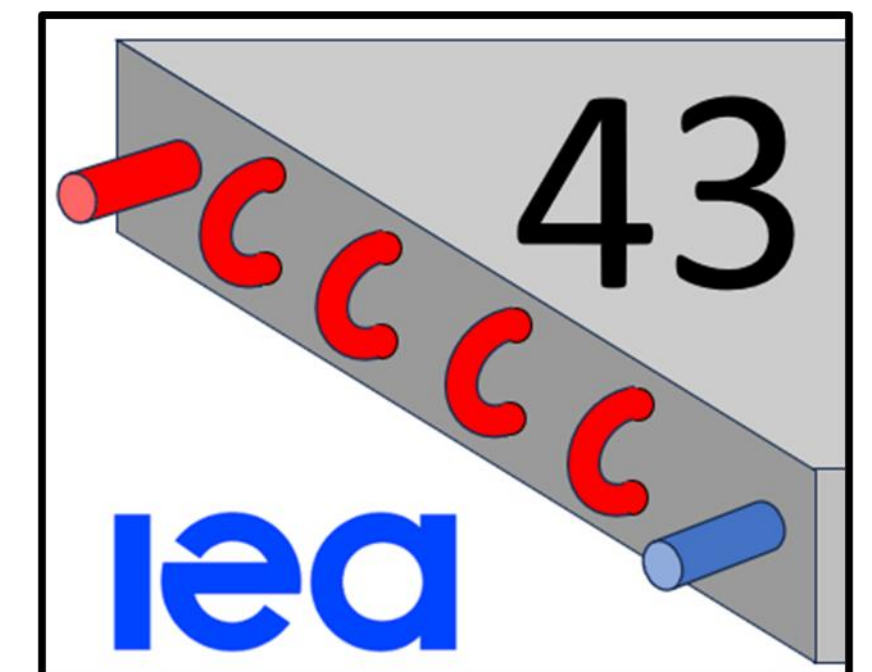
Dr. Daniel Muschick
BEST research
Subtask B



Prof. Alireza Afshari
Aalborg University
Subtask C



DI Joscha Reber
TU Darmstadt
Subtask D



<https://iea-es.org/task-43/>