

Sector coupling and district heating flexibility

2nd Expert Meeting 22nd – 24th April 2026, Torino (ITA)

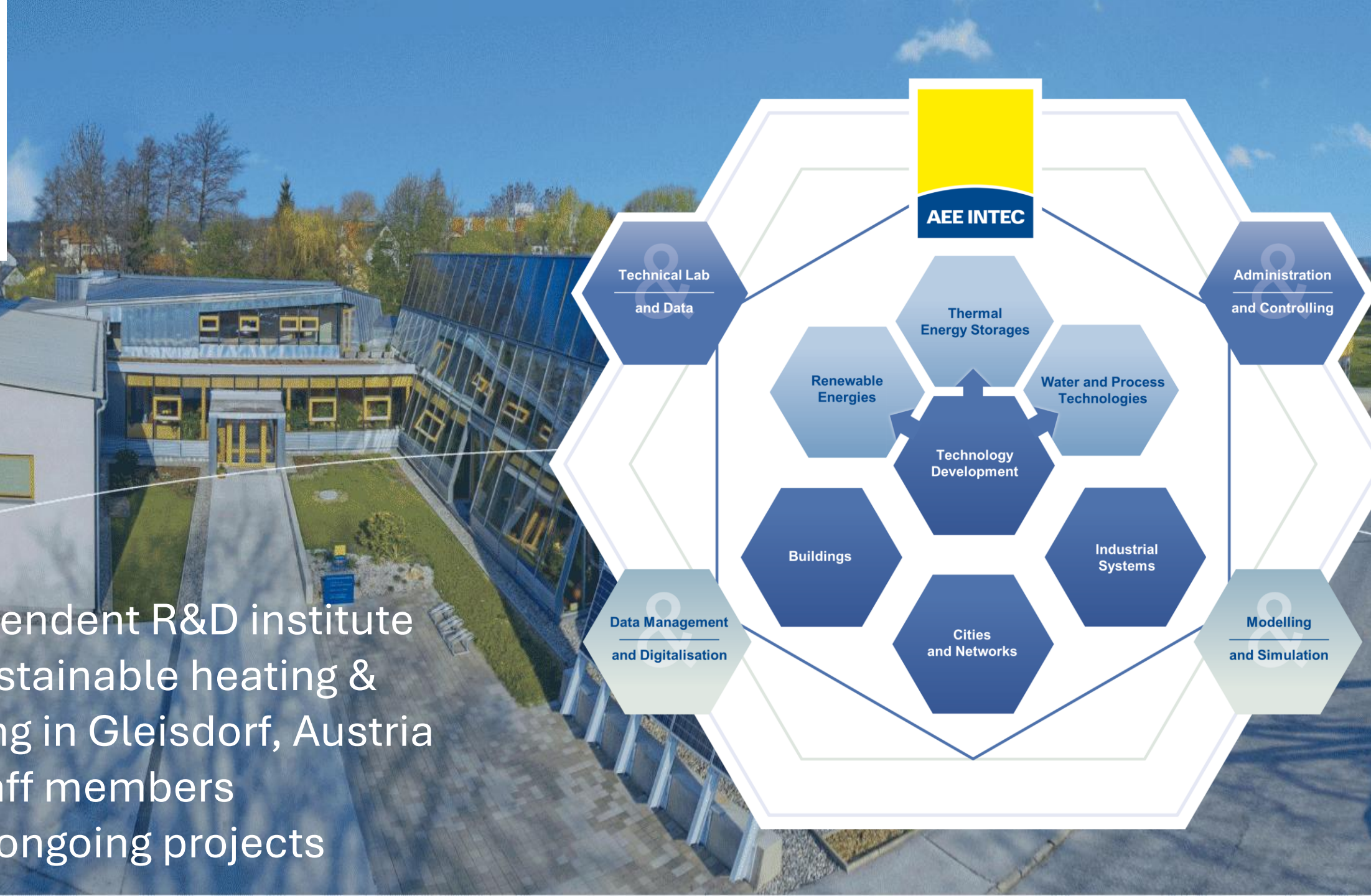
Ingo Leusbrock (AEE INTEC, AT)



Aims for this pitch

- Why more focus on heating and cooling?
- „The hidden storage potential of buildings“
- Work in previous IEA projects and current motivation
- Perspectives
 - The Austrian perspective
 - The district heating and cooling perspectives
- Introduction of possible activities

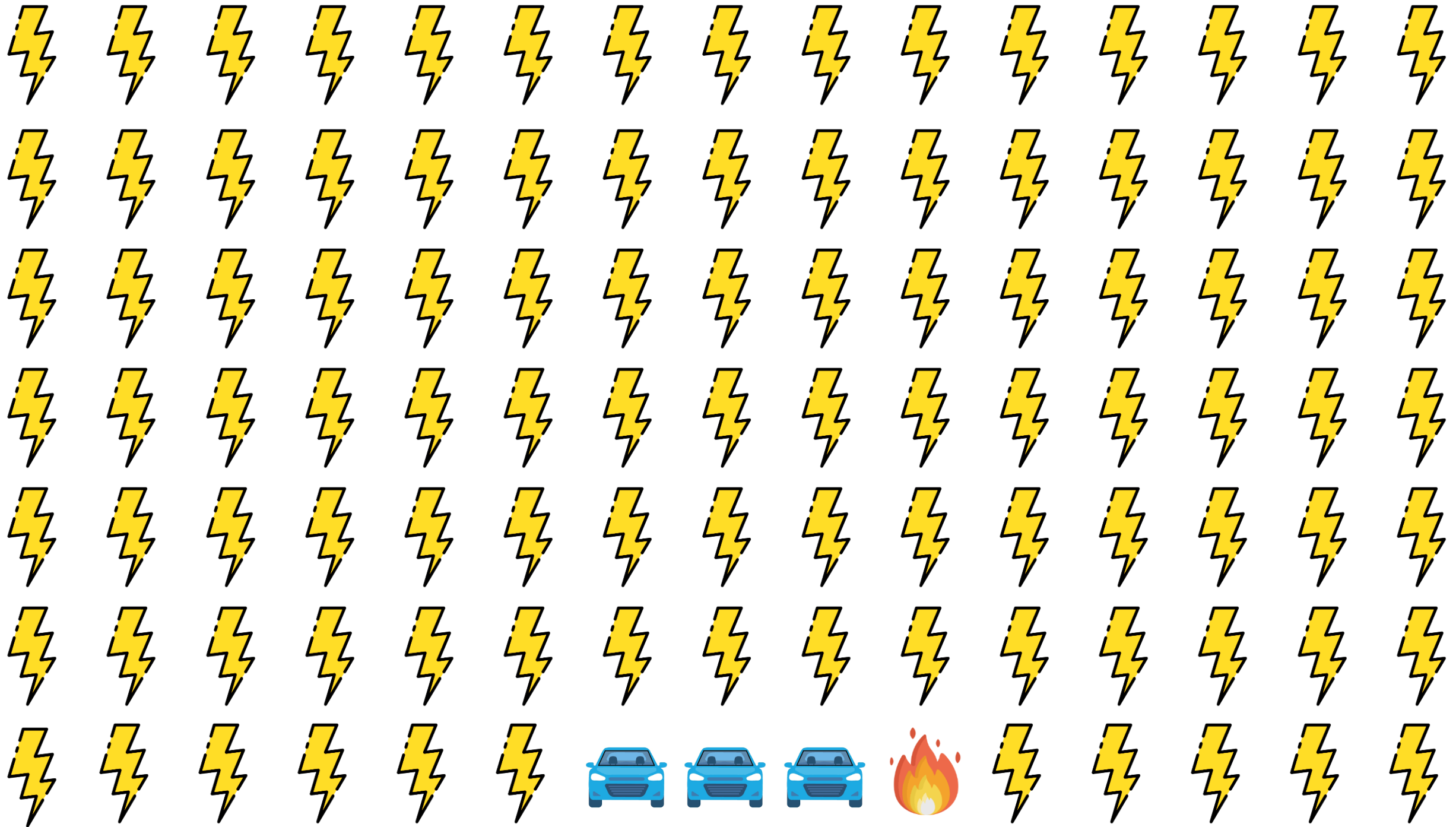


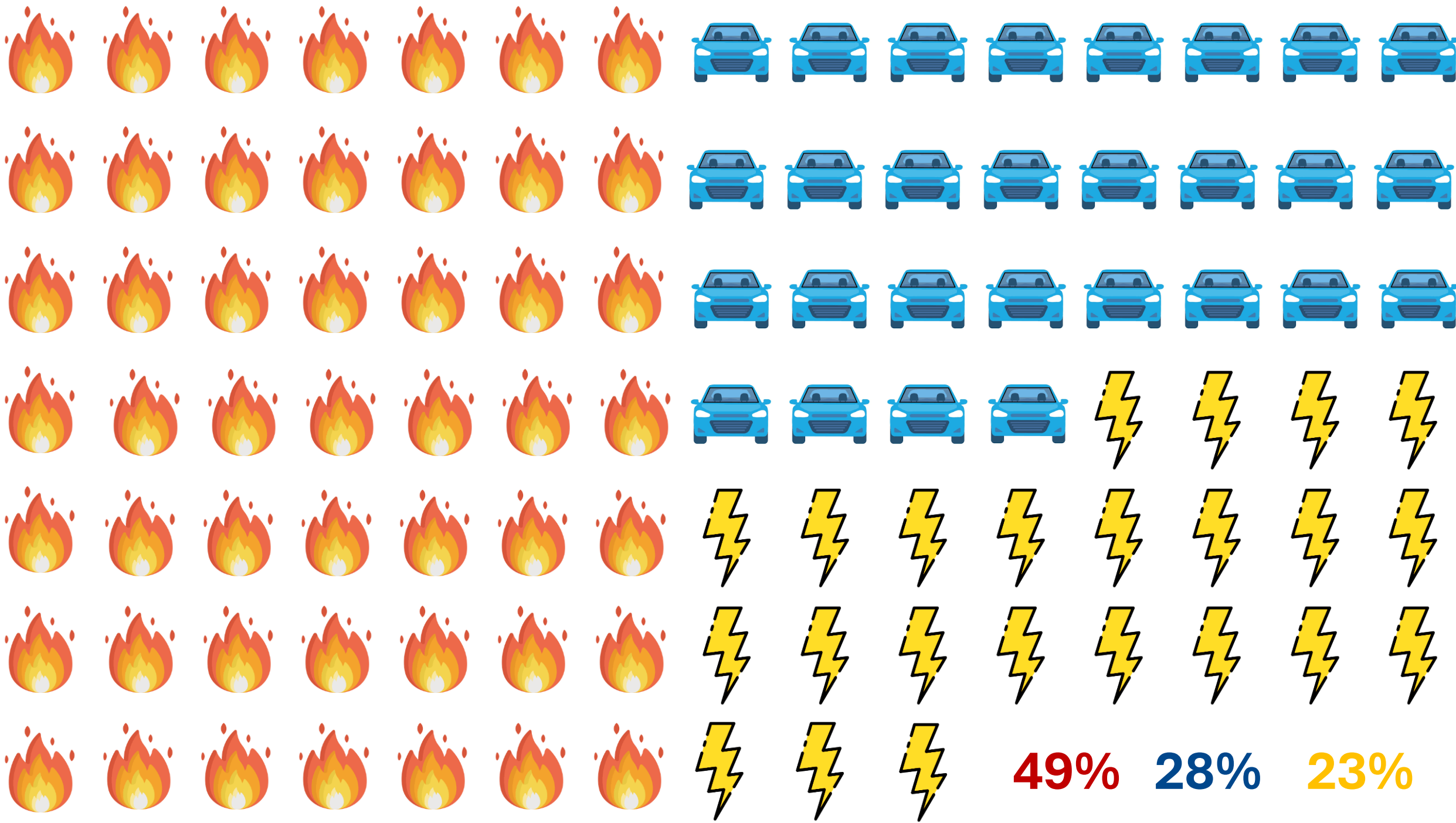


- Independent R&D institute on sustainable heating & cooling in Gleisdorf, Austria
- 90 staff members
- ~130 ongoing projects

Diverse energy system = resilient energy system





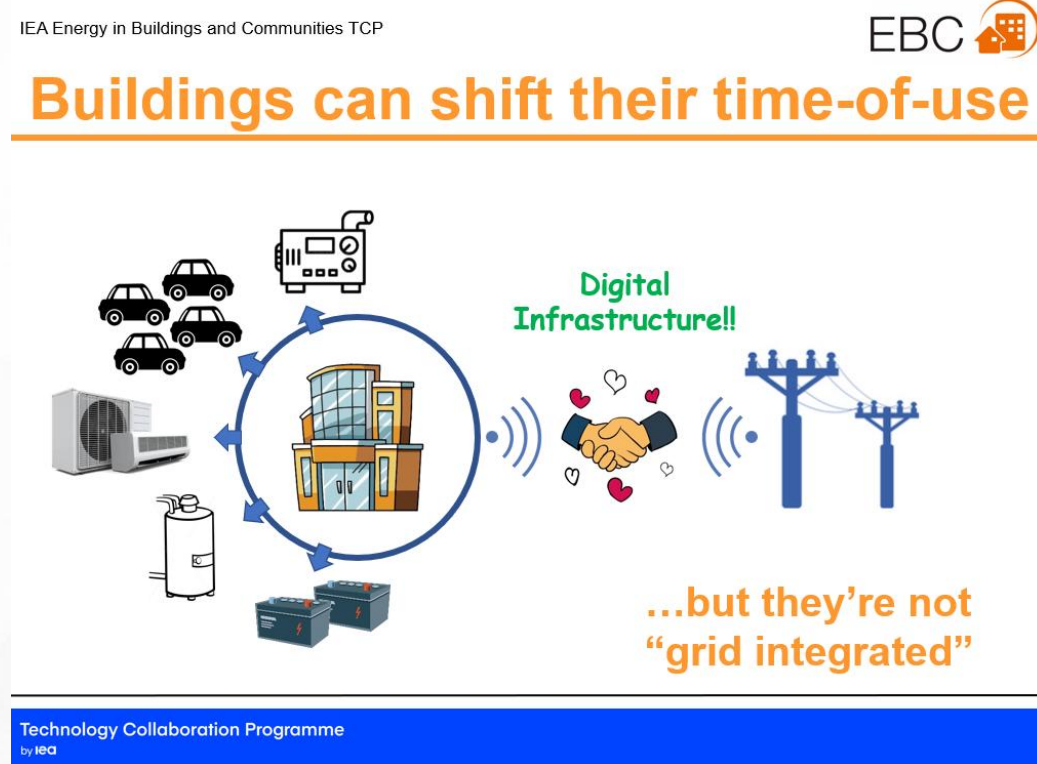
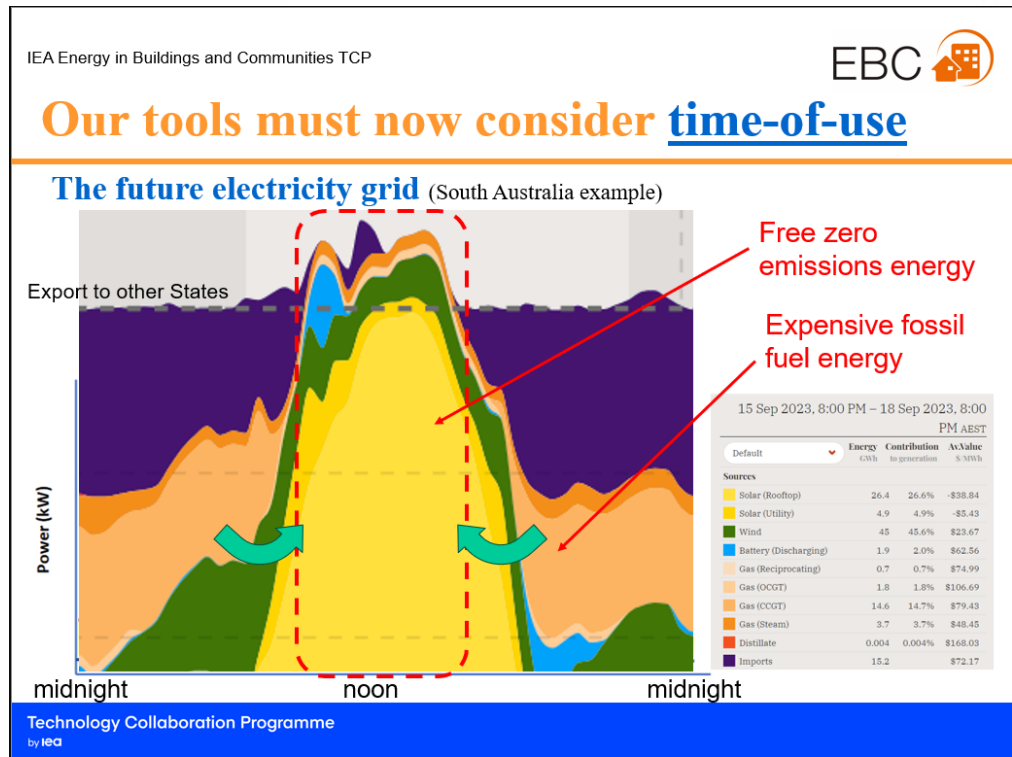


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What about (district) heating and cooling? What about sector coupling?



The „hidden“ storage potential in buildings



source: ISOCHROM

The „hidden“ storage potential in buildings



source: ISOCHROM, edited
with ChatGPT by Walter
Becke. Artificial storage
sizing based on measured
data



Costs, costs, costs



Chemical storage



Electric storage



Thermal storage

Costs per MWh storage capacity

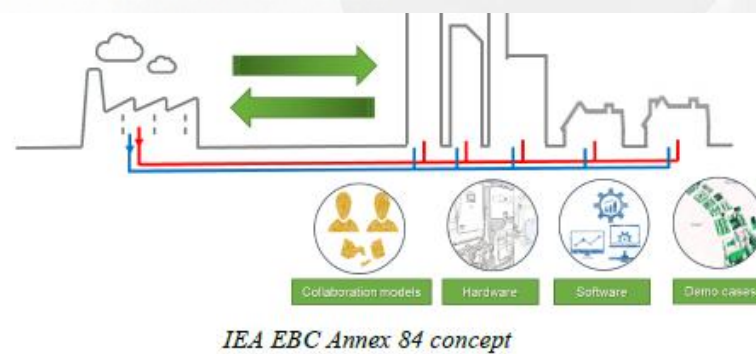


Physics

- Thermal systems are
 - Slower
 - Longer time spans for reaction
 - Storage
- Heating and cooling are needed 24/7 365
- Thermal inertia and „not direct need“ for thermal comfort offer flexibility in time
- Heat is a („waste“) product of every process



IEA EBC Annex 84



- “Demand Management of Buildings in Thermal Networks”
 - <https://annex84.iea-ebc.org/>
- Main results
 - Enhance Communication and Customer Engagement including socially equitable Pricing and business models
 - Address Regulatory and Contractual Barriers
 - Diverse building stock and DHC systems requires tailored DSM strategies, high-quality data, clear control and communication standards



IEA ES Task 43

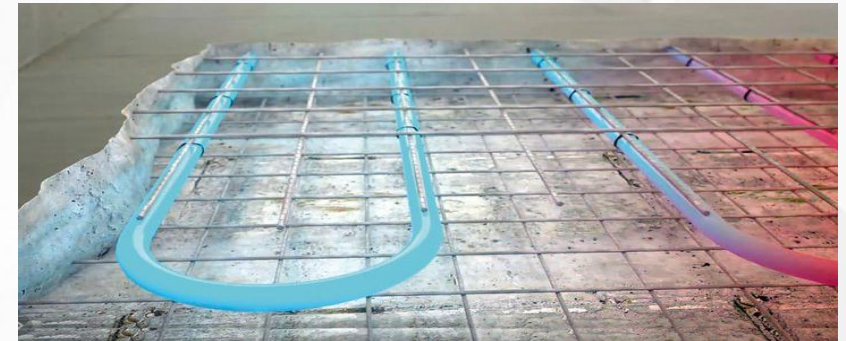


- „Standardized Use of Building Mass as Storage for Renewables and Grid Flexibility”

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

- Main results

- Innovative systems are already on the market
 - Non-technical barriers remain the biggest obstacle for widespread use of thermally activated building (TAB) energy storage
 - Proper control and system design require clear intention and cooperation of crafts at the very beginning



Source: AEE INTEC



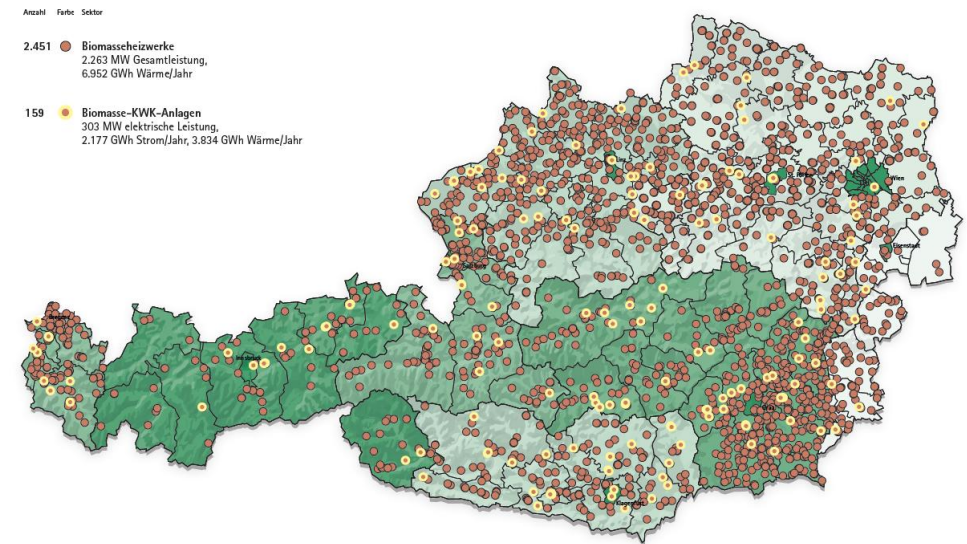
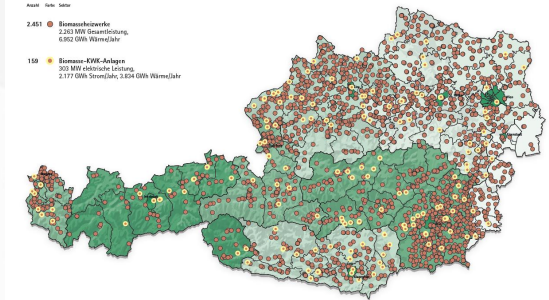
Motivation for joining forces

- Integration and utilization of both existing (e.g., building stock) and additionally installable (e.g., thermal storage, TAB, heat pumps) thermal flexibility potentials in local (!) energy systems
 - combined with intelligent business models, control concepts, and appropriate digitalization
- Added value
 - Increased use of renewables, local value creation & resource efficiency
 - Infrastructures be better utilized, faster than large-scale solutions
 - Avoid overload and reduce investment in (over)capacity for peak and high-load periods in our energy systems (e.g. DHC, electricity)



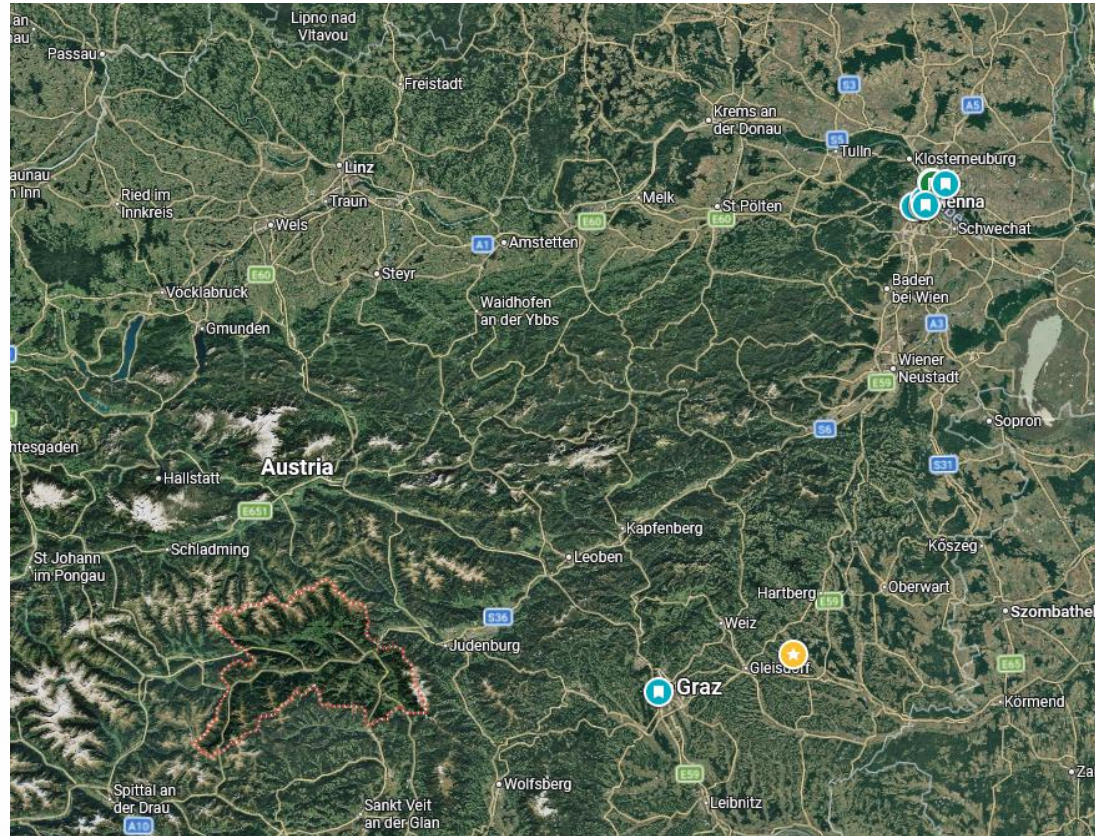
The Austrian perspective

- Large number of DHC systems
 - More than 3000 systems in ~ 2000 municipalities
- Large numbers of energy communities
 - 5.590 „renewable energy communities“ communities“, 5.000 community-based
 - Mainly focused on electricity, heating / cooling
- Rural and isolated regions with infras
 - see example District Murau



Source: ÖBMV, Basisdaten Bioenergie 2023; Daten von 2022/2023

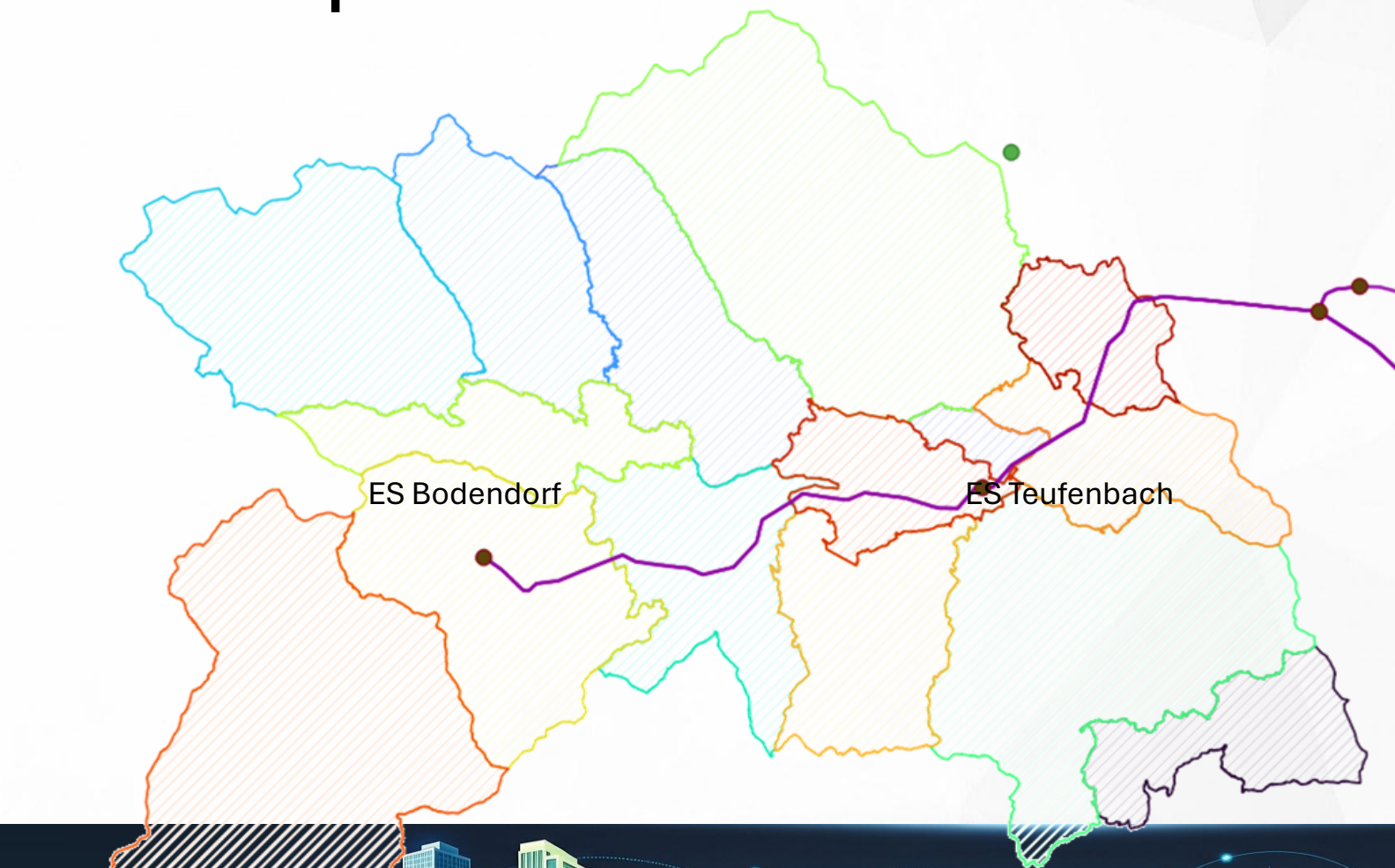
The alpine district of Murau



- Plenty of hydropower
- Plenty of PV
- Plenty of wind power
- Plenty of biomass
- But...



The alpine district of Murau

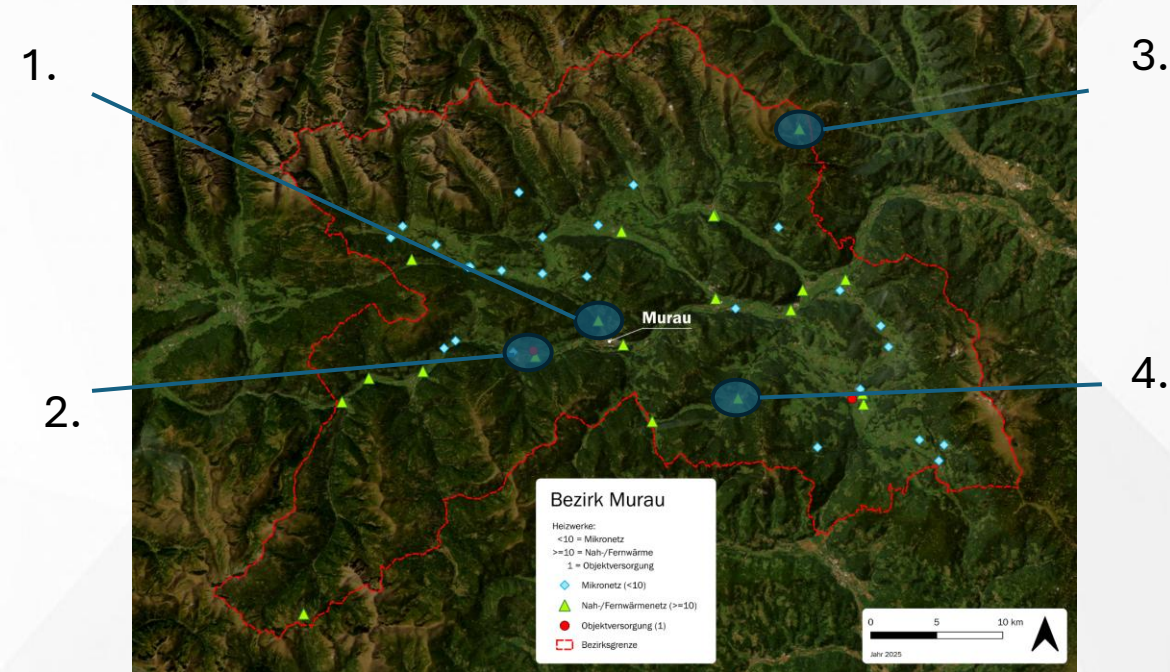


- Electricity substation Teufenbach as bottleneck
 - Current extension already too small



The alpine district of Murau

- Multiple district heating systems present
 - Largely biomass-based
- Combination / substitution with electricity-based heating / cooling / DHW on all levels?



1. Murauer Stadtwerke GmbH
2. Biowärme St. Georgen ob Murau GmbH
3. Biowärme Lachtal GmbH
4. WLG St. Lambrecht reg. Gen. mbH

@AEE INTEC: Murau-Karte



The district heating and cooling perspective

- Large temporal differences
 - Seasonally
 - Day-by-day
 - You want to have flexibility in demand and supply
- Temporal delay between supply and demand
 - Read: heat transport from A to B
- Smaller combined heating / cooling + X systems become viable
 - On building cluster / campus / neighbourhood scale



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Idea I: Flexibility concepts

- load management options and strategies for providing flexibility by integrating a wide range of electricity, heating and cooling supply options in individual buildings, building clusters, neighbourhoods and district heating systems,
- Scaling load management from individual buildings to building clusters
- Assess the influence of building physics properties / the potential of flexible loads in buildings for building-level / system-wide decarbonisation



Idea II: Integration of “Thermal Flexibility Learnings” from Annex 84

- Transfer the thermal flexibility typologies, component evaluations, and the flexibility readiness framework (esp. for DHC substations and building-internal systems) developed in Annex 84
- Quantify flexibility potential / profiles for different buildings
 - Apply the building classification logic and thermal envelope performance KPIs
 - Test and compare white-box, grey-box and RC approaches and use them for scenario on “building clusters”



Idea III: Business Models, Tariff Design & Regulatory Models

- Develop (digital) concepts for providing flexible load resources for the energy markets,
- Compare incentive & business models
- Propose tariff structures that reward building-side flexibility and coordinate with utility-side needs
- Derive policy recommendations



Idea IV: Digital Infrastructure & Data Integration Models

- “Aligned” digital infrastructure for HVAC, thermal storage, and renewable production with market-based grid signals.
- Interaction of distributed storage and sensor-rich networks ((U)LTDHC, geothermal).
- Development of “minimum information” models and semantic data models for flexibility platforms.



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Questions & Discussion joint activities

