# giga_TES: Giga-Scale Thermal Energy Storage for Renewable Districts

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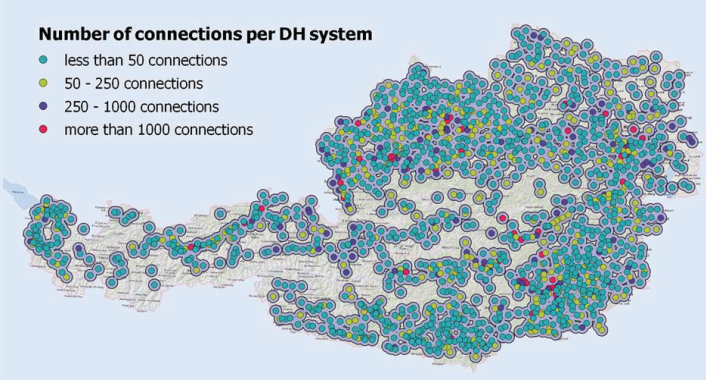
## Motivation

- Target 100% renewable energies
- Large part of heat provision through District Heating and Cooling (DHC)
- Large scale thermal storage provides the required flexibility
- Large Storages need to be: **Bigger – Better – Affordable**

## Objective

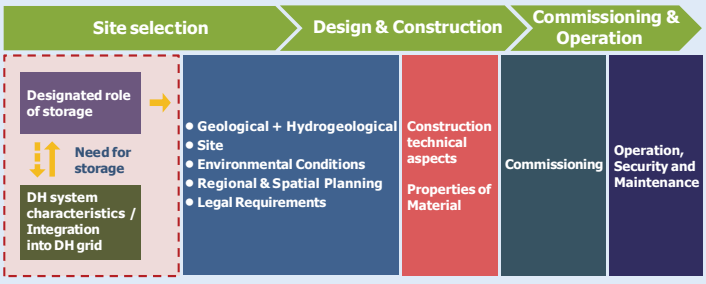
Development of different, dedicated concepts for large scale thermal storage that

- provide more storage capacity
- are energetically better than state-of-the-art solutions
- are more cost effective than current technologies
- are better integrated in the overall district heating system
- have increased lifetime



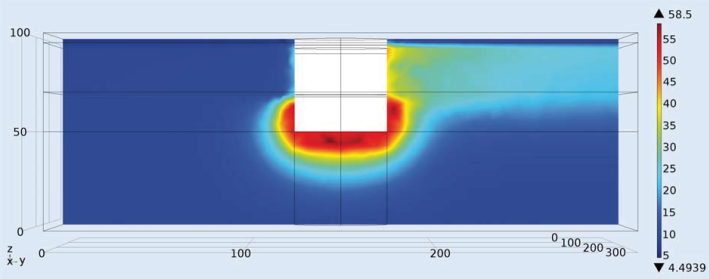

*DH Networks in Austria with 5 km Buffer Zones*

## giga_TES – Design Boundary Conditions




## Computer Assisted Storage Optimisation

- Development of a detailed multi-physics storage model for storage design, optimization and evaluation
- Modeling of single components for system and component pre-design
- Development of an adapted and calibrated coarse structure model for system simulation

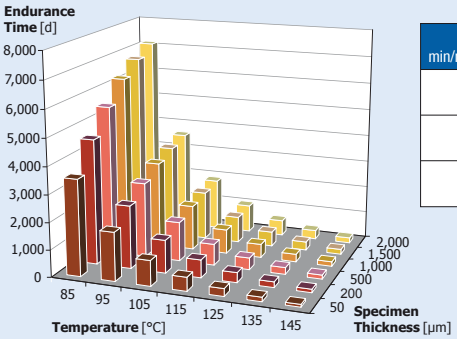



*2D simulated temperature field of a storage with groundwater flow*

Source: University of Innsbruck

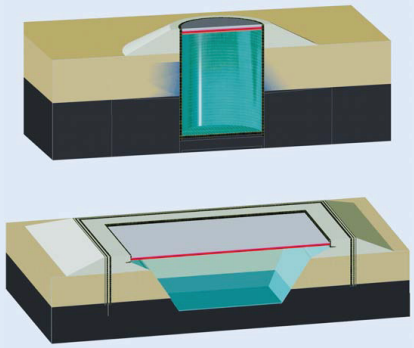
## Materials Development and Testing

- Polymeric materials for thermal energy storages with lower material and installation costs
- For operating temperatures up to 95°C in air or water novel material formulations are developed and investigated on their long-term performance
- Focus is to investigate the effect of thickness and temperature on the aging behaviour of novel PolyPropylene random copolymers




| Storage type min/max. temperature [°C] | Predicted lifetimes [years] |
|---|---|
| **low** 40/75 | 47 |
| **medium** 50/85 | 34 |
| **high** 60/95 | 20 |

## Giga-Scale Thermal Storage Technology Development



Different geometries and construction principles are investigated. For instance, on top is a cylindrical concept with diameter and depth of 50 m, and a volume of about 100,000 m$^3$; on the bottom a pit-type concept, typically applied for volumes larger than 500,000 m$^3$; here the depth is 50 m and the surface 130 × 130 m$^2$

powered by klima+ energie fonds

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## Project Consortium

**Industry**: PORR, AGRU, VAM, Wien Energie, SOLID, Ste.p, METAWELL, Geologie und Grundwasser, Gabriel Chemie, Lenzing Plastics, Salzburg AG, GVT
**Research**: AEE INTEC, UIBK, Johannes Kepler Universität Linz, IPMT: Smart Minerals
**Foreign expertise**: PlanEnergi, SOLITES