

# HEATSTORE

## HIGH TEMPERATURE UNDERGROUND THERMAL ENERGY STORAGE (HT-UTES)

KNOWLEDGE SHARING AND MONITORING MEETING, 28. OCTOBER 2020

THOMASVANGKILDE-PEDERSEN, GEUS



# HEATSTORE FACTS AND FIGURES

- GEOTHERMICA ERA-NET funded project focused on demonstration of high-temperature underground thermal energy storage, HT-UTES
- Consortium of 23 partners in 9 European countries, coordinated by TNO, the Netherlands
- Strong involvement of industry, providing close to 50% project funding
- 6 demonstration sites, 8 case studies
- 16.3 MEUR total project budget

[www.heatstore.eu](http://www.heatstore.eu)

**TNO** innovation  
for life



$u^b$

storengy

ECW  Network



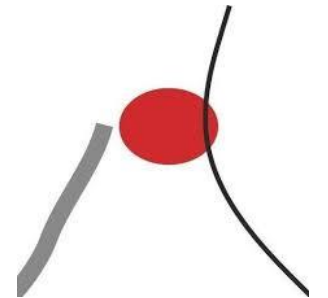
  
KEMPENS  
WARMTEBEDRIJF  
groene warmte uit de regio

KWR



unine  
UNIVERSITÉ DE  
NEUCHÂTEL

ewb  
PlanEnergi



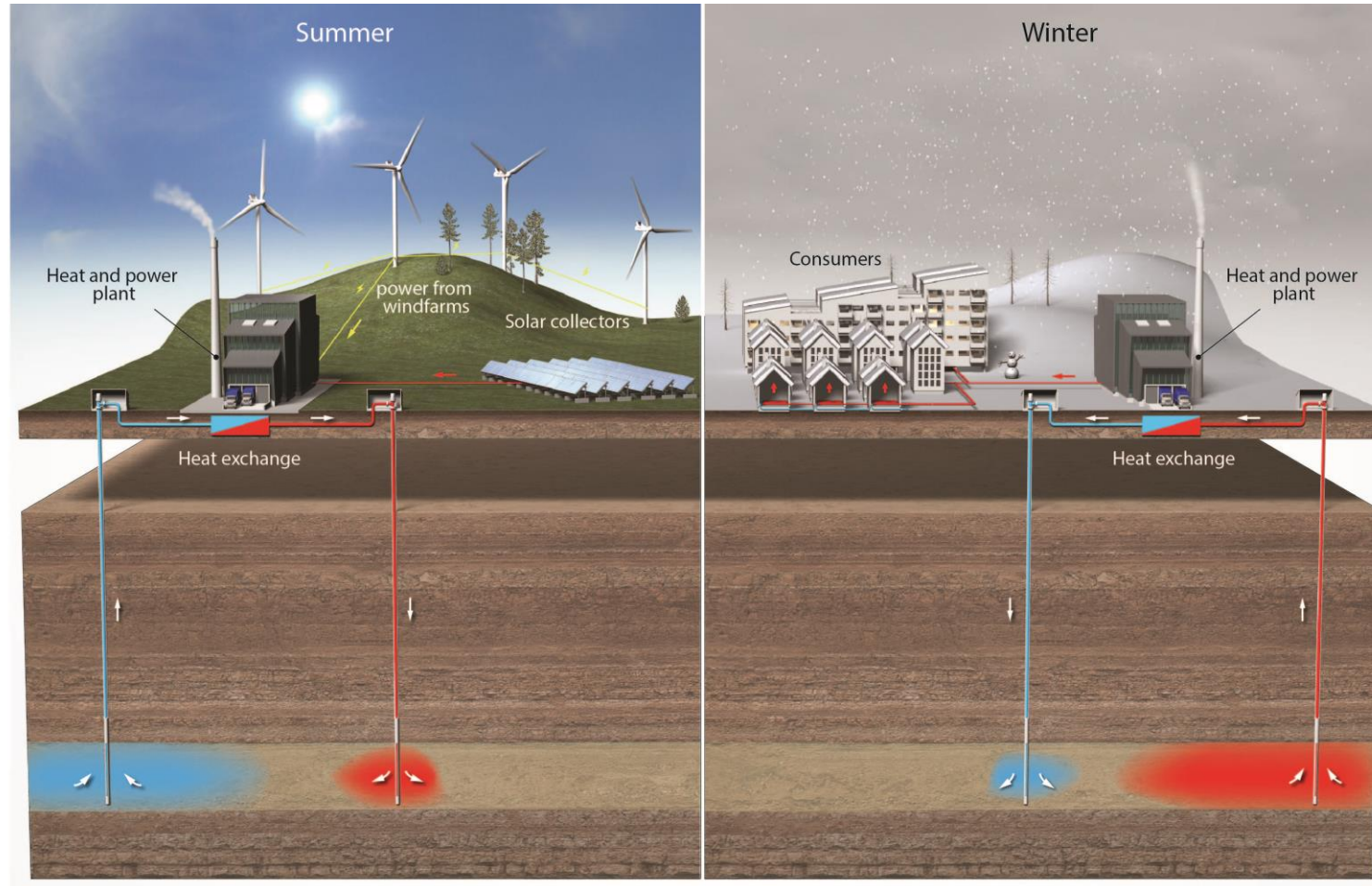
SPIE

delta h  
Ingenieurgesellschaft



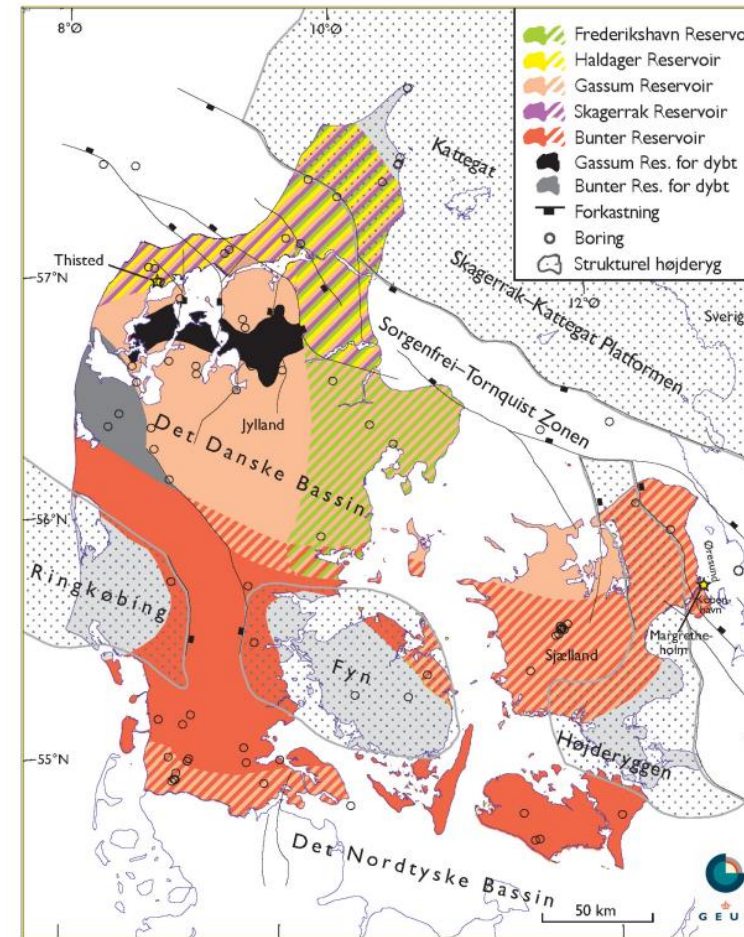
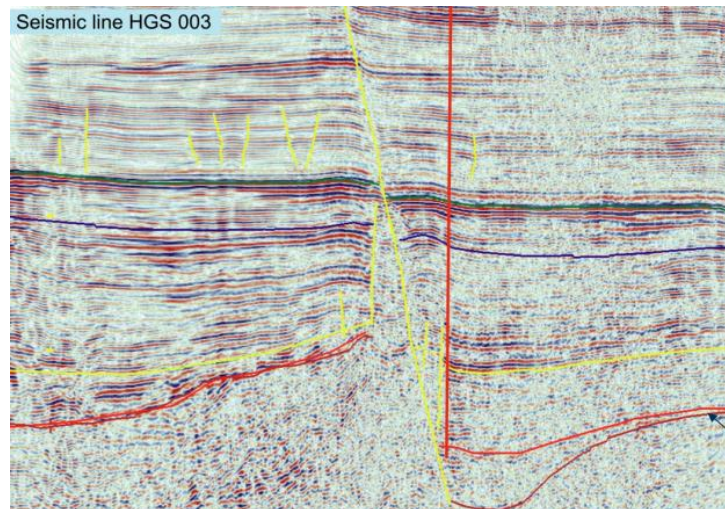
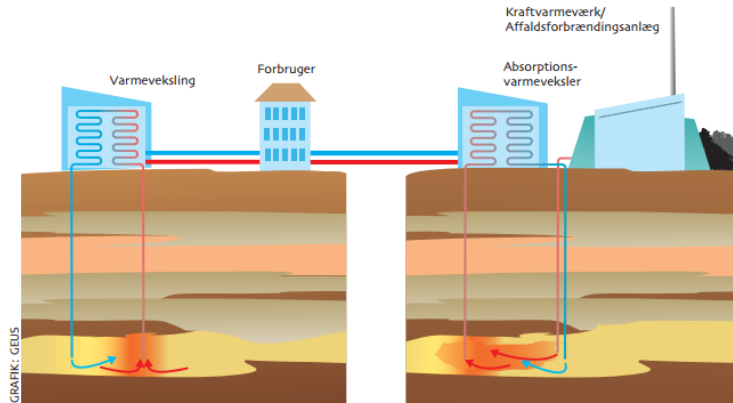
OR  
Reykjavík Energy

# AQUIFER THERMAL ENERGY STORAGE (ATES)

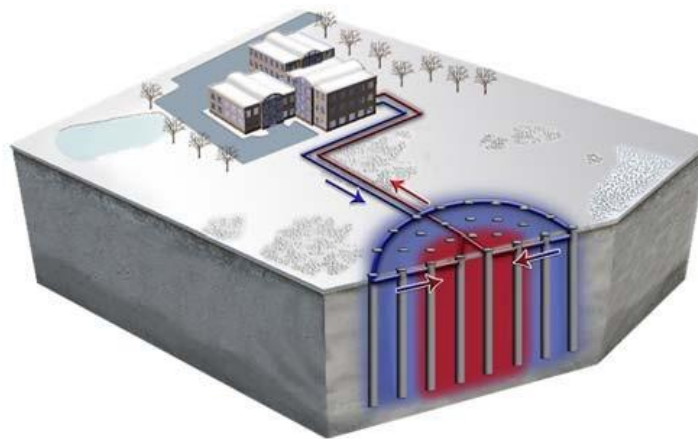
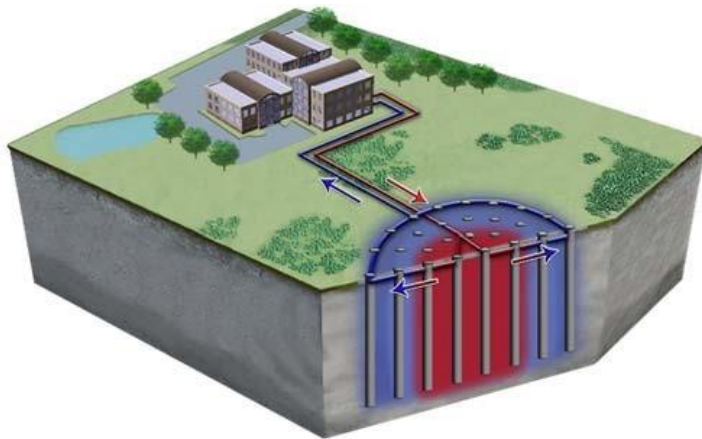
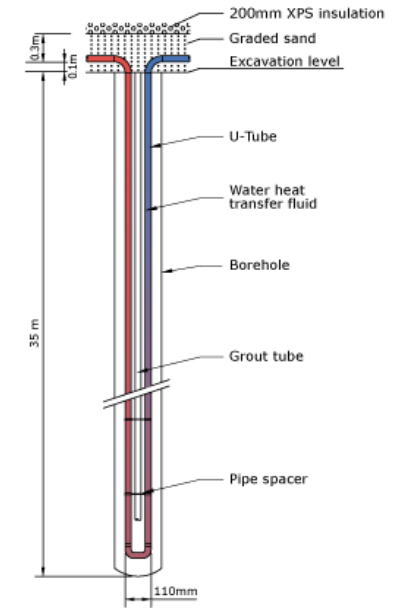
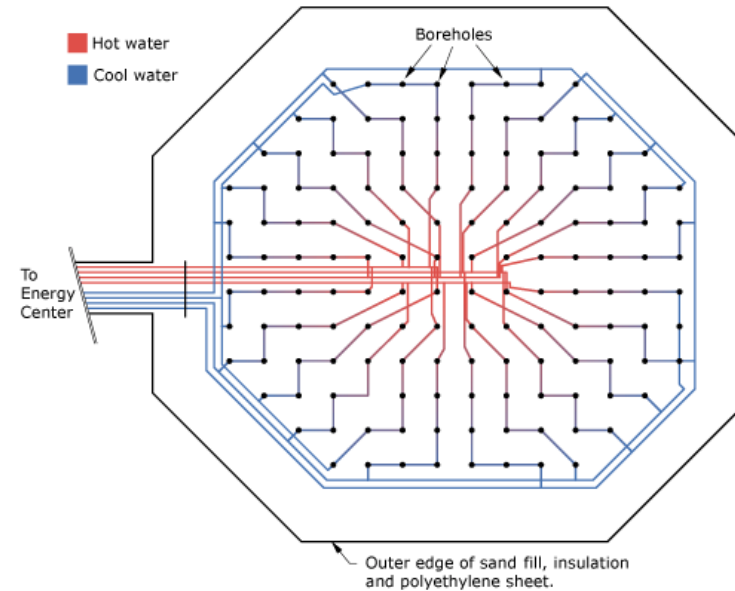




# HIGH-TEMPERATURE ATES (HT-ATES)



# BOREHOLE THERMAL ENERGY STORAGE (BTES)

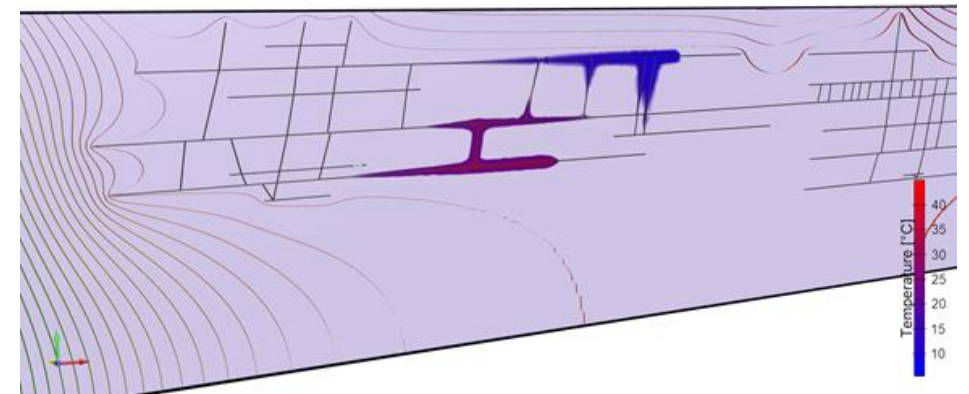
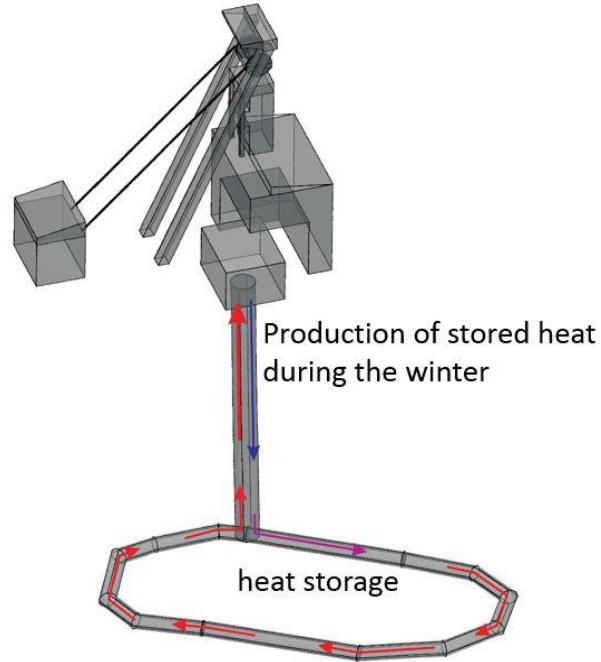
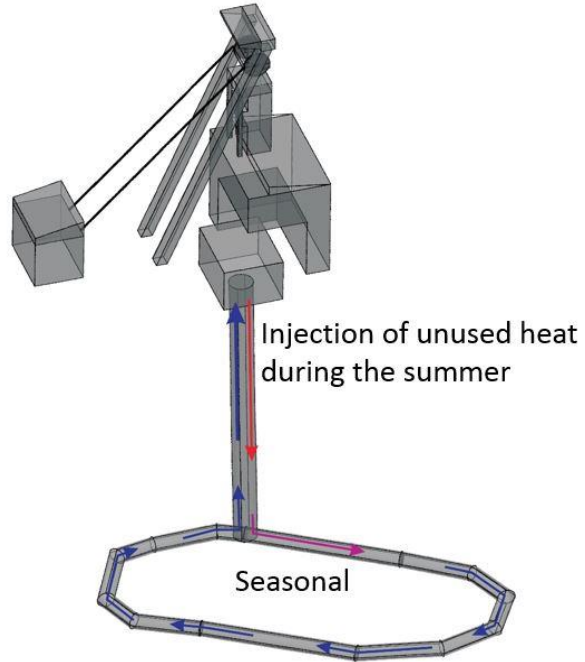


# PIT THERMAL ENERGY STORAGE (PTES)



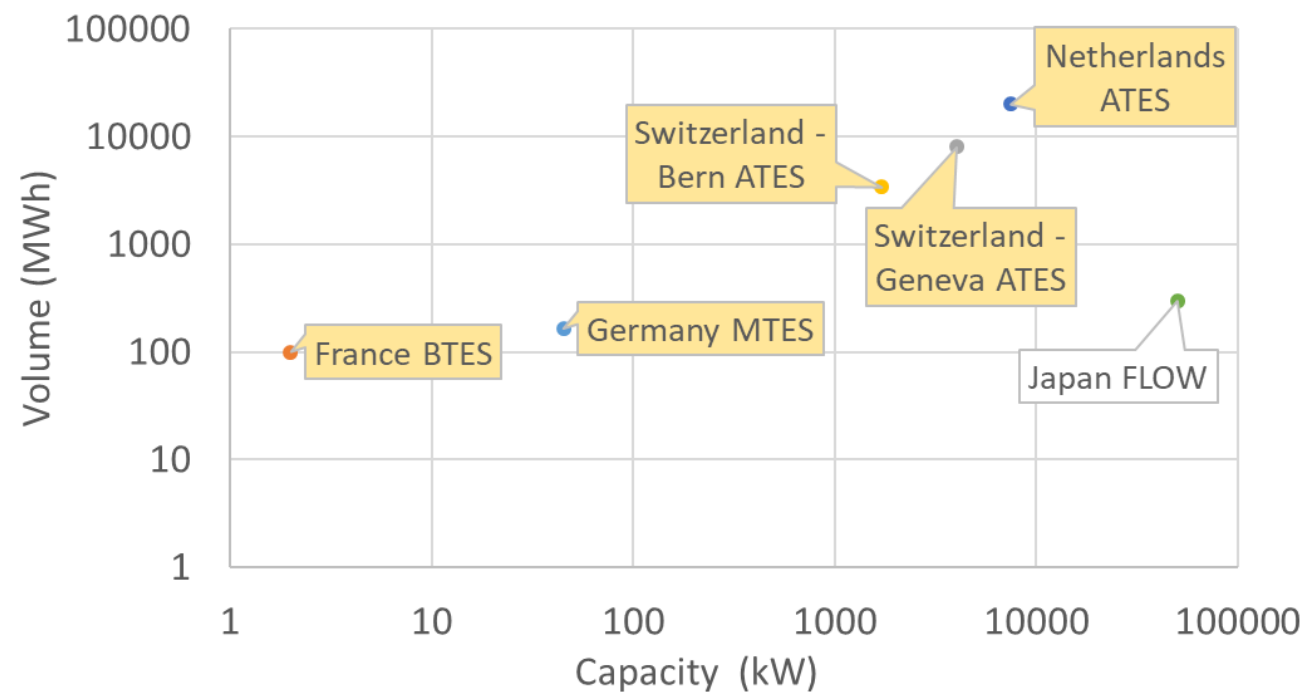
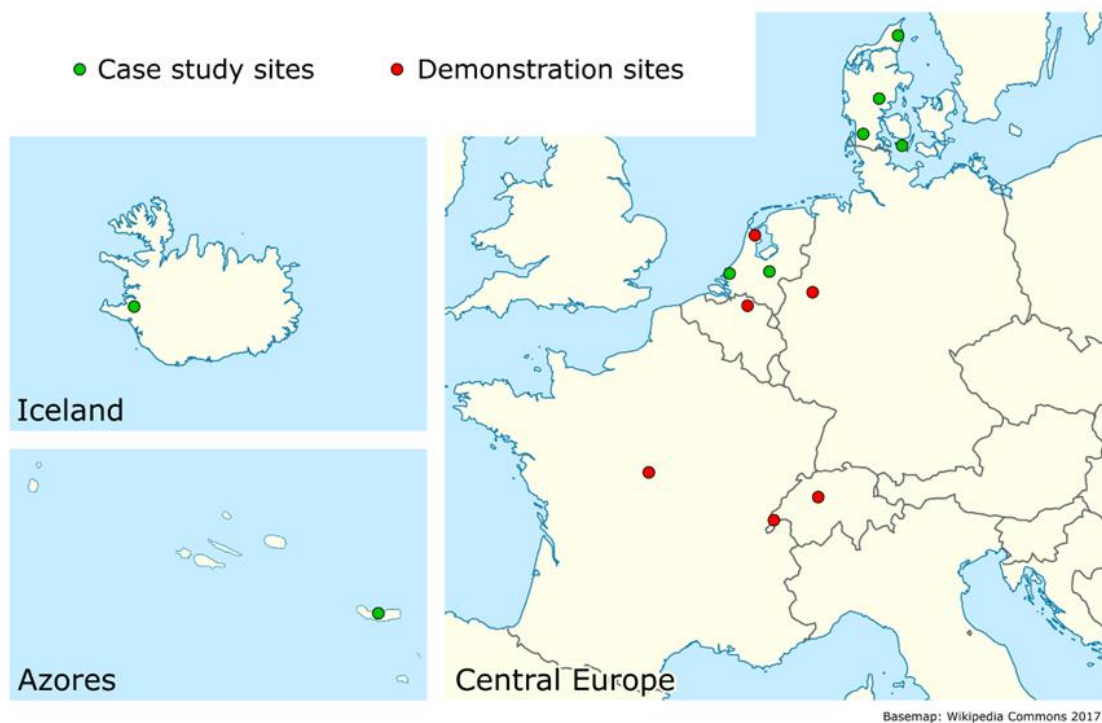


# MINE THERMAL ENERGY STORAGE (MTES)





# HEATSTORE DEMO/CASE STUDY SITES



# HEATSTORE DEMONSTRATION PROJECTS AND CASE STUDIES

## ■ Demonstration projects:

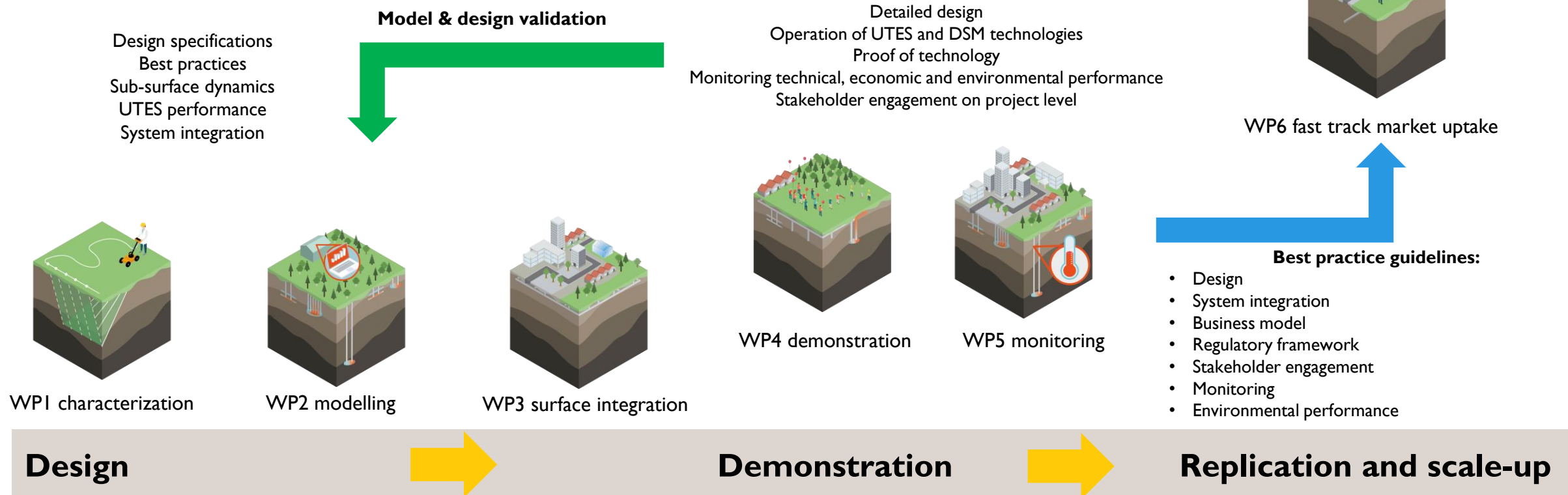
- HT-ATES in sand aquifer in the Netherlands in combination with deeper geothermal plant
- HT-ATES in limestone in Geneva, Switzerland in combination with waste incineration
- HT-ATES in molasse (conglomerates, sandstones and shales) in Bern, Switzerland in combination with combined heat and power
- BTES in France in combination with solar collectors
- MTES in Germany in combination with solar collectors
- Demand Side Management in pilot project in Belgium in combination with geothermal plant

## ■ Case studies:

- Environmental monitoring of MT-ATES (45°C) pilot plant in Wageningen, the Netherlands
- Monitoring data from MT-ATES (45°C) after conversion from LT-ATES by introducing solar collectors in Haag, the Netherlands
- Monitoring data and experience from Dronninglund HT-PTES in Denmark
- Monitoring data and experience from Gram HT-PTES in Denmark
- Monitoring data and experience from Marstal HT-PTES in Denmark
- Monitoring data and experience from Brædstrup HT-BTES in Denmark

# HEATSTORE WORK PACKAGE STRUCTURE

Technical future potential UTES and DSM in Europe  
new business models  
Stakeholder engagement and dissemination beyond the projects  
Roadmap for fast track uptake



## WORK IN PROGRESS IN DENMARK

- In Denmark GEUS and PlanEnergi has been leading an international review of experience and lessons learned from existing and past UTES systems and prepared a comprehensive report in cooperation with other project partners (<https://www.heatstore.eu/downloads.html>)
- As part of the work in HEATSTORE PlanEnergi contributes with monitoring data from Danish PTES and BTES sites, analyses efficiency compared to model estimates in the design phase and provide input for business case models
- GEUS has conducted a survey among Danish district heating companies about actual or possible plans for introducing UTES in their networks and is currently working on characterization of the geological conditions and possibilities for UTES in selected areas based on the results of the survey



## UPCOMING WORK

- In the remaining part of the project GEUS will be lead in establishing a GIS-platform for showing the technical potential for UTES in selected partner countries and GEUS and PlanEnergi will contribute to a European best-practice guideline for developing large scale UTES systems as well as a roadmap for the deployment of smart heat grids with UTES delivering flexibility to the European energy systems
- An existing web-tool established in a previous EUDP project and showing information on geological formations with possibilities for UTES will be updated and expanded with results from the HEATSTORE project by GEUS
- In relation to HT-ATES in deep geothermal reservoirs, GEUS has described Danish experience with modelling reservoir dynamics and will be testing newly developed model codes on a Danish case study scenario
- PlanEnergi will continue working with monitoring data, model validation and business case models

# THANK YOU FOR YOUR ATTENTION

[www.heatstore.eu](http://www.heatstore.eu)



HEATSTORE (170153-4401) is one of nine projects under the GEOTHERMICA – ERA NET Cofund aimed at accelerating the uptake of geothermal energy by 1) advancing and integrating different types of underground thermal energy storage (UTES) in the energy system, 2) providing a means to maximise geothermal heat production and optimise the business case of geothermal heat production doublets, 3) addressing technical, economic, environmental, regulatory and policy aspects that are necessary to support efficient and cost-effective deployment of UTES technologies in Europe. The three-year project will stimulate a fast-track market uptake in Europe, promoting development from demonstration phase to commercial deployment within two to five years, and provide an outlook for utilisation potential towards 2030 and 2050.



The GEOTHERMICA project is supported by the European Union's HORIZON 2020 programme for research, technological development and demonstration under grant agreement No 731117.