

Workshop on Closed Loop Boreholes 7-8. sept. 2011

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# Why modelling?

- Evaluate the potential for vertical GHE in Denmark by extrapolating knowledge from existing plants
- Evaluate effects from GHE installation on the ambient groundwater system



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#### Dynamic system



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### Varying hydrogeological settings



Cross section profile of the subsoil layers from SW to NE

• Varying thermal properties

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Varying groundwater flow velocities



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# Seasonal and short terms variation in heat/cooling demand







## Expected workshop output

- Input to modelling strategy
  - What to consider:

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- Varying (hydro-)geology, i.e. varying thermal properties and flow velocities
- Near/far field heat transport
- Short term transport or local equilibrium
- Coupling between GHE and surface installation to account for varying demand for heating/cooling





# Expected workshop output

- Pros and cons of different software systems
  - Simulation of relevant processes
  - Simulation at different scales
  - Near and far field heat transport
  - Coupling of underground heat transport and surface installations
  - Ease of use
- Expected software system:
  - Feflow

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– Coupling to Trnsys?

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### Expected workshop output

• Output from modelling

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- Tabularised/type curves based on sensitivity study
- Recommendations of software/tools