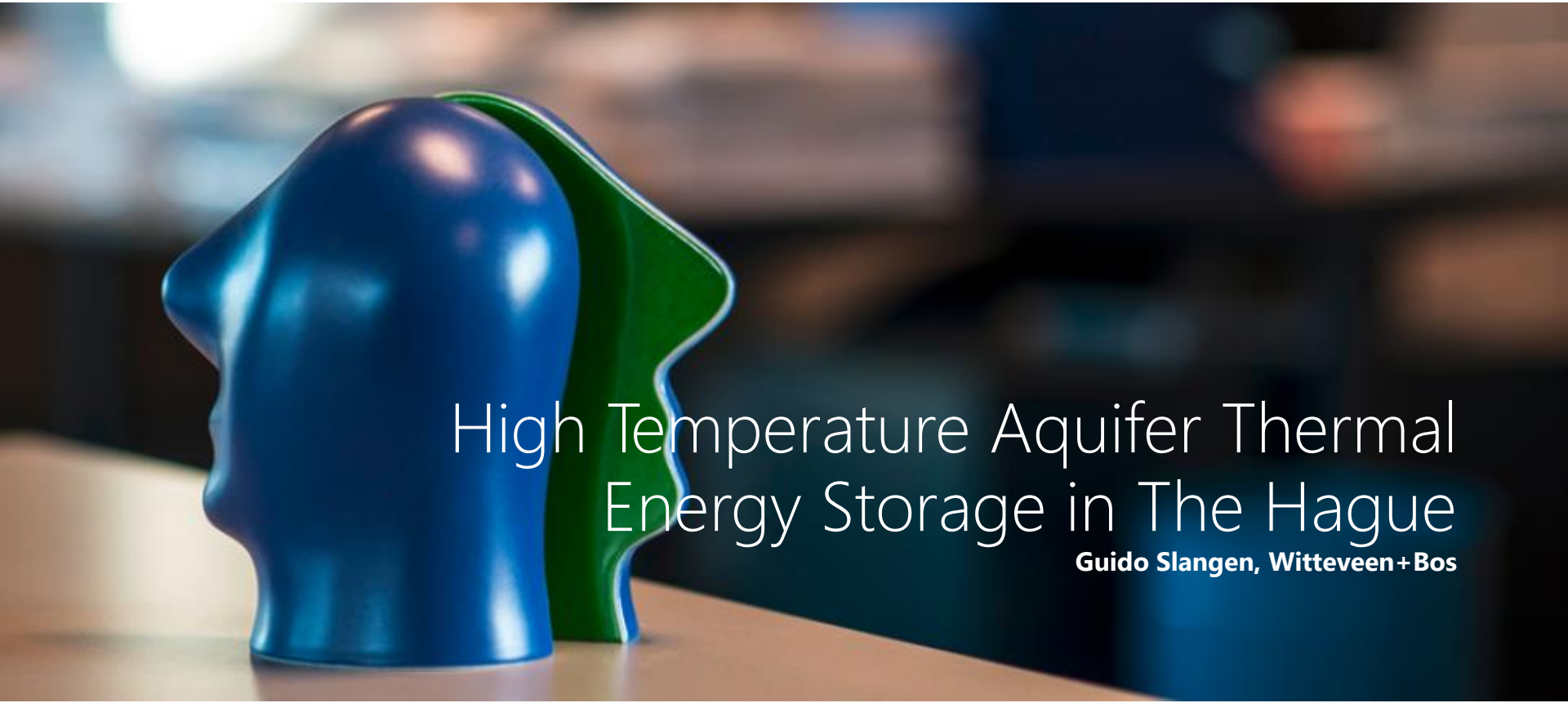


High Temperature Aquifer Thermal Energy Storage in The Hague

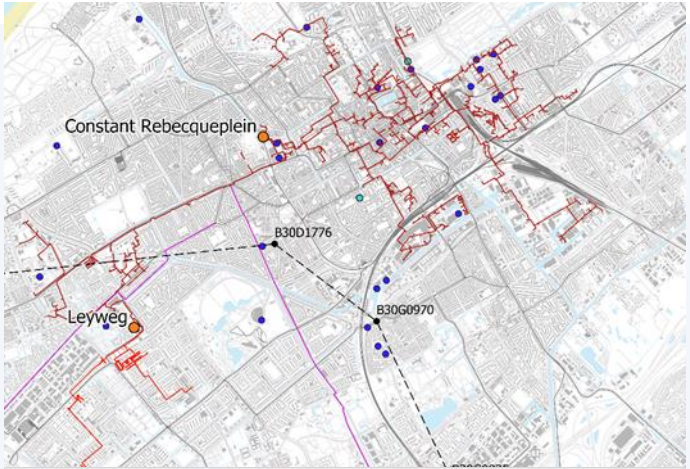
Guido Slangen, Witteveen+Bos

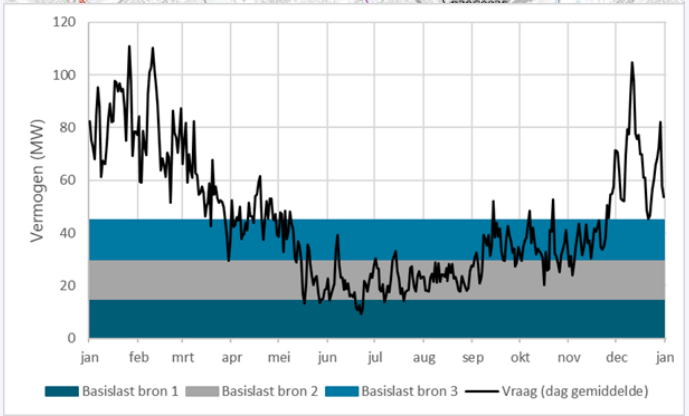
Status of HT-ATES worldwide and in the Netherlands

- Worldwide
  - Germany: two projects (>60°C) operational, one in development
- Netherlands
  - Two projects (>60°C). Both are now shut down.
  - One demo project (HEATSTORE). Expected operational 2021.
  - One test drill recently carried out.

Why HT-ATES in The Hague?

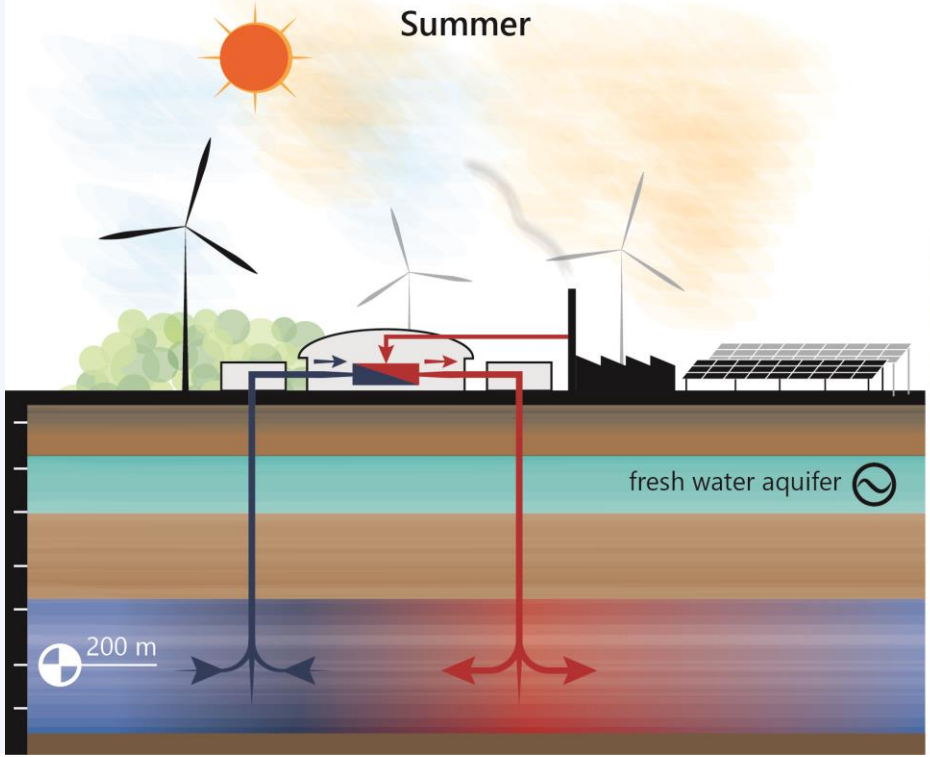
- Presence of district heating, currently powered by Combined Cycle Gas Turbine producing electricity and heat
- Pipeline under construction transporting industrial waste heat from the Rotterdam harbour area
- Geothermal projects under development

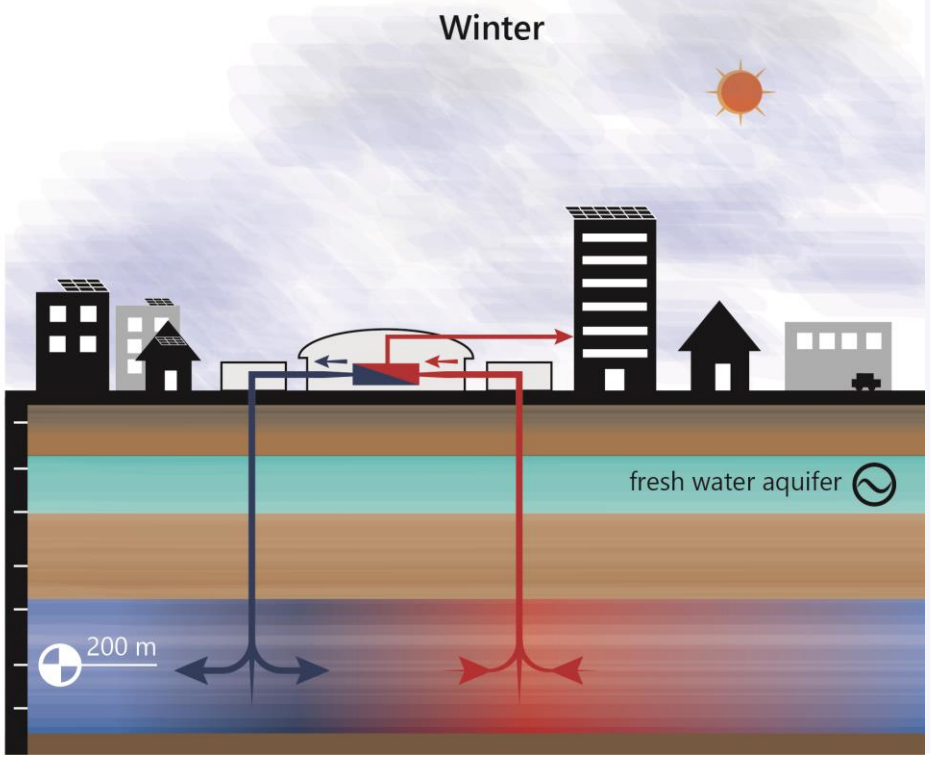




Witteveen + Bos

Aquifer Thermal Energy Storage



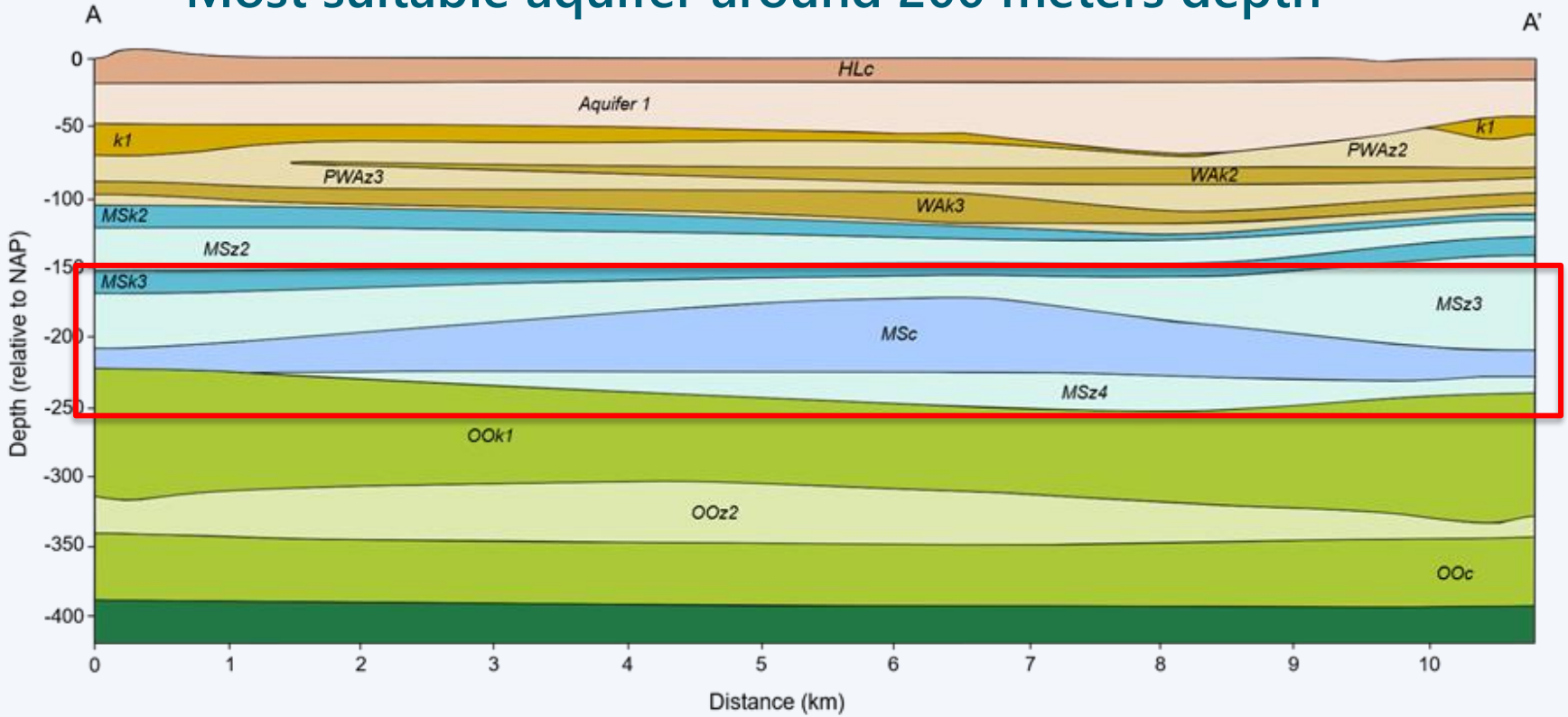


Aquifer selection

Criteria:

- Thickness and permeability
- Sealing clay on top
- Distance to drinking water extractions
- Distance to other underground thermal energy systems

Most suitable aquifer around 200 meters depth

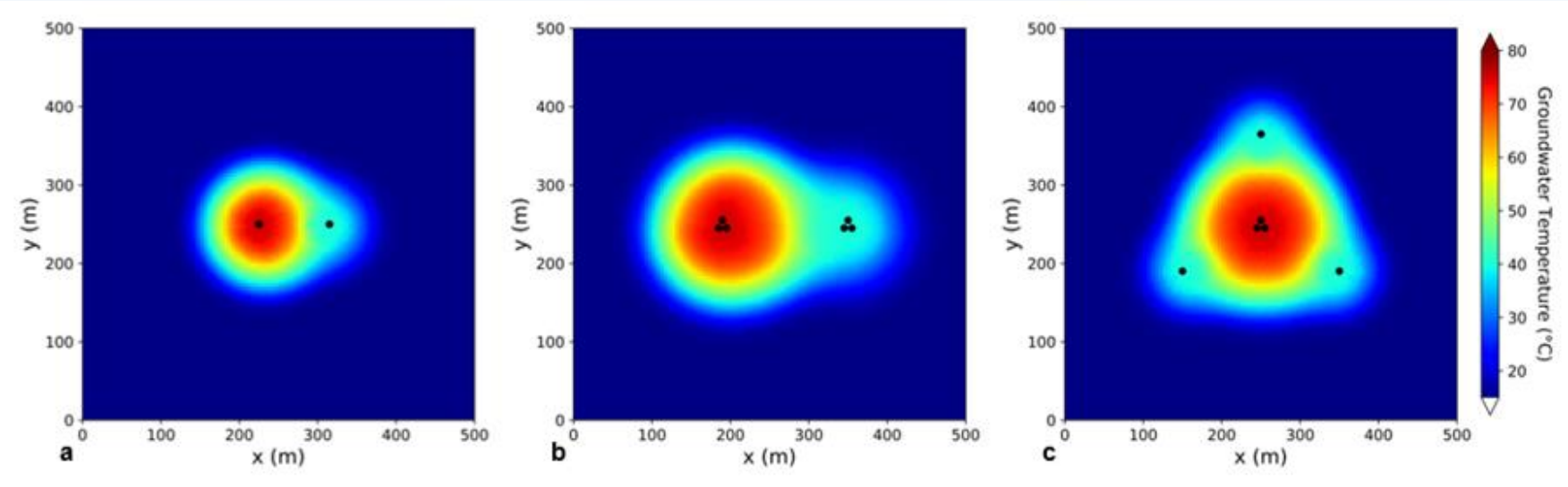


Well configurations

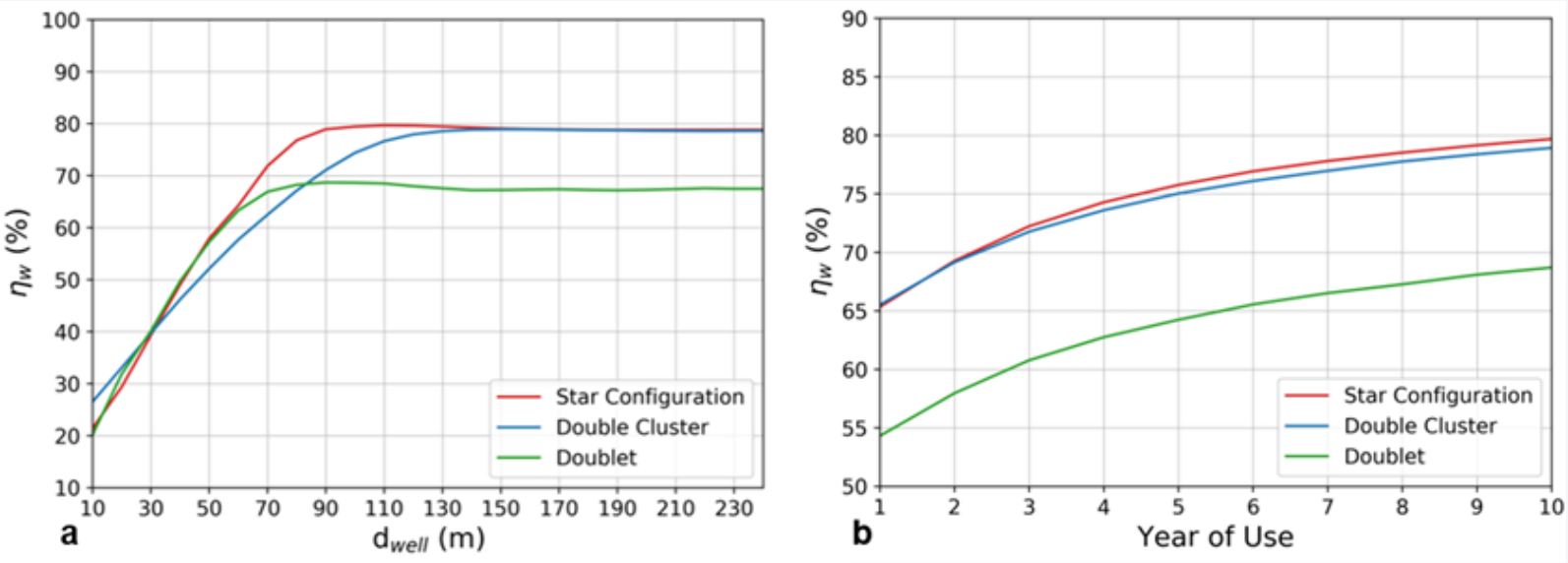
Doublet

Double Cluster

Star configuration



Heat recovery efficiency



Conclusions

- Future supply of waste heat and geothermal heat offers opportunity for HT-ATES in The Hague
- Suitable aquifer for HT-ATES present in The Hague
- Best recovery efficiency obtained with well clusters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