



IEA Geothermal



# Overview of ATES & BTES in the Netherlands and the World

Bas Godschalk – IF Technology – 28  
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# Bas Godschalk



- Business developer HT-ATES and International Projects at IF Technology (16 years)
- Before: 7 years at a soil remediation company with electro(bio)reclamation
- Projects from first idea to design, realisation and exploitation in the Netherlands and abroad.
- [B.godschalk@iftechnology.nl](mailto:B.godschalk@iftechnology.nl) // +31 6 3088 7473

# IF Technology

- Consultant and engineering company in shallow and deep geothermal energy systems
- Employing approx. 70 (hydro-) geologists, civil-, mechanical- and well engineers and energy consultants
- Founded in 1989 and based in Arnhem in the Netherlands. We worked on 3,000 projects.
- [www.iftechnology.nl](http://www.iftechnology.nl) | [www.iftechnology.com](http://www.iftechnology.com)

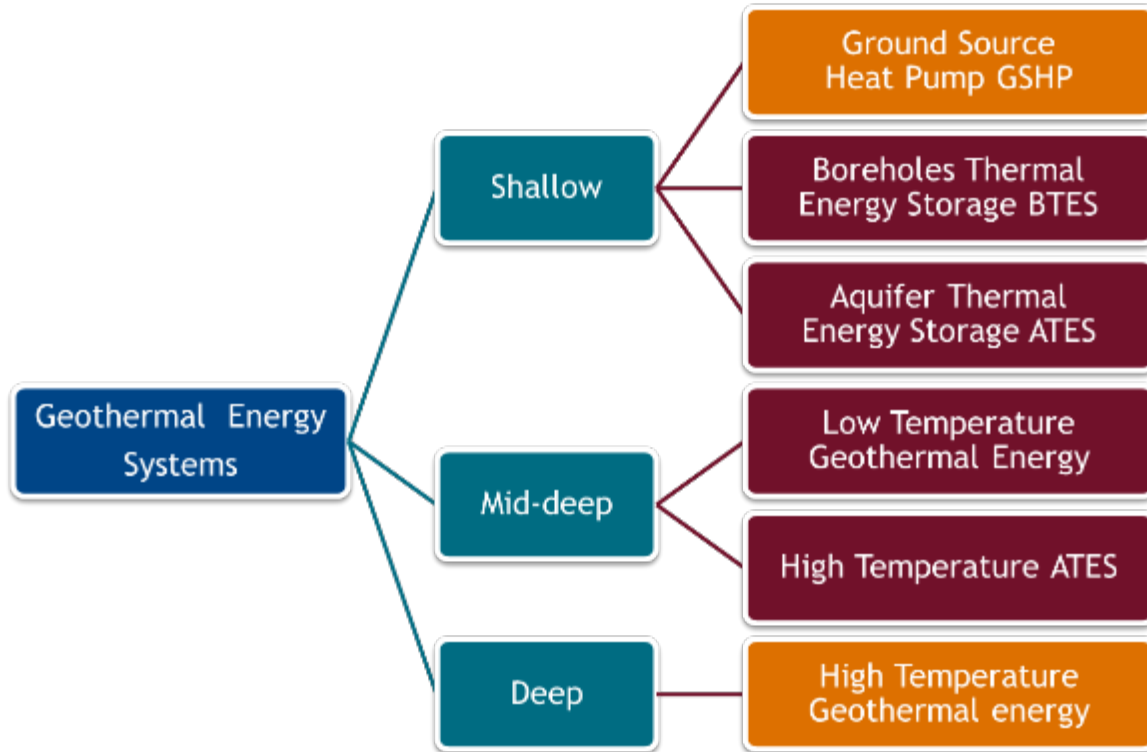




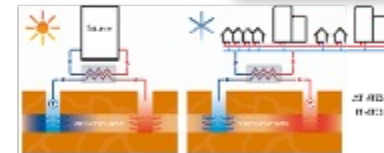
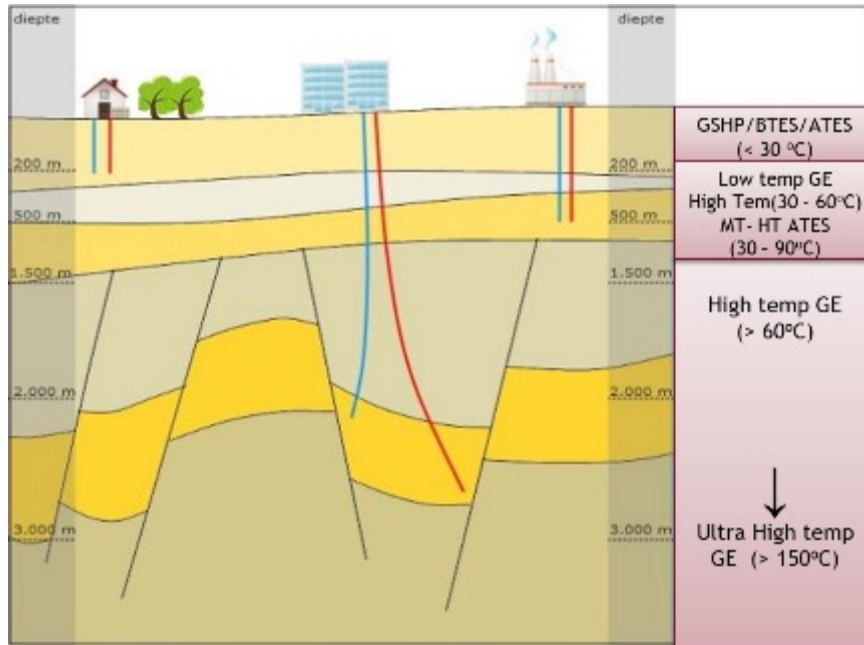
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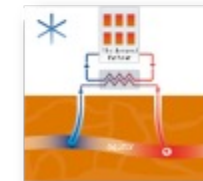
# Geothermal solutions



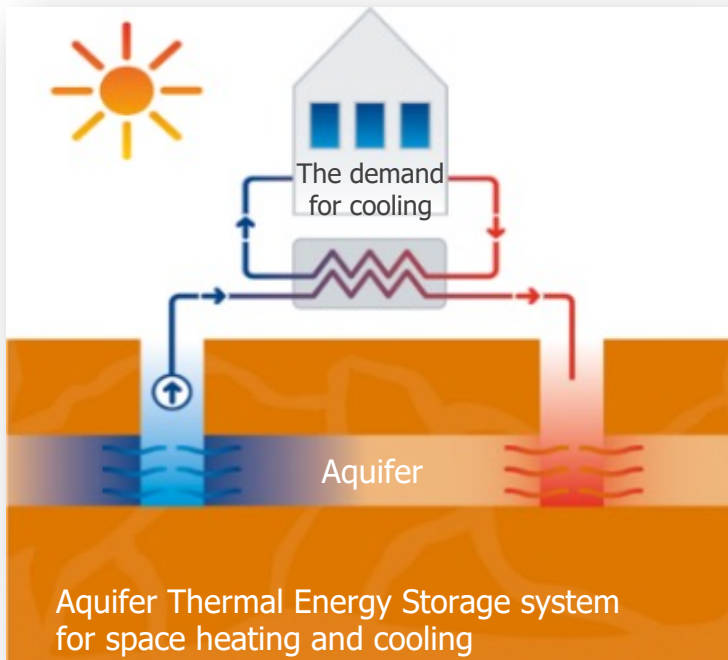
# Overview geothermal energy solutions



HT- HT storage temp  $30 - 90\text{ }^{\circ}\text{C}$   
HT- HT storage temp  $> 60\text{ }^{\circ}\text{C}$

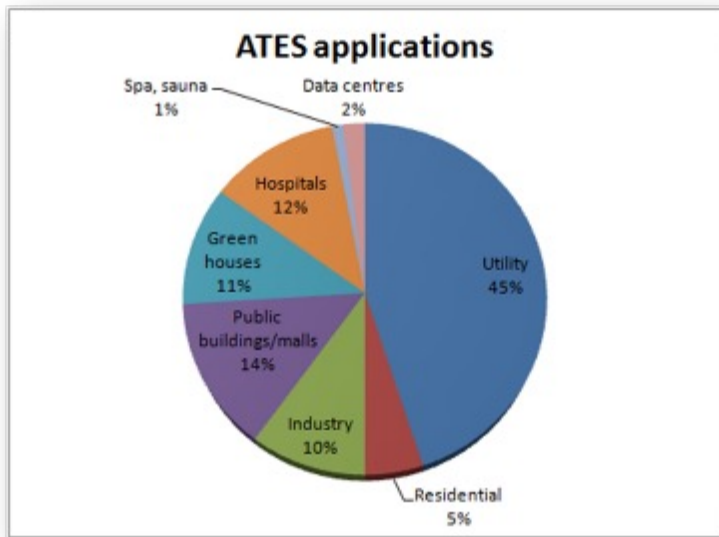


# Aquifer Thermal Energy Storage System



- Storage of seasonal energy = battery
- Cold well (range 5-10 °C)
- Warm well (range 13-17 °C)
- Depth 40 to 250 m
- Flow rates 25 – 250 m<sup>3</sup>/h per doublet
- Energy and CO<sub>2</sub> savings up to 80%
- No smell, no noise, no visual impact

# Where is ATEs applied?



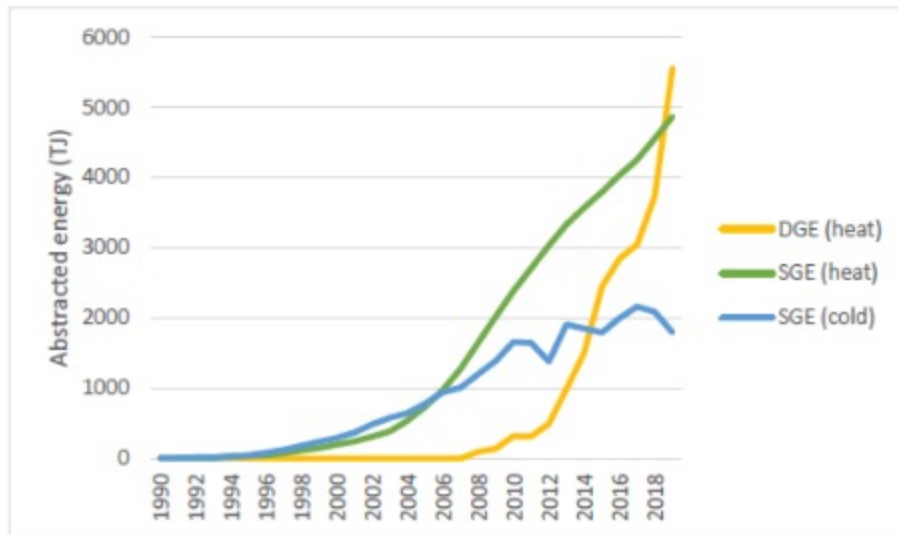
- Utility (office buildings)
- Hospitals
- University campuses
- Greenhouses
- Airports
- Data centers
- Shopping malls
- Residential areas



# A few of the 3,000 ATEs projects



# Status of geothermal energy in the NL



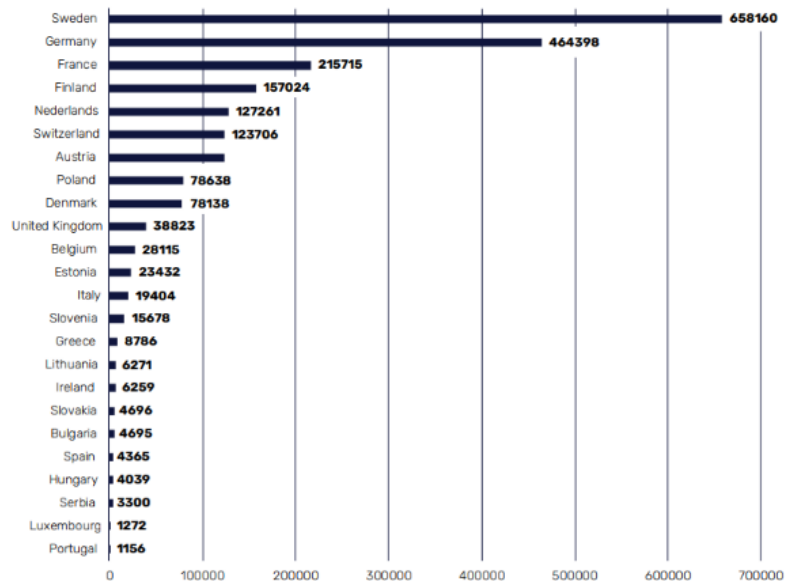
## Status in the Netherlands

- DGE = Deep Geothermal Energy; over 26 doublets and still increasing
- SGE = Shallow Geothermal Energy
- Major technique ATES instead of BTES/GSHP
- Over 3,000 ATES systems in operation

# Geothermal Heat pumps in Europe

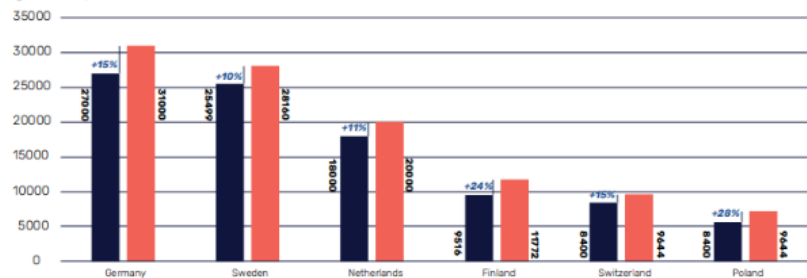
EGEC Geothermal **Market Report 2022**

**Fig. 14** Number of geothermal heat pumps installed (stock) in 2022 in Europe, per country

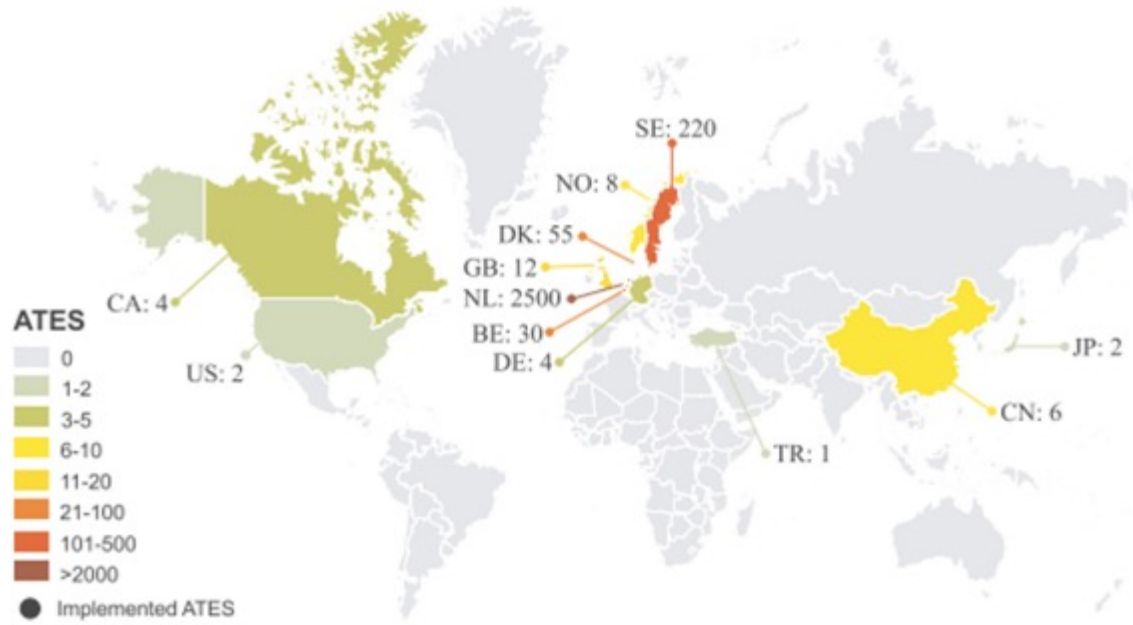


**Fig. 13** Sales of geothermal heat pumps in Europe (2021-2022) in selected countries highlighting growth rate

Largest European markets

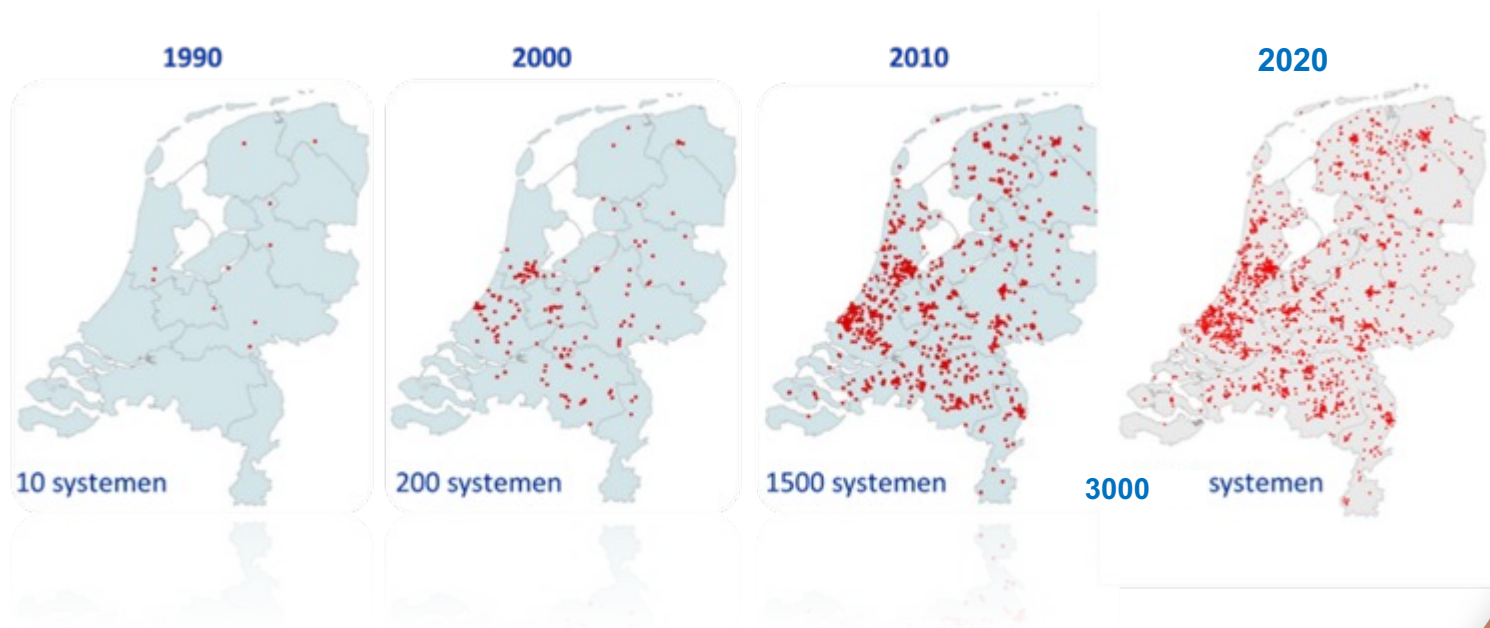


# Status of ATEs in the World



Fleuchhaus et al., Worldwide application of aquifer thermal energy storage - a review. Renewable and Sustainable Energy Reviews 94 (2018) 861-876.

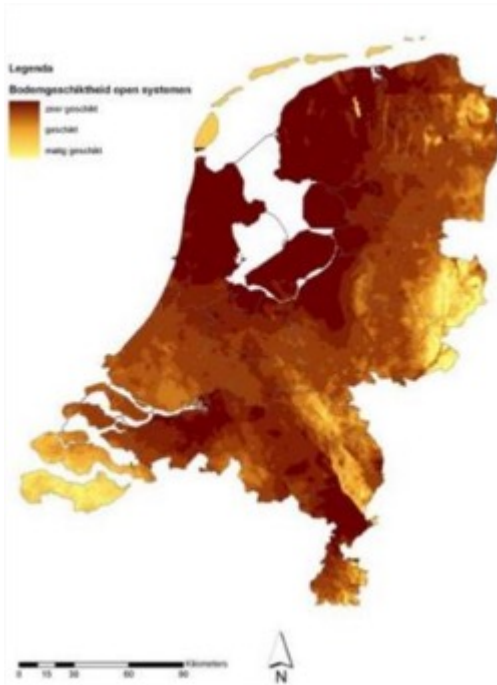
# Development of ATEs in the last 35 years



# So, why is it a success in the Netherlands?



# We have aquifers



- ATES needs proper aquifers.
- The Netherlands does have many good aquifers.
- Most requests for ATES can be accepted and realised.
- This resulted in a broad acceptance of the technology.
- Due to a central and free database, good knowledge of aquifers and reduction of costs

# Good climate for ATES



- Cooling is often the business
- ATES and BTES is a storage technology. Heat of the summer and cold of the winter will be stored and re-used in the next season.
- A warm and a cold period are required to store energy, but also to have a demand of energy.
- Big savings in cooling mode compared to AC



# Good legal framework

- Clear and transparent legal framework and procedure
- Attention for all stakeholders (existing installations, drinking water, nature, etc.)
- Protection of your ATEs system
- Obligations to use ATEs in a good way



# We did a lot of applied research

- Solving clogging problem
- Preventing subsidence of the soil
- Improving drilling method: reversed rotary drilling with air lifting
- Combined research MMB to:
  - Impact on soil & water chemistry
  - Biological processes
  - Interference
  - High temperature storage
  - Combination ATEs + remediation
- Also: setup of a hydrogeological database



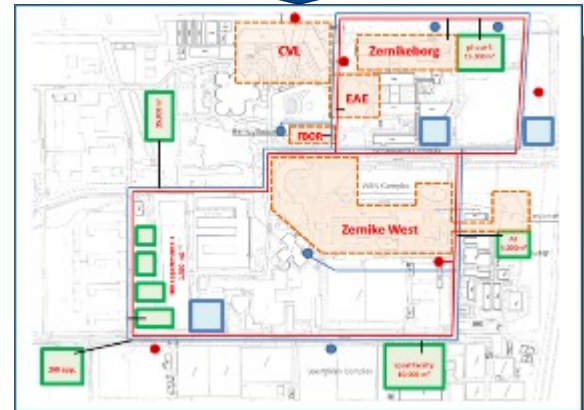
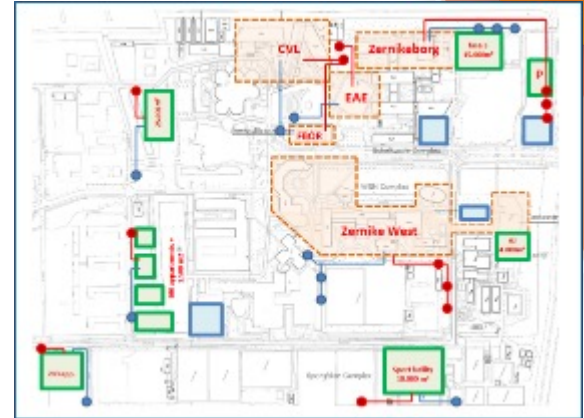
# We have a supportive authority

- No subsidies on ATES or BTES, only at small scale on HP's.
- Funding of scientific research
- Apply ATES at their own buildings
- Develop and tune the legal framework with market parties
- Access to very useful database of boreholes and groundwater analysis of the Netherlands
- Setup of [www.wkotool.nl](http://www.wkotool.nl)
- Driven by energy savings and CO<sub>2</sub>-reduction



# Actual trends

- From one ATES system for one building to H&C grids with ATES wells
- Since 2018: gas connection in new buildings is not allowed anymore
- ATES is more and more used a Large Heat Storage Solutions in heating networks





# Thank you

Bas Godschalk