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HT-ATES Aquifer thermal energy storage in greenhouses

ULTIMATE CS2 Nieuw-Prinsenland

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Bridging Science to Practice

CS2: HT-ATES in greenhouses

Objective

- Demonstrate HT-ATES for greenhouses

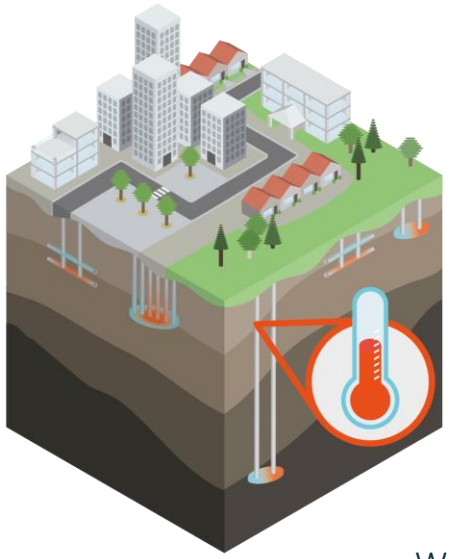
Methodology

- Determine suitable aquifers
- Modelling studies (recovery efficiency)
- Cost-benefit analysis

→ Feasibility study

KPI's

- CO_2 reduction [t/a]
- Delivered heat cost [€/GJ]
- Heat recovery factor aquifer [-]



Website Heatstore (EU Geothermica)

Why HT-ATES in greenhouses

Why HT-ATES?

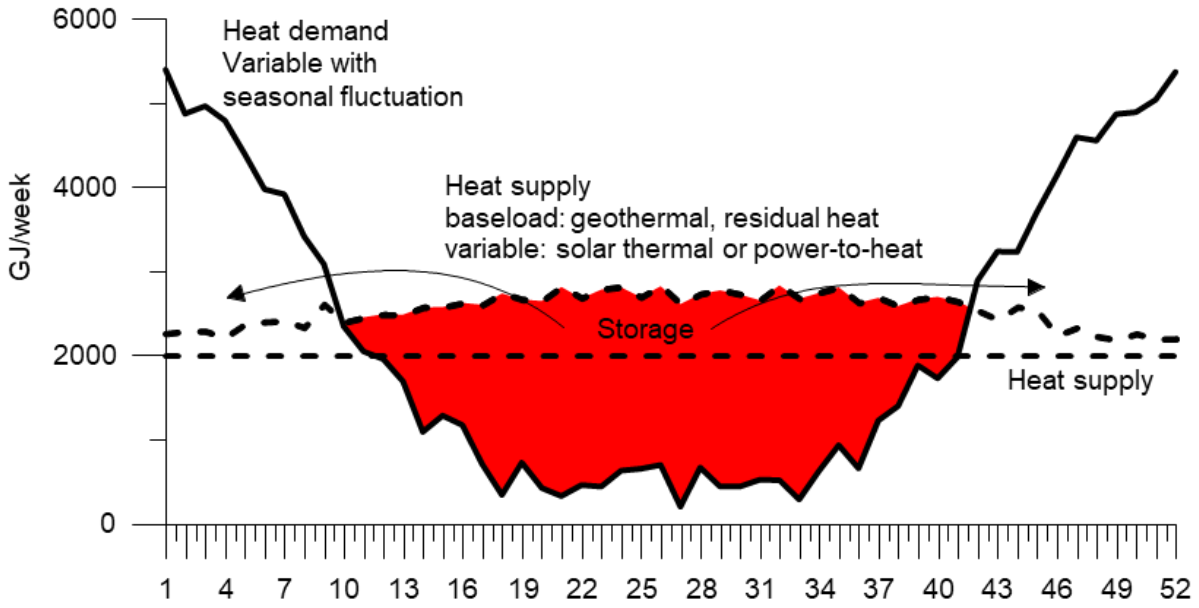
- Match heat demand and supply
- Seasonal storage, optimal use of sustainable energy

Heat demand in greenhouses:

- High demand in winter, low in summer

Heat supply:

- ↓ Gas (boiler of combined heat-and-power)
- ↑ Geothermal or residual heat (baseload)
- ↑ Solar thermal or power-to-heat (variable)



HT-ATES typical features

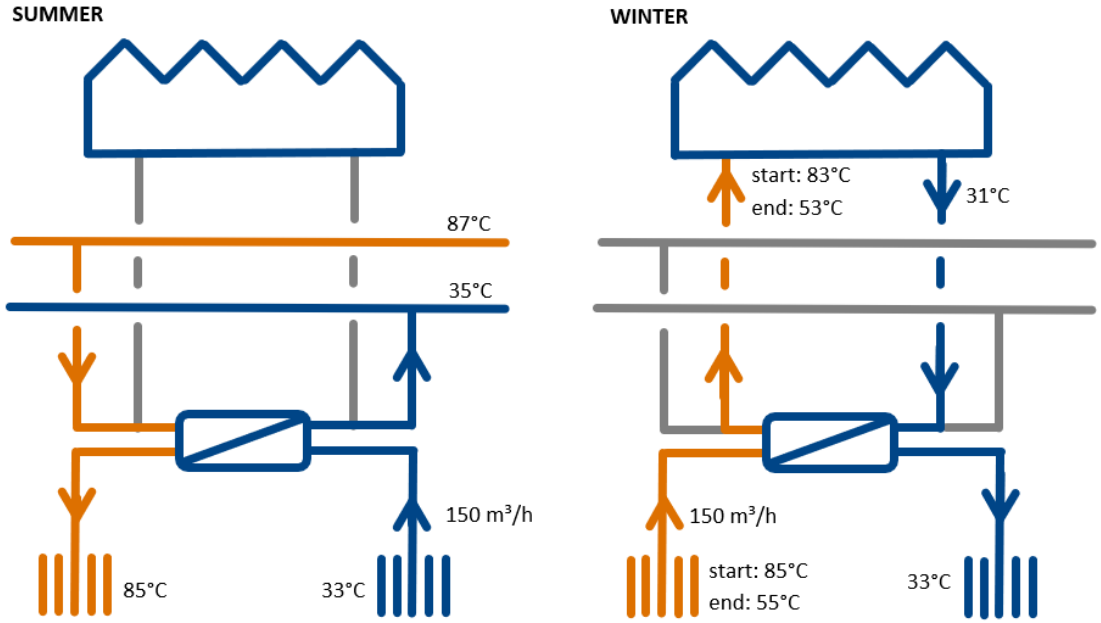
HT-ATES:

- Storage temperature up to 90°C
- Warm and cold well(s)
- Aquifer depth 100 – 500 mbgl

- Heat capacity 2 - 20 MW_{th}
- Heat storage 10.000 – 150.000 GJ/a
- Recovery efficiency 10 - 90%

Current research projects on HT-ATES:

- HEATSTORE, Nextgen, WINDOW, WarmingUP
- HT-ATES is not a proven technique yet



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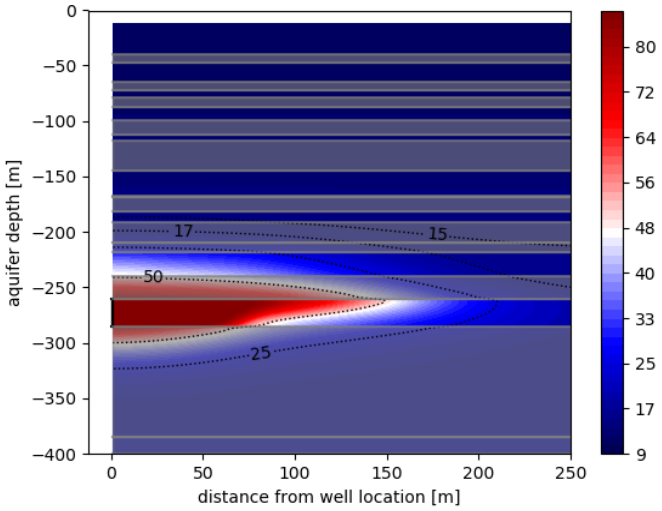
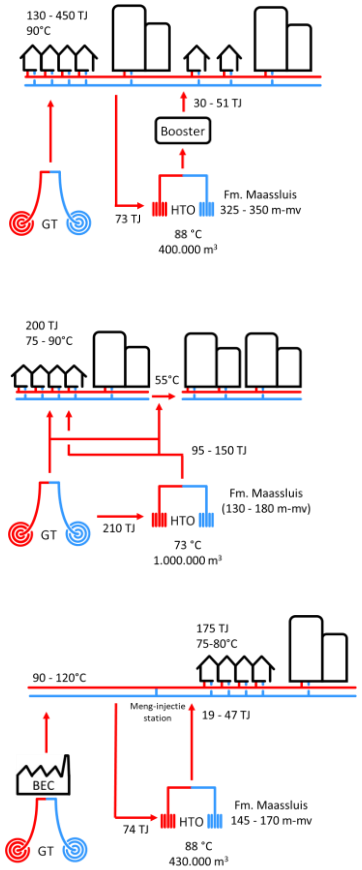
Results from current research





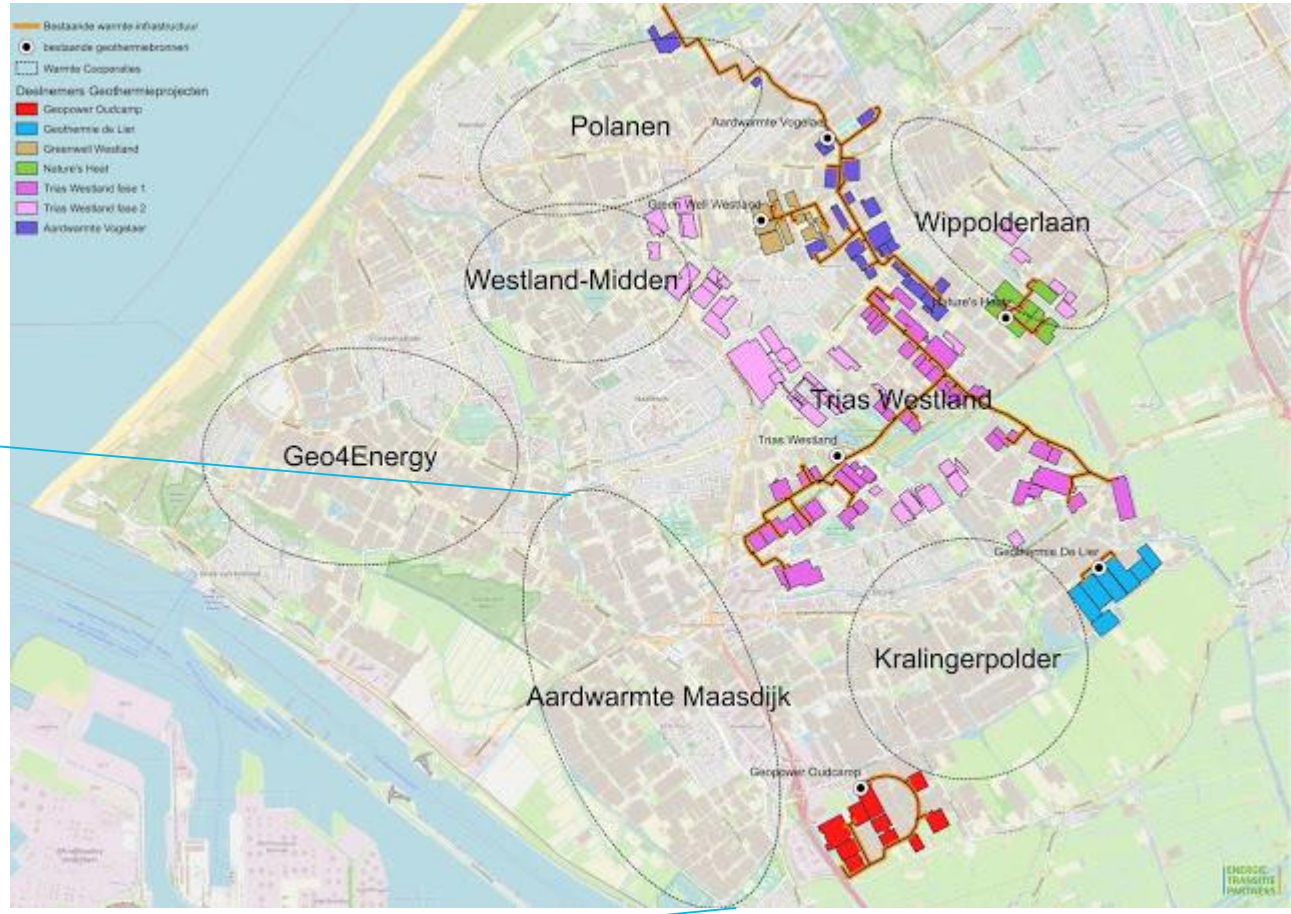
Sustainable energy for greenhouse area Westland

Combination of geothermal system and HT-ATES:

- Expected to be a winning combination!

Development of geothermal energy systems:

- Trias Westland
- Polanen
- Maasdijk



Pilot Westland (Maasdijk) determine suitable aquifers

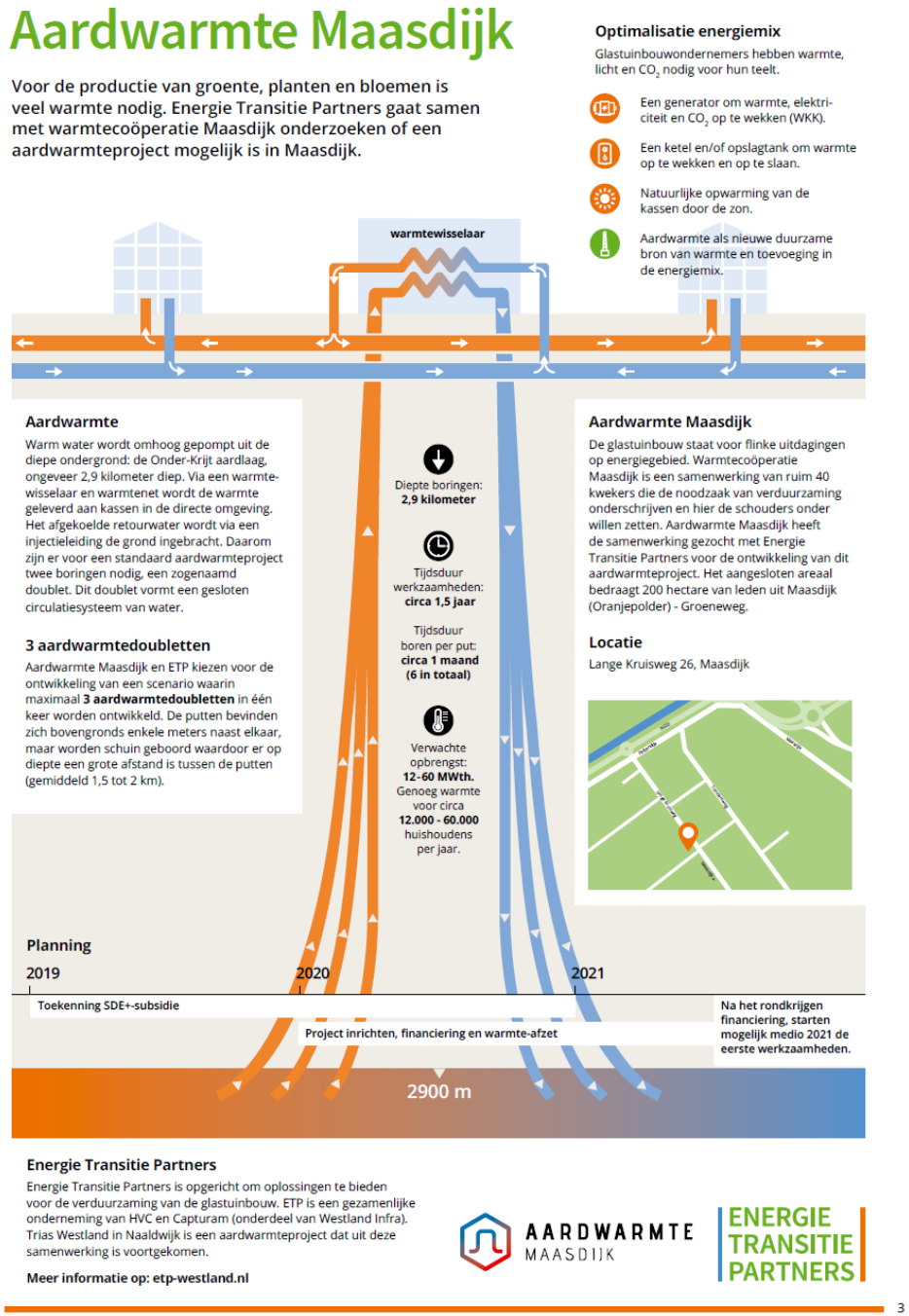
Determine suitable aquifers:

- Develop a cost-effective method
- Combine drilling of a geothermal well with the screening of potential HT-ATES aquifers
- Geohydrological riks aspects are seized
- No separate test drilling needed

Challenge while drilling the geothermal well:

Dependency on time schedule

Possible measurements



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