

Sonnenspeicher Süd

Toward a Decarbonized District Heating System in Graz with the World's Largest Seasonal Heat Storage

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A Quarry becomes a Heat Storage

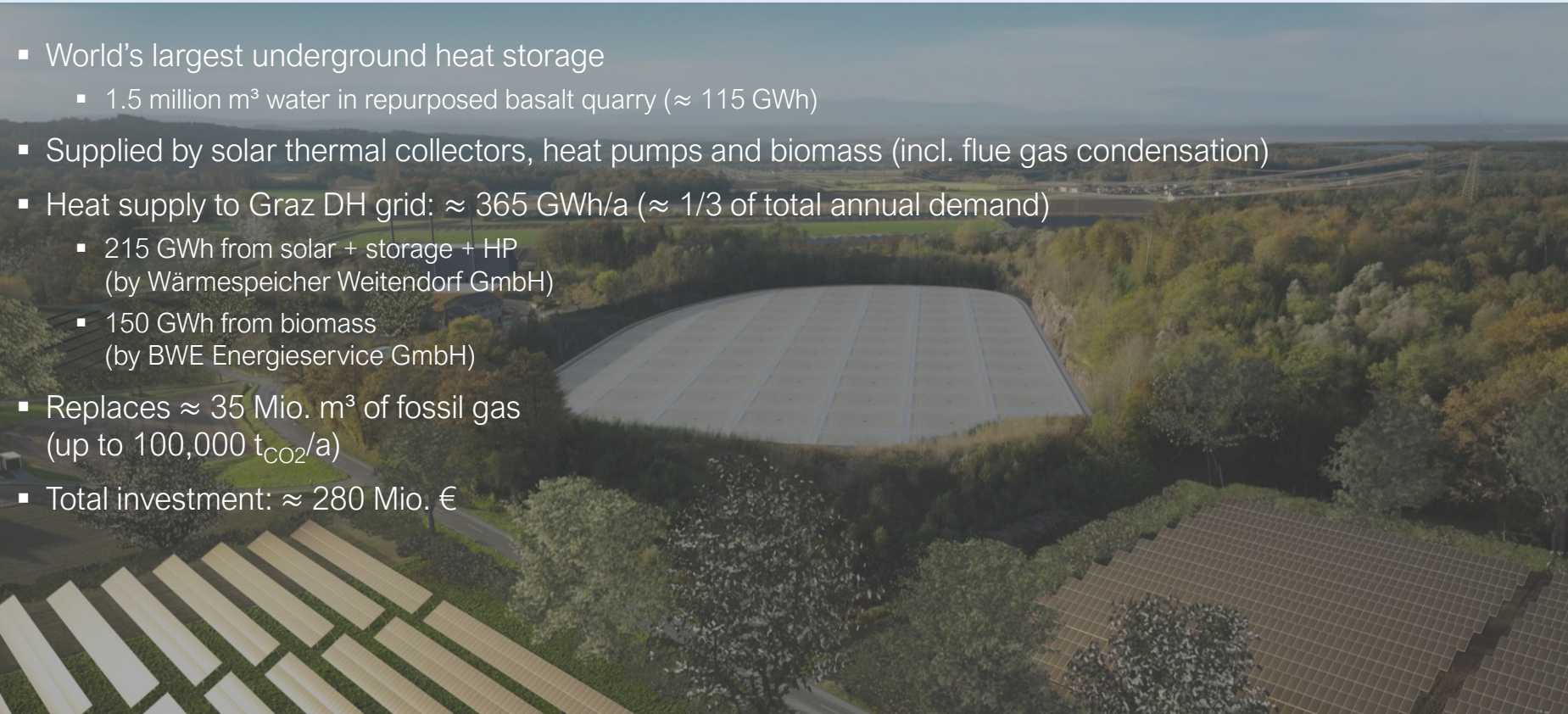




- Transforming an old basalt quarry in a 1.5 million m³ large-scale underground heat storage

Project Overview and Main Facts

SONNEN SPEICHER SÜD



- World's largest underground heat storage
  - 1.5 million m³ water in repurposed basalt quarry (≈ 115 GWh)
- Supplied by solar thermal collectors, heat pumps and biomass (incl. flue gas condensation)
- Heat supply to Graz DH grid: ≈ 365 GWh/a (≈ 1/3 of total annual demand)
  - 215 GWh from solar + storage + HP
    (by Wärmespeicher Weitendorf GmbH)
  - 150 GWh from biomass
    (by BWE Energieservice GmbH)
- Replaces ≈ 35 Mio. m³ of fossil gas
  (up to 100,000 t_{CO2}/a)
- Total investment: ≈ 280 Mio. €

Project Location

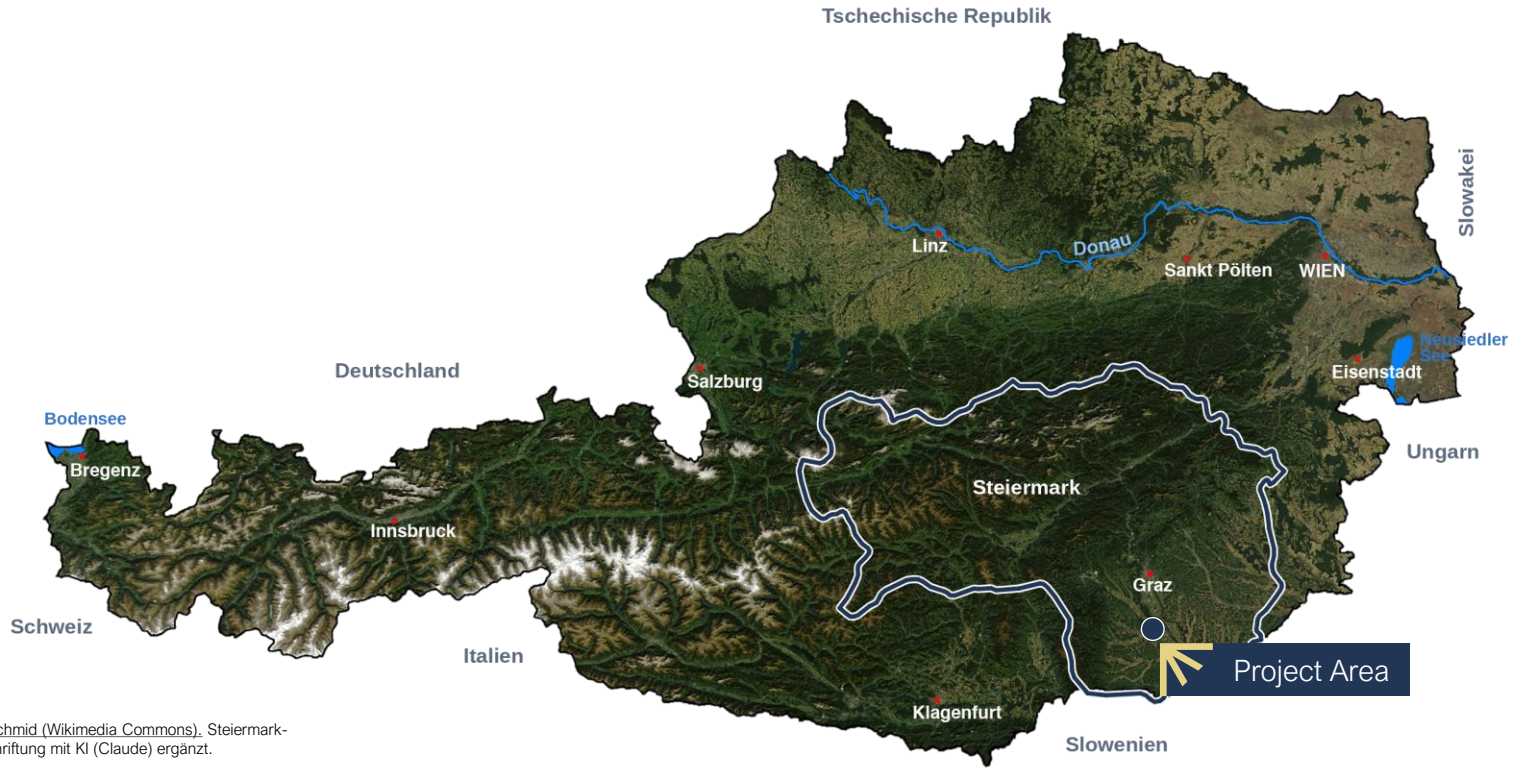
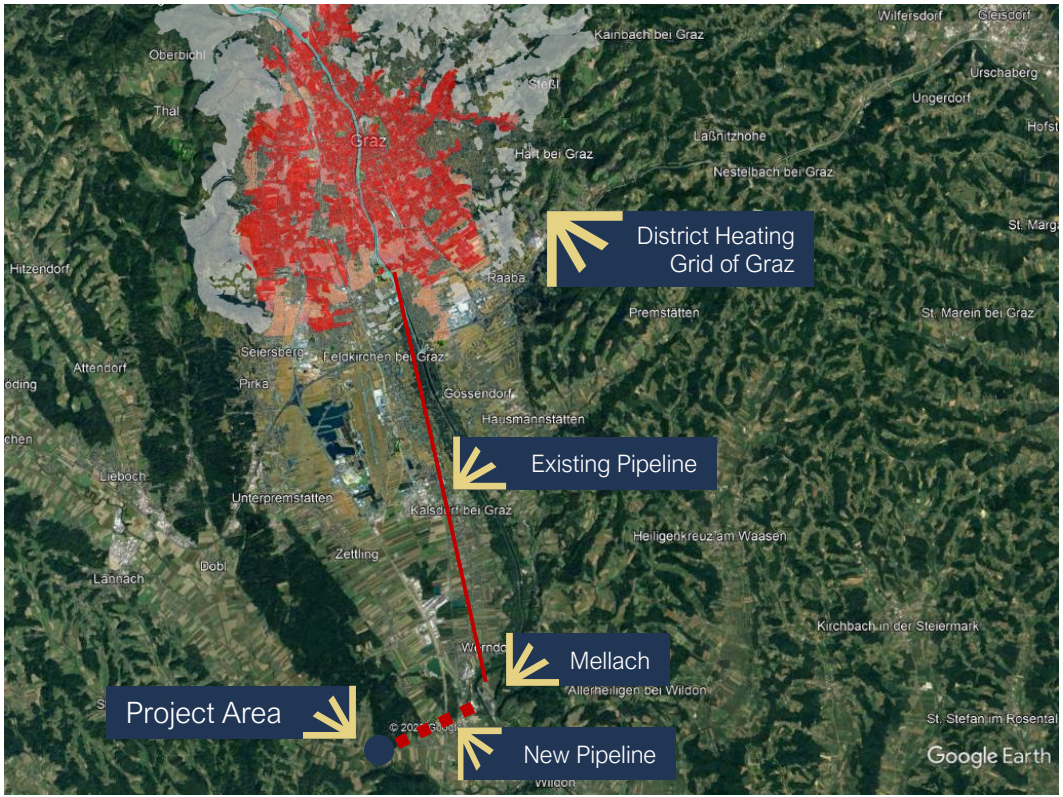
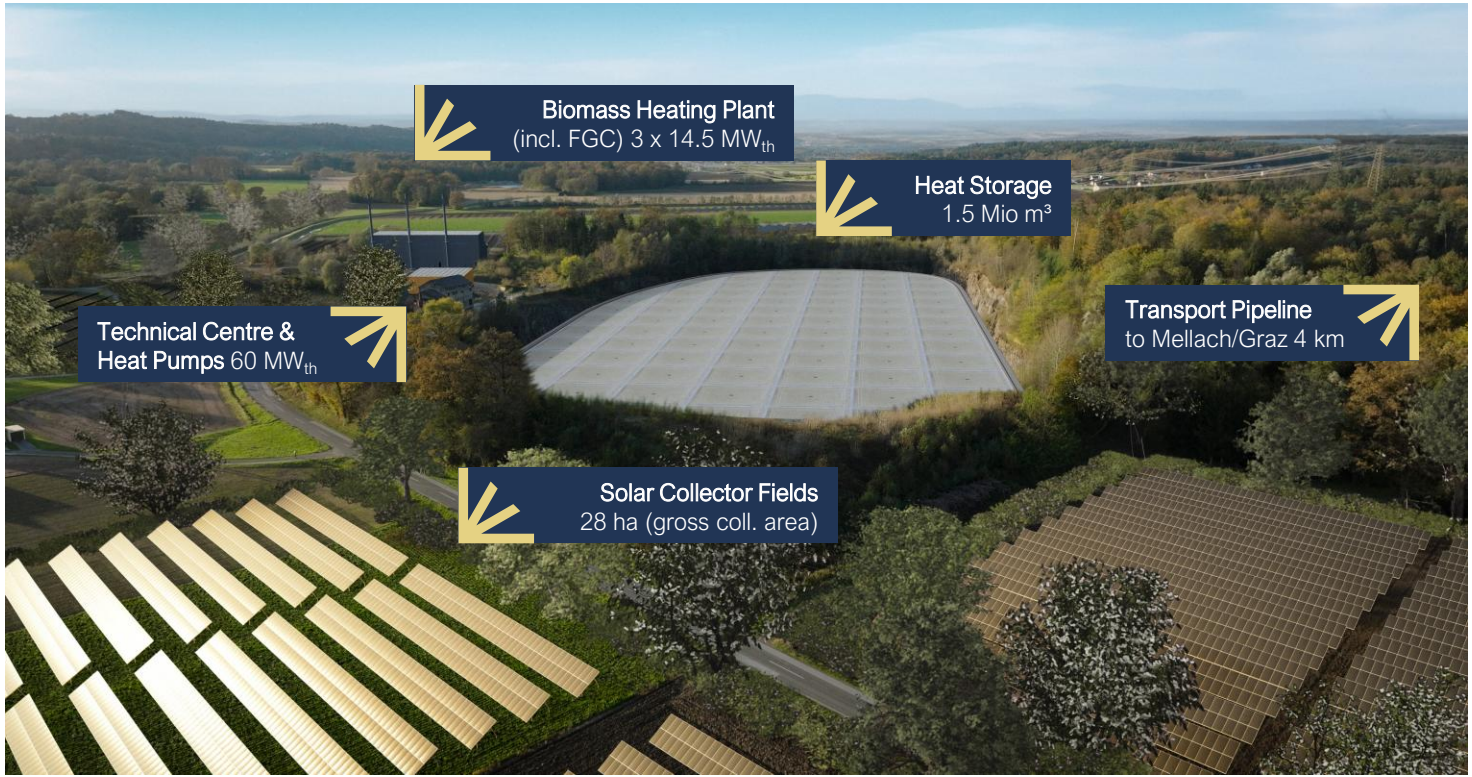


Bild: NASA / M. Schmid (Wikimedia Commons). Steiermark-Grenze und Beschriftung mit KI (Claude) ergänzt.

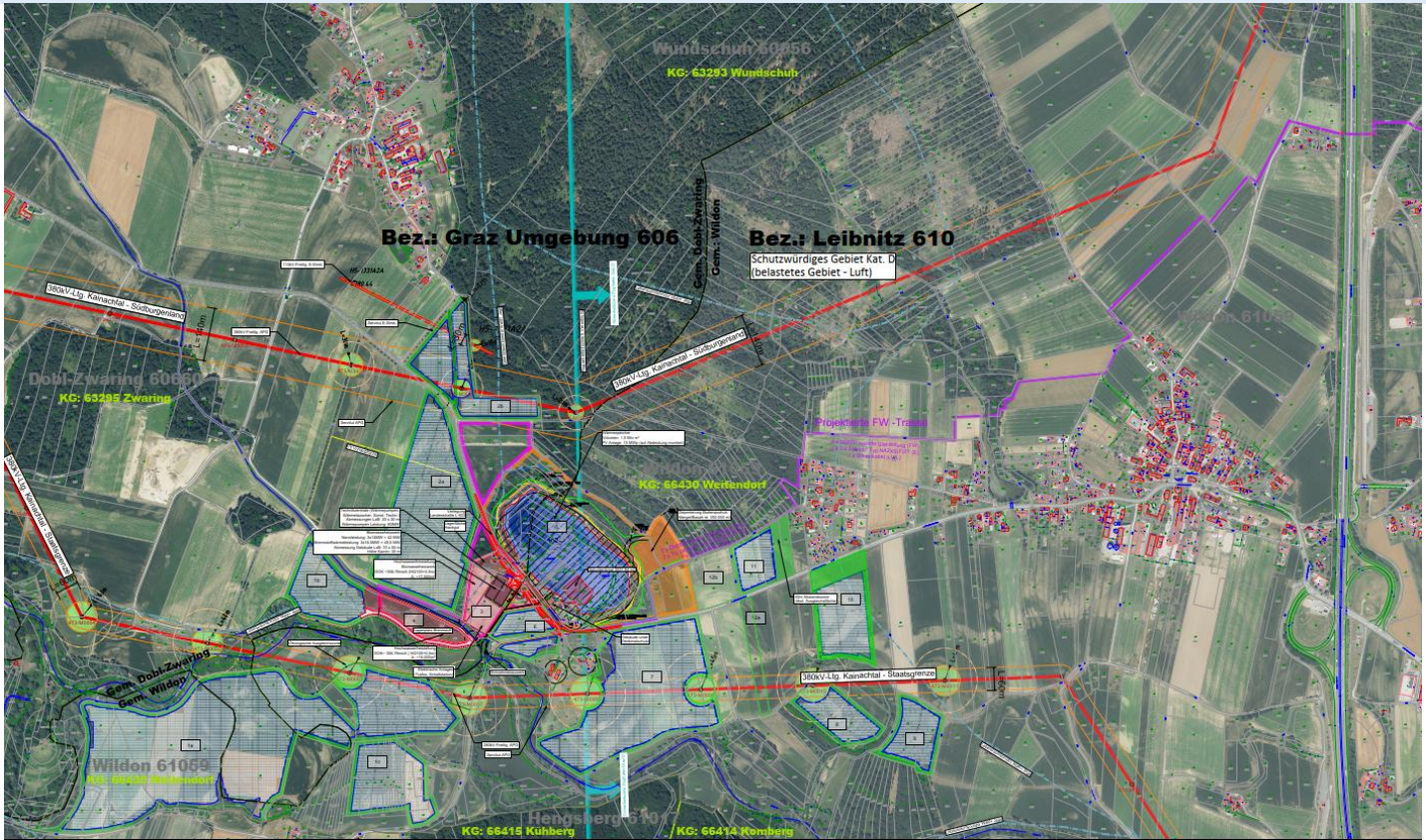
Project Location



Main Components



Site Plan


Bez.: Graz Umgebung 606
Bez.: Leibnitz 610
Schutzwürdiges Gebiet Kat. D
(belastetes Gebiet - Luft)
KG: 63293 Wundschuh
KG: 63295 Zwaring
KG: 66430 Weitendorf
KG: 66415 Kühberg
KG: 66414 Kornberg
380kV-Ltg. Kainachtal - Südburgenland
Projektierte FW -Trasse
Gem. Dobl-Zwaring
Gem. Wildon

Why this Location?

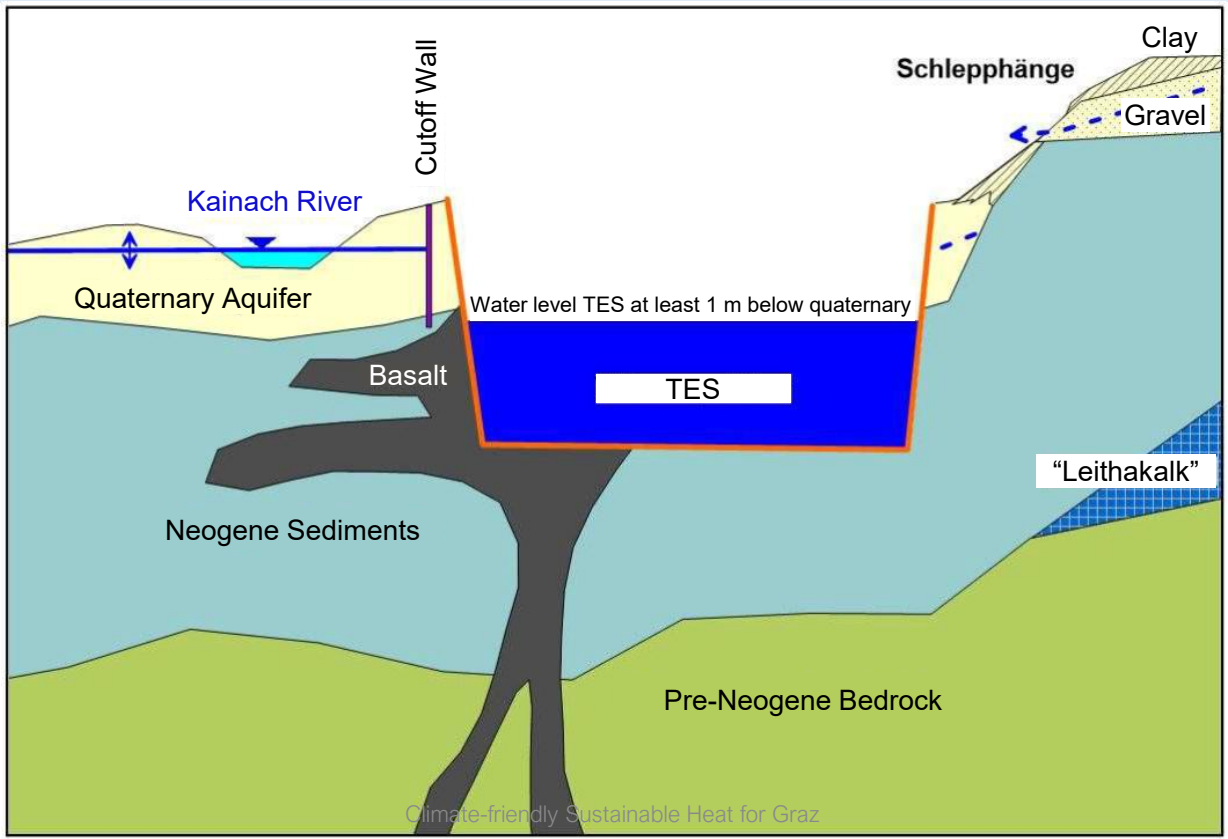
- Use of an already industrialized mining area (existing infrastructure)
- Suitable geometry and geological conditions ⇨ Only minor adjustments necessary
- Very low permeability of the ground
- Only 4 km away from the main district heating pipeline Mellach-Graz
- Suitable areas for solar collectors in the immediate surroundings
- No settlements in the immediate vicinity
  - Additionally, reduction in traffic congestion and fine dust emissions compared to quarry operation



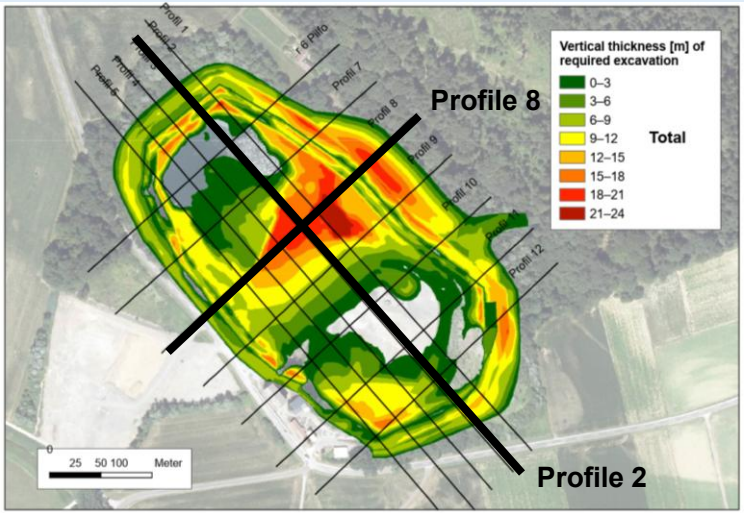
The Basalt Quarry

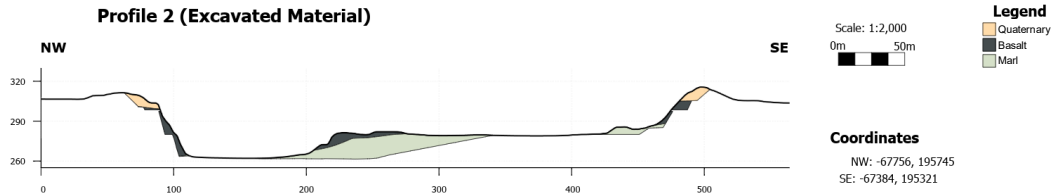


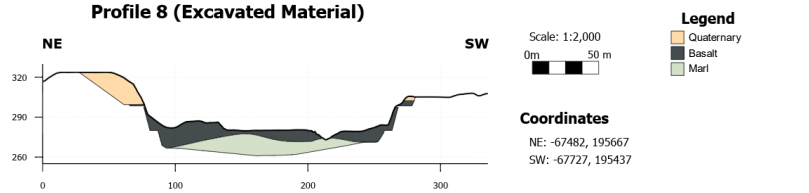
Geological Structure

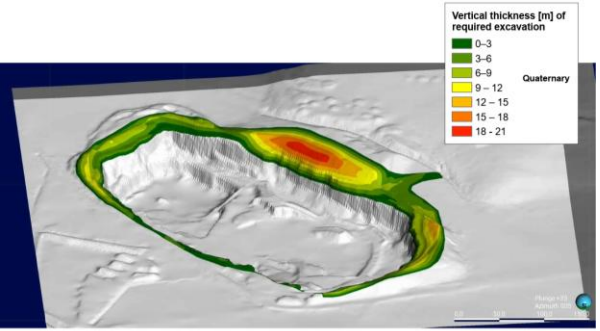


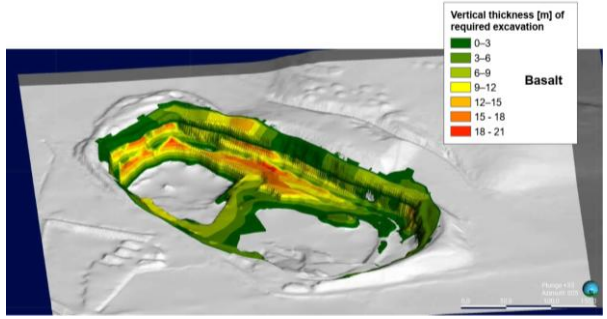
Excavation Works

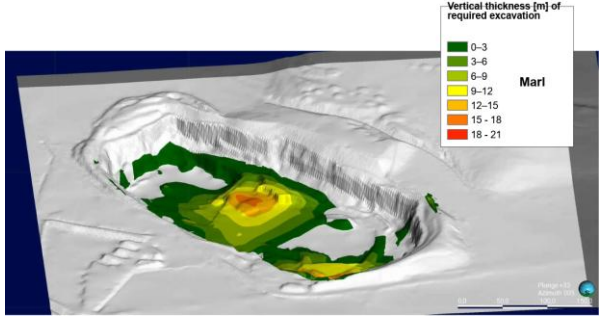












Excavation Works

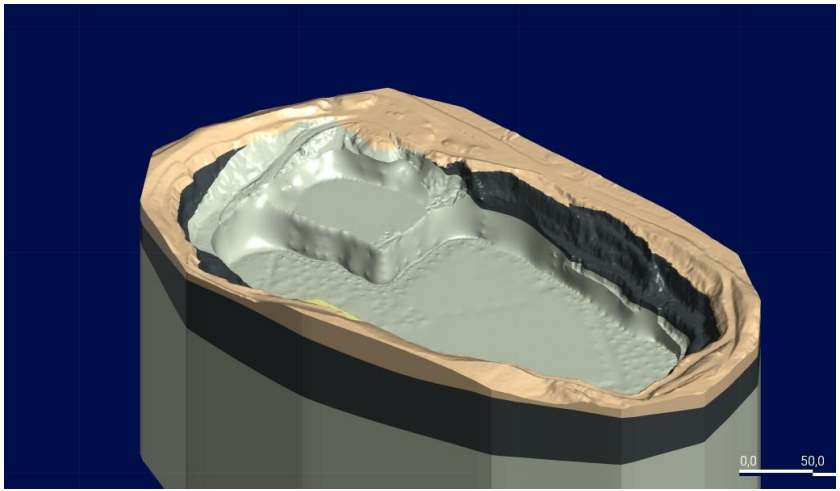


Fig. Geological model: Final expansion 1.5 Mio. m³.

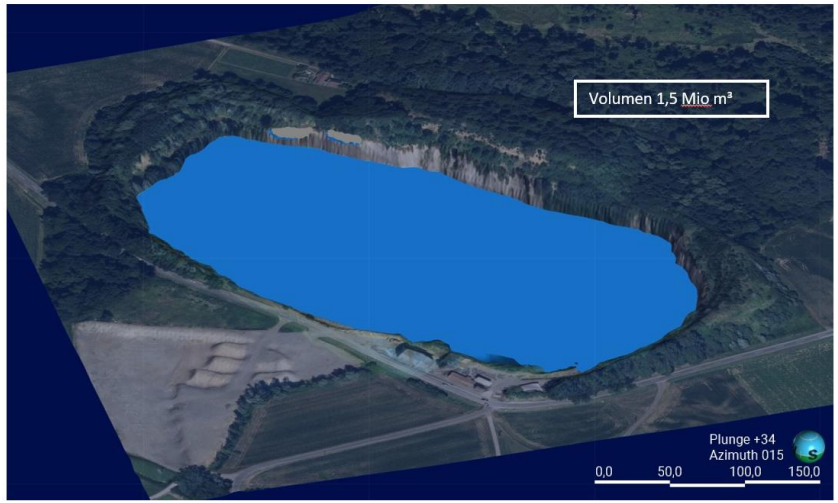
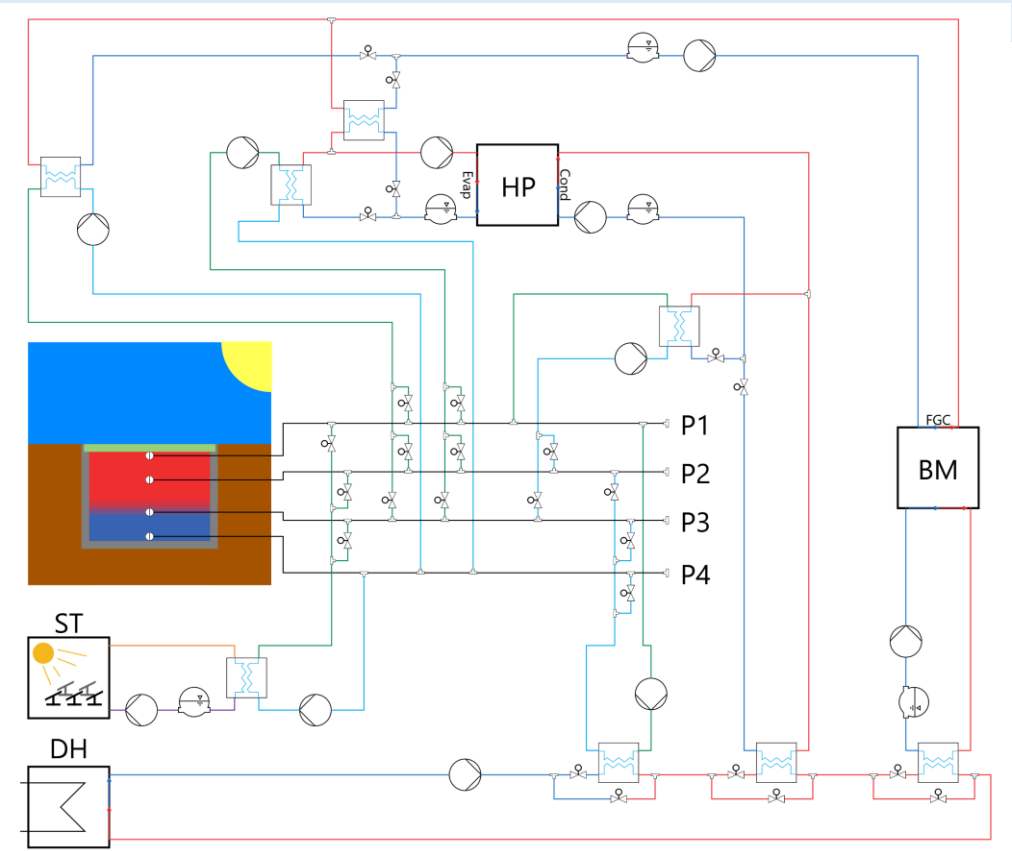


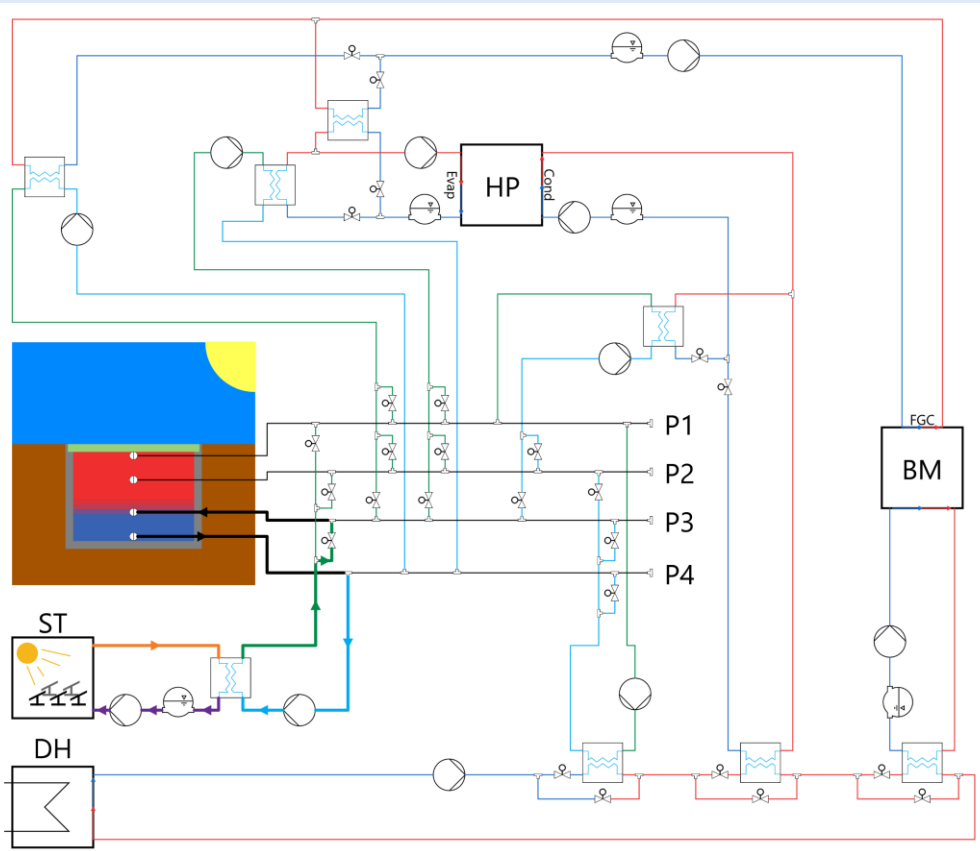
Fig. Geological model: Storage water level 298 müA, approx. 7 m below ground level.

Plant Concept



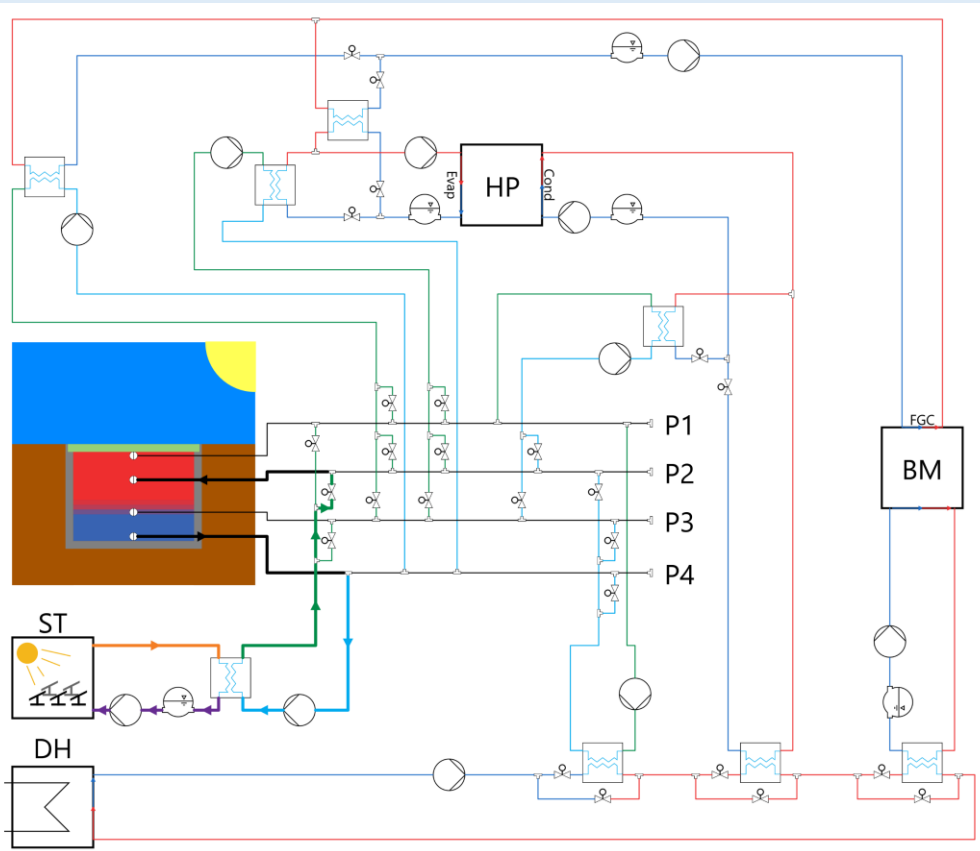
Main Operation Modes

ST charges TES



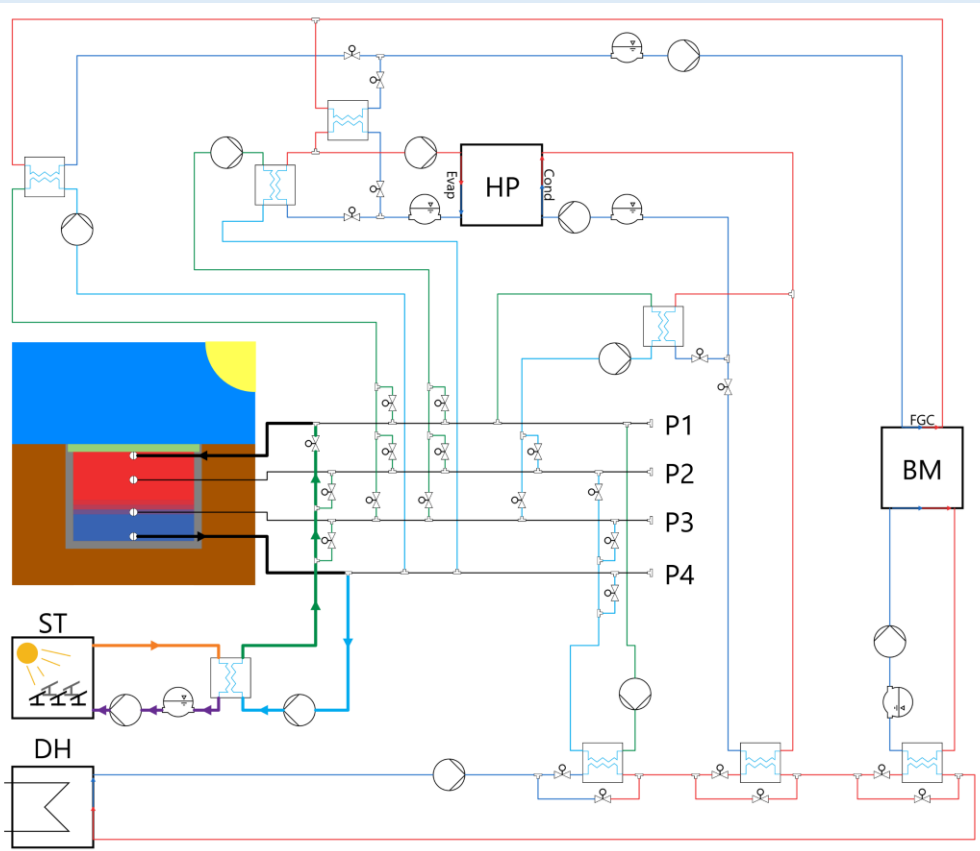
Main Operation Modes

ST charges TES



Main Operation Modes

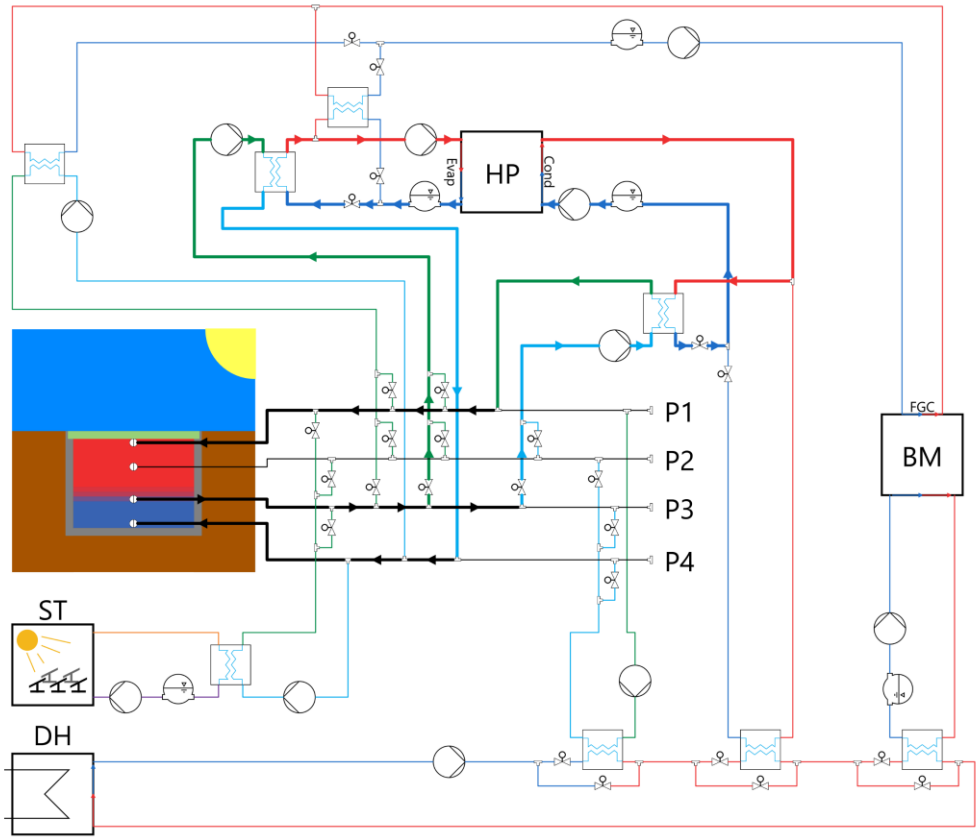
ST charges TES



Main Operation Modes

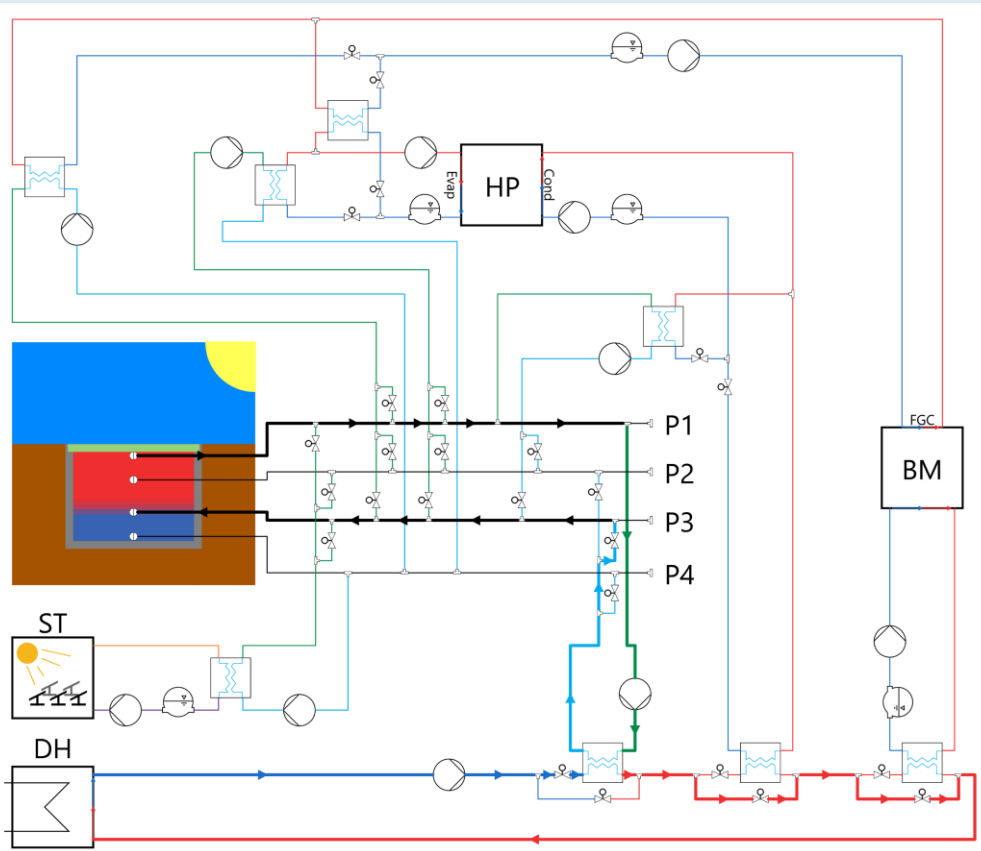
HP charges TES

HP summer operation



Main Operation Modes

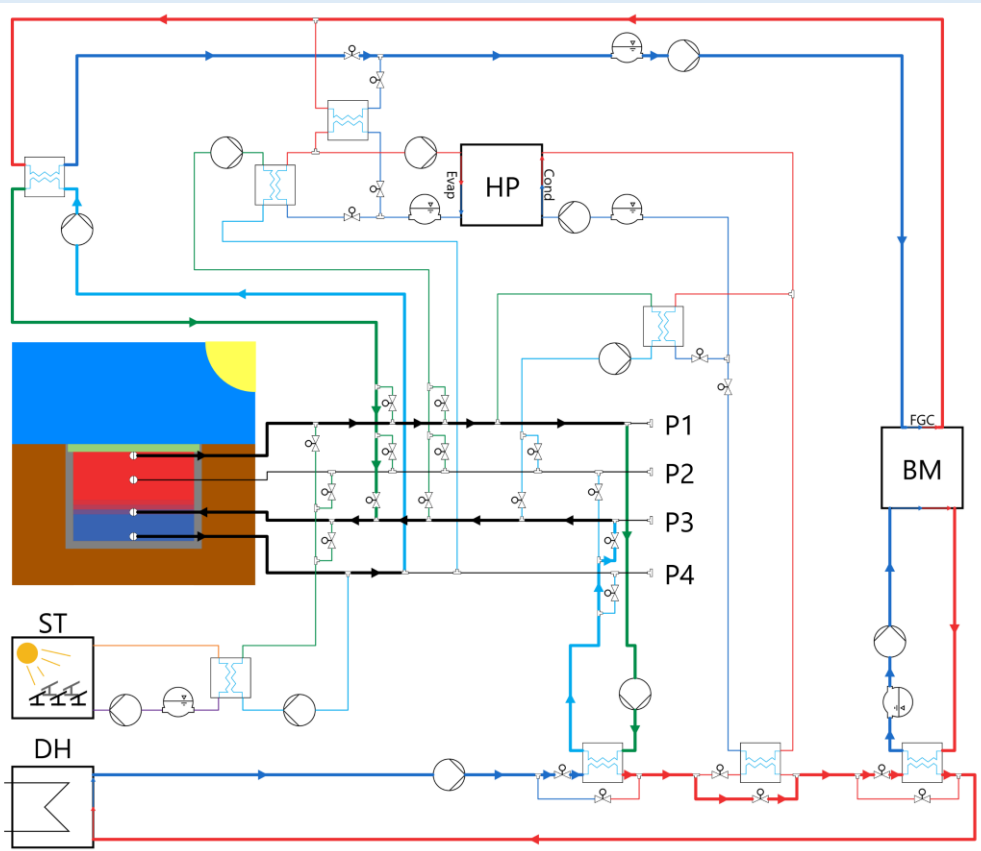
TES supplies DH



Main Operation Modes

TES supplies DH

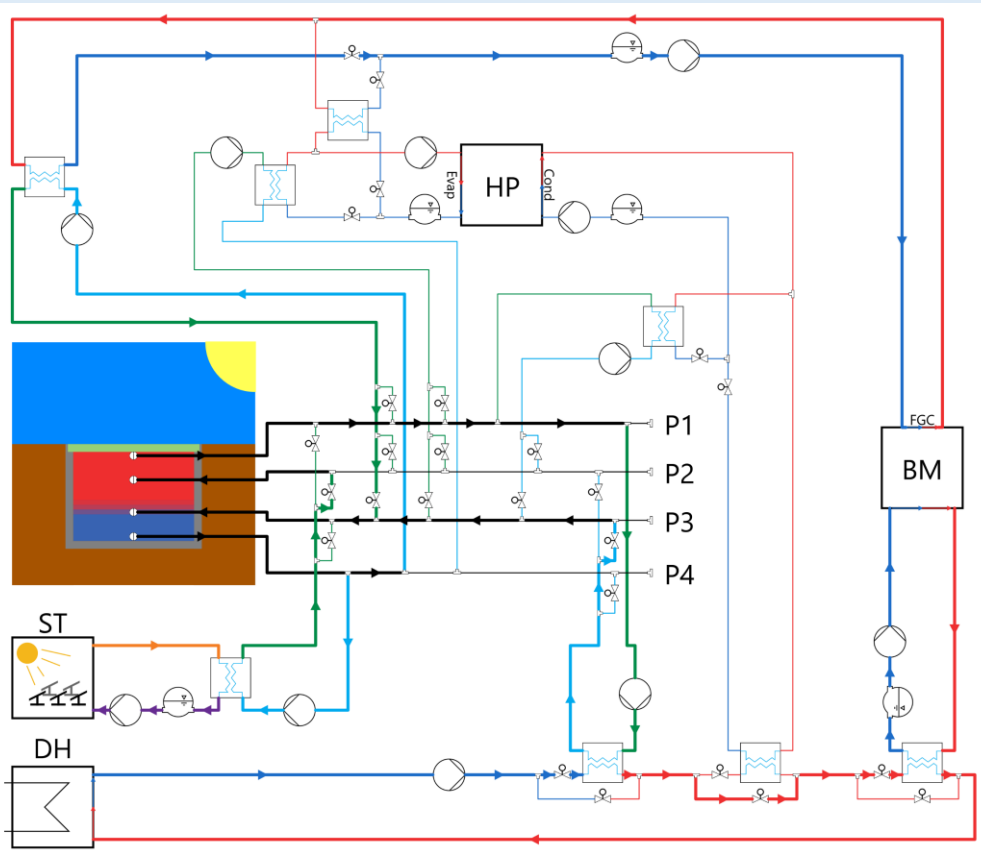
+ BM post-heating



Main Operation Modes

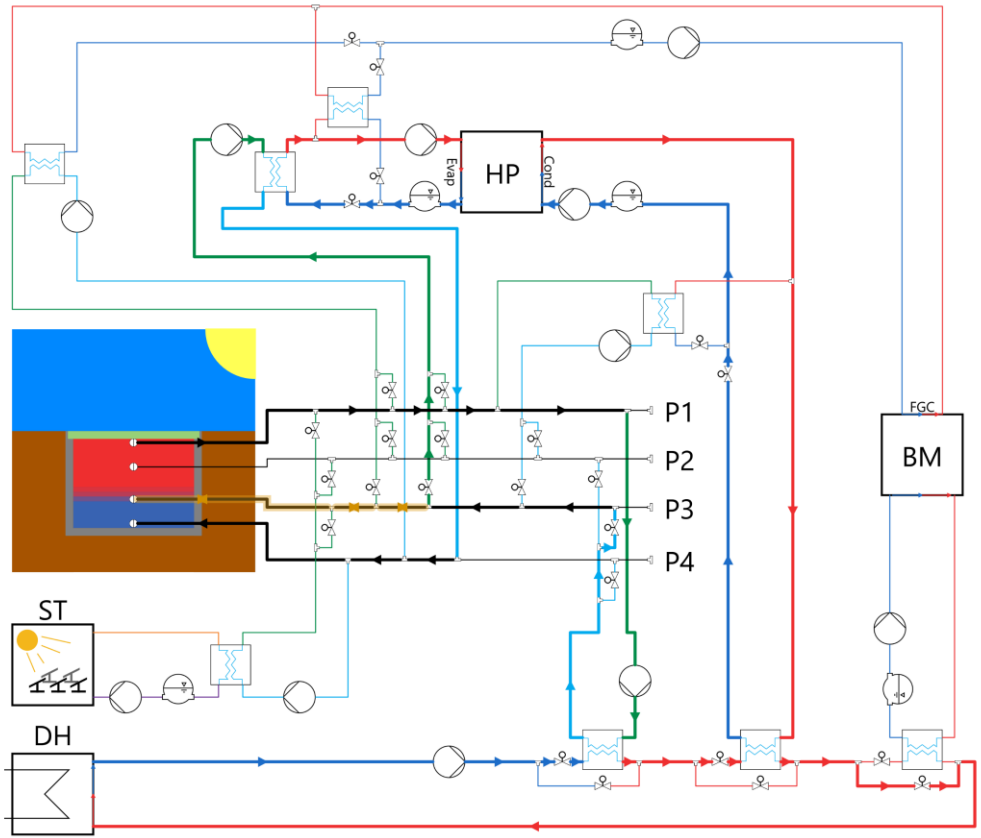
TES supplies DH

+ BM post-heating
+ ST charges TES



Main Operation Modes

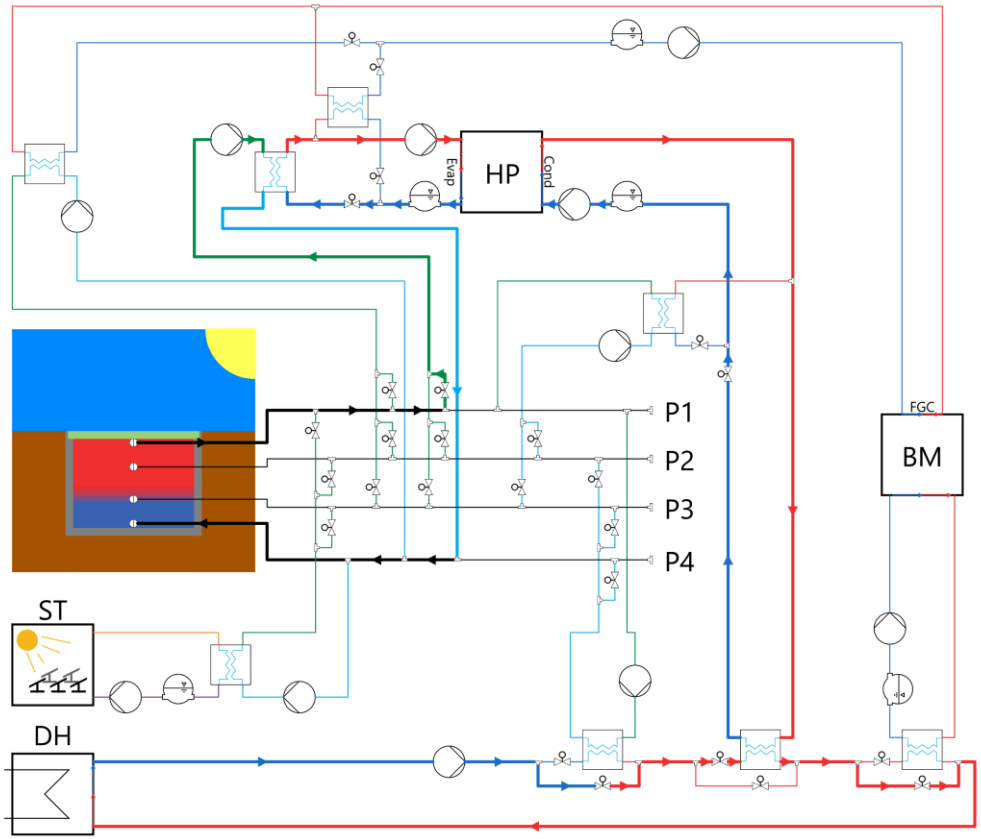
TES+HP supply
DH



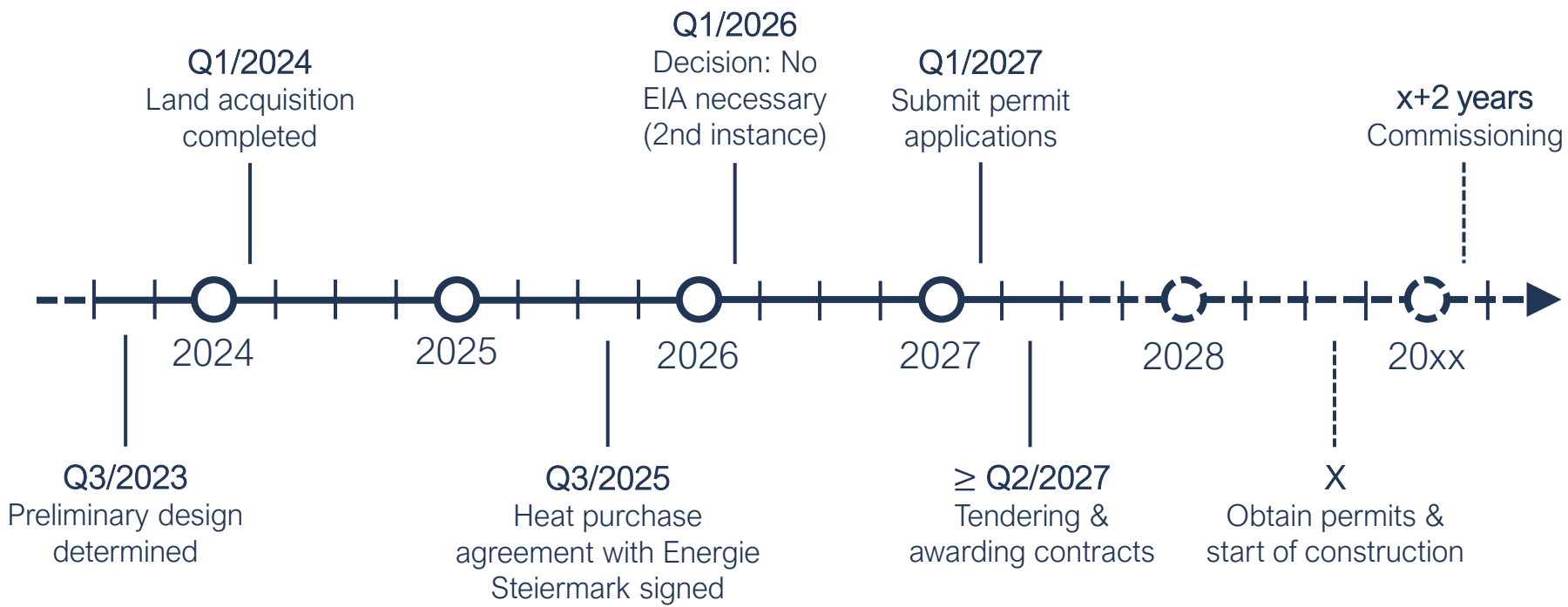
Main Operation Modes

HP supplies DH

with TES as source



Timeline


Q1/2024
Land acquisition completed
Q1/2026
Decision: No EIA necessary (2nd instance)
Q1/2027
Submit permit applications
x+2 years
Commissioning
2024
2025
2026
2027
2028
20xx
Q3/2023
Preliminary design determined
Q3/2025
Heat purchase agreement with Energie Steiermark signed
≥ Q2/2027
Tendering & awarding contracts
X
Obtain permits & start of construction

Co-funded by the InvestEU Advisory Hub of the European Union

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SONNEN SPEICHER SÜD



A Project by Styrian Companies

Storage, Solar, and Heat Pumps:

Wärmespeicher Weitendorf GmbH

together with

E3 F/ENERGIES

in close collaboration with

enso GMBH HERESCHWERKE

Biomass and heat transport pipeline:

BWE Energieservice GmbH

together with

bioenergie.at Gruppe

in close collaboration with

enas Energietechnik