Geothermal heat supply with high - temperature heat pumps

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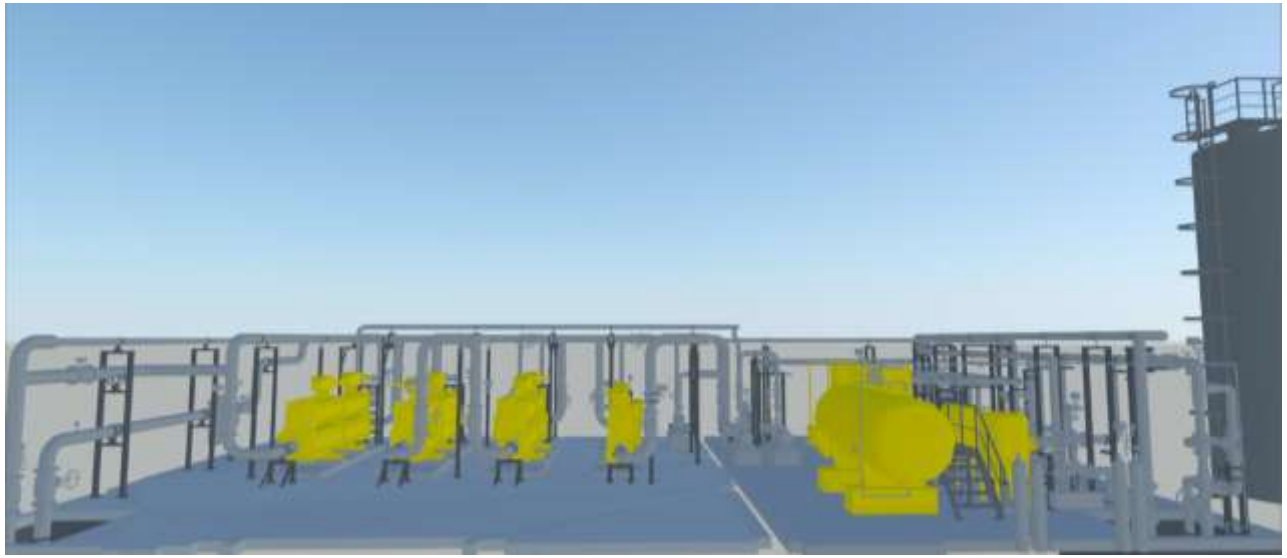
Peter Seibt

Geothermie Neubrandenburg GmbH (GTN)



Klaipeda 2022.06.03

GTN at a glance

GTN is an internationally active office of engineers and geoscientists.

The business activities cover the whole range of geotechnical and engineering solutions to geothermal energy supply.

- Founded in: 1992
- Shareholders:
  - Mannvit GmbH 74.0 %
  - Dr. Frank Kabus 13.0 %
  - Dr. Peter Seibt 13.0 %
- Employees: 24
- Offices in Germany:
  - Neubrandenburg
  - Berlin

Project

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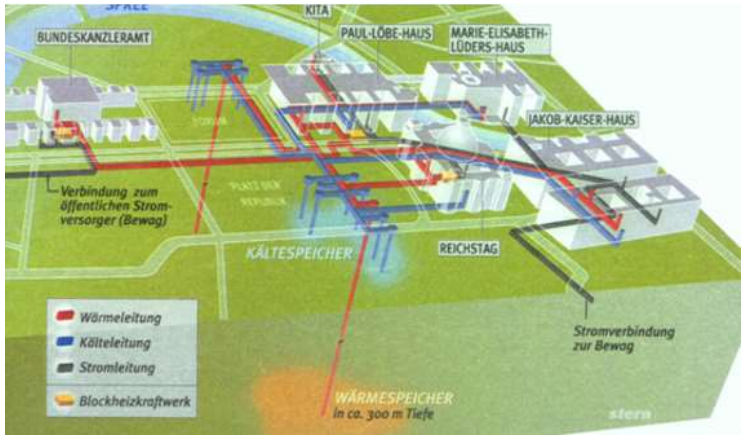
Selected projects

Neustadt-Glewe
Geothermal heating plant

Client
Erdwärme Neustadt-Glewe GmbH

Services
- Geoscientific support
- Design and site supervision of the geothermal facility
- Monitoring



Berlin
Aquifer storage Bundestag

Client
Planungsgesellschaft TVP

Services
- Energy concept
- Licensing procedures
- Design and site supervision of the total system

Neubrandenburg
Aquifer storage for district heating

Client
Stadtwerke Neubrandenburg GmbH

Services
- Project concept
- Licensing procedures
- Geoscientific support
- Design and construction supervision

Hydrogeothermal technology

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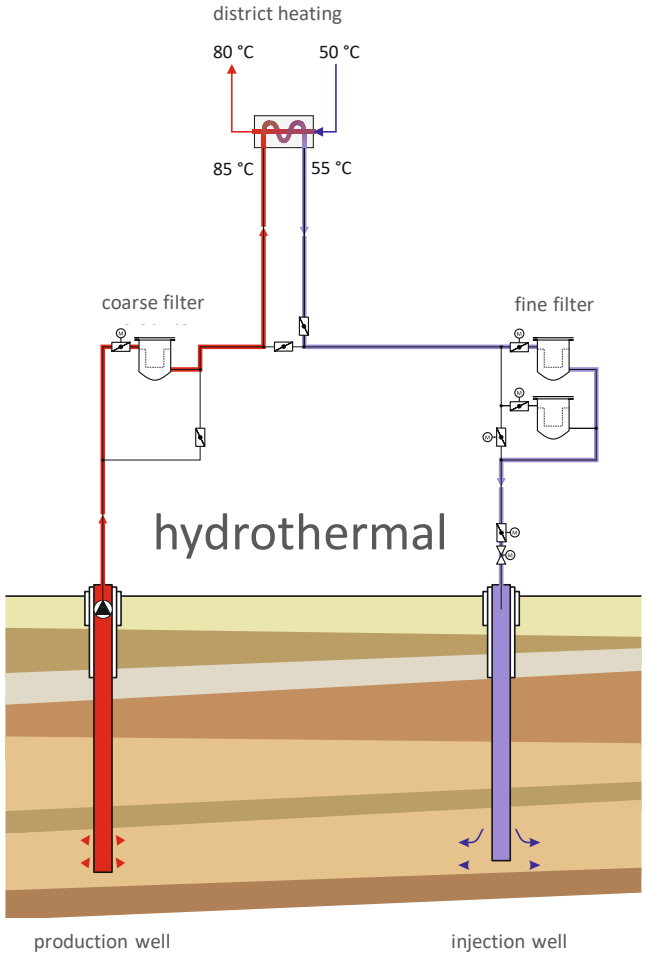
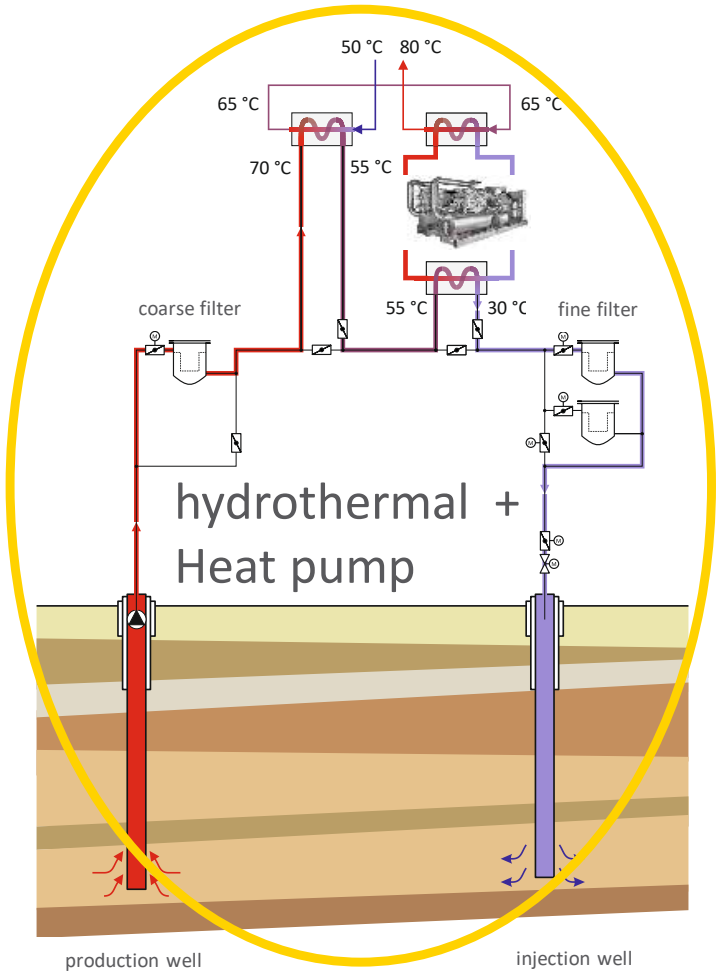
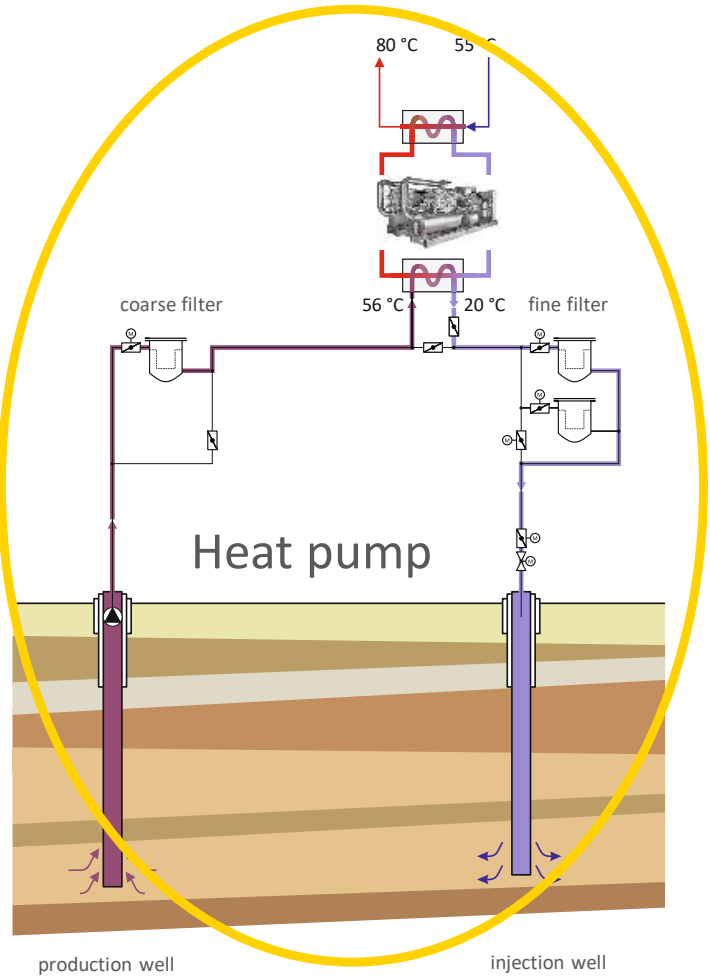
Technical concepts adapted to temperature







Geological Background

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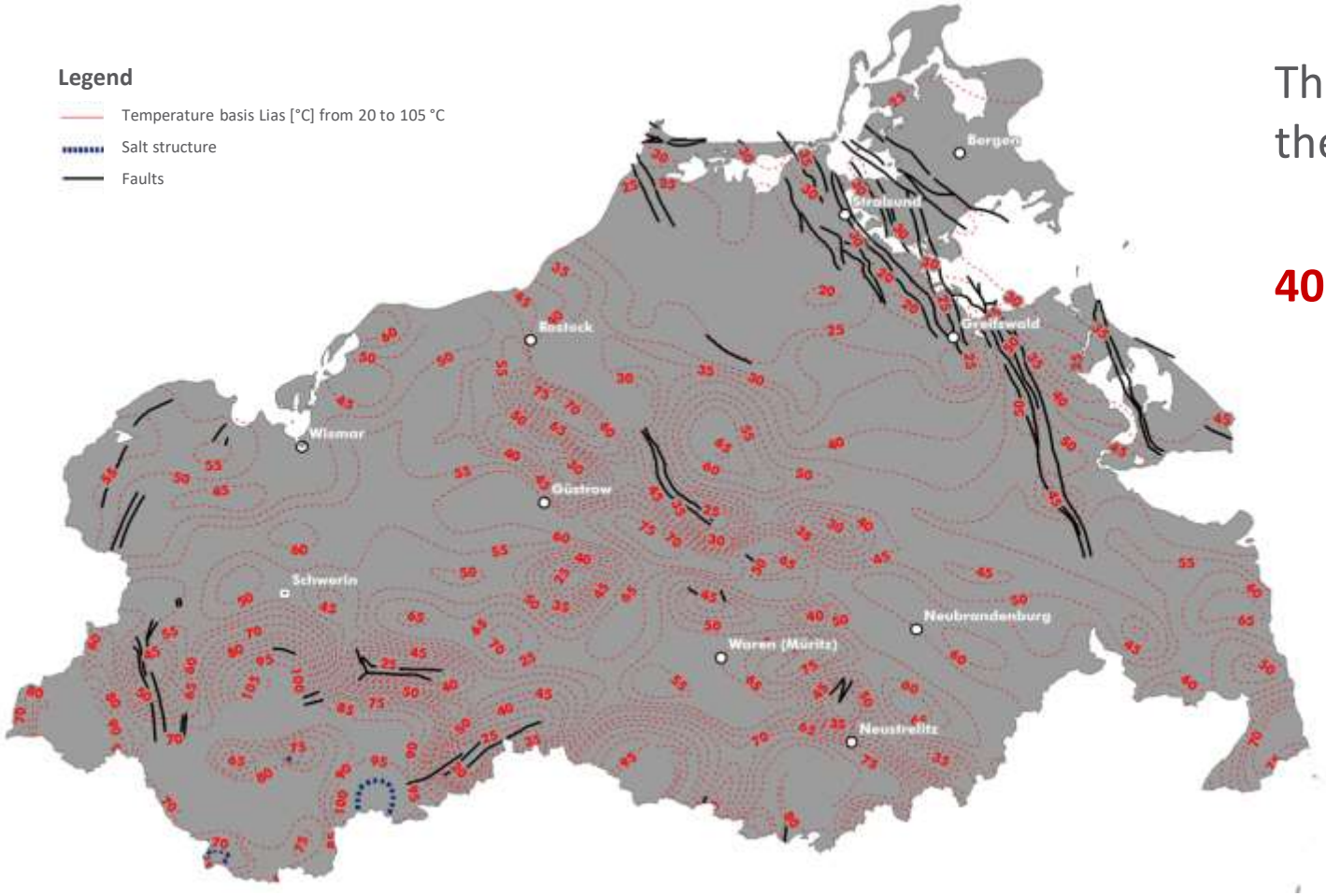
Oberrhät: temperature distribution Mecklenburg-Vorpommern



The most probable range of thermal water temperature:

40 °C … 80 °C

Geological Background

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Heat source capacity of heat pumps

Depending on:

- Thermal water flow rate (50 m³/h to 150 m³/h)
- Wellhead temperature (40 °C to 80 °C)
- Return temperature of heating grid (50 °C to 65 °C)
- Cooling of thermal water (here: down to 20 °C)

Heat source capacities for heat pumps in the range of **1.000 kW to 7.000 kW** can be expected.

Example Schwerin

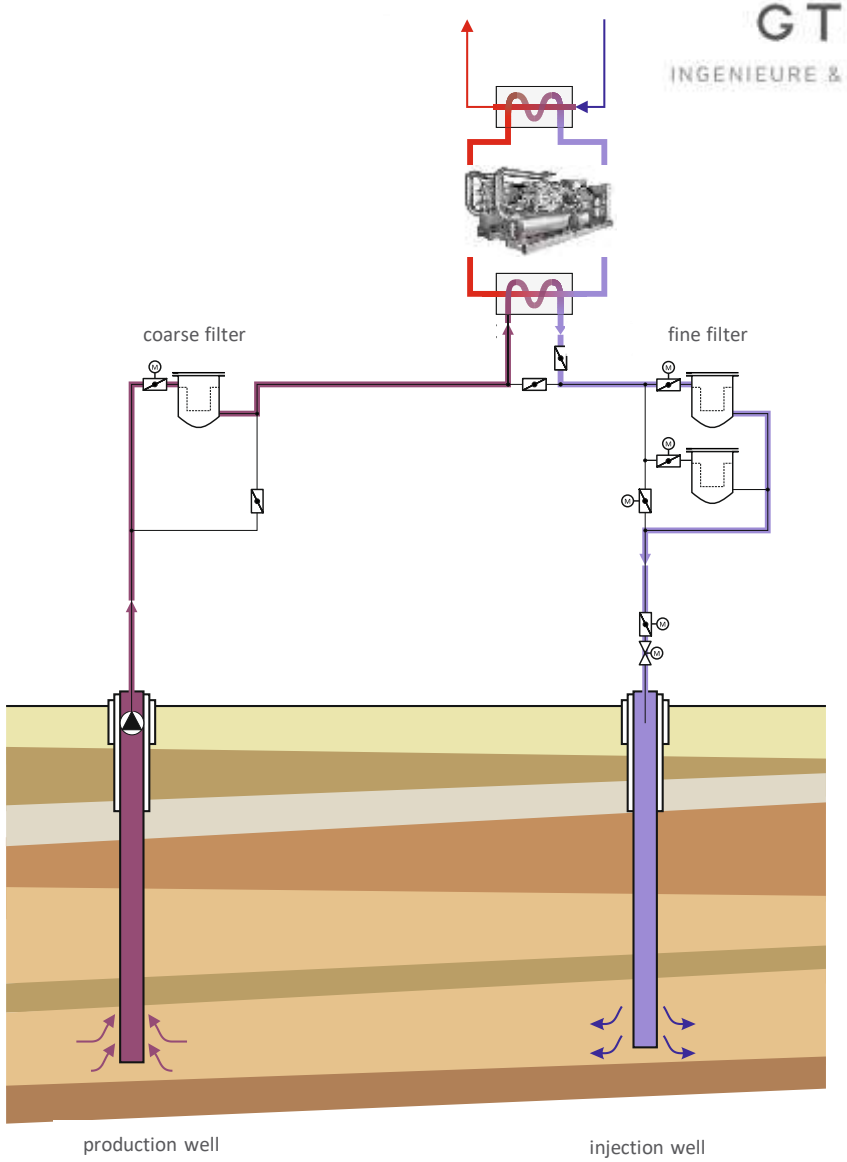
Boundary conditions

- Thermal water temperature 55.5 °C
- Mineralization 145 g/l
- Thermal water flow rate 150 m³/h

- District heating supply temperature 120 °C … 80 °C
  Base load 80 °C
- District heating return temperature 55 °C … 65 °C

→ Direct heat transfesr is not possible

→ Heat pump utilization **(approx. 7 MW)**



Example Schwerin

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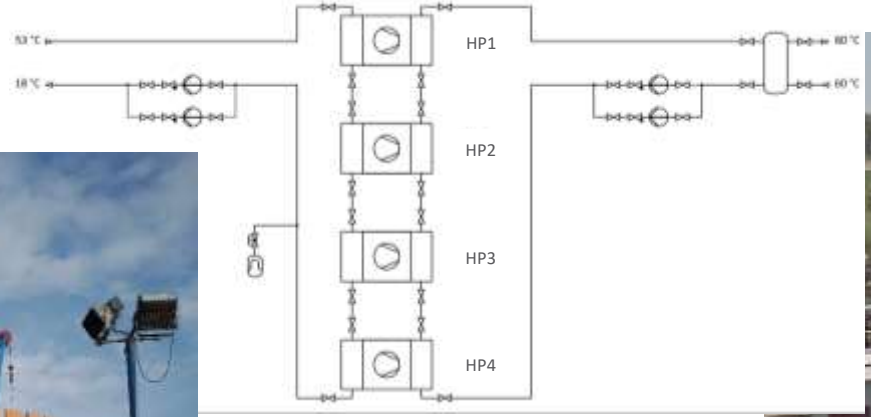
Project status – under construction



Example Schwerin

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Results

Heating capacity	6.9 MW
Thermal water volume	1.1 Mio. m^3/a
Geothermal heat supply	60 GWh/a
Electricity input	14.4 GWh/a
Annual performance factor of heat pump system	4.2

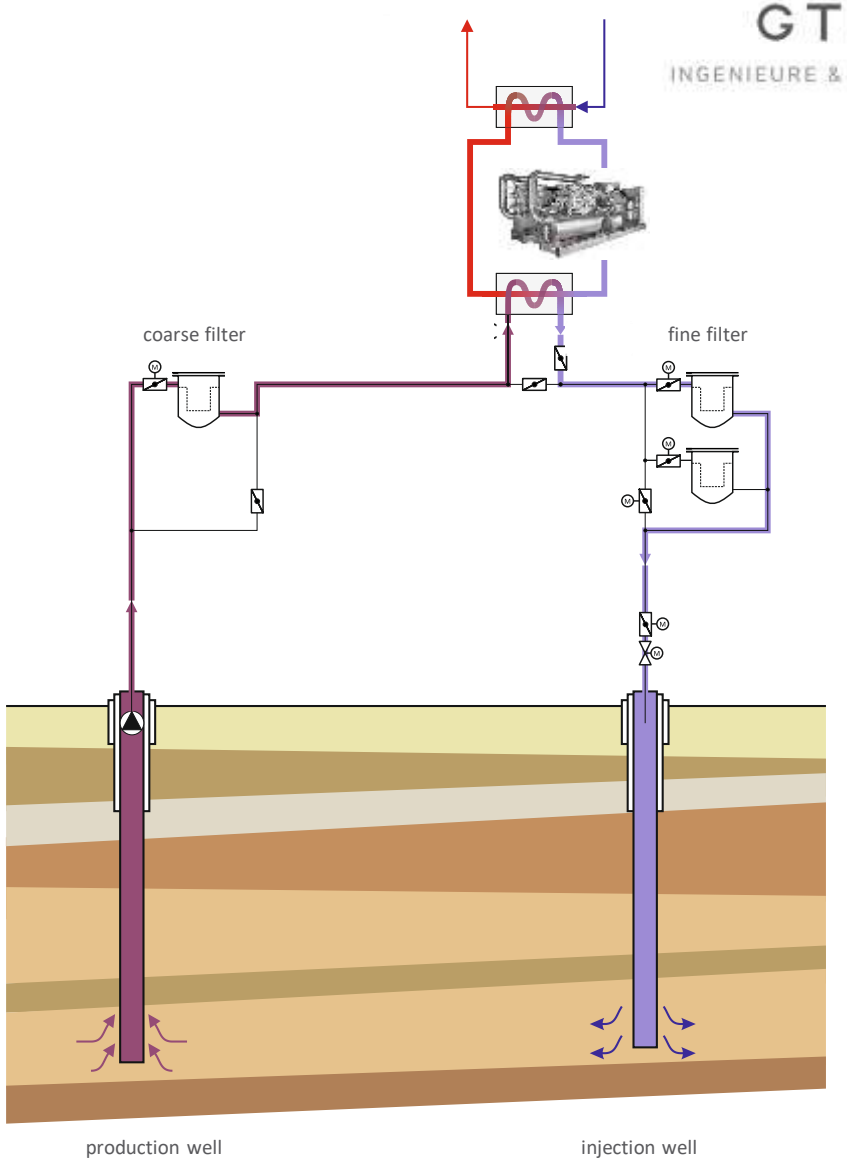
Example Prenzlau

Boundary conditions

Thermal water temperature	44 °C
Mineralization	88 g/l
Thermal water flow rate	130 m³/h
District heating supply temperature	85 °C … 75 °C
Base load	75 °C
District heating return temperature	60 °C … 70 °C

→ Direct heat transfer is not possible

→ Heat pump utilization **(approx. 4.5 MW)**



Example Prenzlau

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Results

Heating capacity	4.5 MW
Thermal water volume	0.9 Mio. m³/a
Geothermal heat supply	21.7 GWh/a
Electricity input	5.4 GWh/a
Annual performance factor of heat pump system	4.5

Possible future example Vilkaviskis ?

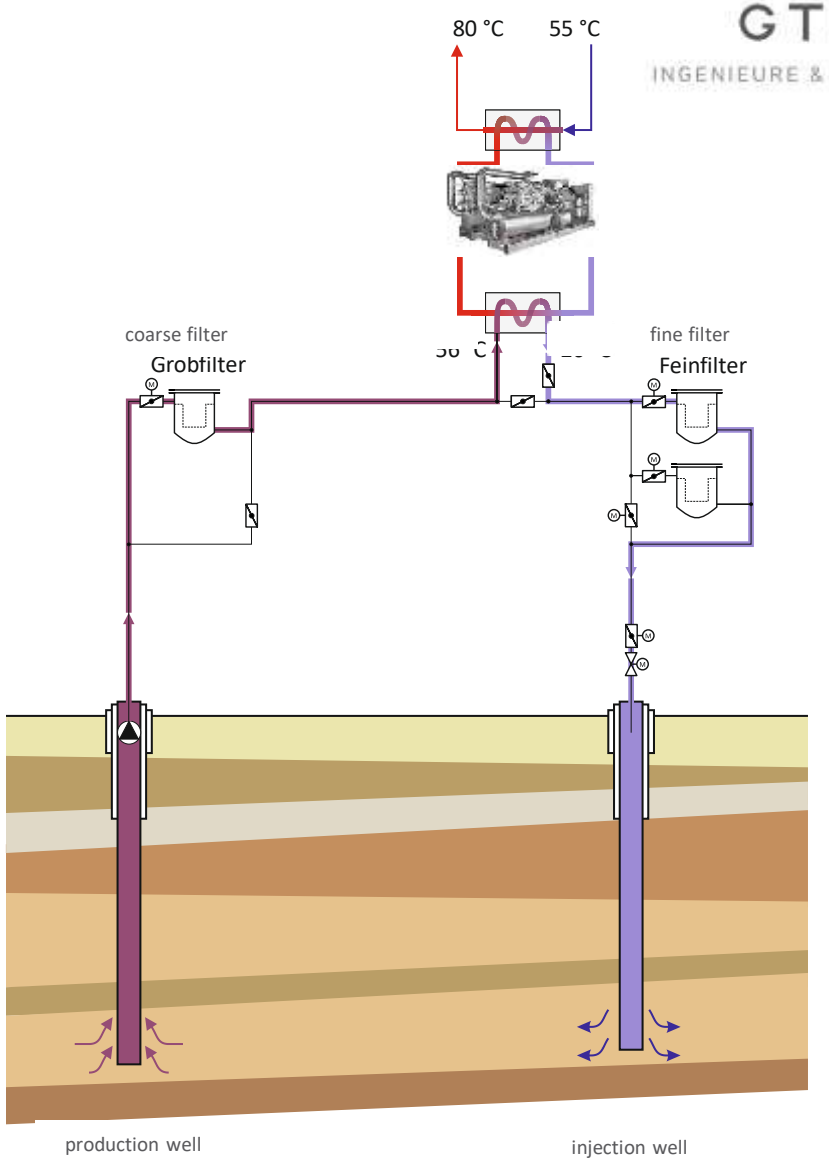
Boundary conditions

- Thermal water temperature 49 °C
- Mineralization 130 g/l
- Thermal water flow rate 150 m³/h

- District heating supply temperature *120 °C … 80 °C*
  Base load *80 °C*
- District heating return temperature *55 °C … 65 °C*

→ Direct heat transfesr is not possible

→ Heat pump utilization **(approx. 6 MW)**



Possible future example Vilkaviskis ?

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Results

Heating capacity	*6.2 MW*
Full load hours	*6.000 h/a*
Thermal water volume	*0.9 Mio. m^3/a*
Geothermal heat supply	*37 GWh/a*
Electricity input	*8.8 GWh/a*
Annual performance factor of heat pump system	*4.2*

Geothermal Studies in Latvia and Lithuania

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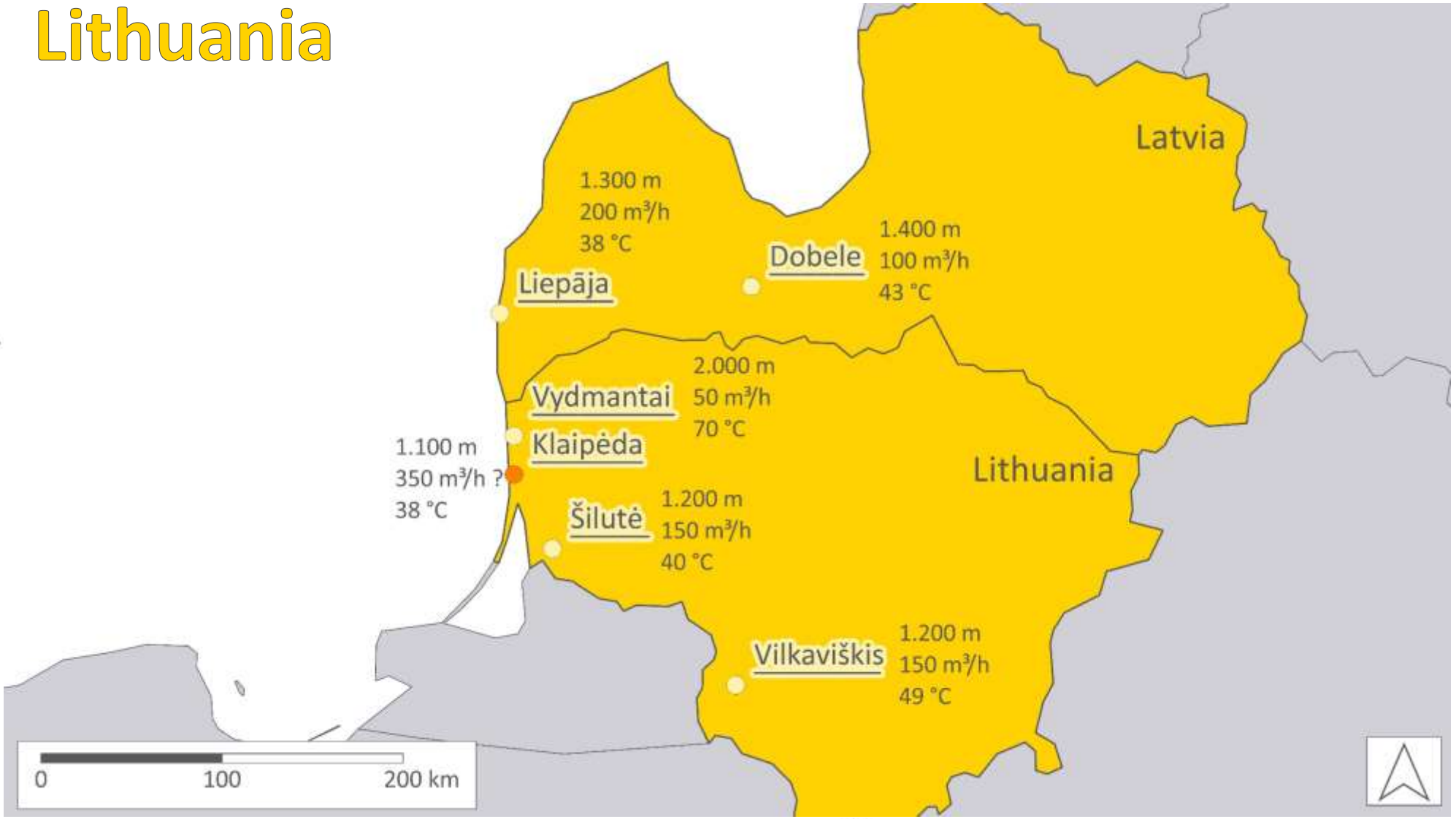

Conclusion

- Source temperatures below 60°C can be used technically and economically
- The plant in Schwerin as an example in the North German Basin and Lithuania
- Lithuania has good geothermal potential
- Adaptation to local conditions necessary - update the existing studies
  - Thermal water circuit adapted to water chemistry
  - Heat pump system adapted to source and consumer
  - **The public must be involved**

„There is nothing good, unless you do it“ Erich Kästner

Dėkojame už dėmesį!

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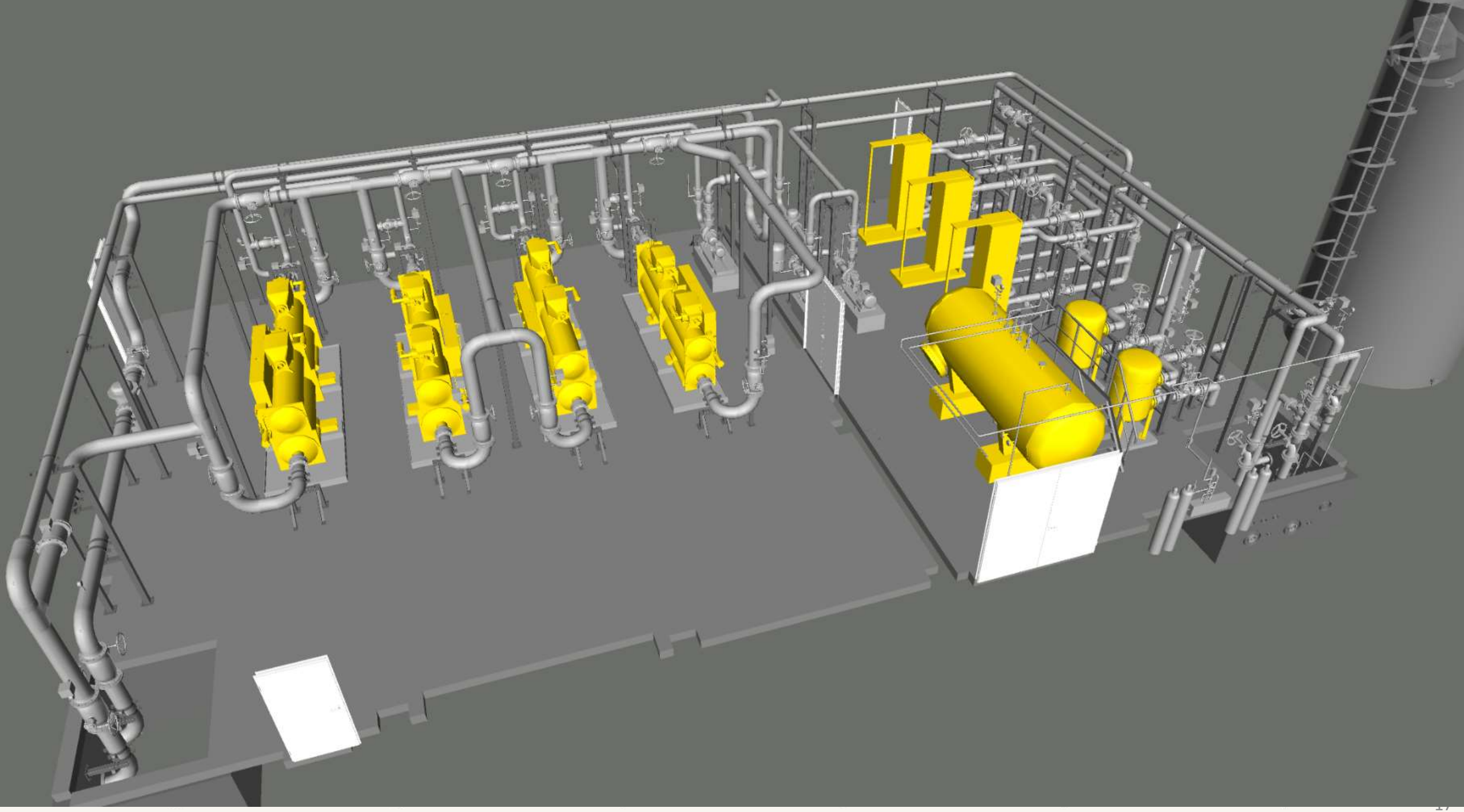

Thermal Water Circuit

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System layout