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Research study on renewable heat potential in climate-neutral heat supply Berlin 2035

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On behalf of BBK Berlin and Fridays for Future Berlin

1. Demand assessment

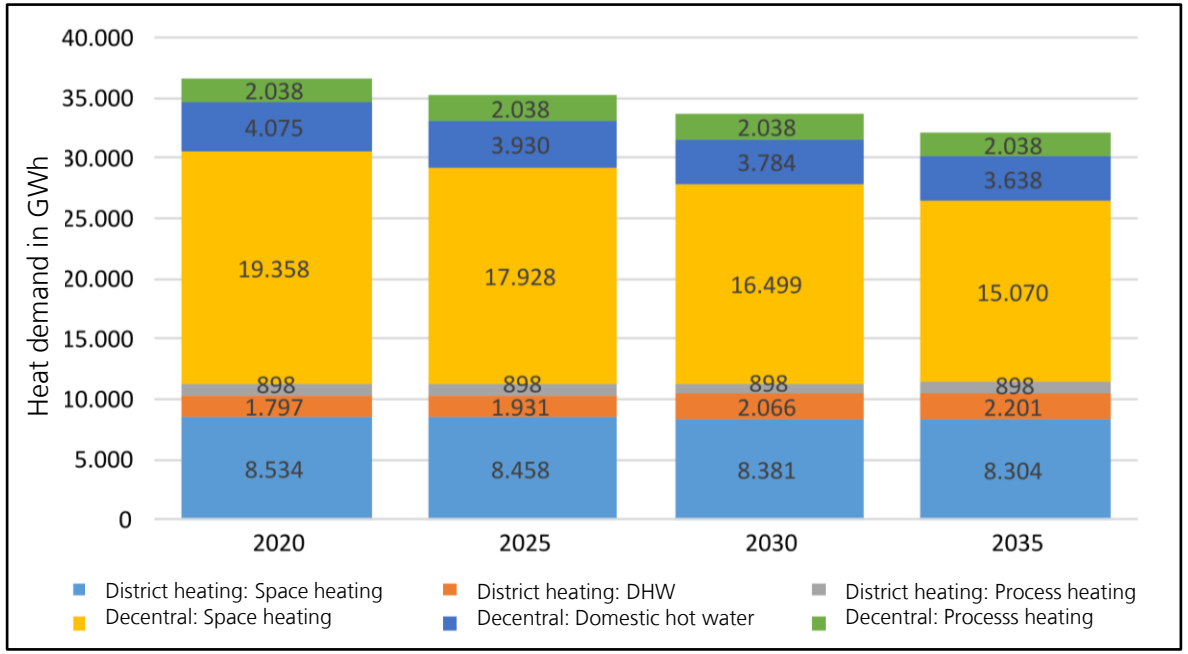
Heat demand forecast, heat load profile

Development of the heat demand in Berlin

- Final energy consumption for heat applications in Berlin dominates with about ~37 TWh (> 50 %)
- Future heat demand will decrease due to energy refurbishment, but potential is limited
- Renewable energy generation of heat required
- Great potential especially in district heating sector due to leverage effect

Main objectives

- Present transformation for climate-neutral heat supply ("Thinking from the goal")
- Identify and calculate heat potentials
- Estimate costs and decarbonization potential



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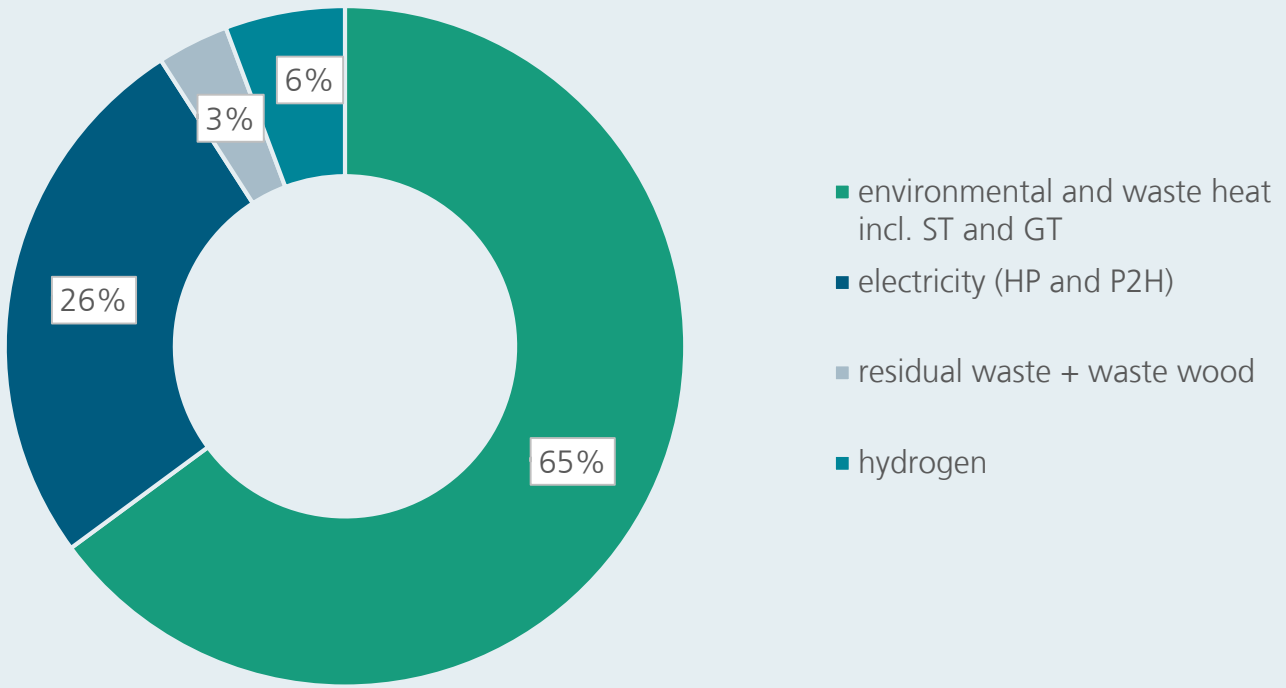
2. Potential analysis

Determination of heat potentials by calculation, research and expert survey

Energy mix of transformation scenario



Capacity of heat storages

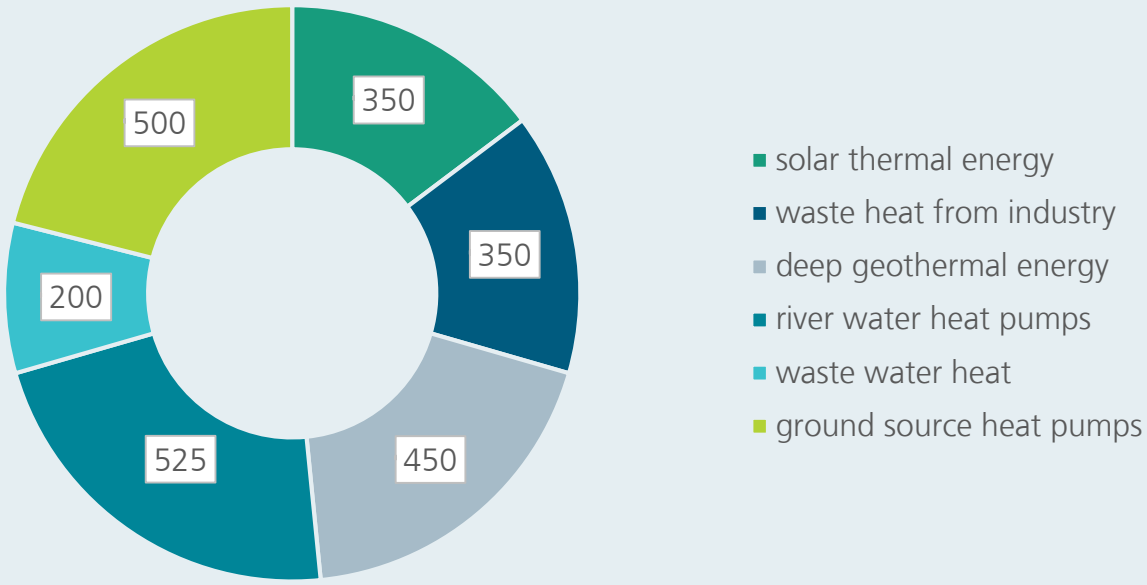
200.000 MWh capacity for flexibility and seasonal storage

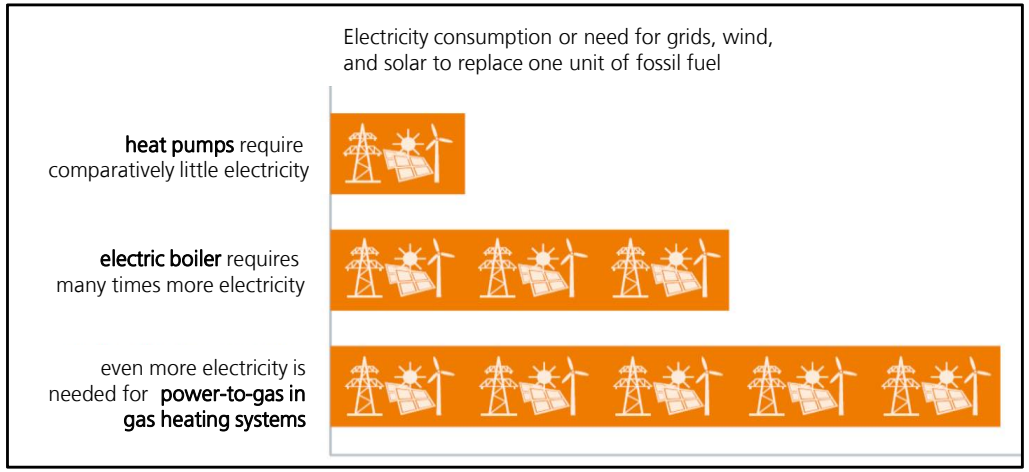
700.000 MWh seasonal storage capacity for solar thermal energy

2. Potential analysis

Determination of heat potentials by calculation, research and expert survey

Installed capacity of environmental and waste heat in MW incl. ST and GT





Graphics from: Gerhardt et al.: Hydrogen in the Future Energy System: Focus on Building Heat; Fraunhofer IEE; May 2020.

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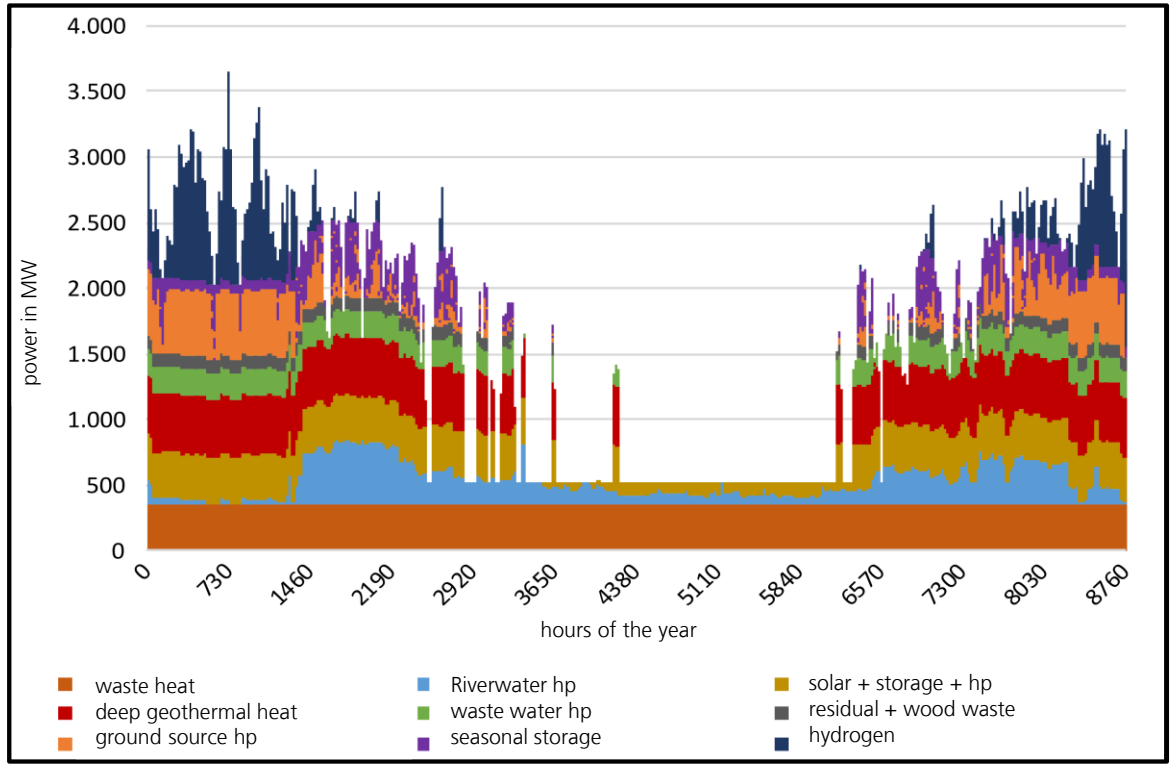
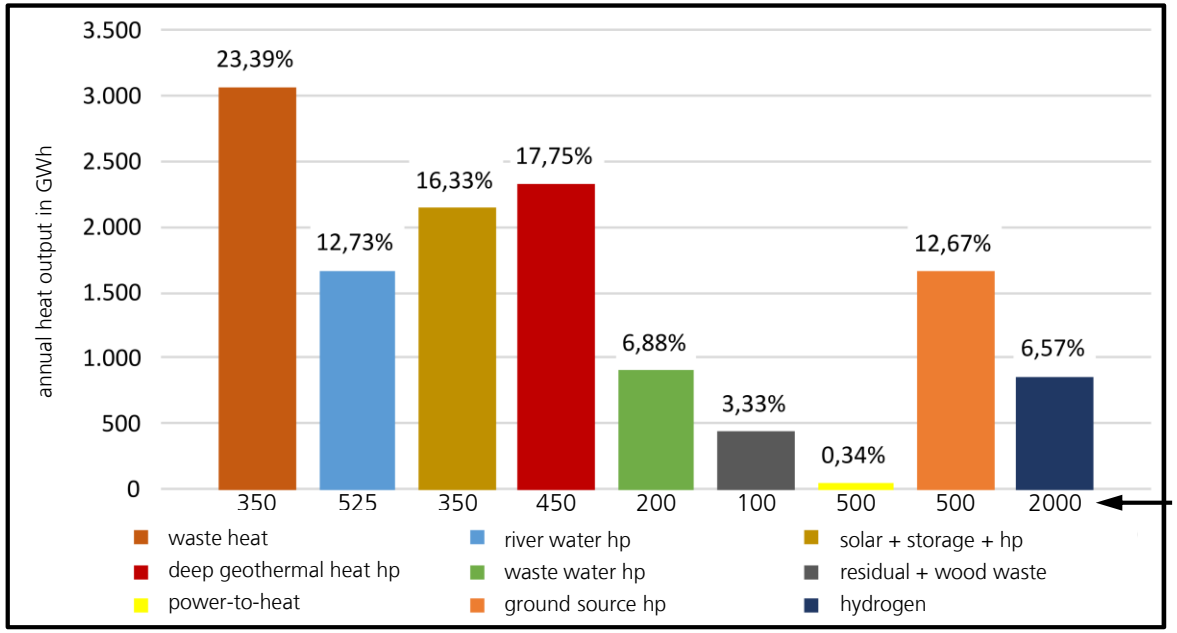
3. Scenario calculation

Definition of scenarios , calculation of energy source mix





base load → peak load

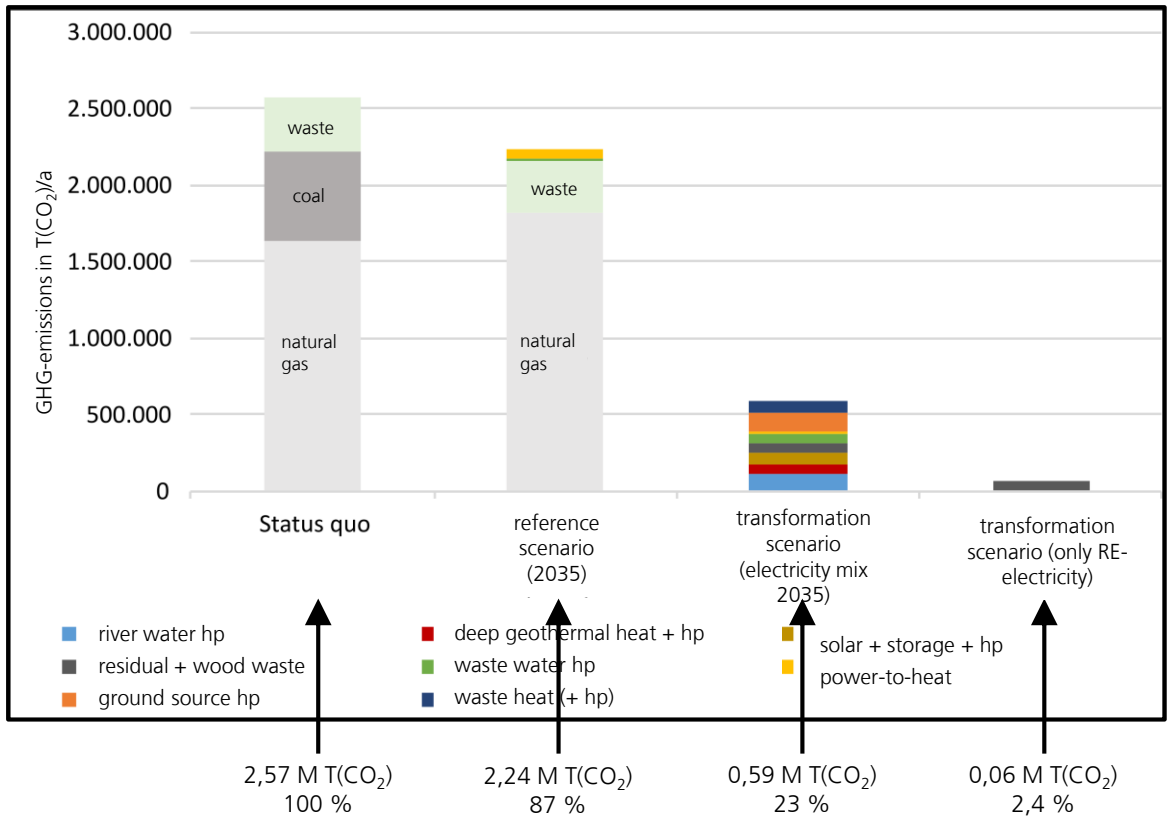
- Determination of the annual heat yield by prioritizing the heat sources and hourly load profile model
- Heat supply based mostly on low-temperature renewable heat sources
- Transformation from fuel-based heat generation (CHP) to use of environmental heat (heat pump)

4. Evaluation

Cost estimation (investment), CO_2 emissions

GHG-emission savings and economical aspects

- Investment costs: 4,24 billion euro
  - Including the complete transformation of the district heating supply, without funding
- Emissions budget for Berlin heat supply allows undiminished use of fossil fuels until 2028 (2 °C target; 66% probability)
- Transformation enables CO_2 savings of 77% (depending on development of power generation)
- Savings by 2035 of ~12.4 million T(CO_2)



Prospects of the transformation scenario

- Technical feasibility until 2030 / 2035 (regarding typical implementation periods of the plants)
- Transformation in line with overall system (waste reduction, power grid discharge)
- Major (political) need for action

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Thank you for your attention!

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