

# From borehole to process heat: Trade-offs between depth and heat pump integration in Aargau

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## Objective

- Decarbonize four industrial heat consumers in Lenzburg using deep geothermal energy.
- Integrate multi-level heat pump (HP) systems: process-to-process (internal HPs), grid-to-process (local HPs), borehole-to-grid (central HP).
- Quantify depth-dependent techno-economic trade-offs (1000–2500 m).
- Evaluate system expansion toward Industry + Community district heating.

## Methodology and data

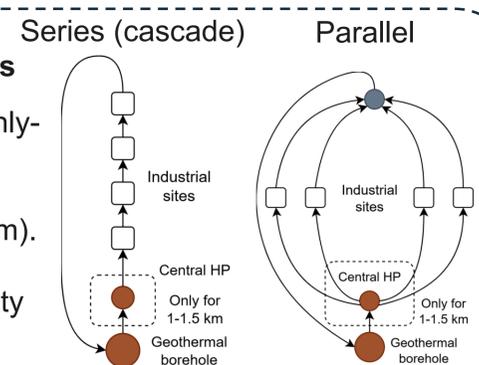
### Industrial companies

| Company           | Process          | Annual heat demand (GWh) * | Target temperature (°C) * |
|-------------------|------------------|----------------------------|---------------------------|
| SCHELLING AG      | Packaging        | 6.6                        | 143                       |
| Messer Schweiz AG | Industrial gas   | 11.2                       | 113                       |
| Traitafina AG     | Meat and sausage | 10.1                       | 114                       |
| Hero              | Convenience food | 7.3                        | 85                        |

\* Estimated values

### System configurations

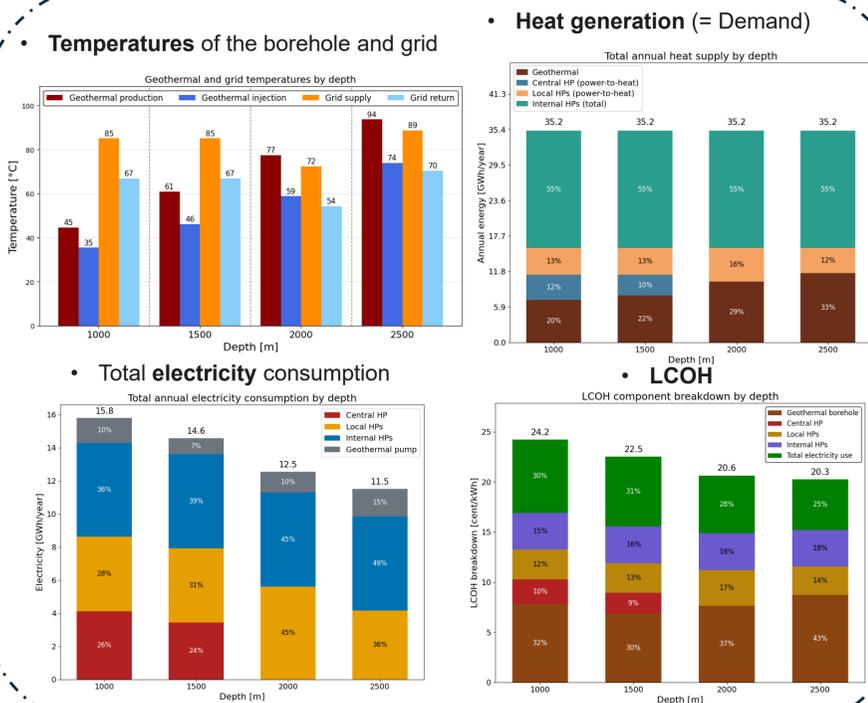
- **Series** applied to Only-Industry (all depths) and Industry + Community (1-1.5 km).
- **Parallel** applied to Industry + Community (2-2.5 km).



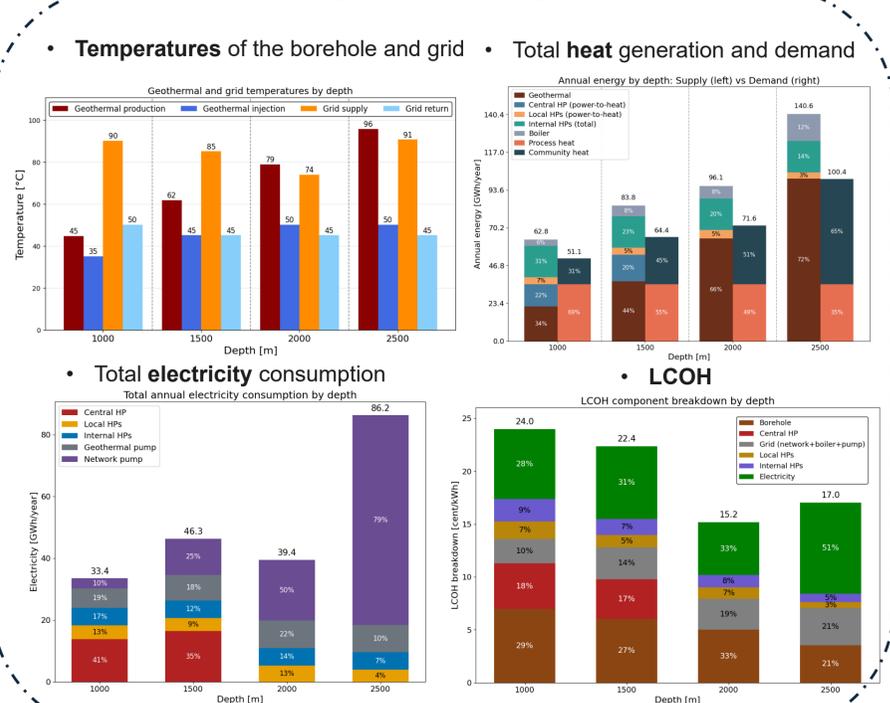
- Borehole cost functions are based on a German study, adjusted to Swiss conditions using a markup factor of 1.8

## Results (preliminary)

### Only Industry scenario



### Industry + Community scenario



## Limitation and Outlook

- Industrial heat demand was estimated using the STATENT dataset and characterized by temperature level through proxy composite curves.
- The circulation pump is configured as CCCP; performance could be improved by adopting a DVSP configuration.
- Drilling risk is not included and may alter the economic optimum.

## Conclusions

- In the **Only-Industry** case, LCOH remains higher than natural gas.
- Expanding to **Industry + Community** allows full geothermal exploitation; revenue from supplying community buildings reduces the effective LCOH of industrial heat to an economically acceptable range.