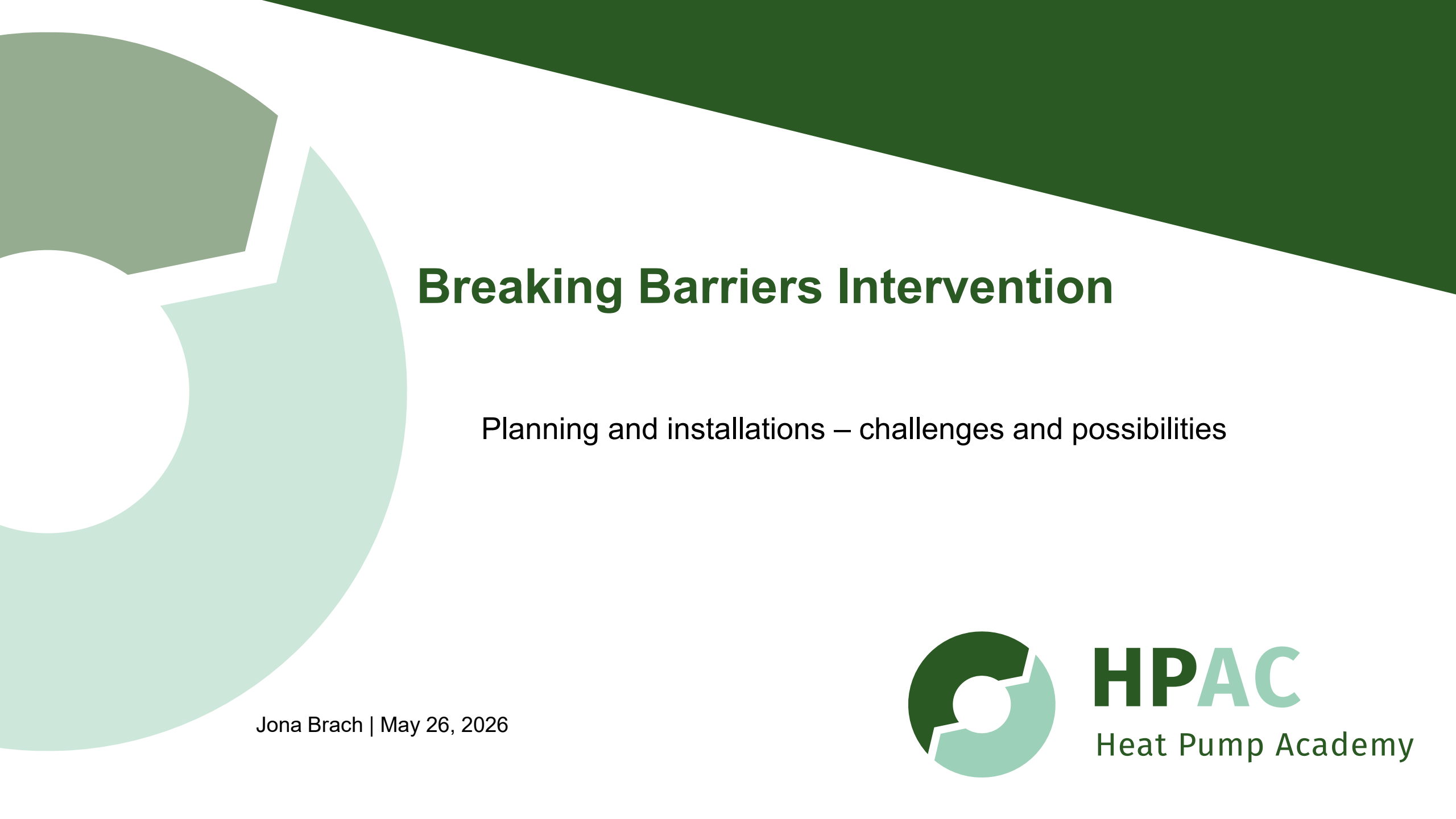




Breaking Barriers Intervention

Planning and installations – challenges and possibilities

Jona Brach | May 26, 2026

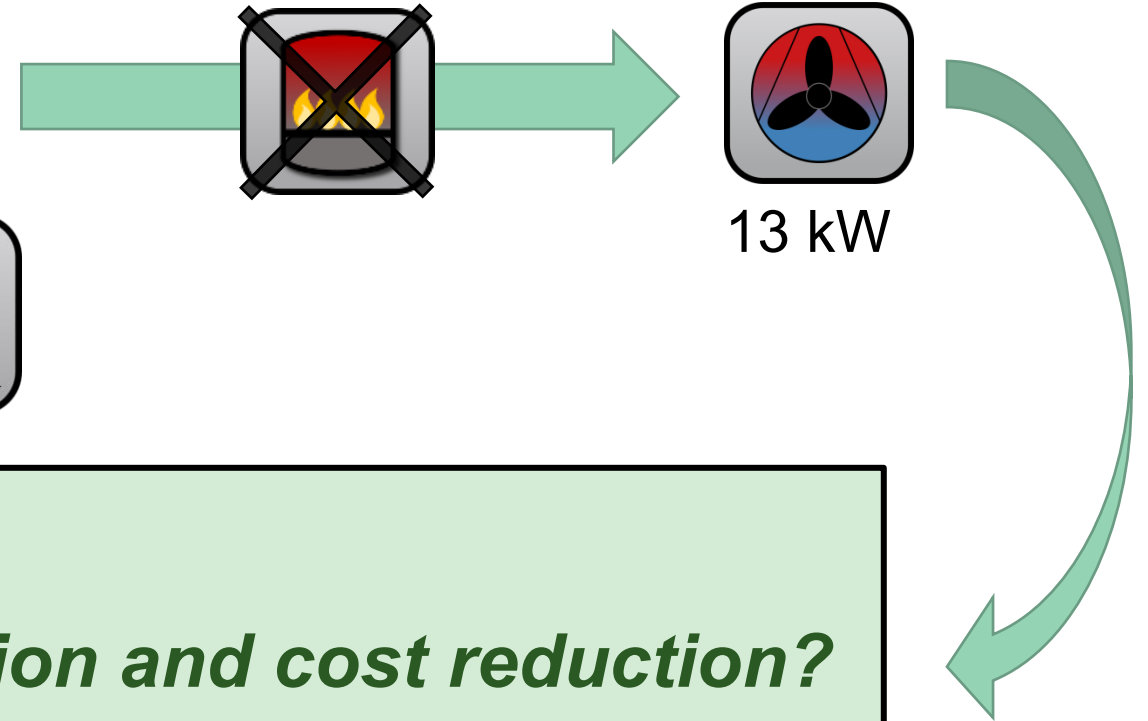
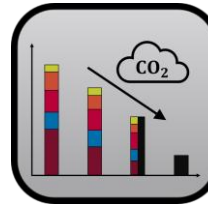


HPAC
Heat Pump Academy

Replacing the gas boiler with a heat pump

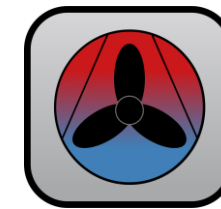
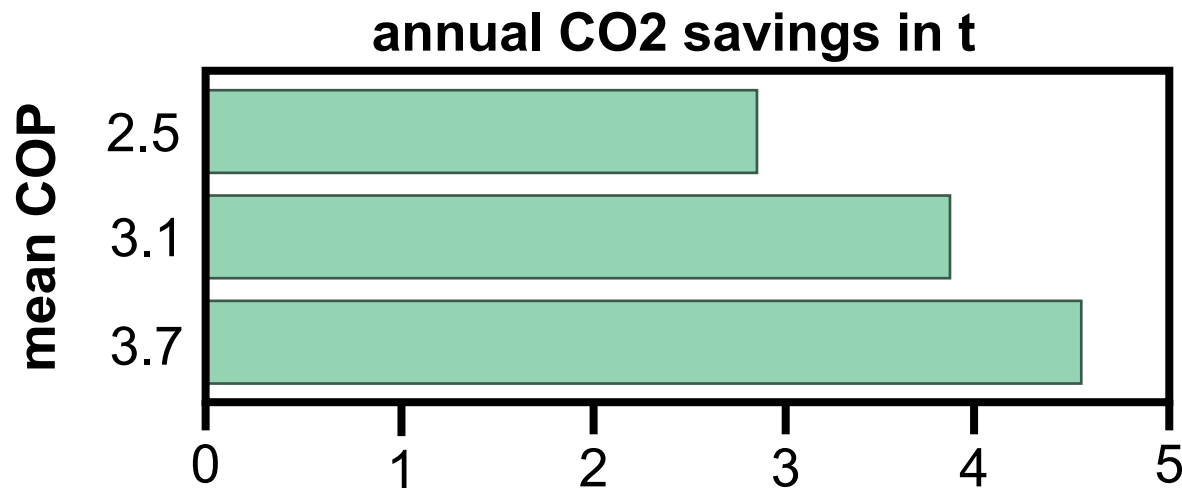


- Heat demand ~31,000 kWh / a
- 110 kWh / m²
- 5 people
- Gas boiler
- Goal:



CO₂ Emissions

- Approximately 3 to 4.5 tons of CO₂ can be saved each year
- Data assumed for 2023
- Greener energy mix → higher CO₂ saving



switching to BEV
(30,000 km/a)

Heating Costs

- Installed gas boiler: 12.3 ct/kWh
- New heat pump:
 - ≡ Investment: €30,000
 - ≡ 31,000 kWh of heat $\approx$ 10,000 kWh of electricity
 - ≡ 33 ct/kWh (standard rate) or 22 ct/kWh (heat pump rate)

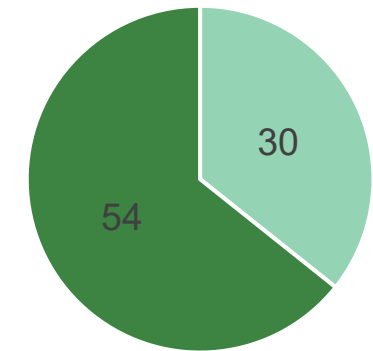
LCoH	standard rate	heat pump rate
w/o subsidies	16.6 ct/kWh	13.0 ct/kWh
w/ subsidies	13.6 ct/kWh	10.1 ct/kWh

- In many cases, heat pumps are already competitive
- In the future, gas will become increasingly expensive
- With subsidies, costs can be kept close to 10 cents/kWh
- Annual **savings** of up to 685 €



No subsidy, no HP rate
expenditures in 1000€

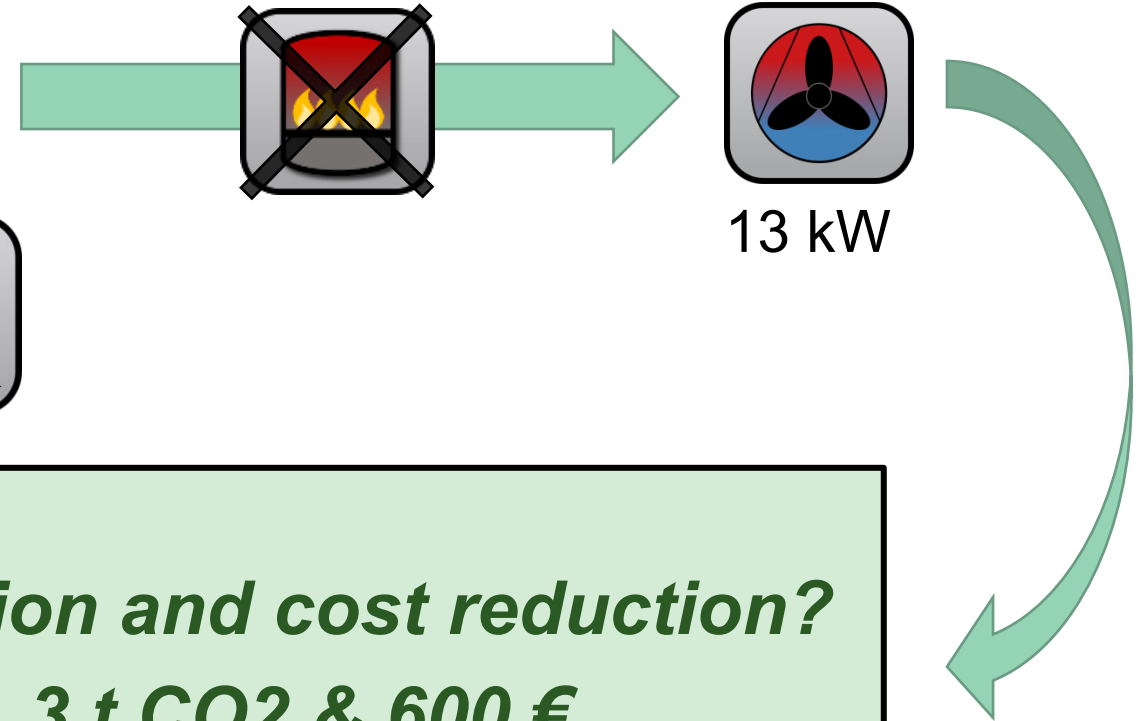
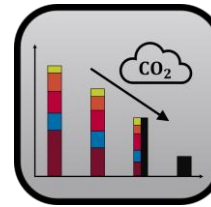
■ CAPEX ■ OPEX



Replacing the gas boiler with a heat pump



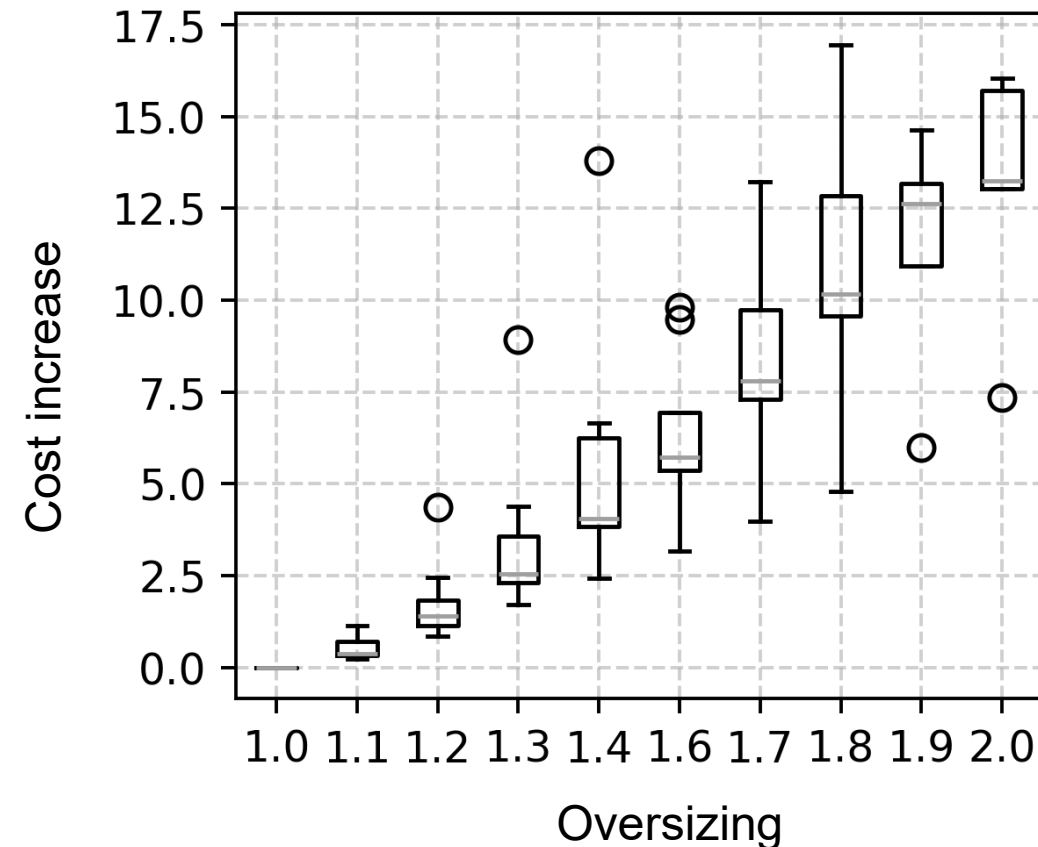
- Heat demand ~31,000 kWh / a
- 110 kWh / m²
- 5 people
- Gas boiler
- Goal:



Emission and cost reduction?
3 t CO₂ & 600 €
...in case of optimal planning

The Impact of Oversizing on End-User Costs

- What happens if I make mistakes in the planning and the heat pump is too large?
- With 20% oversizing, costs increase by a maximum of 5%.
- 53% of heat pumps in the field are oversized
- Avoidable cost decreases through sensible planning and installation
- But: Even with a factor of 2, it's still just as expensive as gas—and there's even more to be gained



Vering, C., Römer, W., et al., "Towards optimal heat pump system design: With a little help from the manufacturers," Nature npj clean energy, in press.

Next steps

- Towards optimal heat pumps in residential buildings
 - ≡ Plan carefully,
 - ≡ build up steadily, and
 - ≡ operate efficiently

- Reduce oversizing as much as possible
 - ≡ Boilers are typically oversized and therefore not a good hint
 - ≡ Validate by consumption data

- Visit pitch presentation on Friday, 11am
 - ≡ The heat pump system planning bottleneck: what data you need for optimal planning and what is accessible

- Open issue: Where would you have placed it? Might it be too noisy?