



Technische Hochschule
Ingolstadt



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Institute of
new Energy Systems

Hybrid Heat Pump⁺

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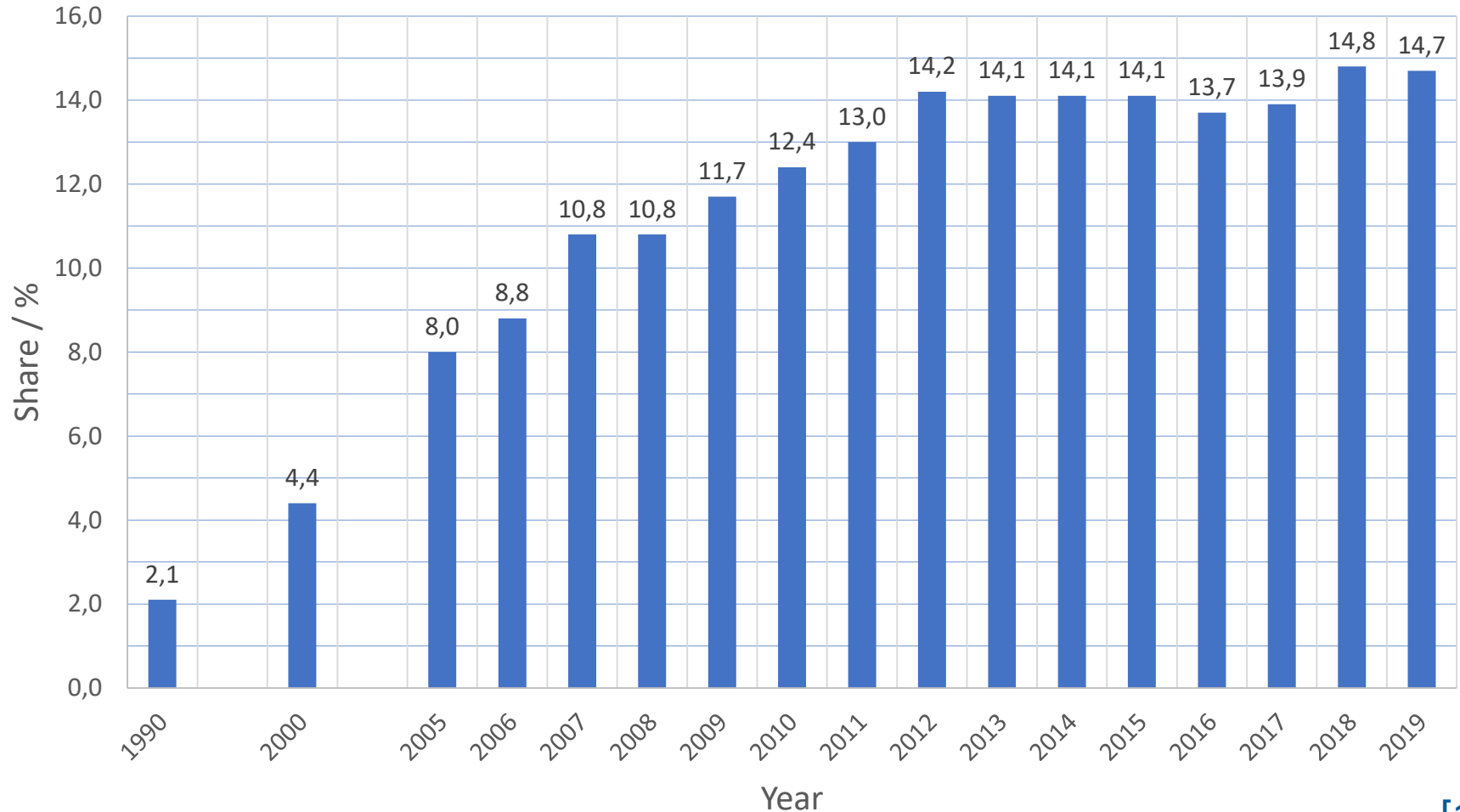


- 1 Motivation / Background
- 2 Project development aim
- 3 Methodology

Literature

1 Background / Motivation

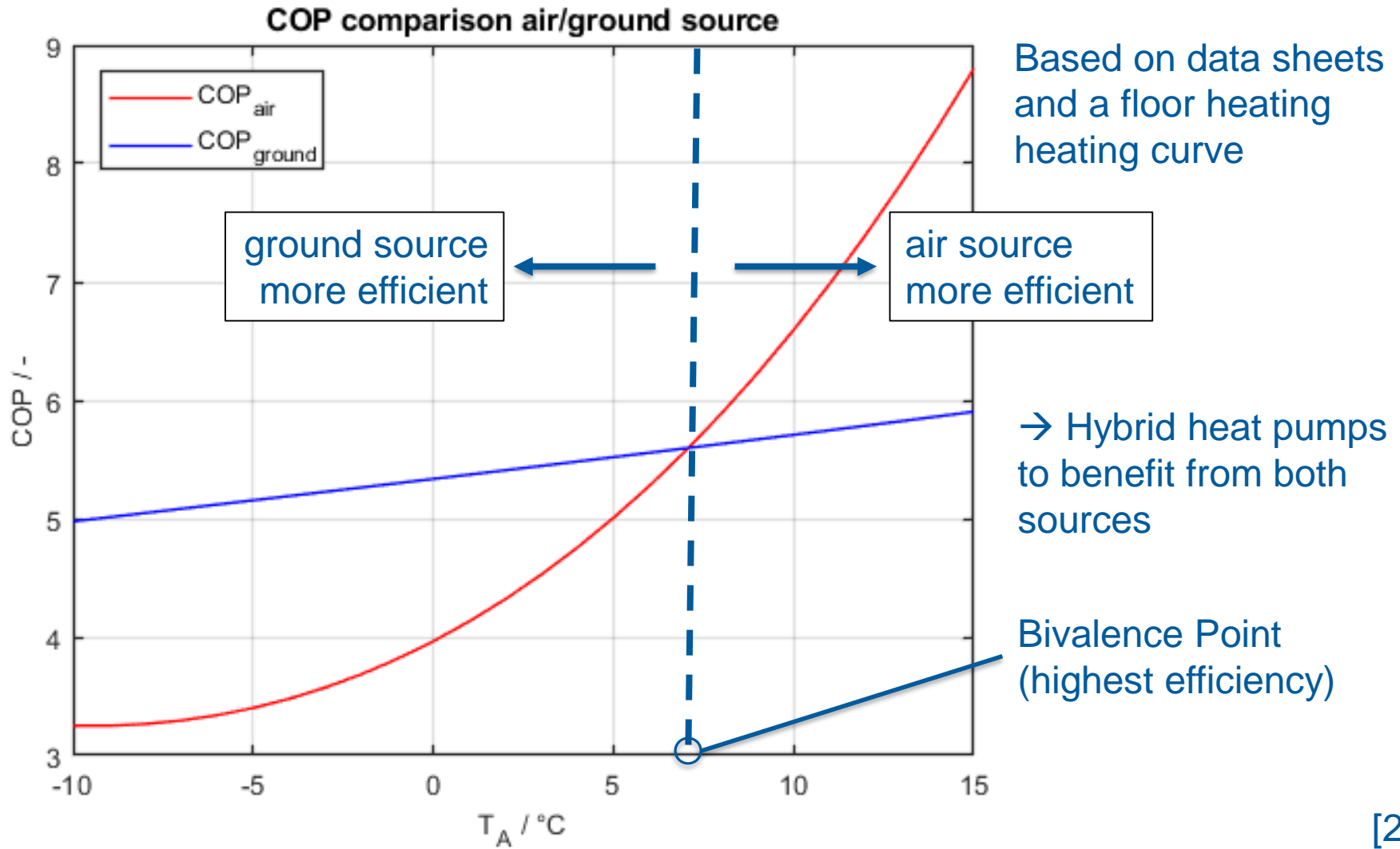
Share of renewables in final energy consumption for heat generation in Germany



[1]

1 Background / Motivation

Heat pumps: COP air source versus ground source

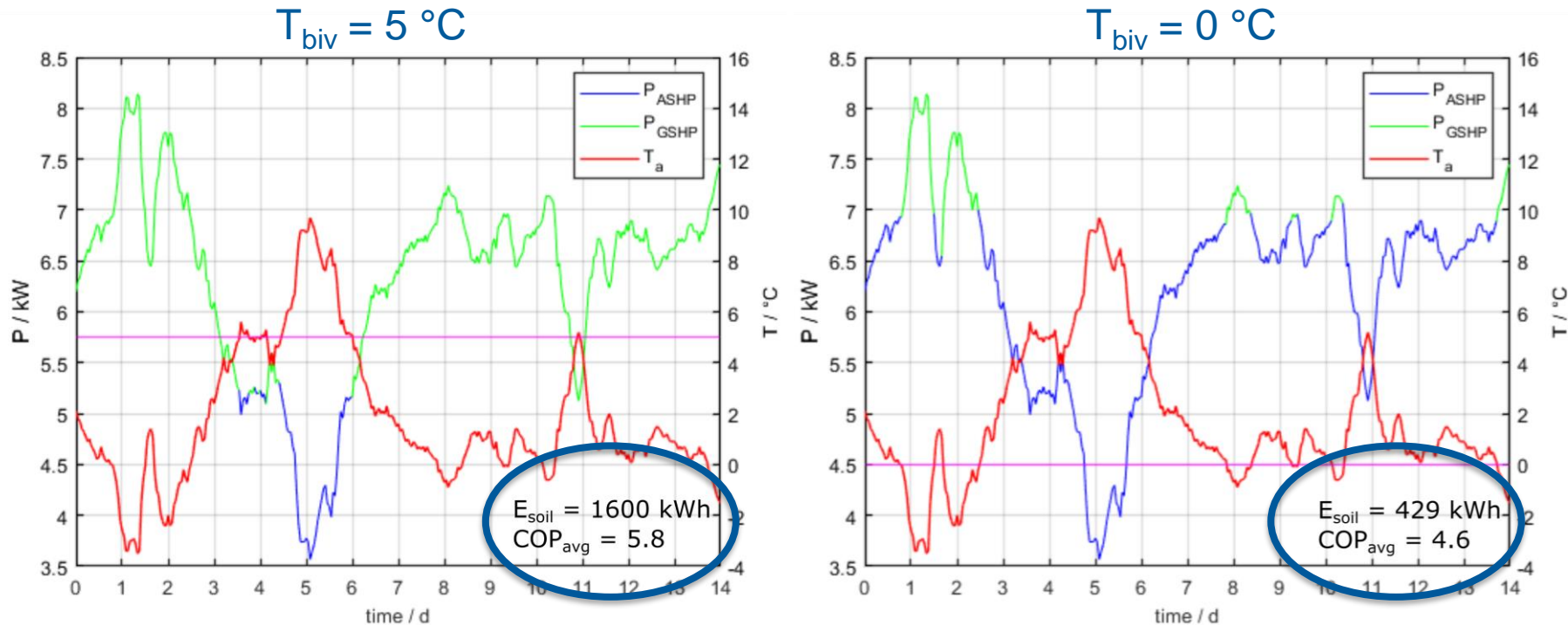


[2, 3]

1 Background / Motivation

Potential of a hybrid heat pump

What effects does changing the bivalence point have?

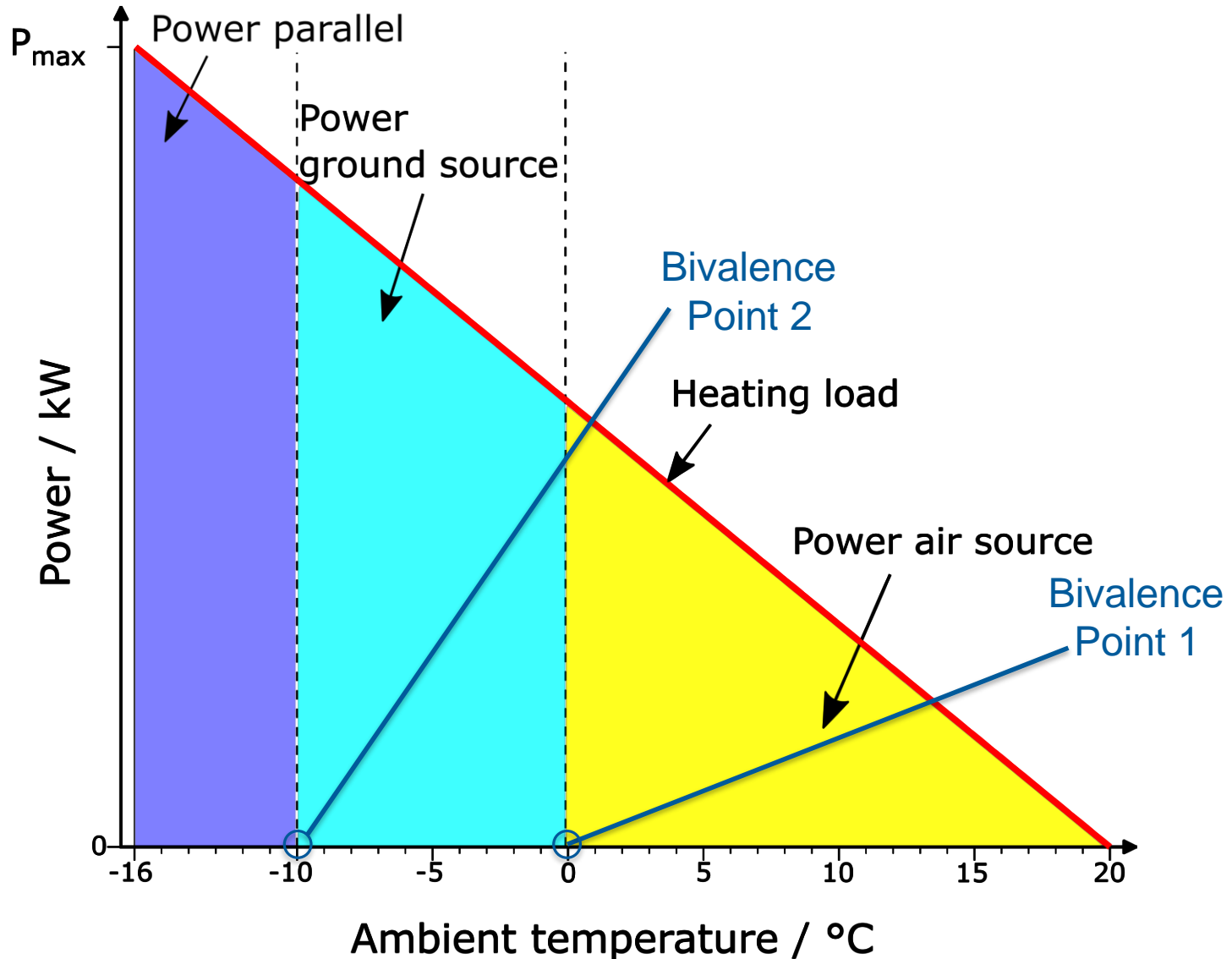


- One can reduce the energy taken from the soil with the bivalence point
- Increase average heat pump efficiency by using more ground heat (in hybrid systems)

[2, 3, 4]

2 Project development aim

Basic idea of the novel interconnection – coverage of the heating load



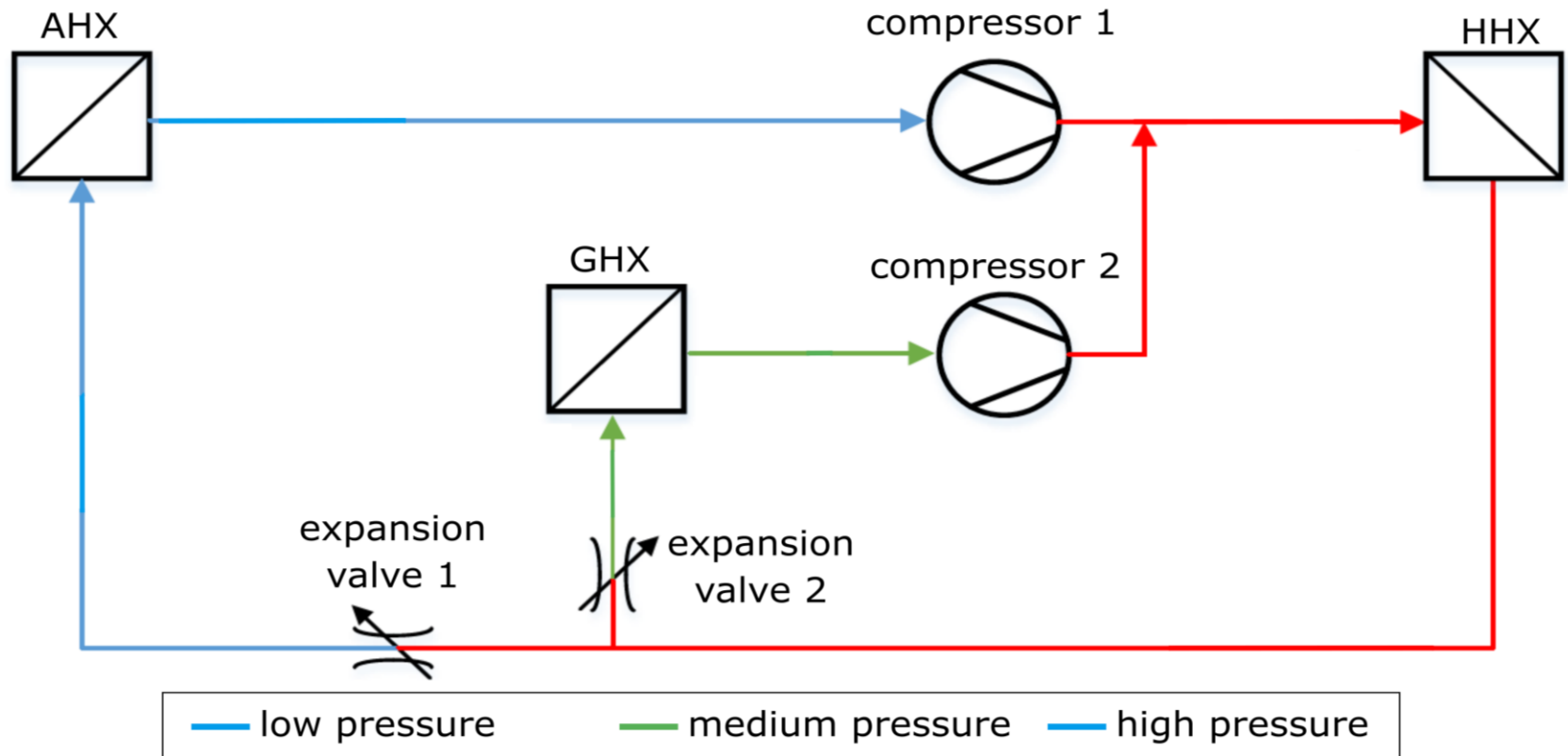
2 *Project development aim*

Basic idea of the novel interconnection – requirements

1. Two heat sources for heat pump (e.g. air and ground) to reduce energy load on secondary source (e.g. ground)
2. Parallel operation possible to reduce power load on both heat sources (high efficiency still possible!)
3. New operation modes to increase efficiency and/or decrease ground source heat exchanger size

2 Project development aim

Basic idea of the novel interconnection



→ Tackles requirements 1. (two sources) and 2. (parallel operation efficiently possible), 3. increases complexity

3 Methodology

Main work packages



Development of the interconnection



Laboratory tests for performance map (based on standards [5]) and to test new operation modes



Annual simulation based on performance map to determine realistic running costs (MATLAB)



Energetic evaluation including critical reconsideration of operation modes (reduce complexity)



Thank you for listening!

Any questions?



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Smart Energy Systems



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- [1] “Renewable energy sources in figures - National and International Development”, 2019, Federal Ministry for Economic Affairs and Energy (BMWi), **2020**.
- [2] Wolf GmbH, “Montageanleitung: Luft / Wasser Wärmepumpe – BWL-1-08 I”, Art.-No. 061477_201204, **2011**.
- [3] Wolf GmbH, “Montageanleitung: Sole / Wasser Wärmepumpe – BWS-1-08”, Art.-No. 3061476_201507, **2015**.
- [4] Deutscher Wetterdienst (DWD), “Test Reference Year 2015: 48,7562° N 11,4287° O”, **2021**.
- [5] “DIN EN 14511:2019-07, Air conditioners, liquid chilling packages and heat pumps for space heating and cooling and process chillers, with electrically driven compressors”, Deutsches Institut für Normung e.V., **2019**.