Combined heat and power storage:
Feasibility in a national renewable energy system context

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#SESAAU2020

CHESTER
Compressed Heat Energy Storage for Energy from Renewable sources

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What is CHEST?

Compressed Heat Energy Storage

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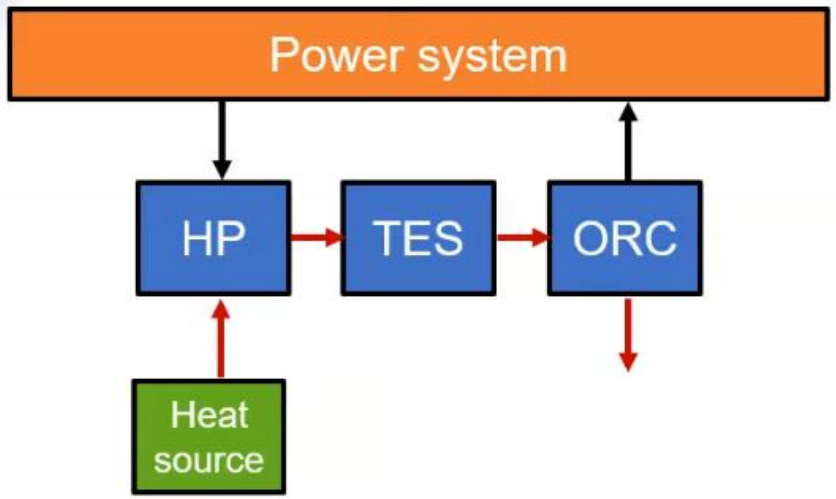
- Basic idea:
  - Electric storage in thermal energy
  - Environmentally friendly materials
  - Versatile operation



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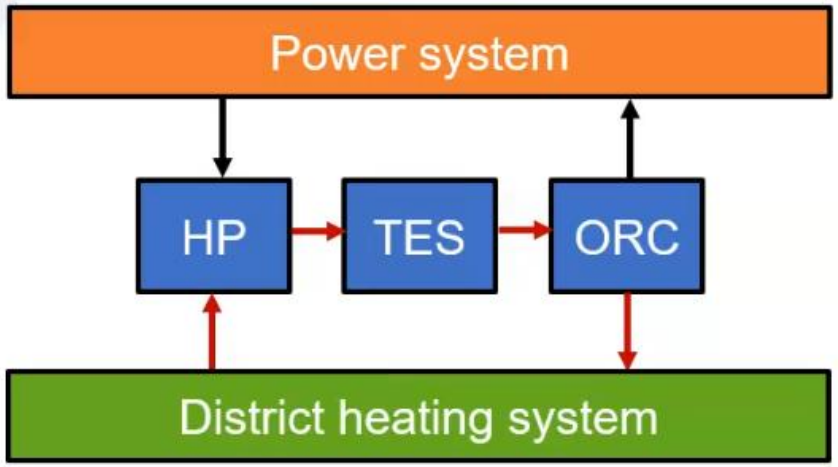
Purpose of this study

- Economic feasibility of traditional power-to-power batteries
- Low cost of thermal storage
- Possible benefit of CHEST in DH integration?



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Approach: Energy system analysis

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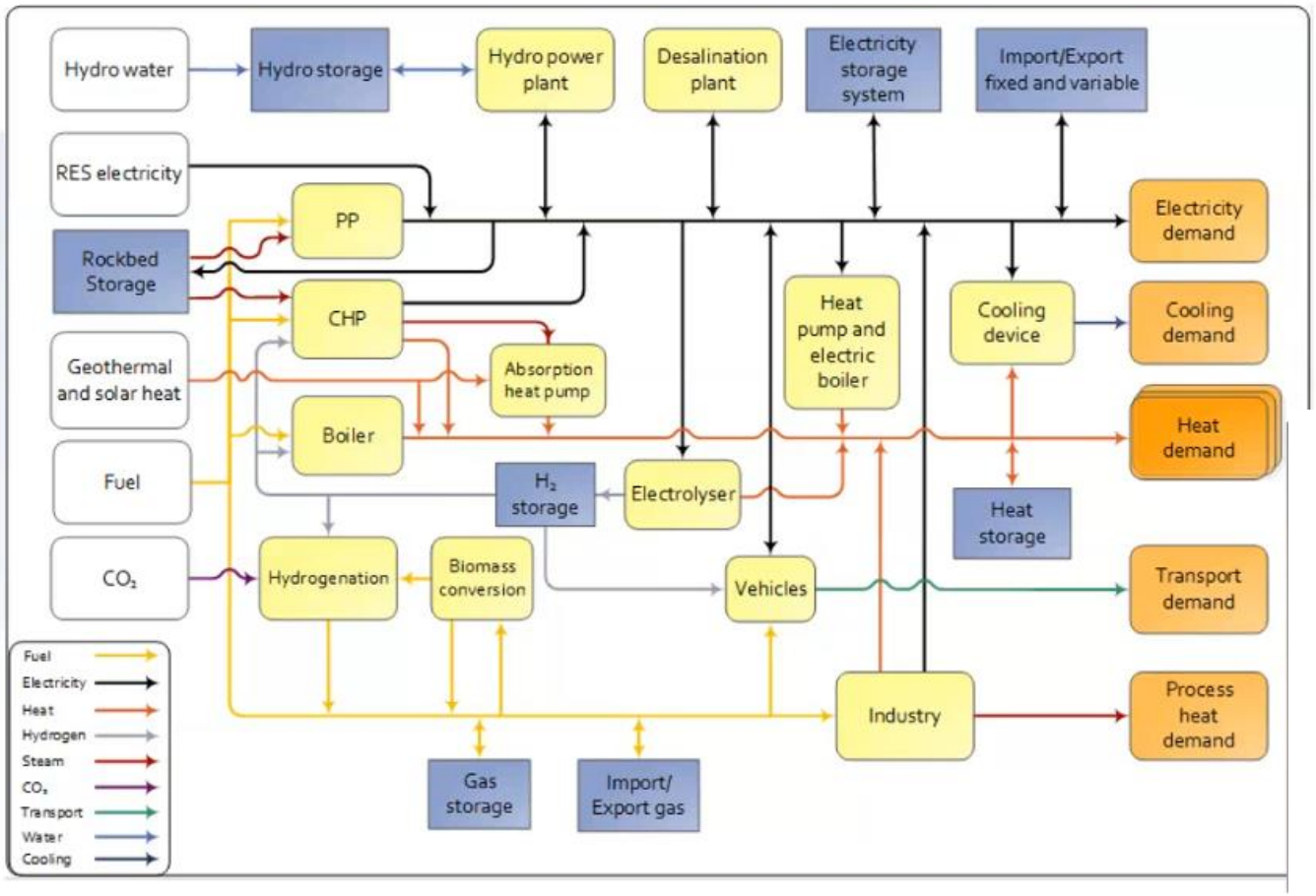
EnergyPLAN

- All major energy sectors
- Integrated system
- Hourly modelling



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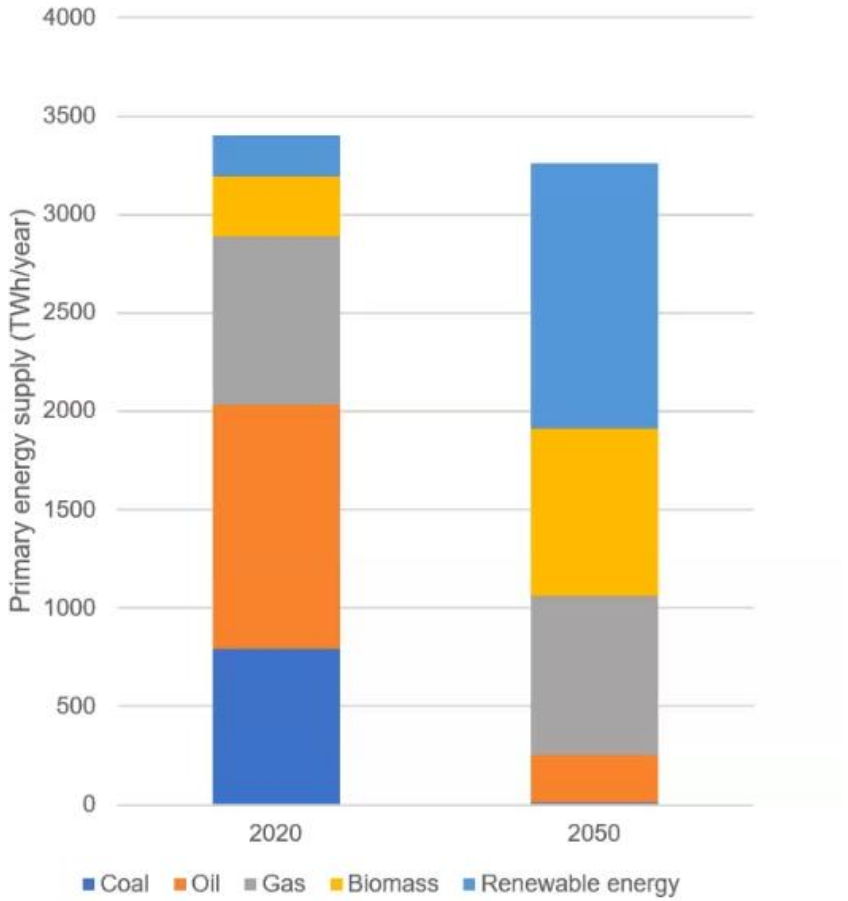
Case study model: Germany 2050

- Reduced demands
- Fossil fuels reduced
- Wind, solar, biomass
- Electrification of transport
- District heating share doubled
- Electro-fuels introduced



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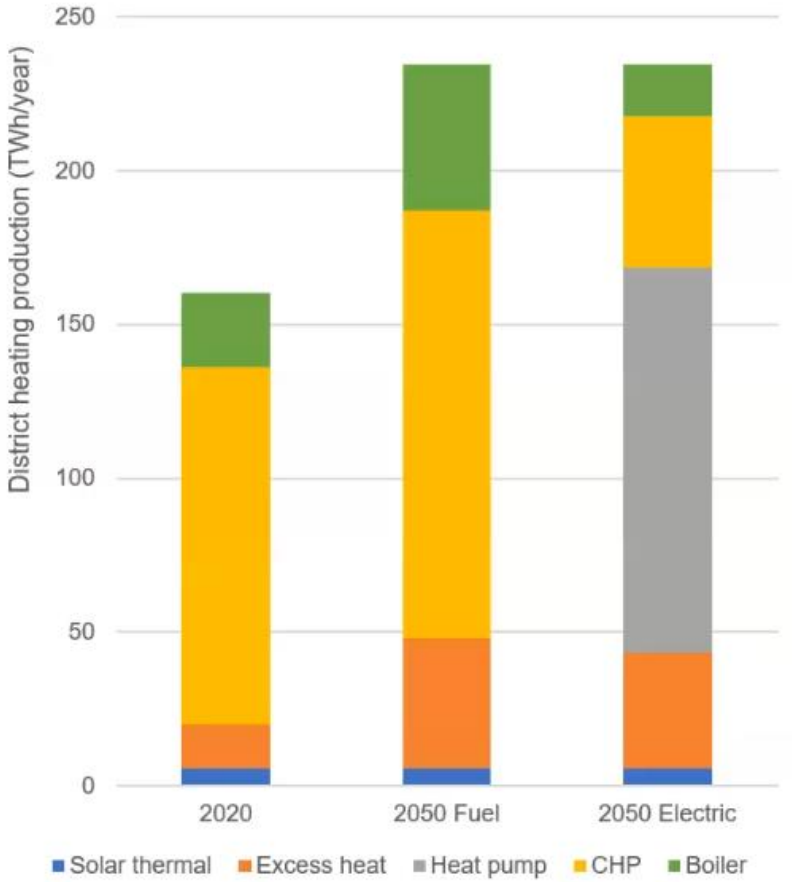
Two scenarios for district heating

1. Fuel-based DH supply: Similar to current supply
2. Electrified DH supply: Large-scale heat pumps introduced



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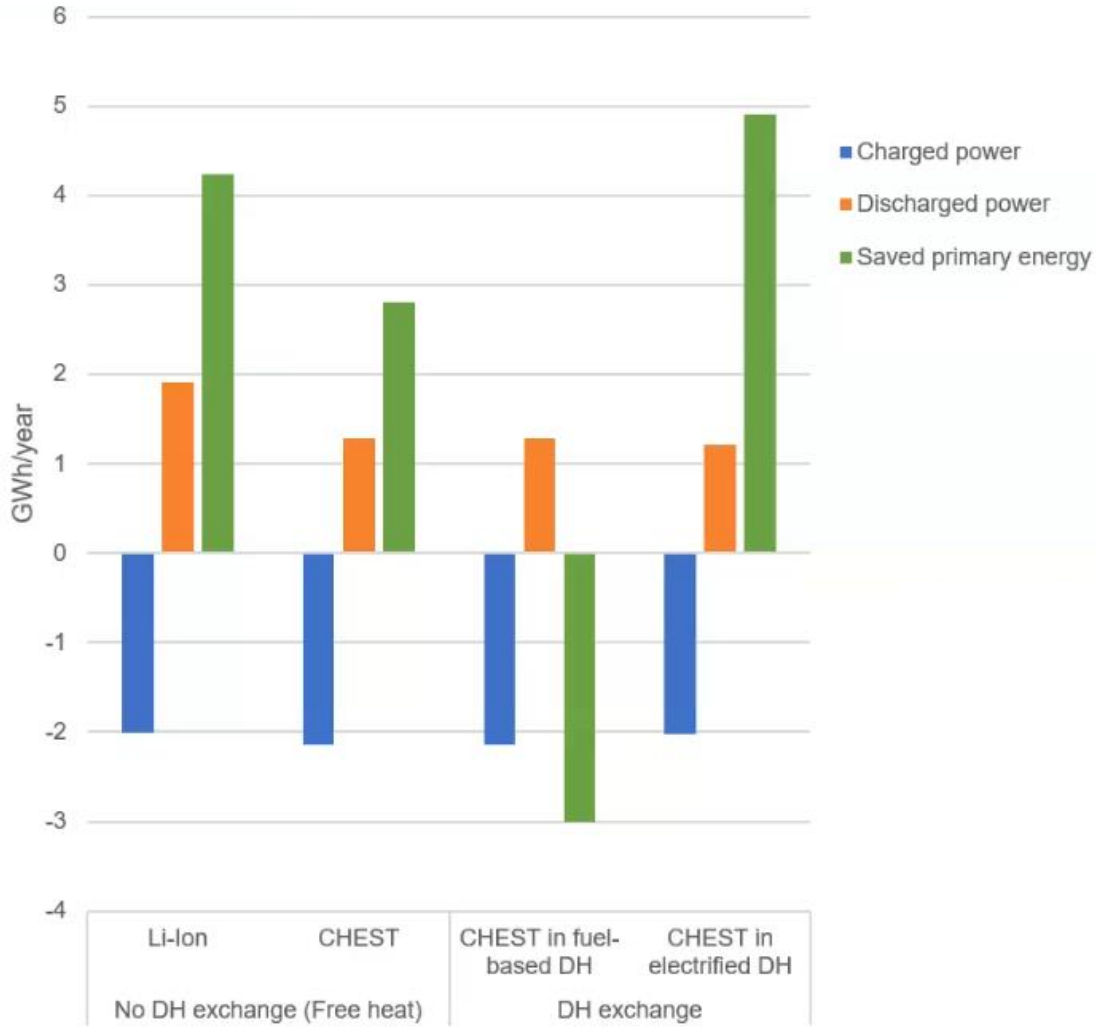
Results

- Li-ion more effective without DH integration
- CHEST increase PES in fuel-based DH integration
- CHEST more effective than Li-ion in electrified DH



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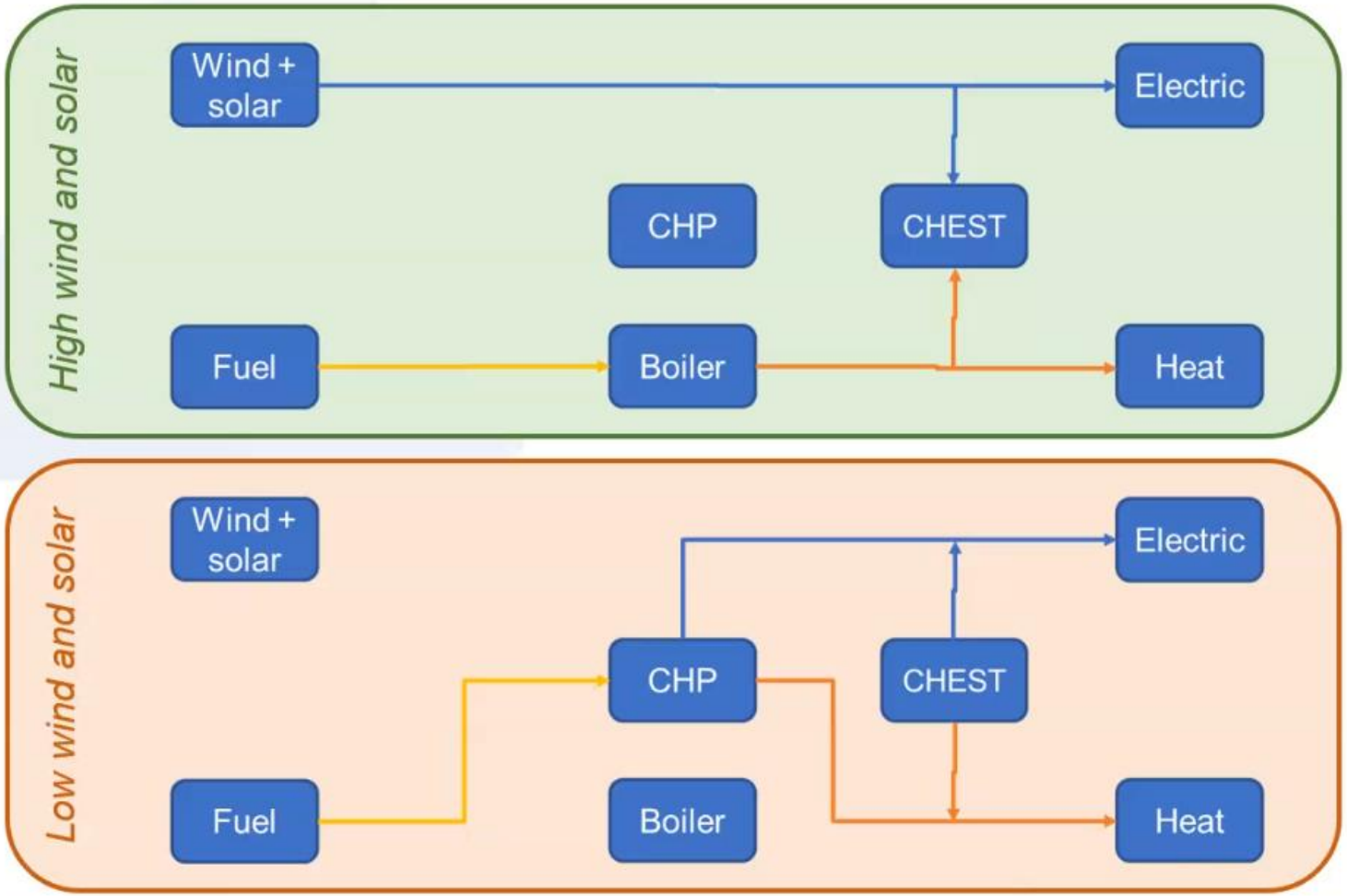
Results: Fuel-based DH supply



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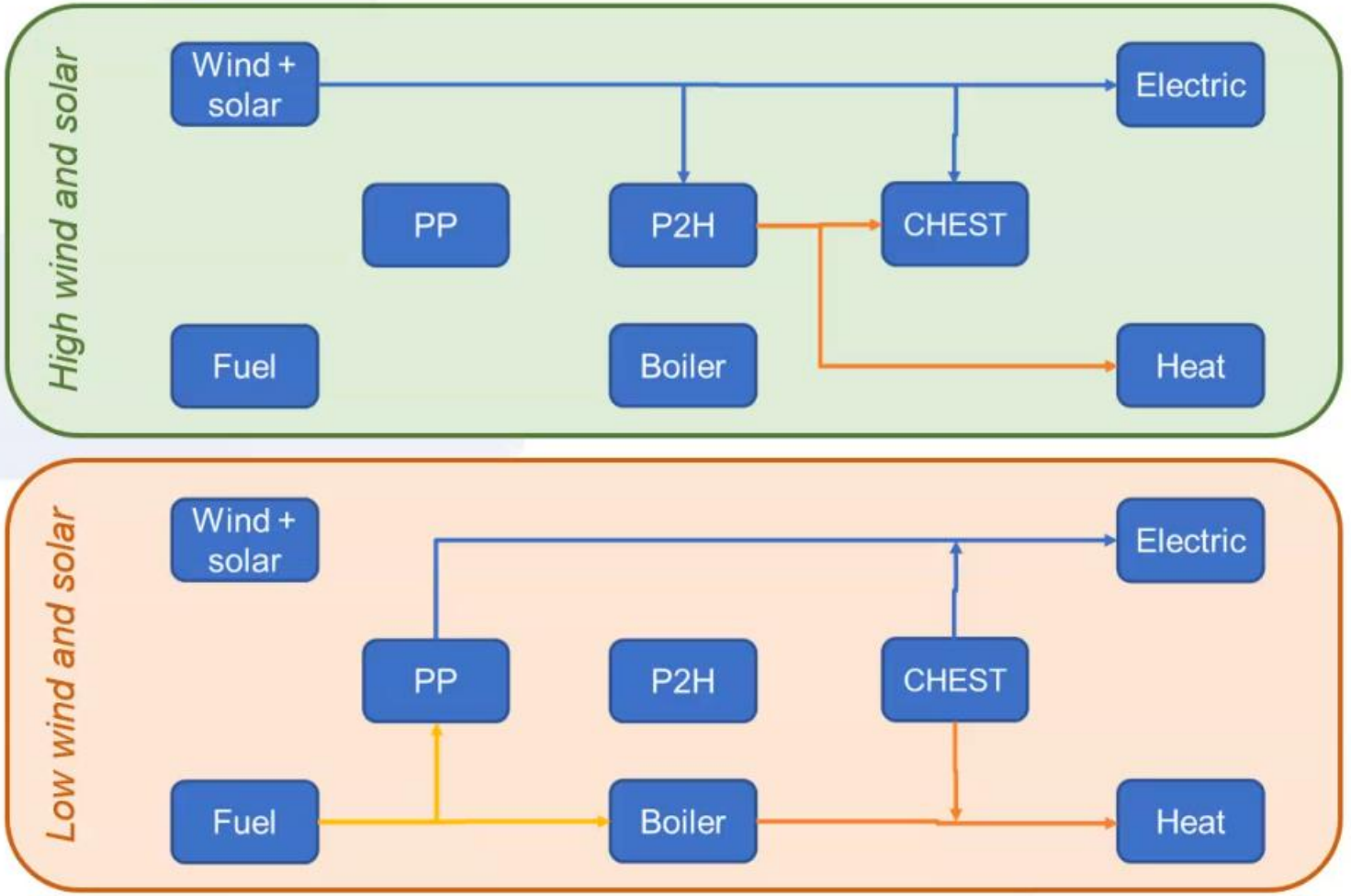
Results: Electrified DH supply



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Conclusions

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- CHEST can obtain an technical added value by DH integration compared to traditional batteries
- Future electrified DH seems more relevant than current fuel-based DH systems
- Economic feasibility of CHEST should be investigated further

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