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RUHR-UNIVERSITÄT BOCHUM

MODELBASED ANALYSIS OF FUTURE DISTRICT HEATING NETWORKS

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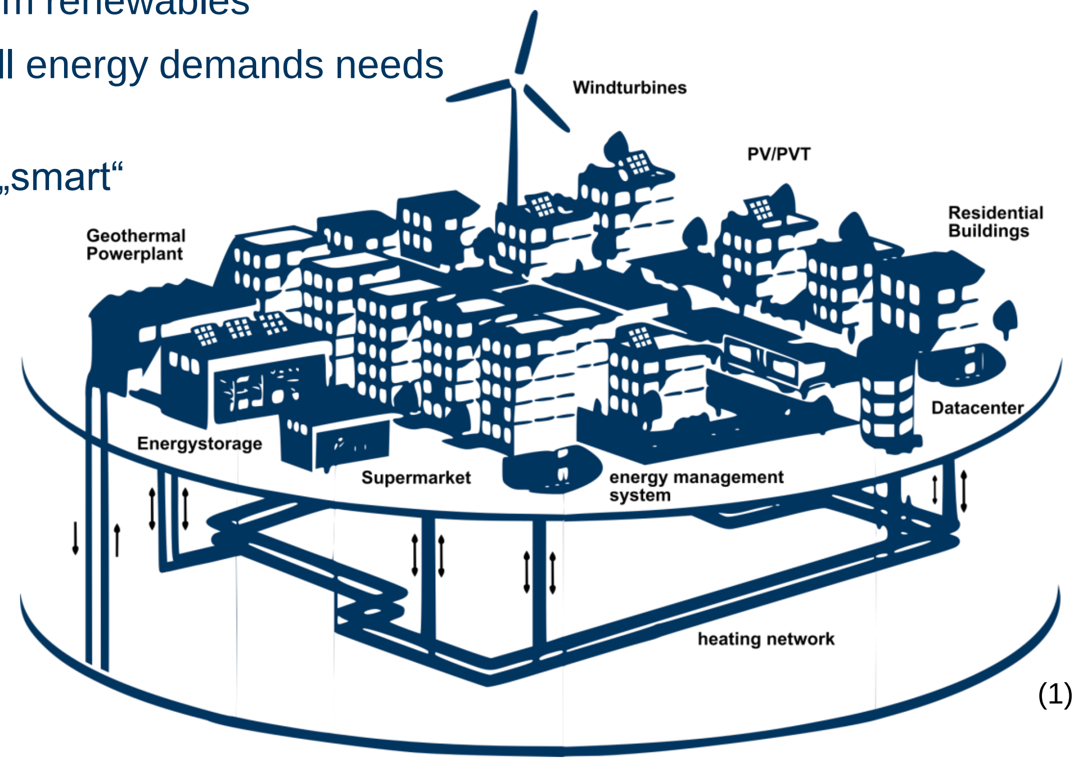
AGENDA

INTRODUCTION

Motivation

- 50 % (HRE4, 2015) of total energy demand in EU28 account for heating & cooling
- Only 13 % (HRE4, 2015) comes from renewables
- For a sustainable energy system, all energy demands needs to be covered with renewables
- Everything will be „connected“ and „smart“
- Enabler for bidirectional networks with prosumers



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[1]https://www.engie.com/en/businesses/district-heating-cooling-systems

AGENDA

I. Introduction

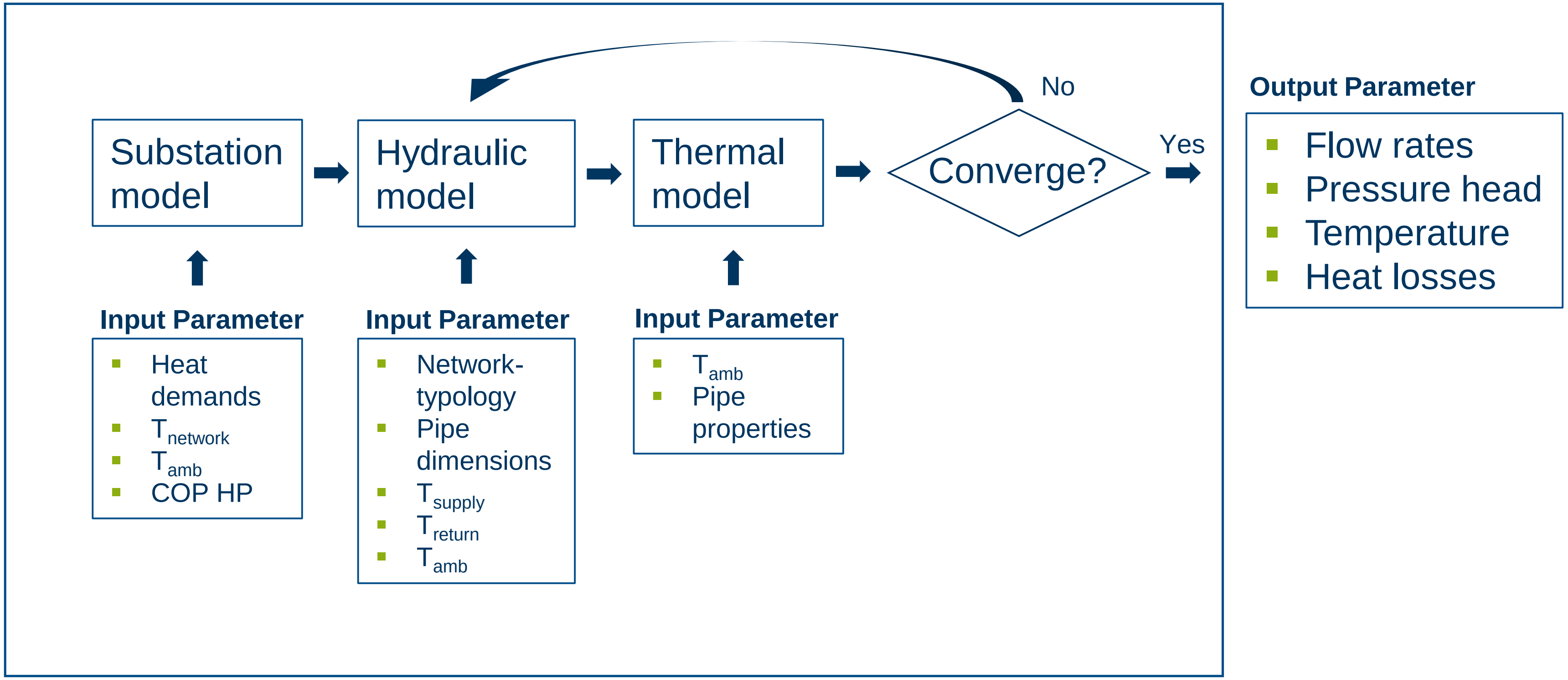
II. Modeling a District Heating Network

III. Case Study

IV. Conclusion

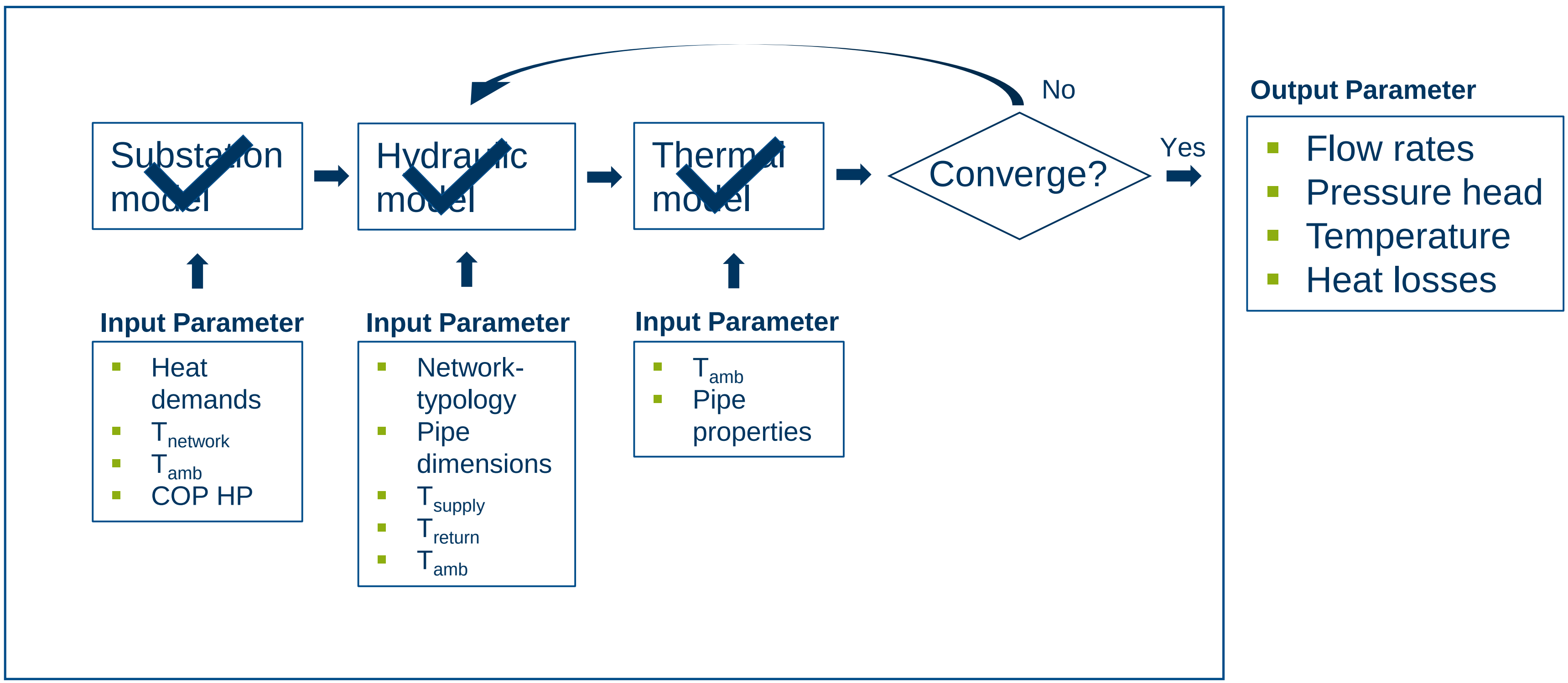
MODELING A DISTRICT HEATING NETWORK

Modelarchitecture



MODELING A DISTRICT HEATING NETWORK

Modelarchitecture



AGENDA

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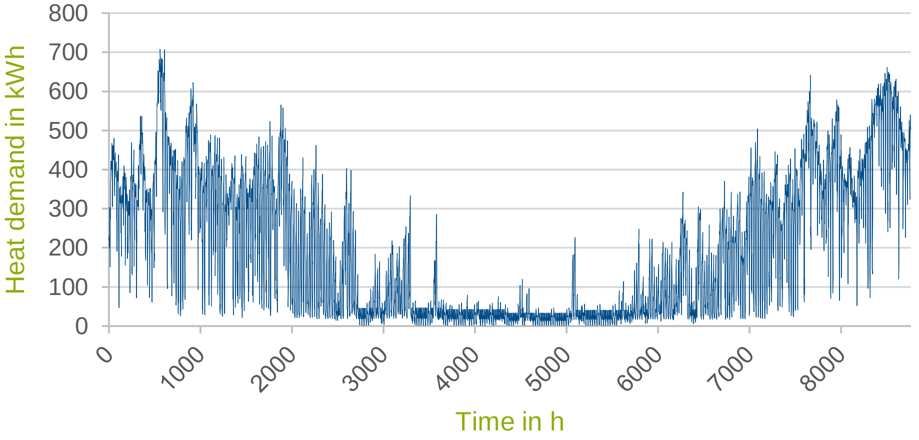
CASE STUDY

- 54 ha (0,54 km²) development area
- ~ 200 living units
- Heat demand (SH+DHW): 1.700 MWh/a
- Max. load: ~ 700 kW



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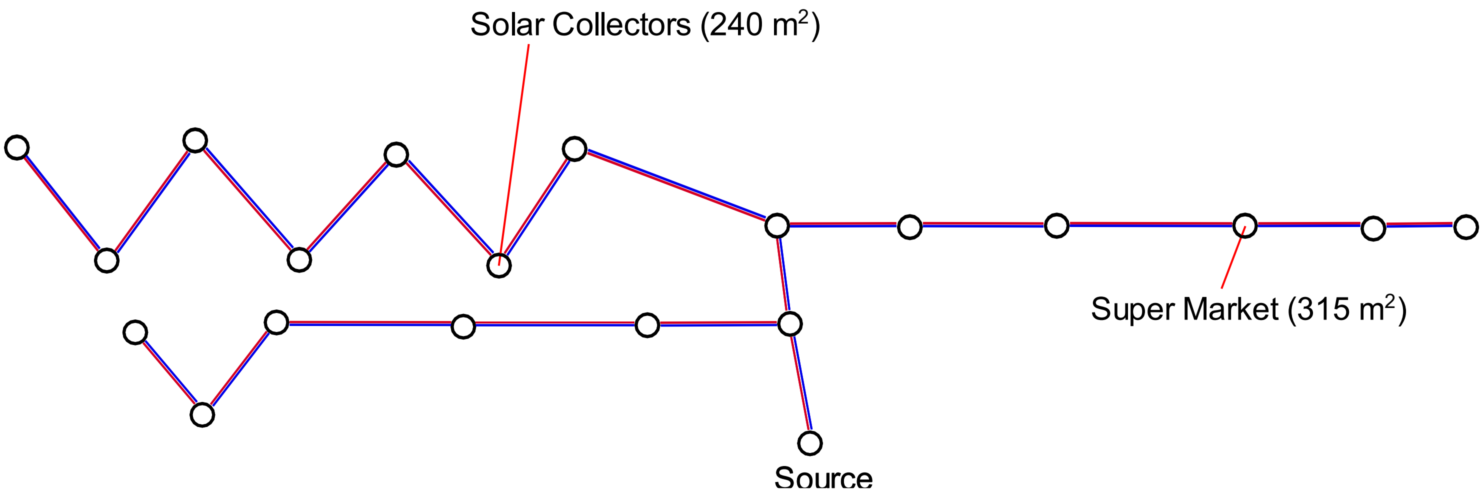
CASE STUDY

Scenarios

Variant 1: LT
- Low-temperature
- 60° C supply temp
- central heat unit
- no prosumer

Variant 2: ULT1
- Ultra-Low-temperature
- 20° C supply temp
- decentral heat pumps
- no prosumer

Variant 3: ULT2
- Ultra-Low-temperature
- 20° C supply temp
- decentral heat pumps
- prosumer



CASE STUDY

Results

Variant 1: LT

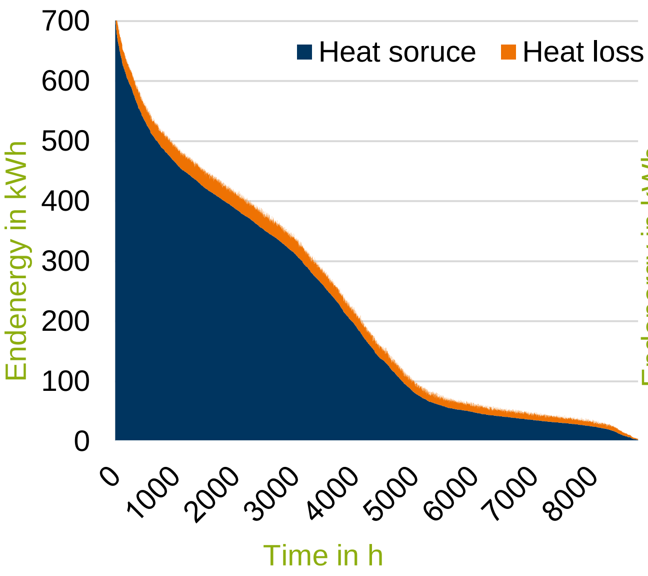
- Low-temperature
- 60° C supply temp
- central heat unit
- no prosumer

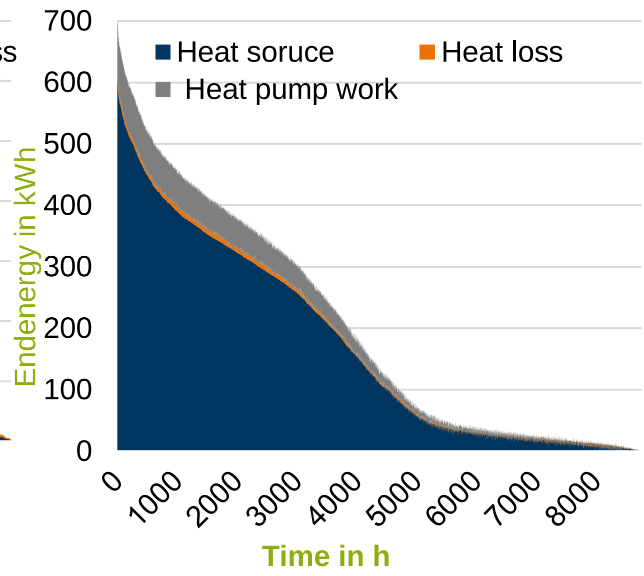
Variant 2: ULT1

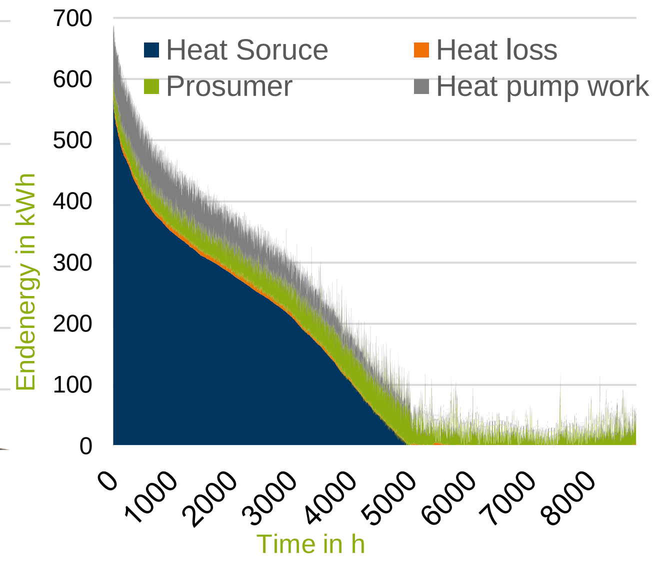
- Ultra-Low-temperature
- 20° C supply temp
- decentral heat pumps
- no prosumer

Variant 3: ULT2

- Ultra-Low-temperature
- 20° C supply temp
- decentral heat pumps
- prosumer







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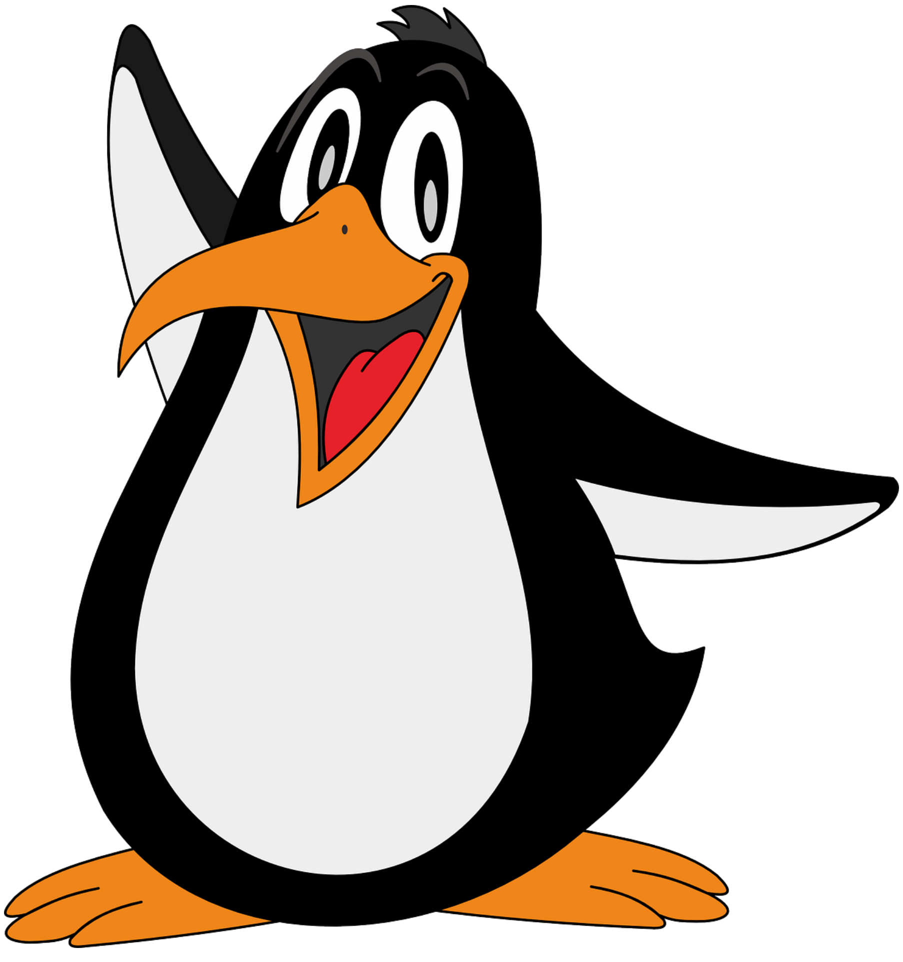
CONCLUSION

Take-aways

- Special structures are needed for prosumer structures → energy is saved
- With prosumer structures, heat losses can be reduced by 80 %
- Electricity usage for circulation pumps is 2.5 times greater for ULT1
  - Pump costs are reduced by 25 % in ULT2 compared to ULT1
- Ultra-Low-Temperature Networks enables cooling supply
- Further development of the model needs to be done to ensure a complete comparison

→ Prosumer structures can be useful and need to be taken into account in every newly built network



Thank you for your attention – Questions?