LOW TEMPERATURE VS. ULTRA-LOW-TEMPERATURE DH FOR HOUSING AREAS WITH VERY LOW LINEAR HEAT DEMAND DENSITIES

Isabelle Best, COPENHAGEN, 13 SEPTEMBER 2017

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ULTRA-LOW-TEMPERATURE DH VS. LOW-TEMPERATURE DH

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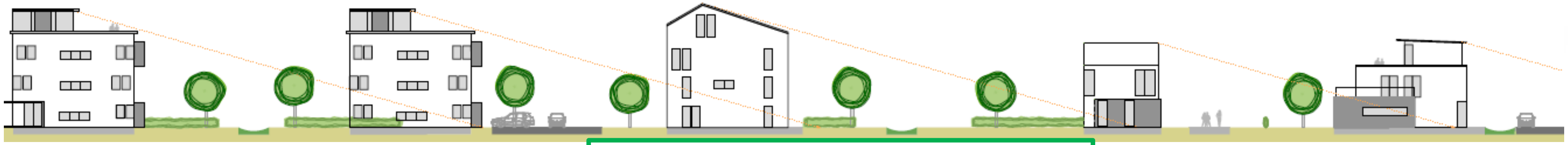
- Which temperature level + temperature difference?
  - Impact on heat generation technology
    → share of renewable energy
  - Impact on pipe design
    → pressure drop
  - Impact on pump energy demand
  - Impact on heat losses
- Which system is the best from economic point of view?



Qh = 1665 MWh/a
¾ Qh = SH
¼ Qh = DHW

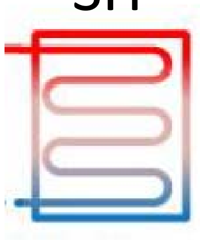
432 kWh/ma

Ultra-low Temperature DH

40 °C Supply 25 °C Return

Semi-decentralised Heat Supply

SH



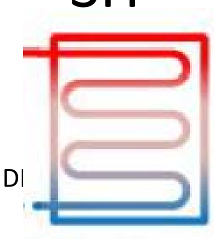
576 kWh/ma

Low Temperature DH

70 °C Supply 40 °C Return

Central Heat Supply

SH + DHW



ULTRA-LOW-TEMPERATURE DH VS. LOW-TEMPERATURE DH

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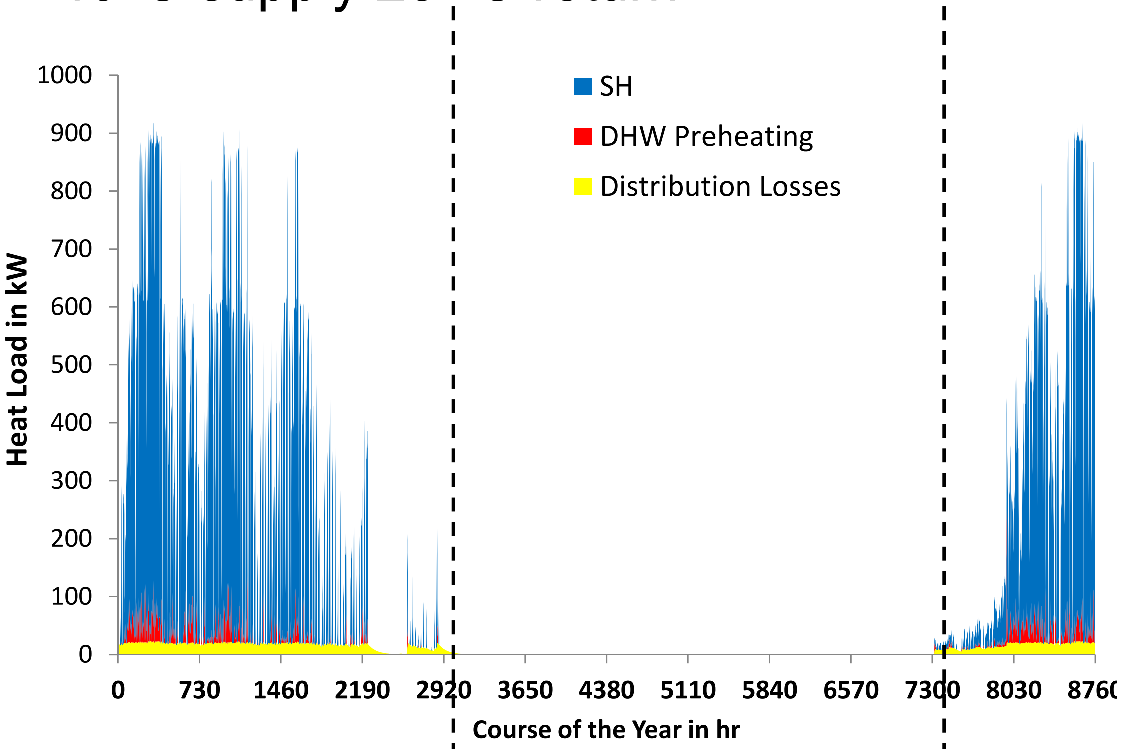
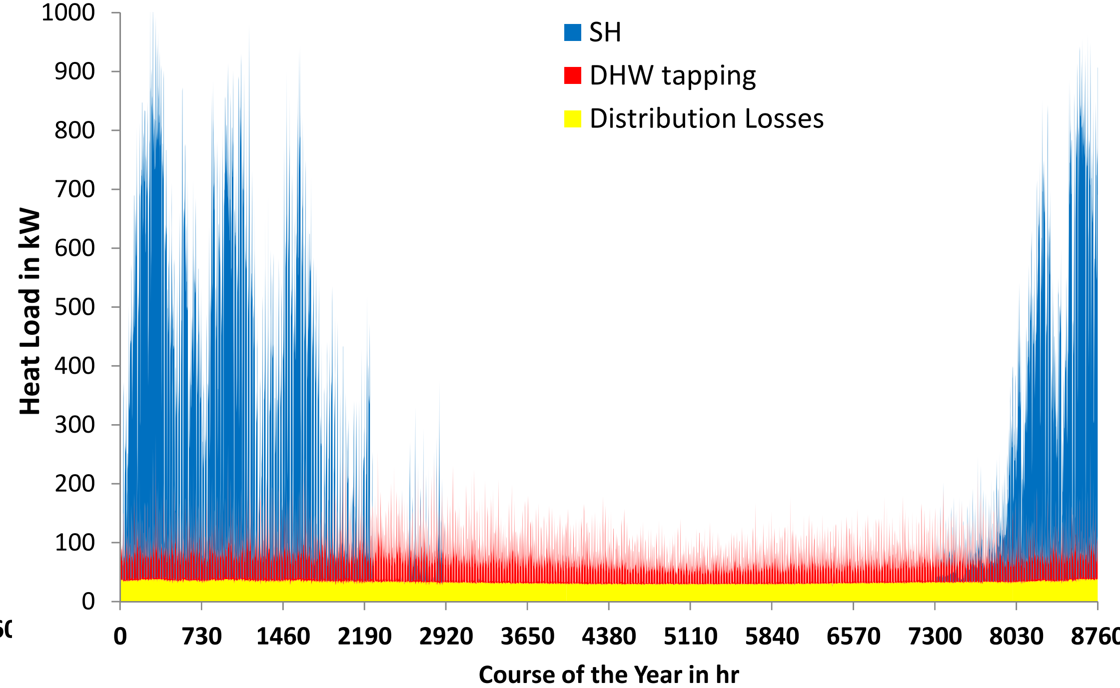
Ultra-Low-Temperature DH:
40°C supply 25 °C return

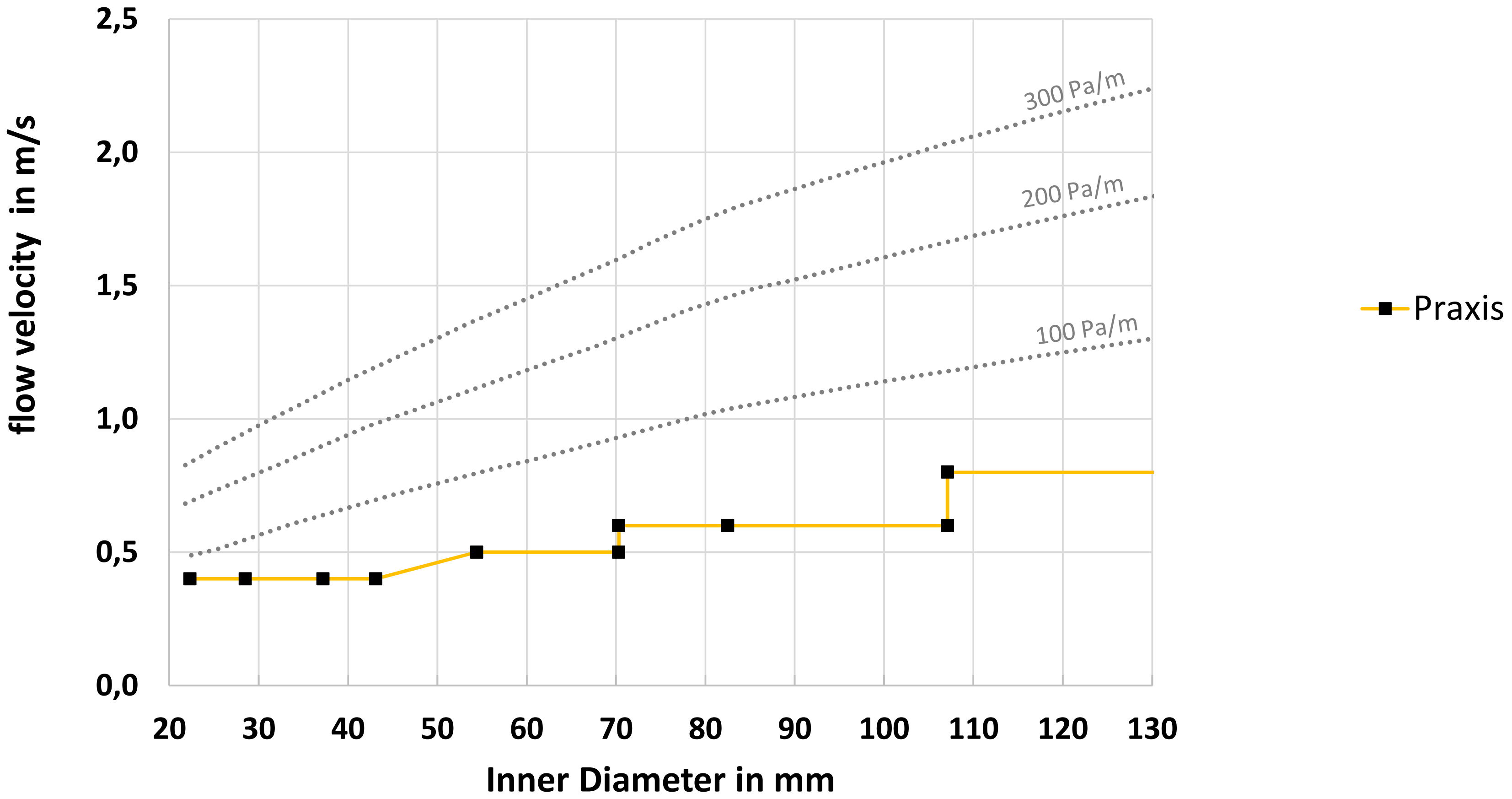
Low-temperature DH:
70 °C supply 40°C return





DH switched off → decentralized DHW preparation

DIFFERENT PIPE DESIGN GUIDELINES



DIFFERENT PIPE DESIGN GUIDELINES

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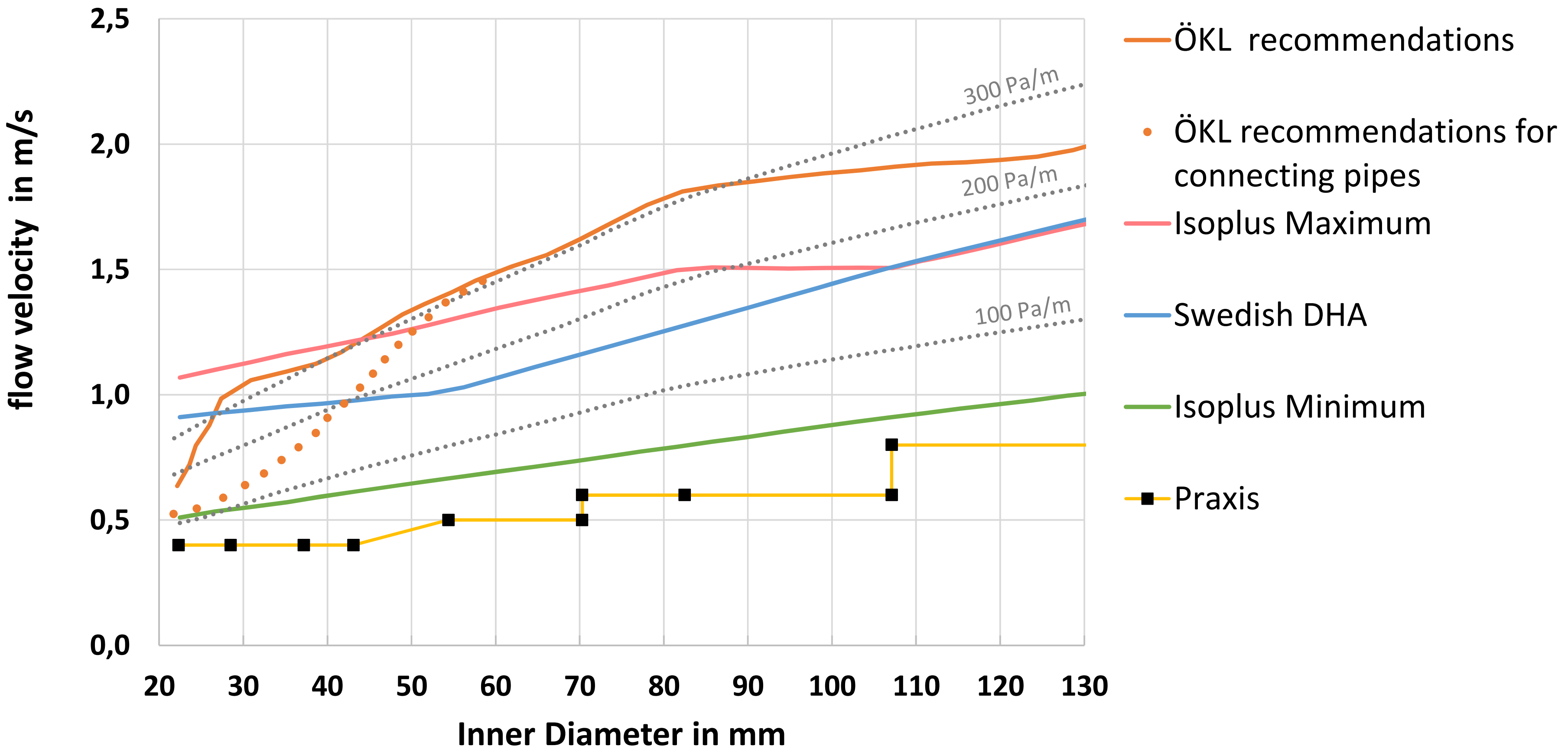
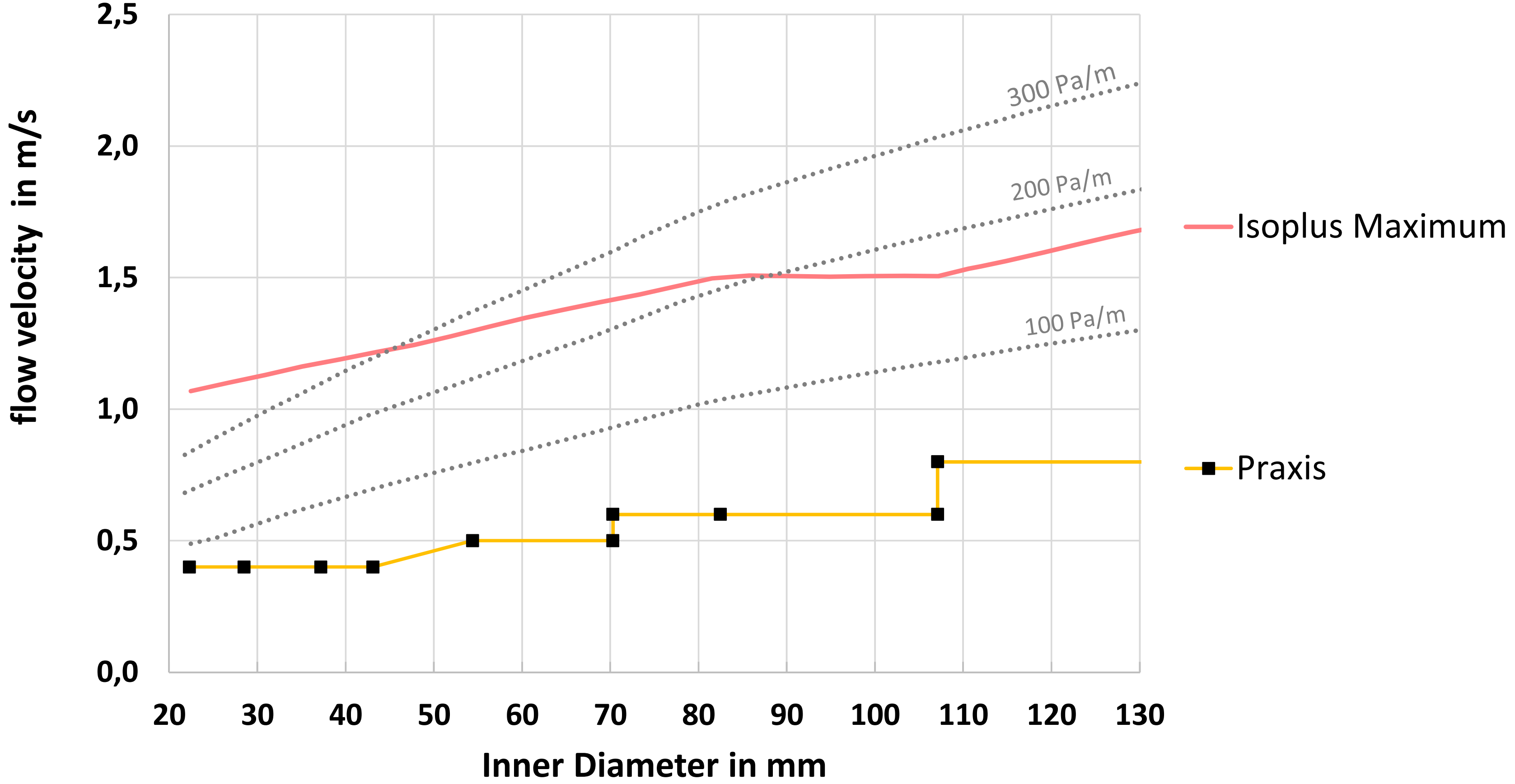
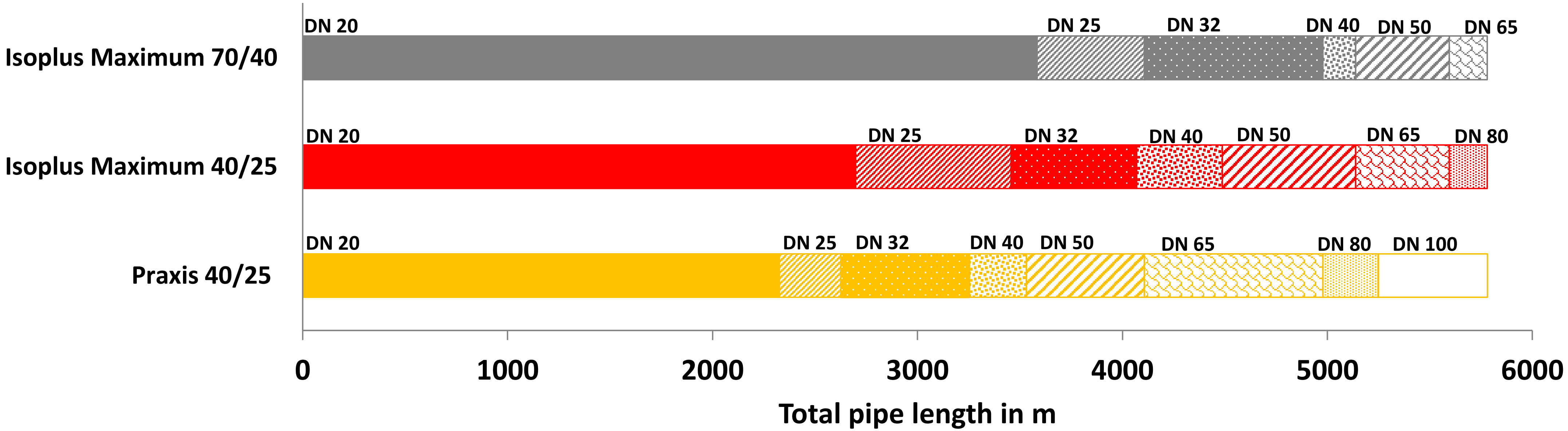


DIFFERENT PIPE DESIGN GUIDELINES



Design Tool: temperature difference + max. load + max. flow rate/ max. pressure drop → pipe diameter

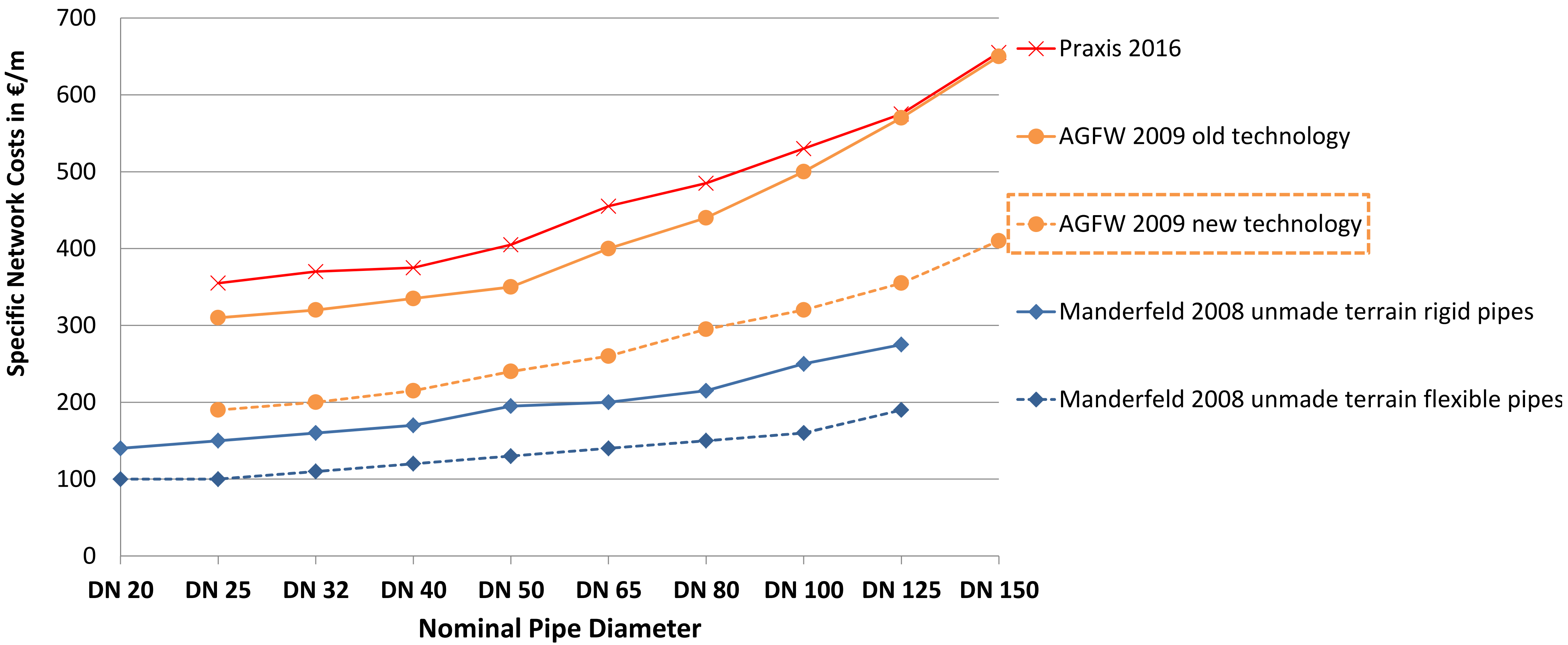
PIPE DESIGN DISTRIBUTION – IMPACT OF TEMPERATURE



- From DH 40/45 to DH 70/40:
  shift from DN 100 to DN 65 + significant increase of DN 20
- How much money do I save?

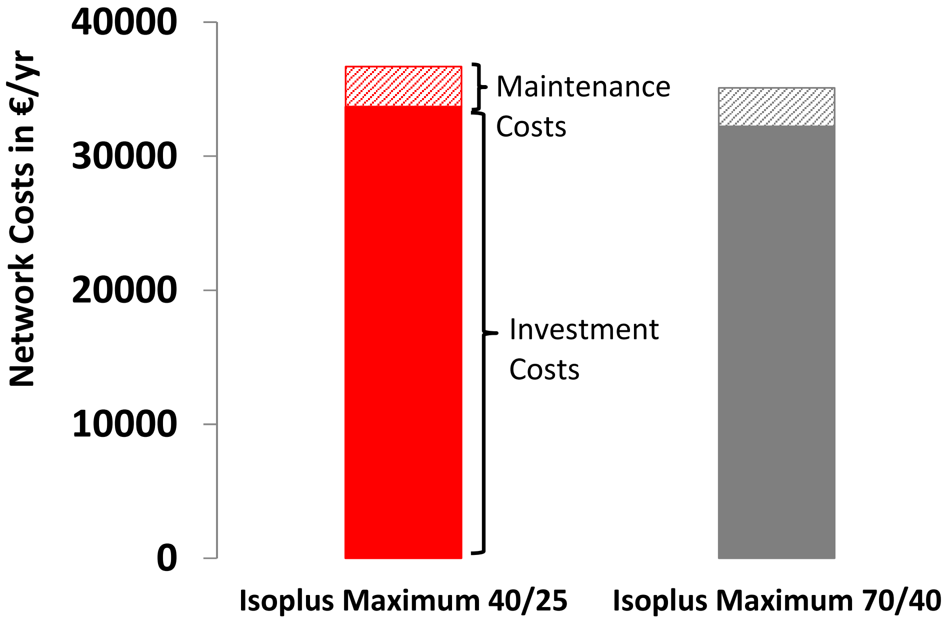
→ Economical Evaluation

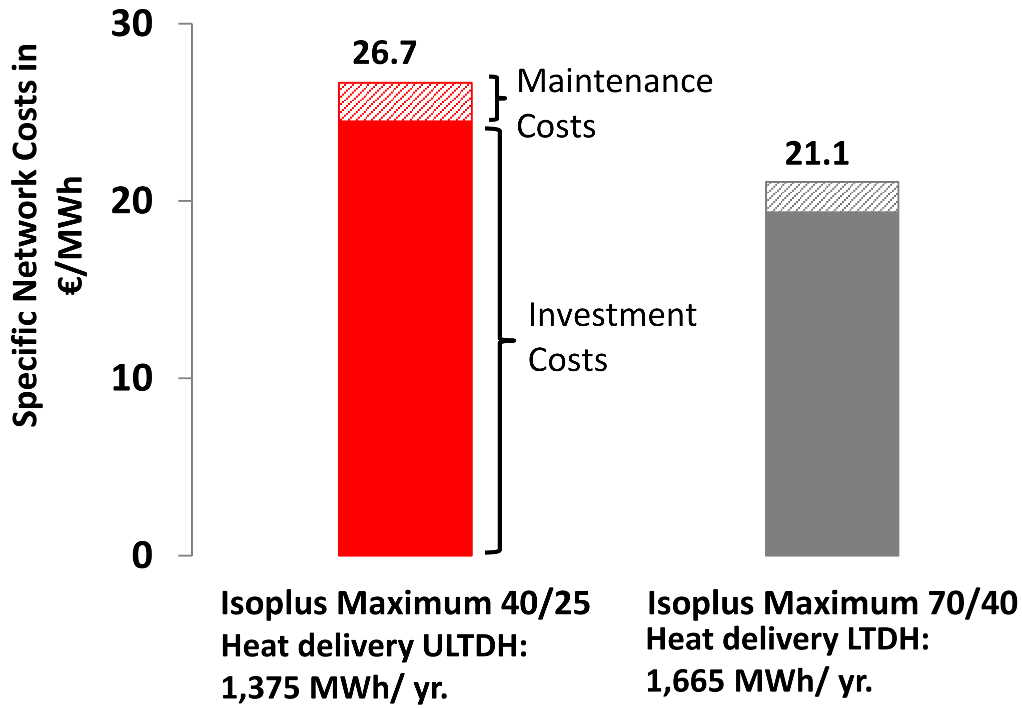
ECONOMIC EVALUATION –
SPECIFIC NETWORK COSTS IN GERMANY



ECONOMIC EVALUATION – HEAT DISTRIBUTION COSTS

Base period: 30 yrs., interest rate: 5.6 %, maintenance costs: 0.5 % of investment



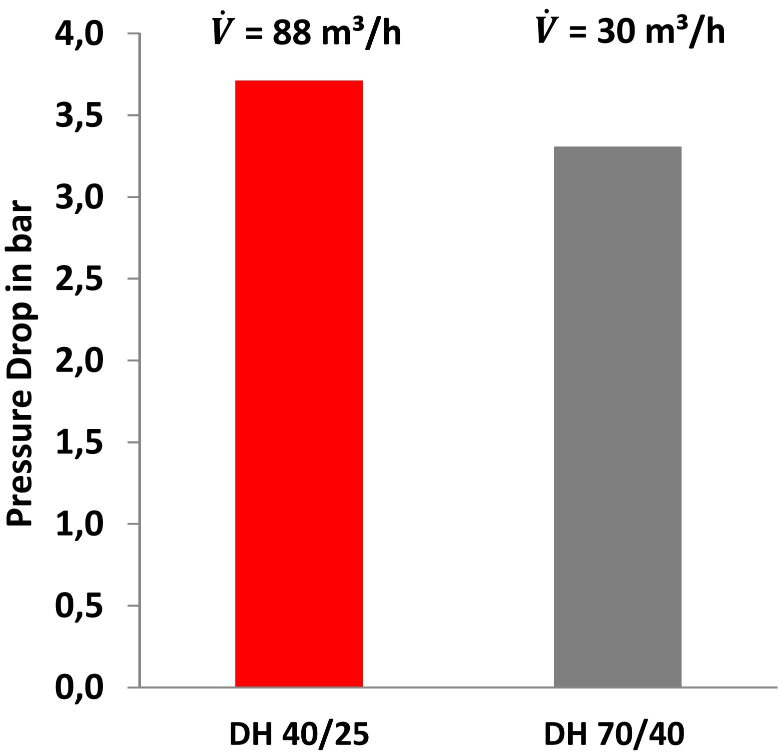


→In yearly costs nearly no difference

→In specific costs reduction of 21 %

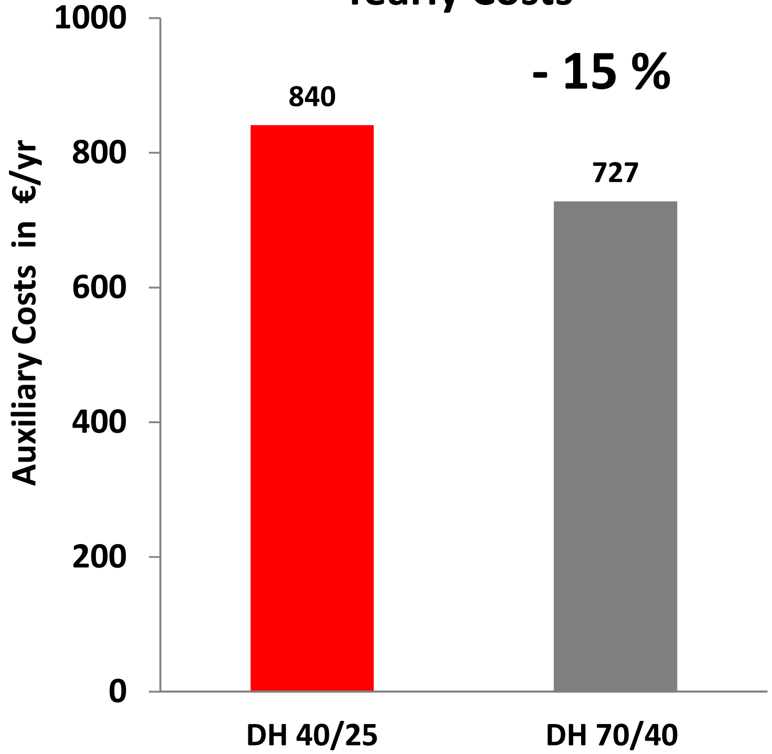
ECONOMIC EVALUATION – AUXILIARY ENERGY DEMAND

Pressure Drop at Maximum Load



DH 40/25	DH 70/40
3.2 kW	*1.7 kW*
3300 hrs	*8742 hrs*

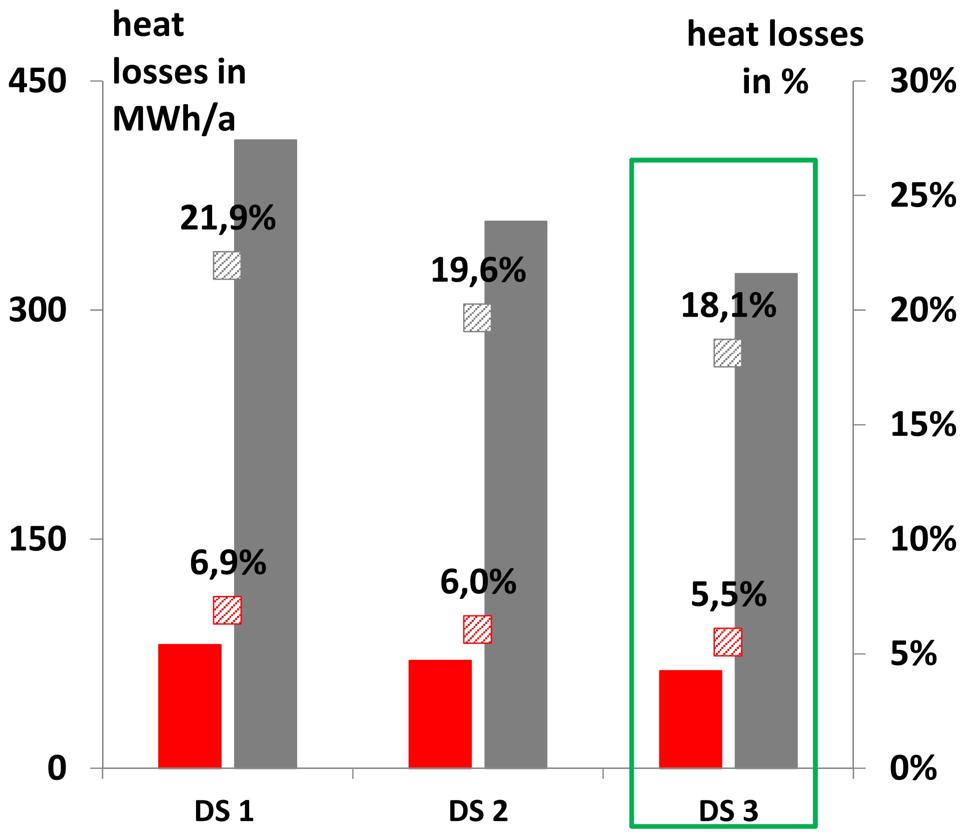
Yearly Costs

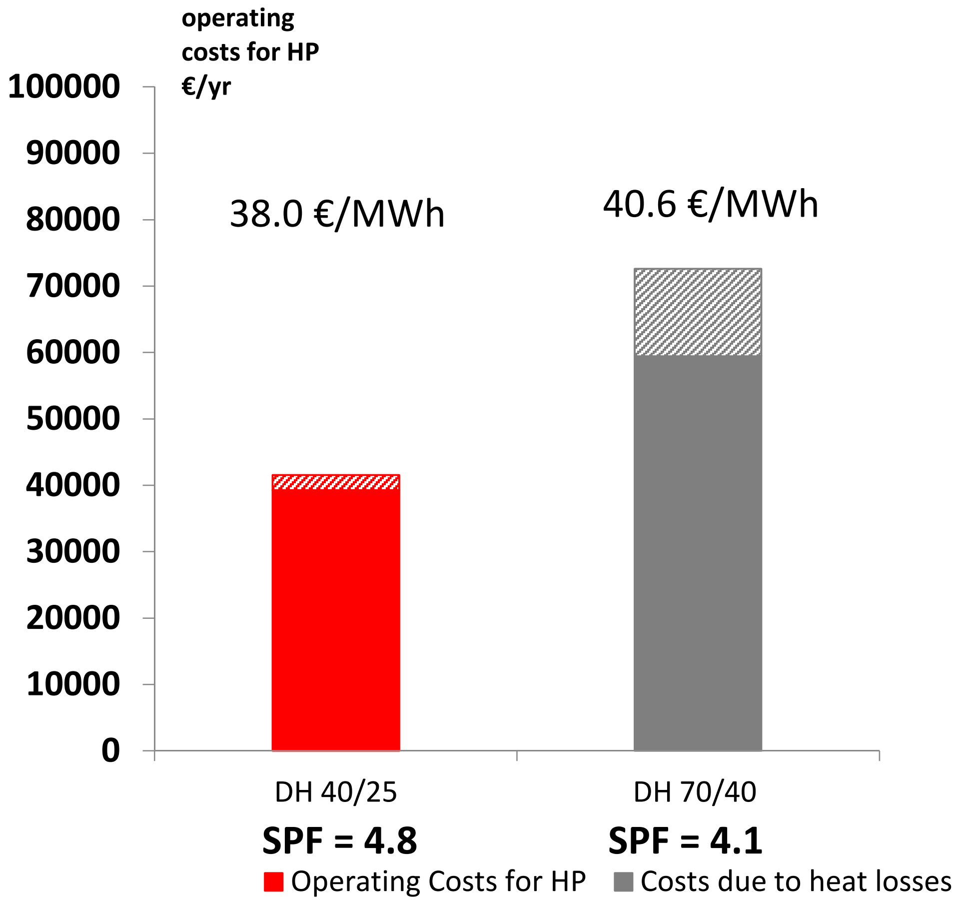


0.36% of total heat supply
→ 0.61€/MWh

0.25% of total heat supply
→ 0.44€/MWh

ECONOMIC EVALUATION – HEAT DISTRIBUTION LOSSES



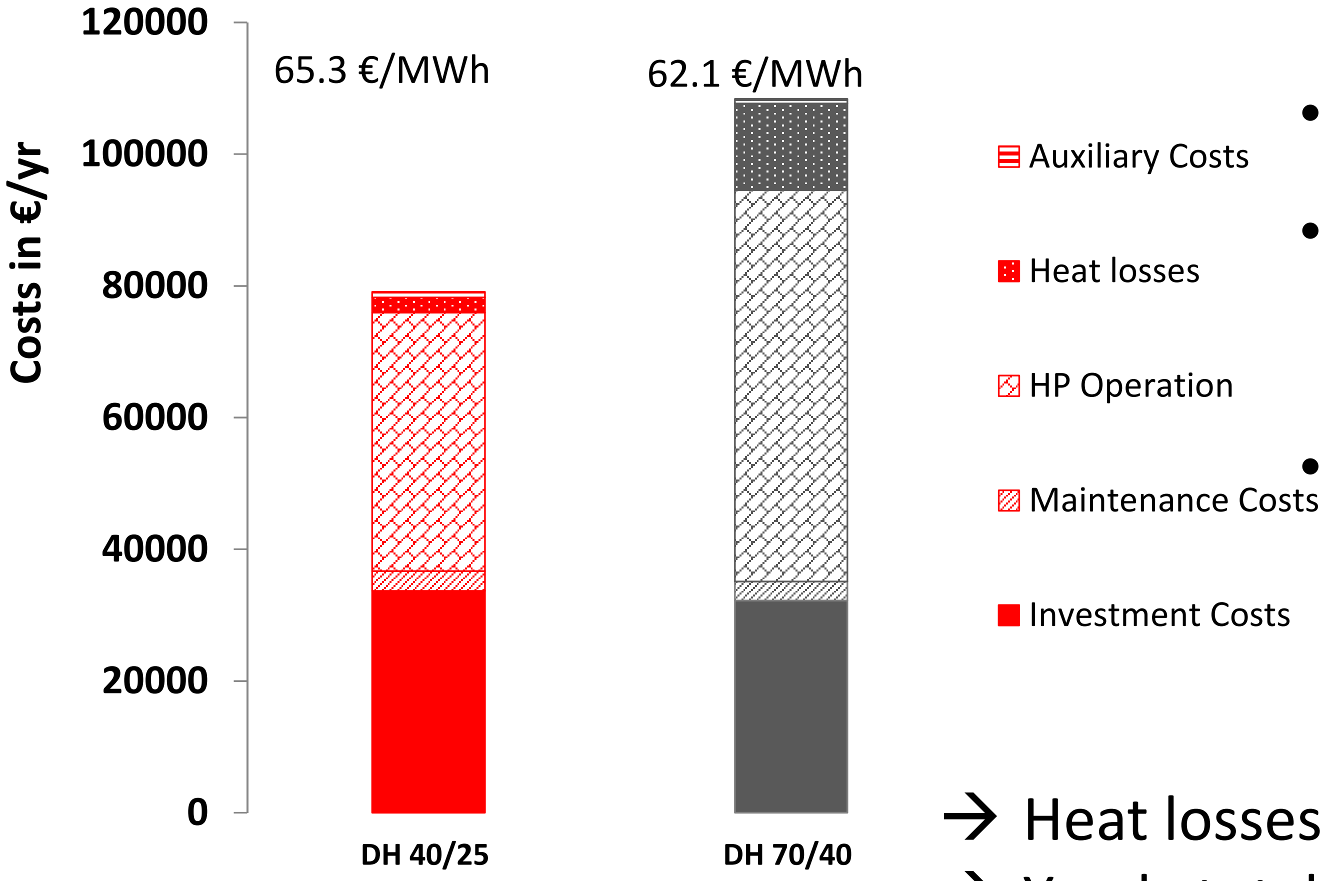


→ Heat losses x 3 higher at LTDH 70/ 40

→ Yearly costs + 75 %

→ Specific costs + 6.8 %

SUMMARY



- Analyses comprise infrastructure
- Investment costs of pumps here not included
- SPF sensitive parameter
  →heat supply side

→ Heat losses **x 3 higher** at LTDH 70/ 40
→ Yearly total costs of LTDH 70/40 **+ 27 %**
→ Specific costs of LTDH 70/40 **- 5 %**

THANK YOU FOR LISTENING

Isabelle Best

PhD Candidate

solar@uni-kassel.de

i.best@uni-kassel.de

University of Kassel, Germany