Challenges and potentials for low-temperature district heating implementation in Norway

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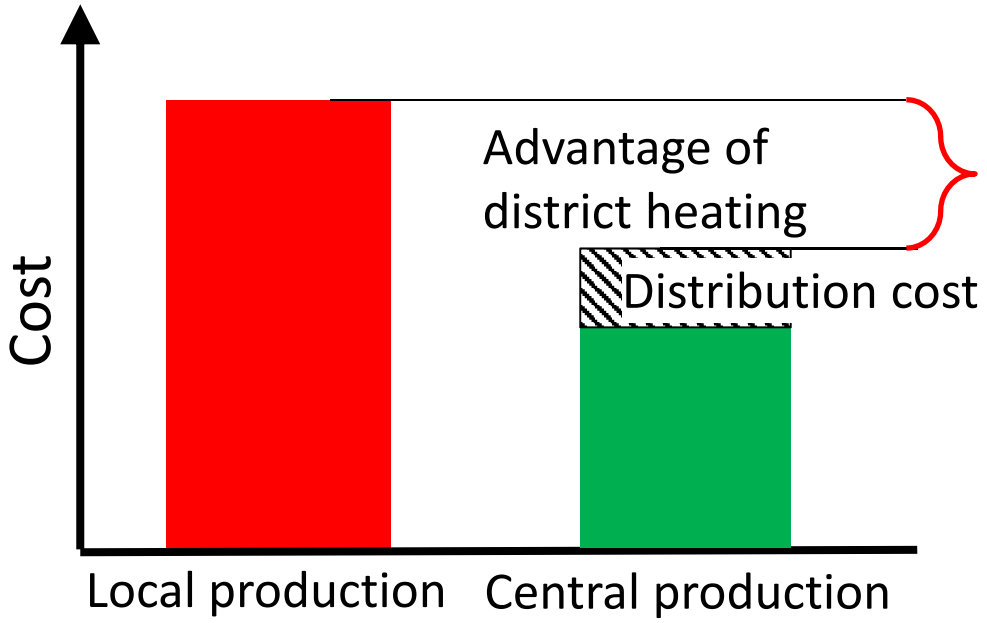
Challenges in transition to LTDH

- Higher share of distribution losses
- High return temperature and low temperature difference
- Aims of the study:
  - Integration of low energy and passive house buildings
  - Estimate possibilities and increase competitiveness of the LTDH in the low heat density area

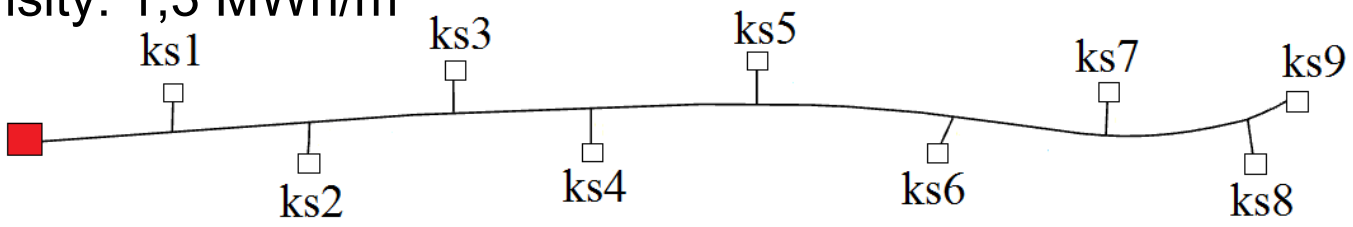


Network structures

ks – consumer substation

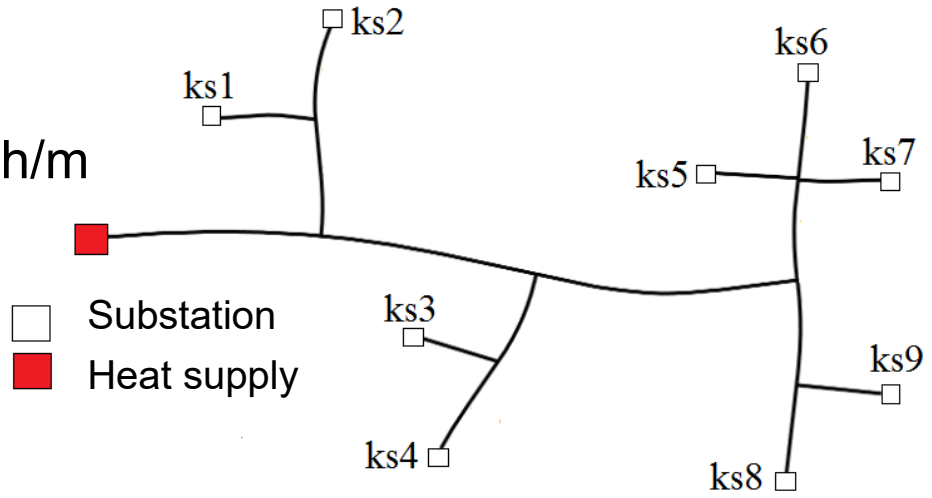
Network A

Linear heat density: 1,3 MWh/m

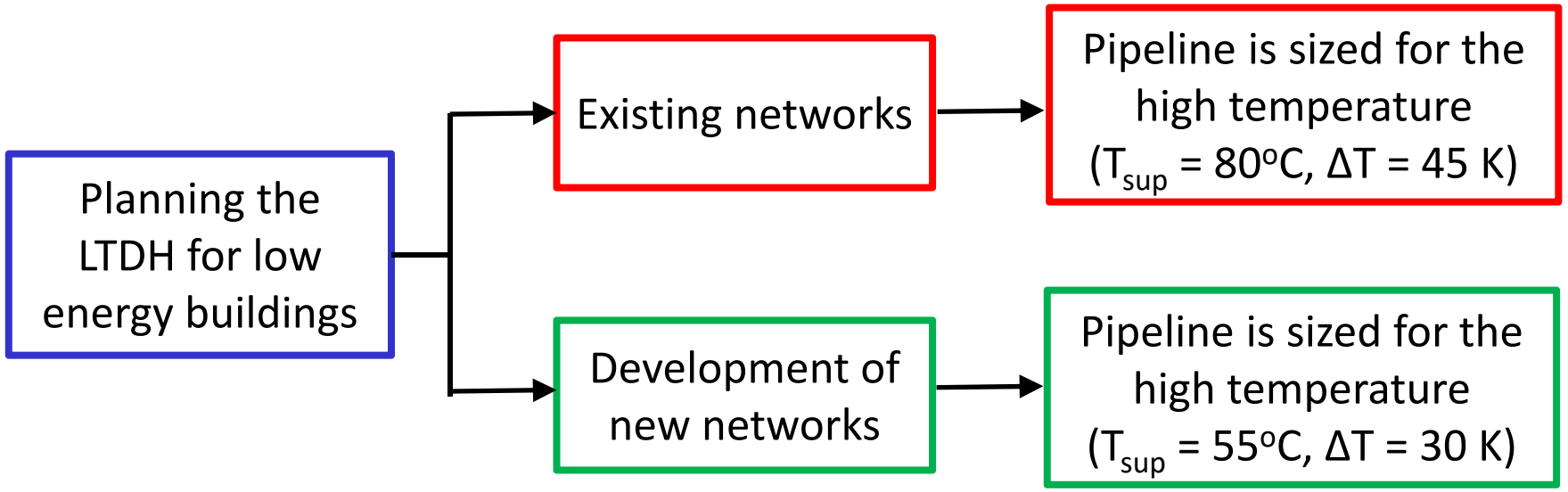


Network B

Linear heat density: 2,3 MWh/m



Planning of the LTDH network

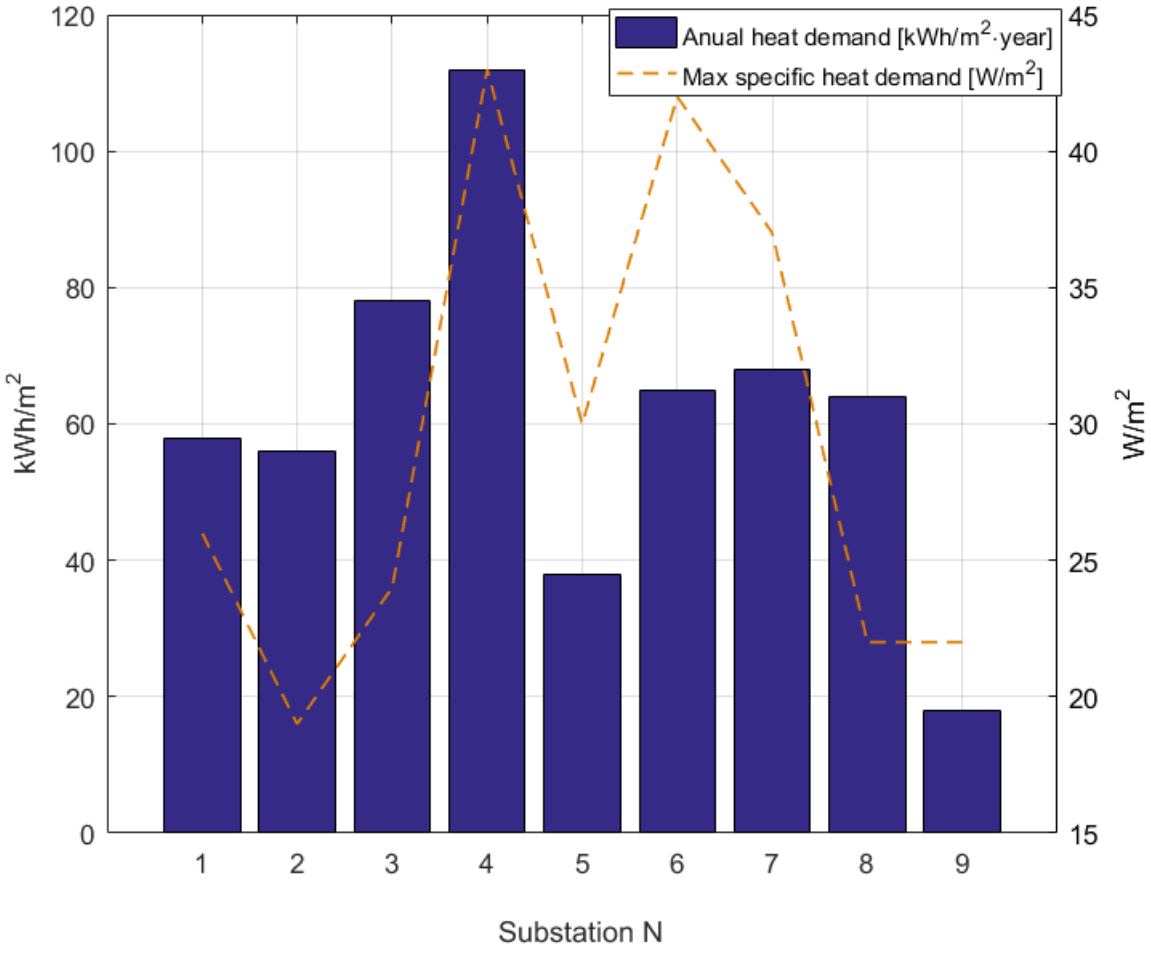


	Temperature in primary	Temperature in secondary
Existing network	Reference case - 80°C	65°C
	Case 1 - 70°C	55°C
	Case 2 - 60°C	50°C
	Case 3 - 55°C	50°C
New network	55°C	50°C

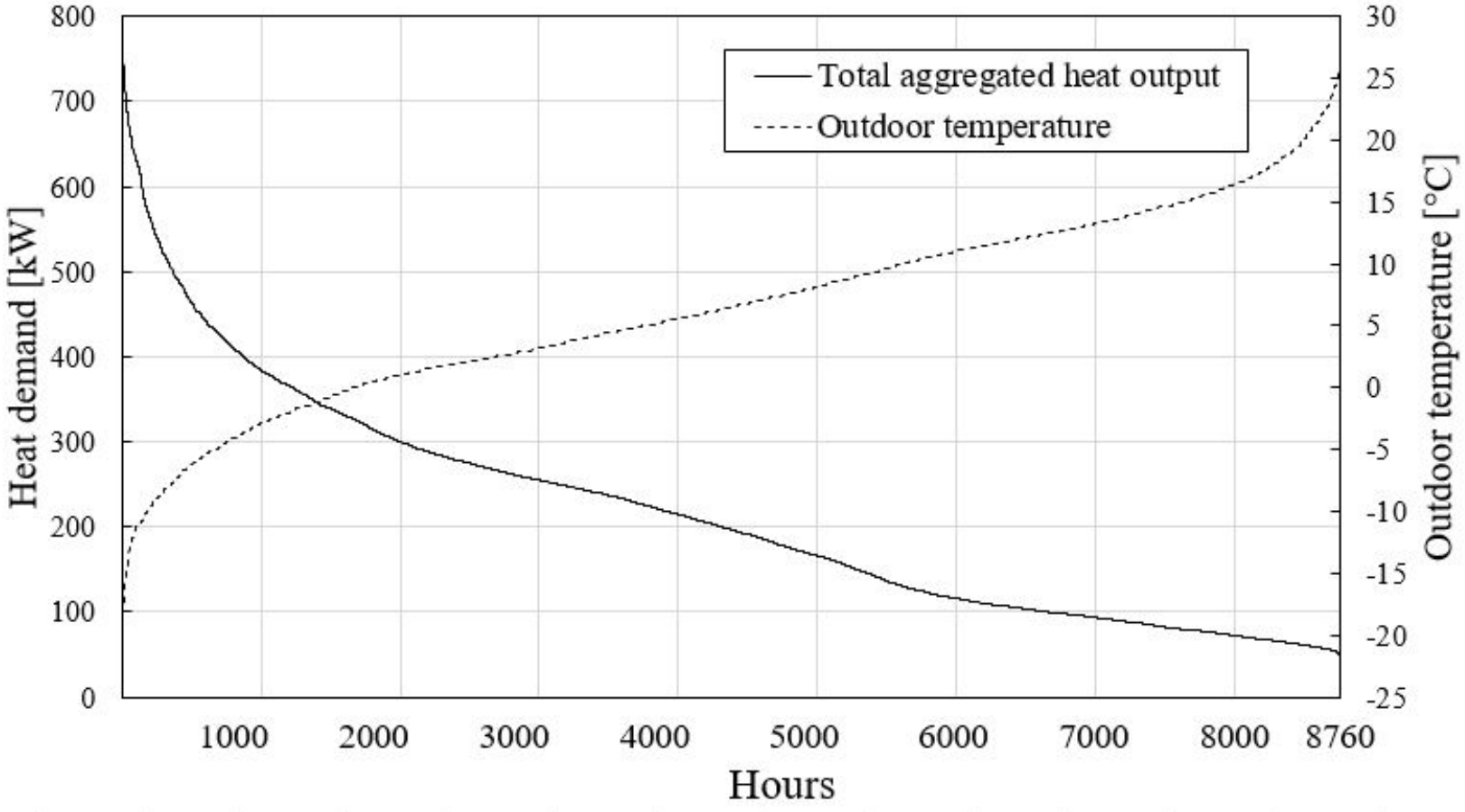
Obs: Legionella problem has to be treated

Heat and energy demand

- Heat demand data on hourly level were provided from different low and passive house buildings
- Heat demand of the area:
  - Heat load: 791 kW
  - Heat energy use: 1.9 GWh

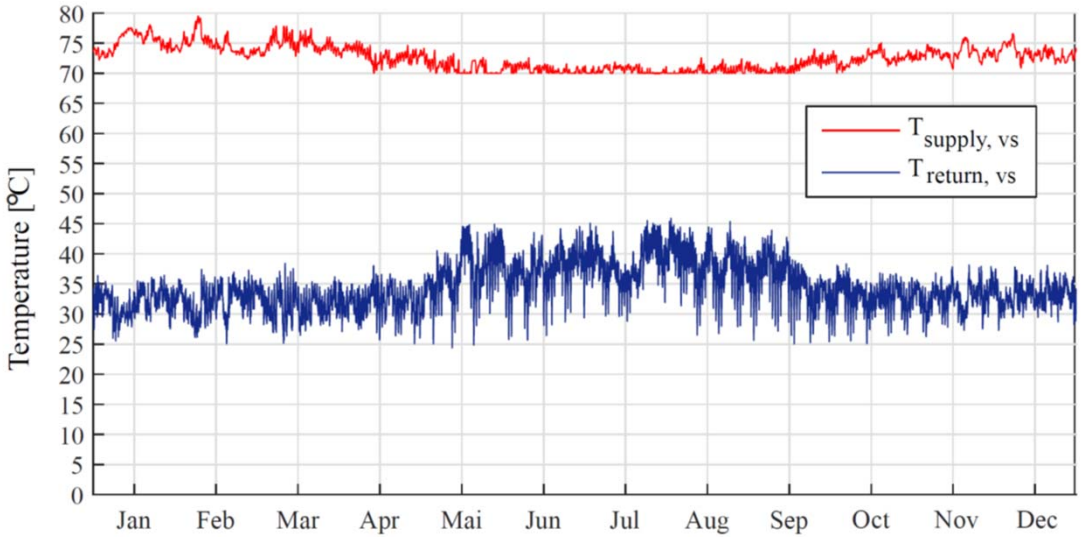


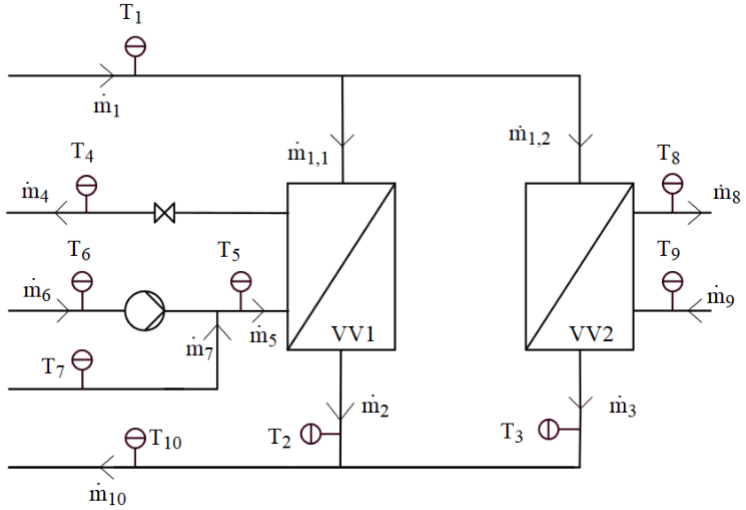
Duration curve for the area



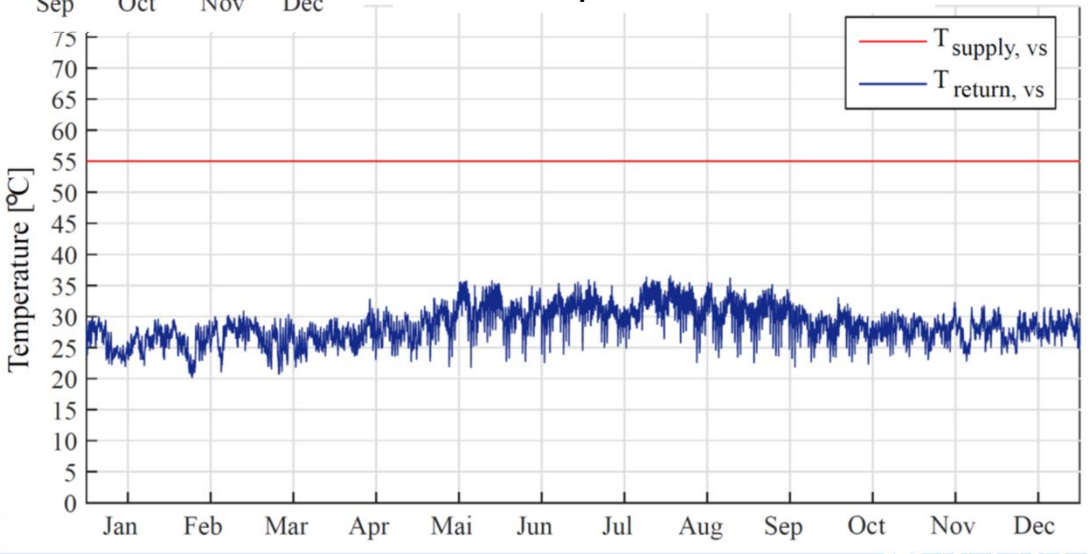
Temperature distribution

Reference case - 80°C

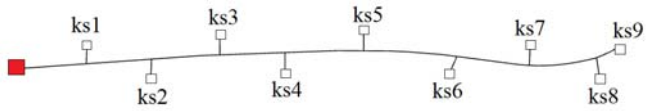


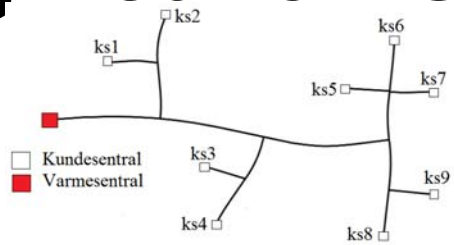


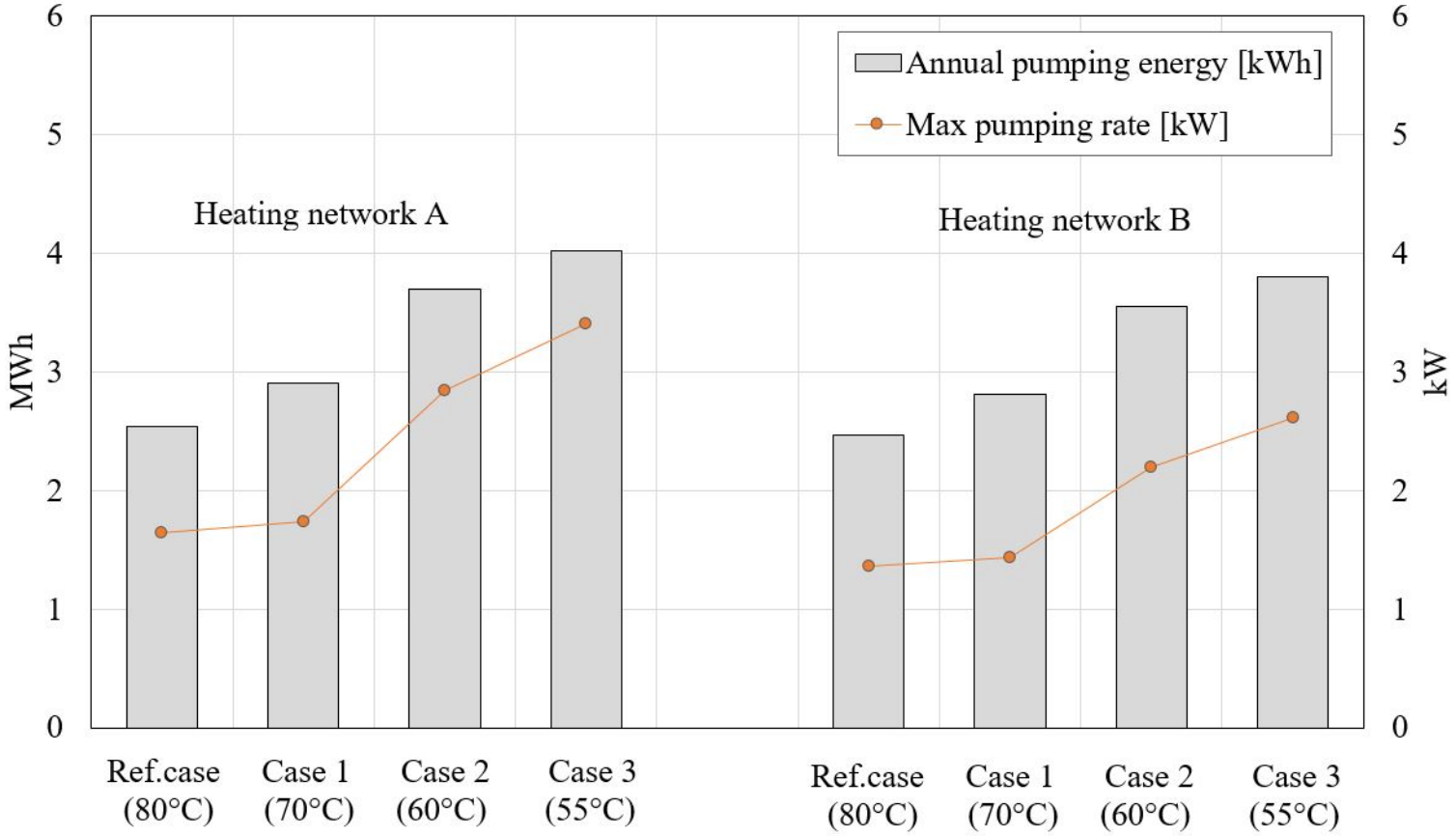
Low temperature - 55°C



Pump energy for existing networks







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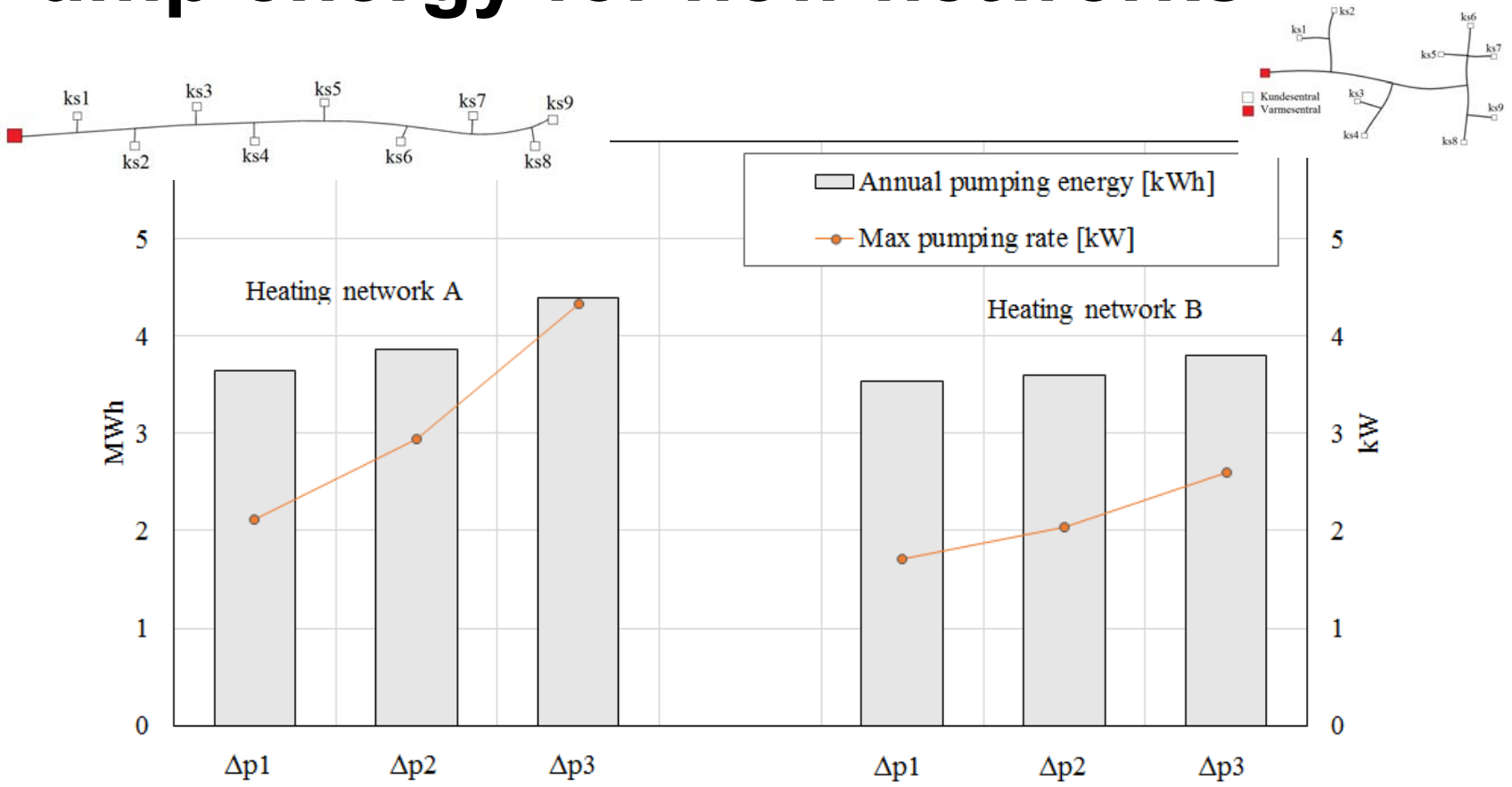
Pump energy for new networks



	Δp1	Δp2	Δp3
Main pipe	R ≤ 150 Pa/m	R ≤ 300 Pa/m	R ≤ 600 Pa/m
Service pipe	R ≤ 200 Pa/m	R ≤ 550 Pa/m	R ≤ 800 Pa/m

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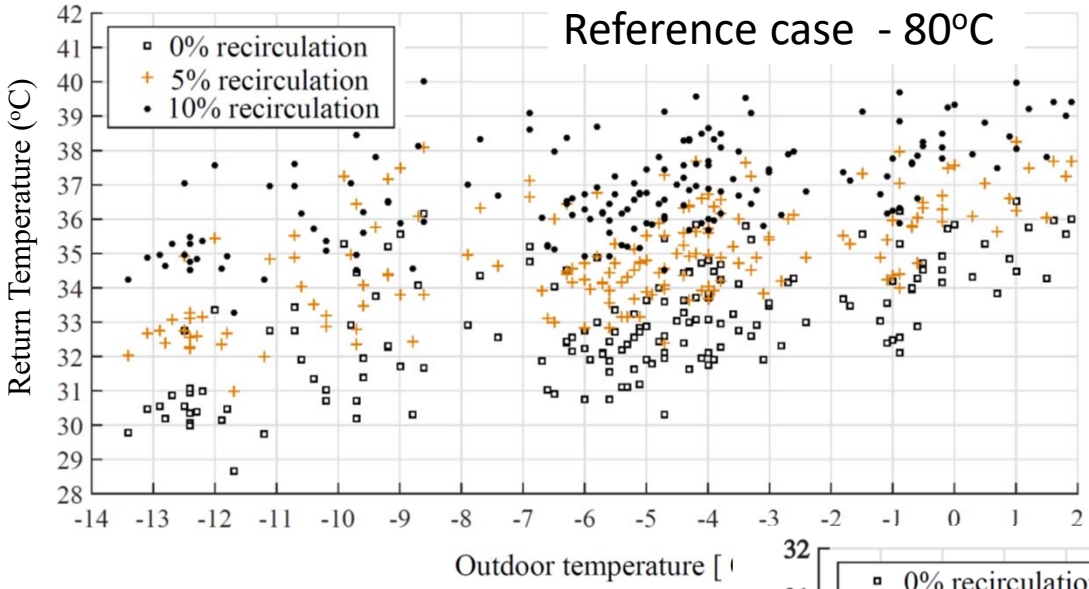
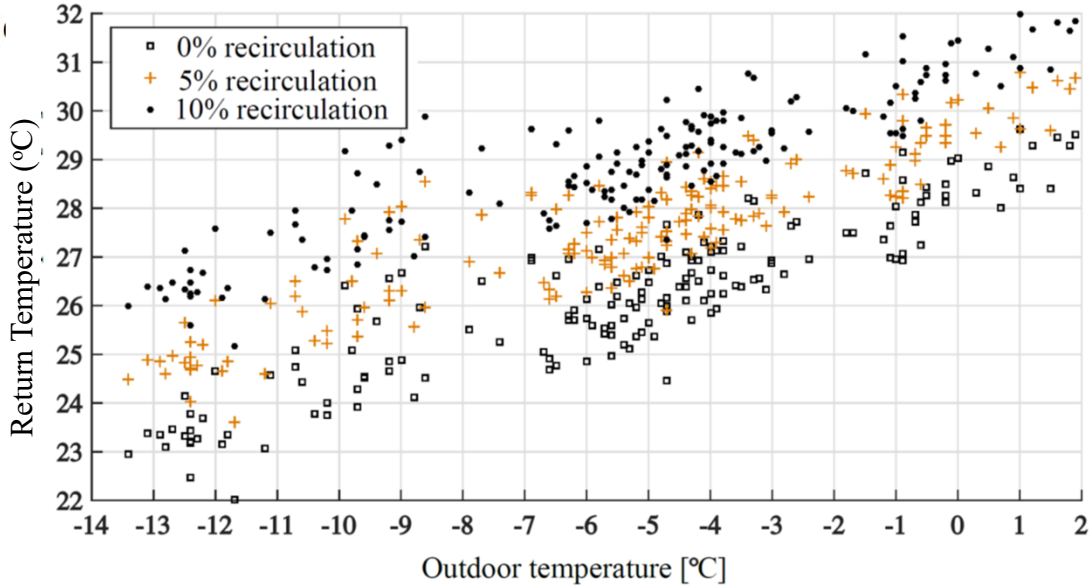
Issues with achieving the low return temperature

Reference case - 80°C



High return temperature due to short circulations or by-passes

Low temperature - 55°C



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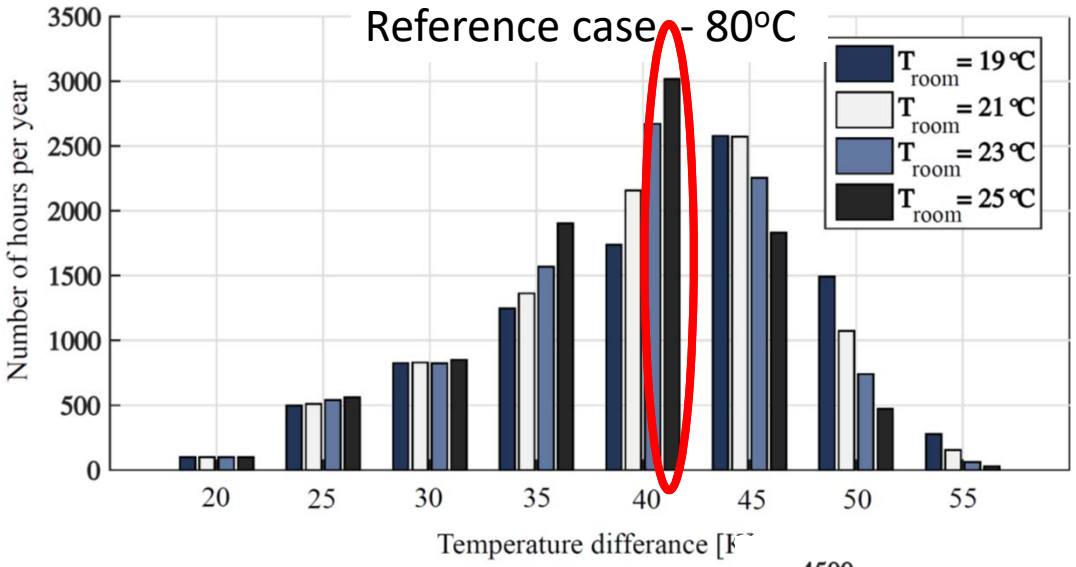
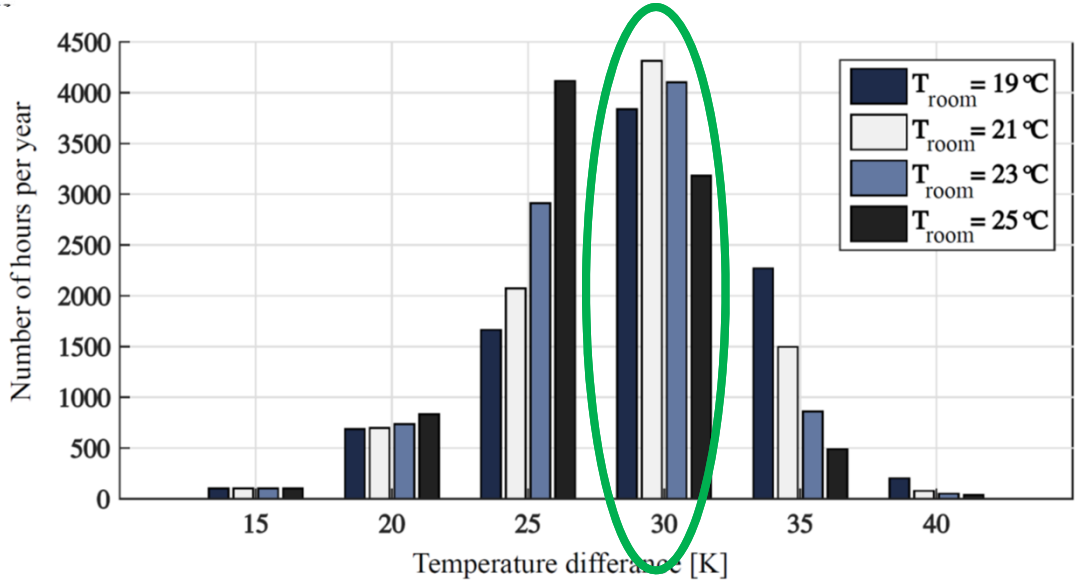
Issues with achieving the low return temperature

Reference case - 80°C

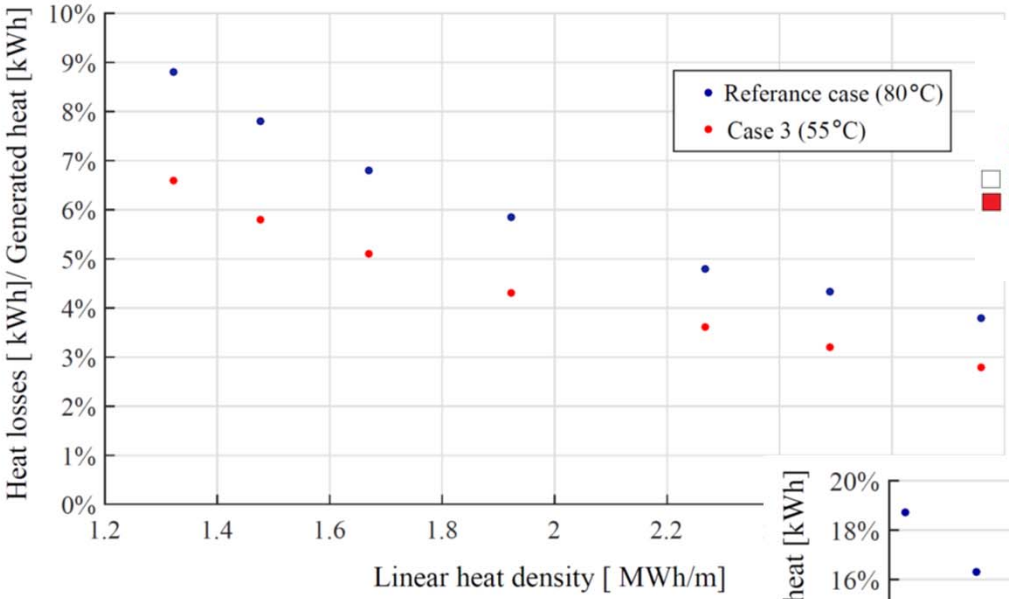


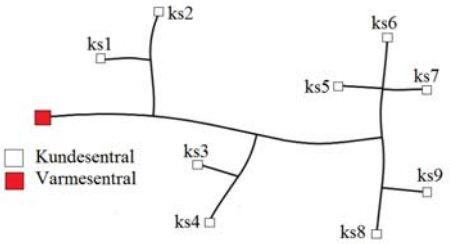
Issues with the temperature difference due to high indoor temperature

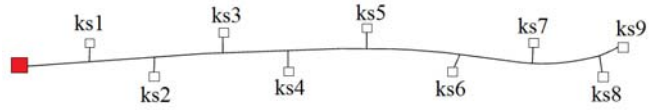
Low temperature - 55°C

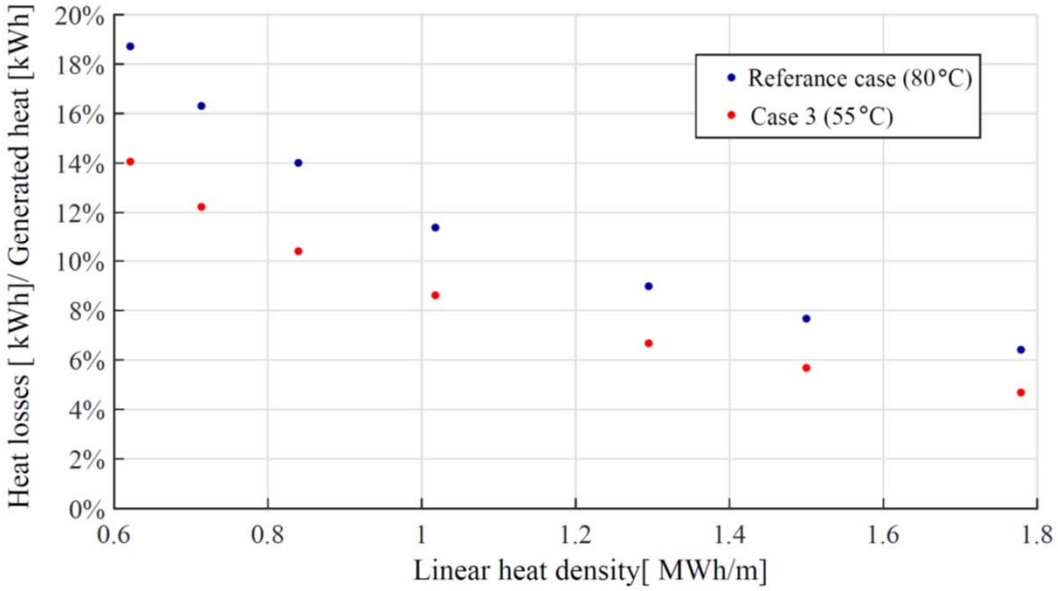


Development of the LTDH









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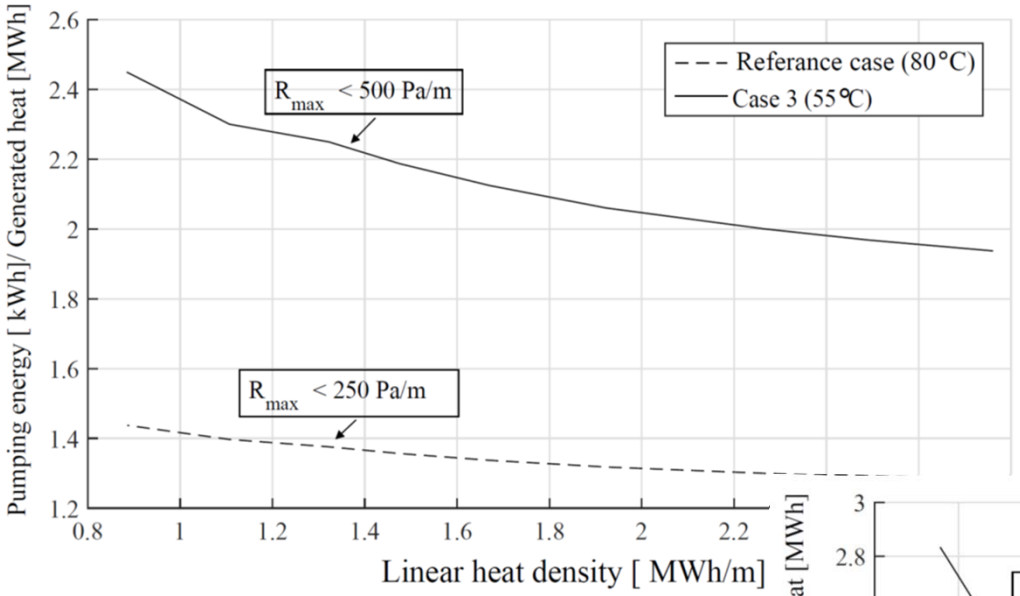

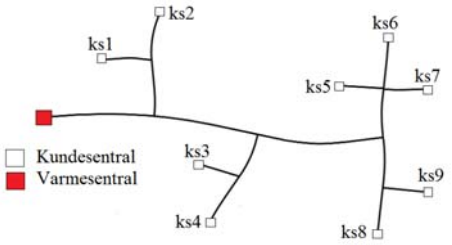

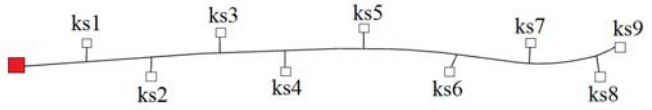

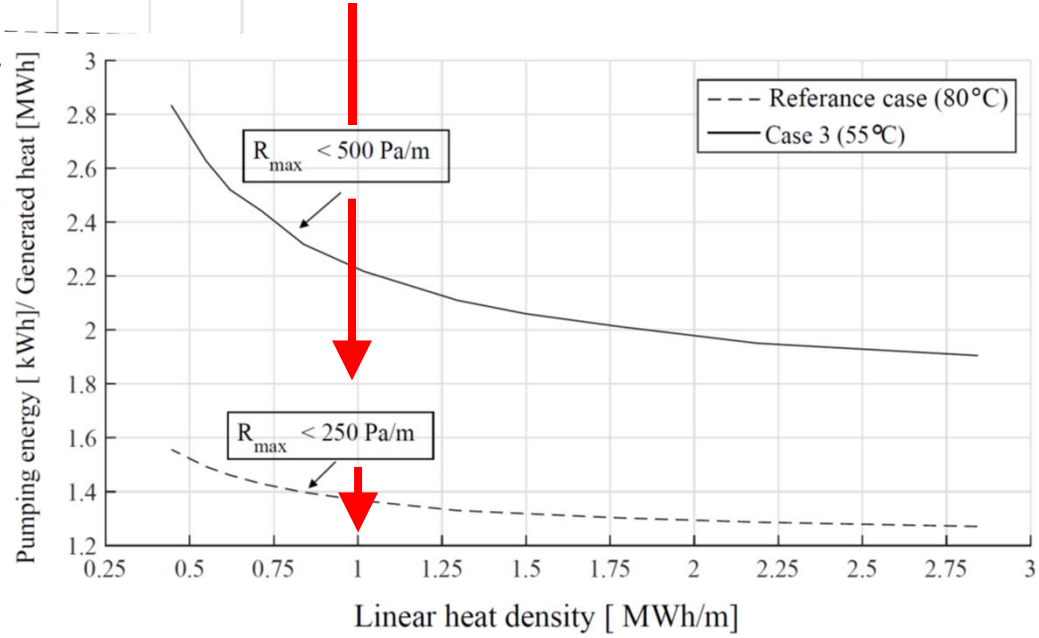

Conclusions

- LTDH may be competitive in the low heat density area
- The effects of the system faults are smaller in the LTDH
- The oversized radiators shows the biggest influence on the maximal flow rate – meaning issues in control
- For the distributed area, the pump energy is increasing significantly when the heat density is lower than 1 MWh/m

THANK YOU FOR ATTENTION!

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