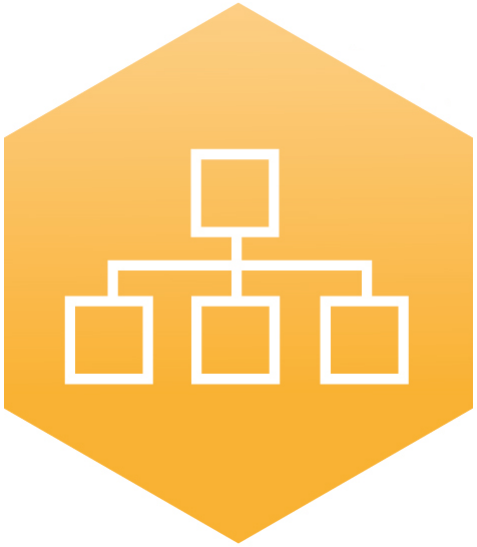
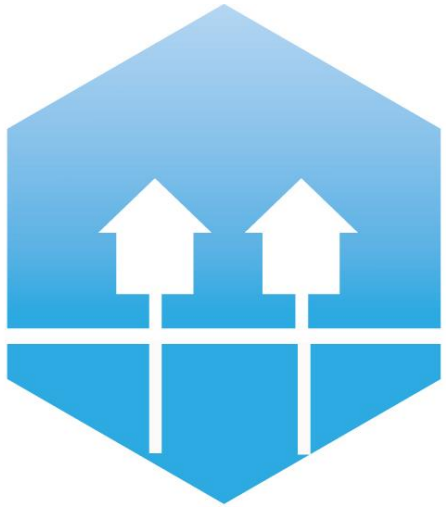
2nd International Conference on Smart Energy Systems and 4th Generation District Heating
Aalborg, 27-28 September 2016

Bottlenecks in district heating networks and how to eliminate them





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Bottlenecks?

- **Pipes with too small dimensions to sufficiently meet consumer needs**
- **With lower ΔT of 4GDH (40-20°C instead of 80-40°C) comes higher flows in existing areas**
- **With less bottlenecks it will be easier to lower the supply temperature**

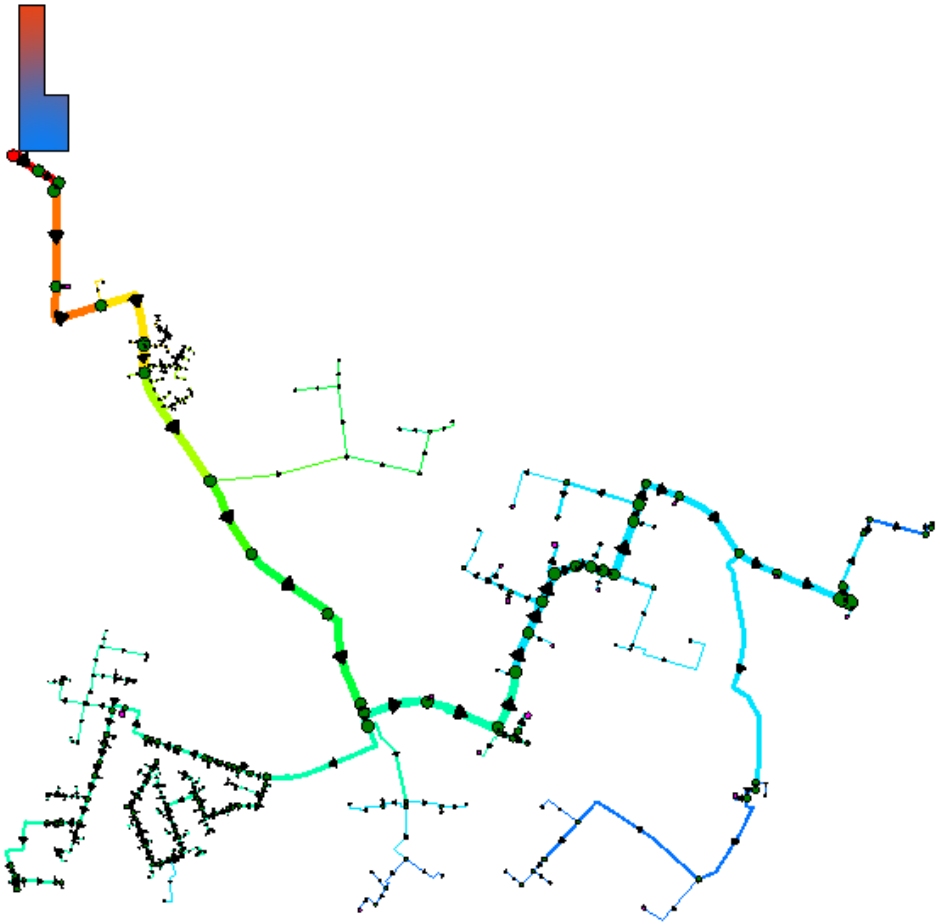
Aim

- **To investigate different bottleneck solutions and see when they work and how much they cost**

Method

- **Simulations of a fictive bottleneck area**
  - **10 MW at dimensioning outdoor temperature**
  - **Highest dp of 600 kPa and lowest of 0 kPa before any measures were taken**
  - **Aim: 100 kPa**
- **Economical estimation of cost of measures**
  - **Input data from district heating companies/experts for each measure**
  - **Net present value calculated on 20 years operation time of the measure and with service and maintenance and operational costs included**
  - **The measure was assumed to be needed 1 week, 1 month or 6 months per year**

The DH case area



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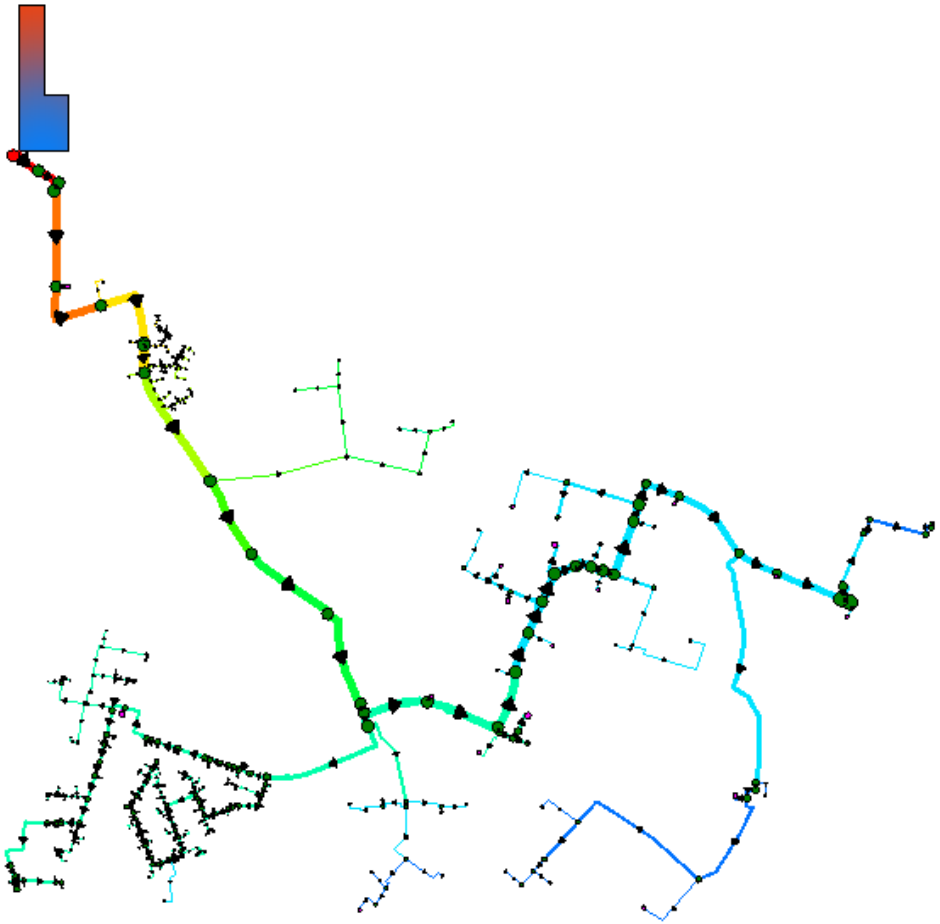
Simulation scenarios

- **Scenario A - Original**
- **Scenario B - Heat sparse**
- **Scenario C - Larger altitude differences**
- **Scenario D - Ring structure**

The DH case area



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Bottleneck measures

- **More pumping**
- **Bigger pipe**
- **Higher supply temperature**
- **Better cooling in the substations**
- **Local heat supply**
- **Demand side management (DSM)**

Result simulations

- **More extensive measures was needed in heat sparse areas and areas with a ring structure**
- **The outcome of pumping was harder to predict in areas with ring structure**
- **In areas with larger altitude differences, it is important to evaluate the pressure increase and/or decrease**
- **Better cooling in the substation was needed at 5-50 consumers, depending on scenario**
- **DSM was needed at 4-8 consumers, depending on scenario**

Results economy

- **Prosumers was always the cheapest alternative**
- **More pumping with existing pumps was also a cheap alternative if the district heating network was fairly small**
- **One of the most expensive solutions was to increase the supply temperature in a big network**
- **Important: no economic benefits from the measures have been included in the study**

Example list economy (Scenario A - original)

More expensive

Prosumers
Existing pump small network
DSM
Increased supply temperature small network
Existing pump big network
Extra small pipe
Peak heat boiler
Better cooling in substations
Heat pump
Exchange pipe into a bigger one
New pump in the small network
Increased supply temperature big network

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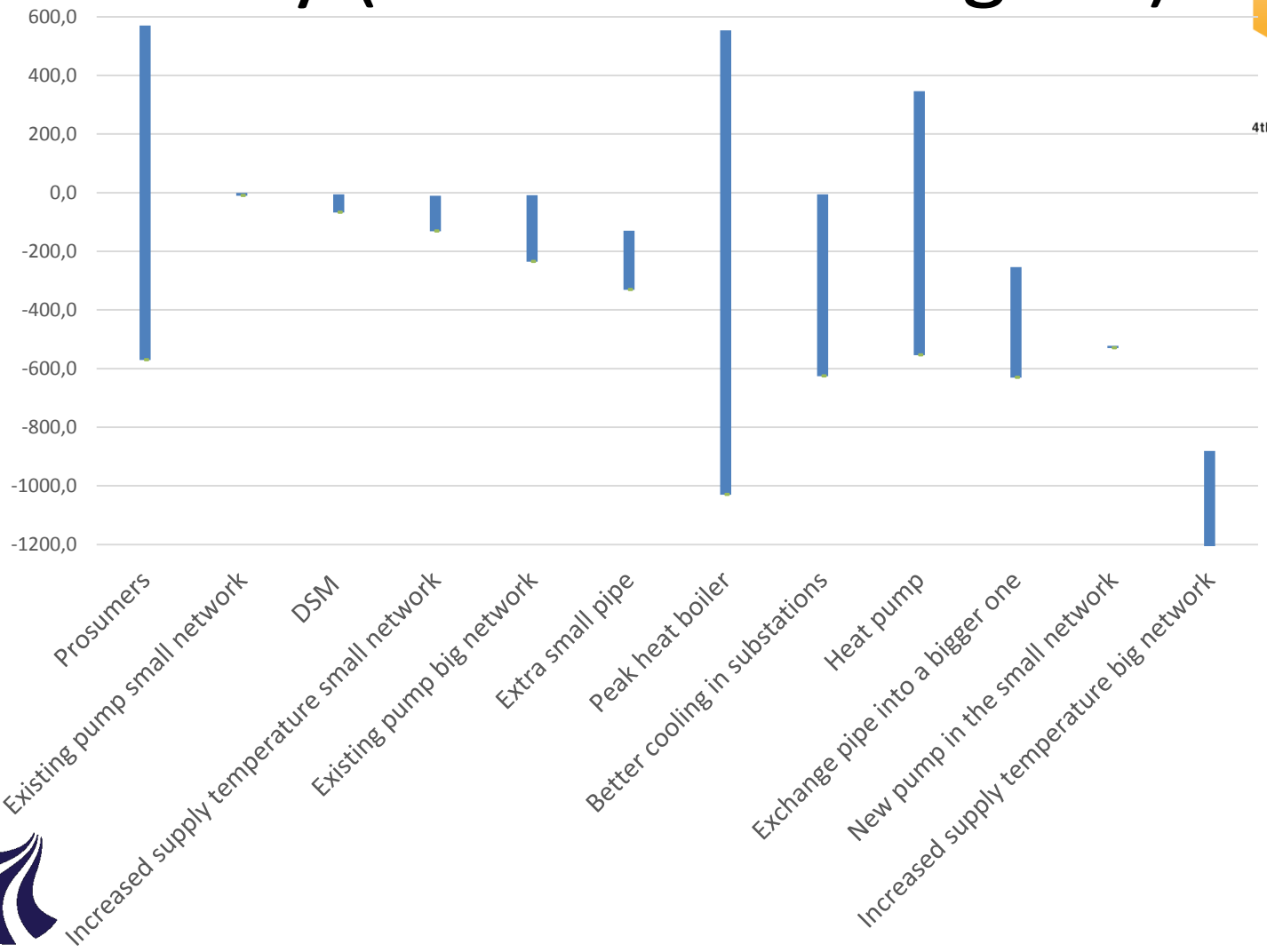
Economy (Scenario A - original)



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Conclusions

- **The simulations show that different measures are not equally suitable for all the network configurations**
- **The economic result depends on a lot of different parameters that varies in different networks**

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Thank you!

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