INCREASING DISTRICT HEATING EFFICIENCY WITH ULTRA LOW SUPPLY TEMPERATURES (35 °C)

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District heating trends

• District heating is becoming greener – more RE technologies applied

• District heating is challenged by individual heating technologies (heat pumps, solar heating, pellet furnaces etc.)

• New buildings are becoming more energy efficient:
  – More buildings have floor heating, eliminating need for high supply temperatures
  – High insulation standards make heat recovery systems for DHW production preferable thus reducing the demand for district heating

• Consequences:
  – Reduced demand for space heating
  – Altered shares of space heating and domestic hot water
  – Increasing heat loss in district heating grids as heat demand decreases unless temperatures are lowered
What is Ultra Low Temperature District Heating?

- Traditional district heating: 70-80 / 40 °C
- Low temperature district heating: 55-60 / 35 °C
- Ultra low temperature district heating: 35-45 / 25 °C

- Link between temperature for space heating and domestic hot water is eliminated
Micro Booster concept
Demonstration project in Geding (Aarhus)
25 family homes of varying standards (1900-2015)
Demonstration project in Geding (Aarhus)

Supply and return temperature, boiler

Start of demonstration

2015

2016

Supply
Return
Demonstration project in Geding (Aarhus)
Demonstration project in Geding (Aarhus)

- Annual heat loss has been reduced by 40%
- Varying between a 63% reduction in November to 9% reduction in April
- Preliminary test in April 2015 so reduction potential could be higher
Main Benefits

• Significantly reduced heat loss (30-50 %)

• Unlinking temperature requirement for space heating and domestic hot water, respectively

• No issues with legionella due to storage tank on the primary side

• Better and more efficient integration of RES (solar, large heat pumps, excess heat, geothermal heat etc.)

• Heat from the existing DH return pipe can supply new areas
  – Cost-effective capacity expansion

• Significant reduction of return temperature
  – Better utilization of primary fuel (e.g. flue gas condensation)
Some disadvantages

- More expensive unit
- Requires more space
- Lower ΔT results in reduced capacity in the district heating grid
- Heat pump electricity consumption
Conclusions

- Great perspectives in contributing to the development and competitiveness of district heating compared to individual alternatives

- Several possibilities for integration
  - RE technologies
  - Existing district heating systems
  - Combined with district cooling supply

- Additional cost of the unit cannot be outweighed by the reduced heat loss alone – other system benefits have to be included
  - Higher heat production efficiency
  - Capacity expansion of the existing district heating grid

- Generally benefits outweigh disadvantages

- DH-unit not in mass production yet
Ongoing demonstration project – Louiselund in Hørsholm

• Upscaling the concept for family houses to apartment blocks

• The nursing home Louiselund
  – 90 sheltered homes
  – 43 senior homes
  – Floor heating for space heating
  – Has its "own" district heating pipe from the main distribution pipe with 9 outlets
New demonstration project – Ultra Low Temperature District Heating in new buildings

SWECO have been awarded funding for a new project to demonstrate ultra low temperature district heating in new buildings.

The project starts ultimo 2016 and also includes technologies for reducing district heating grid costs.

Project partners:
- SWECO (Project Manager)
- I/S Norfors (utility company)
- Thermaflex (pipe supplier)
- Demonstration host
The technology is available and proven to be reliable

Now we need a commercial breakthrough