3TH INTERNATIONAL CONFERENCE ON SMART ENERGY SYSTEMS AND 4TH GENERATION DISTRICT HEATING

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ULTRA-LOW DISTRICT HEATING SUPPLY IN NEW BUILD AREAS AND IN APARTMENT BUILDINGS

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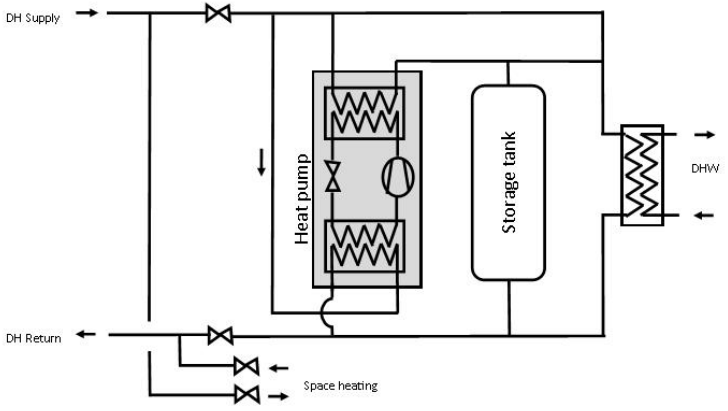
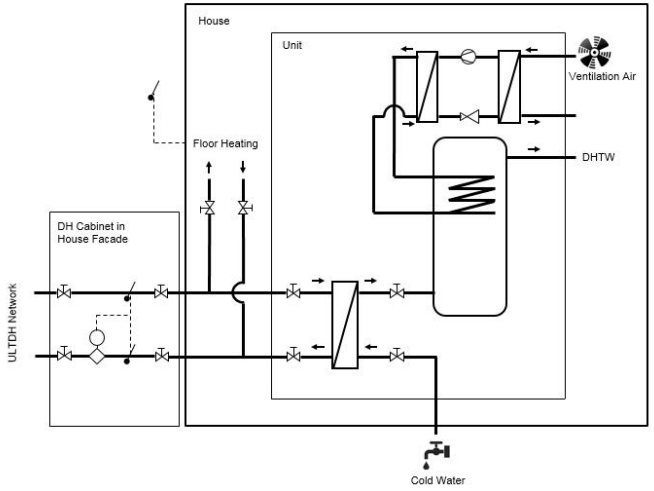
What is Ultra-Low Temperature District Heating?

- Traditional district heating: 70-80 / 40 °C
- Low temperature district heating: 55-60 / 35 °C
- Ultra-low temperature district heating: 35-45 / 25 °C
  - Decoupling of production of Space Heating (SH) and Domestic Hot Tap Water (DHTW)

Decoupling of production of SH and DHTW

- Electrical heating of DHTW
- Micro Booster Concept with Heat Pump. Heat source:
  - DH water (say 40 °C)
  - HX from ventilation
  - A combination
- Other technologies and combinations



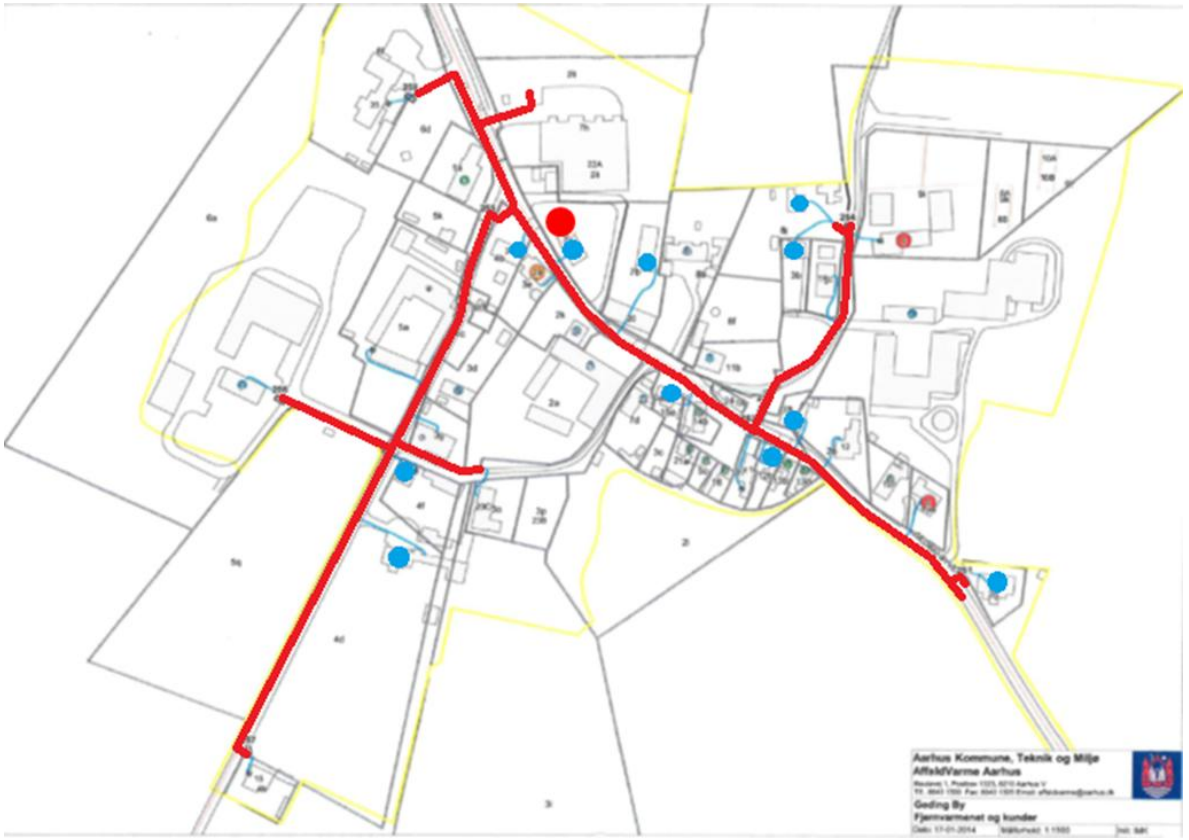


District Heating Trends

- District heating is becoming more and more green – 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:
  - Floor heating is predominant not needing a high supply temperature
  - High insulation standards makes heat recovery systems for DHTW production preferable thus reducing the demand for district heating
- Consequences:
  - Reduced demand for space heating
  - Altered shares of space heating and domestic hot tap water
  - Increasing heat loss in district heating grids as heat demand decreases unless temperatures are lowered

Demonstration project in Geding (Aarhus) 2015/2016

25 family houses of varying standards (1900-2015)



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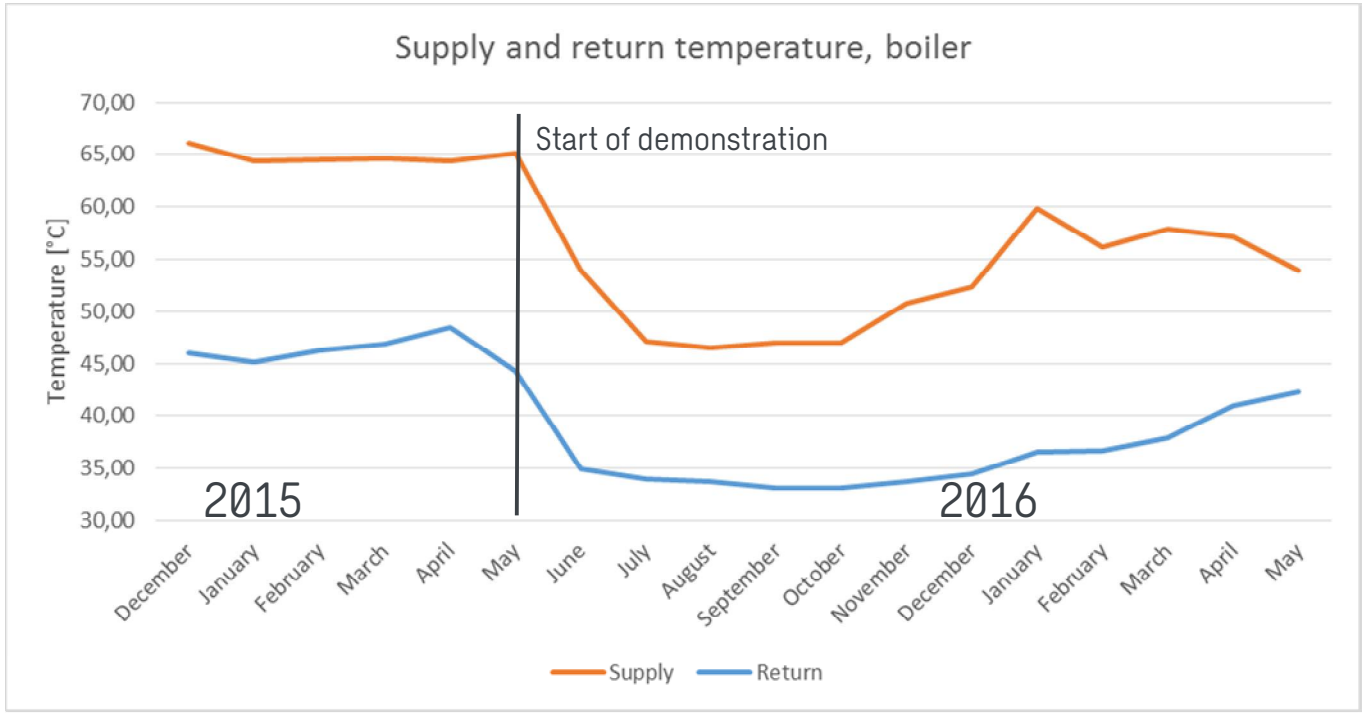
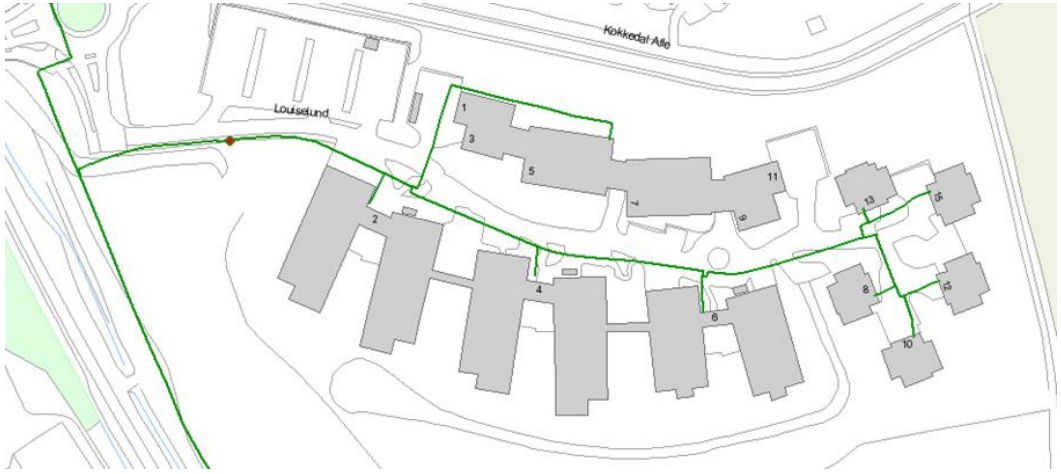


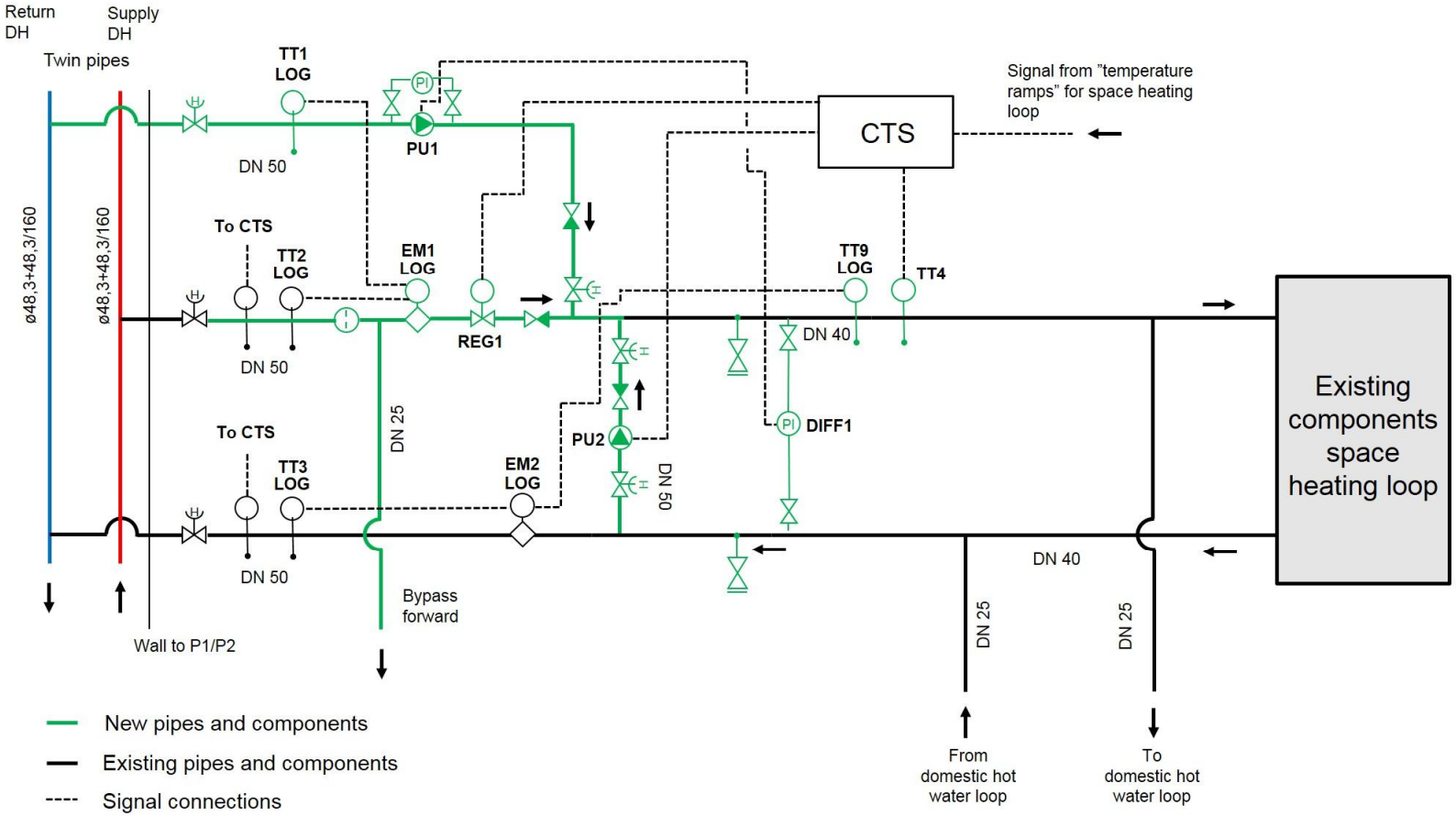
Just finished demonstration project – Louiselund in Hørsholm 2016/2017

- Upscaling the concept for family houses to apartment blocks

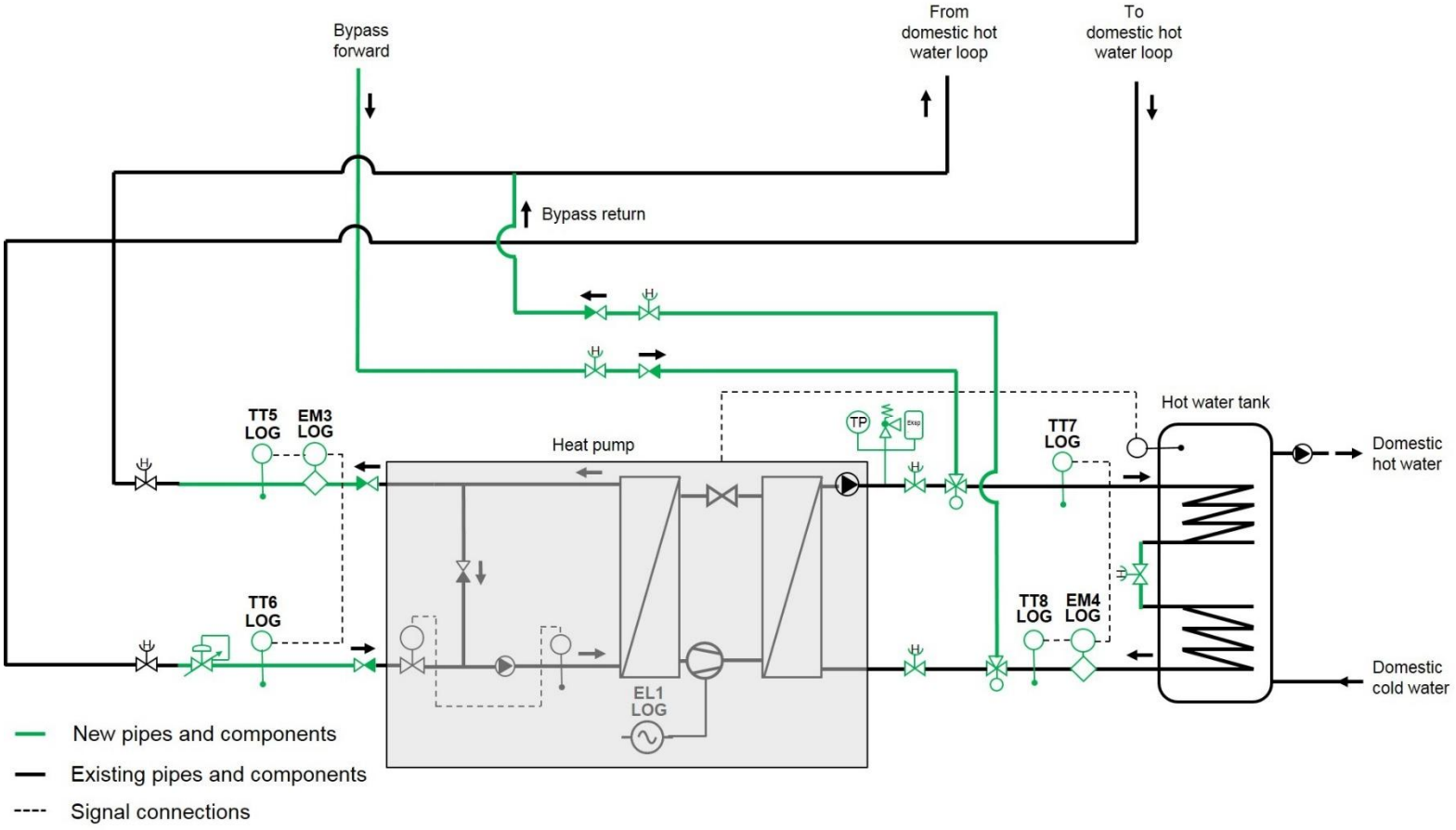
- The nursing home Louiselund
  - 90 sheltered homes
  - 43 senior homes
  - Floor heating as space heating
  - Has its ”own” district heating pipe from the main distribution pipe with 9 outlets



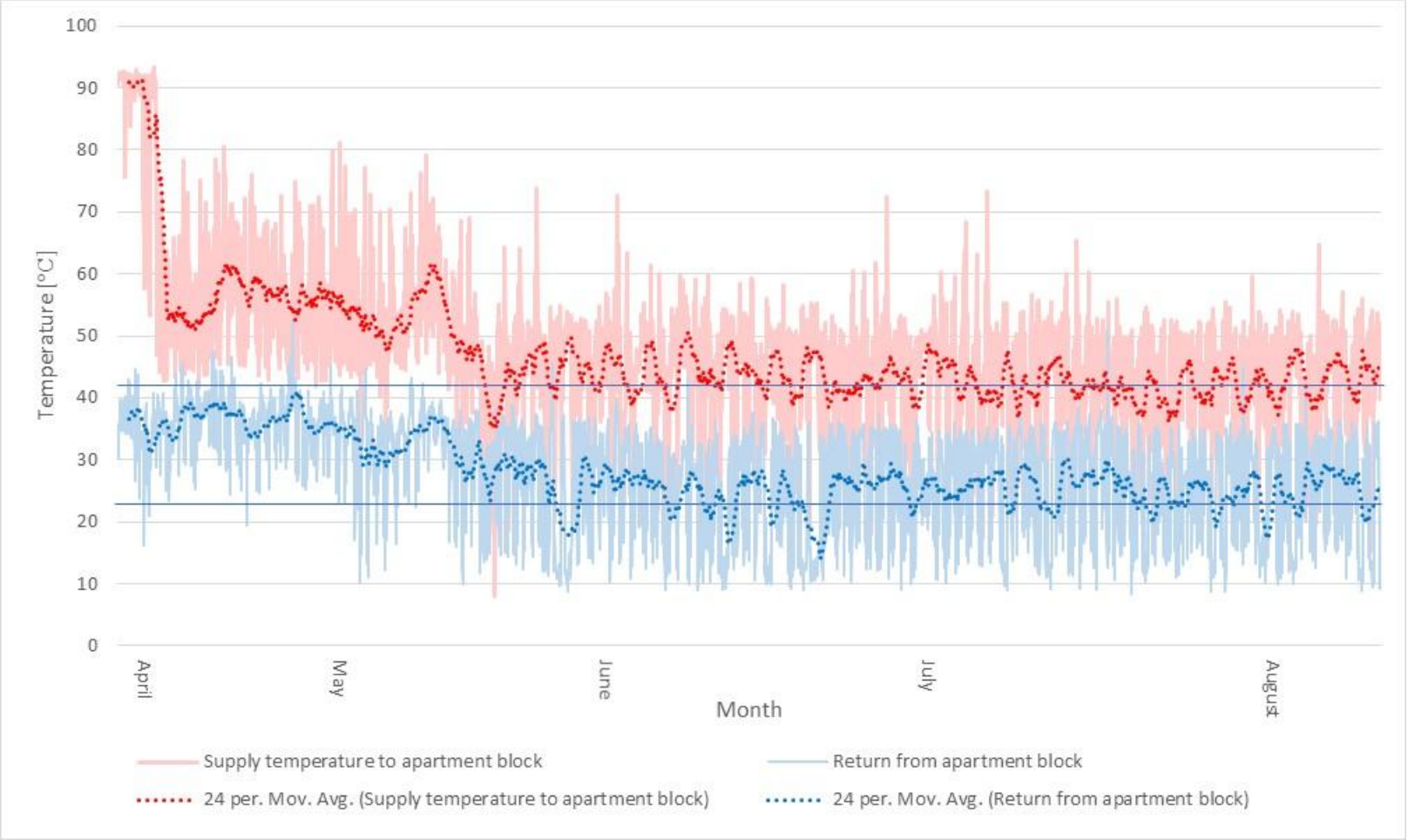
Ultra-Low District Heating concept in Louiselund 1



Ultra-Low District Heating concept in Louiselund 2



The mixing loop



Results

- Calculated heat loss reduced by 40 – 55 %
- Issues with heat pump performance due to components in existing system
  – COP performance not optimal
- Retrofit solutions are possible but not without difficulties
- No financial gain for consumers with current tariff scheme
  – Needs for changed tariff system to quantify system benefits

Ongoing demonstration project
Ultra-Low Temperature District Heating in area with new family houses

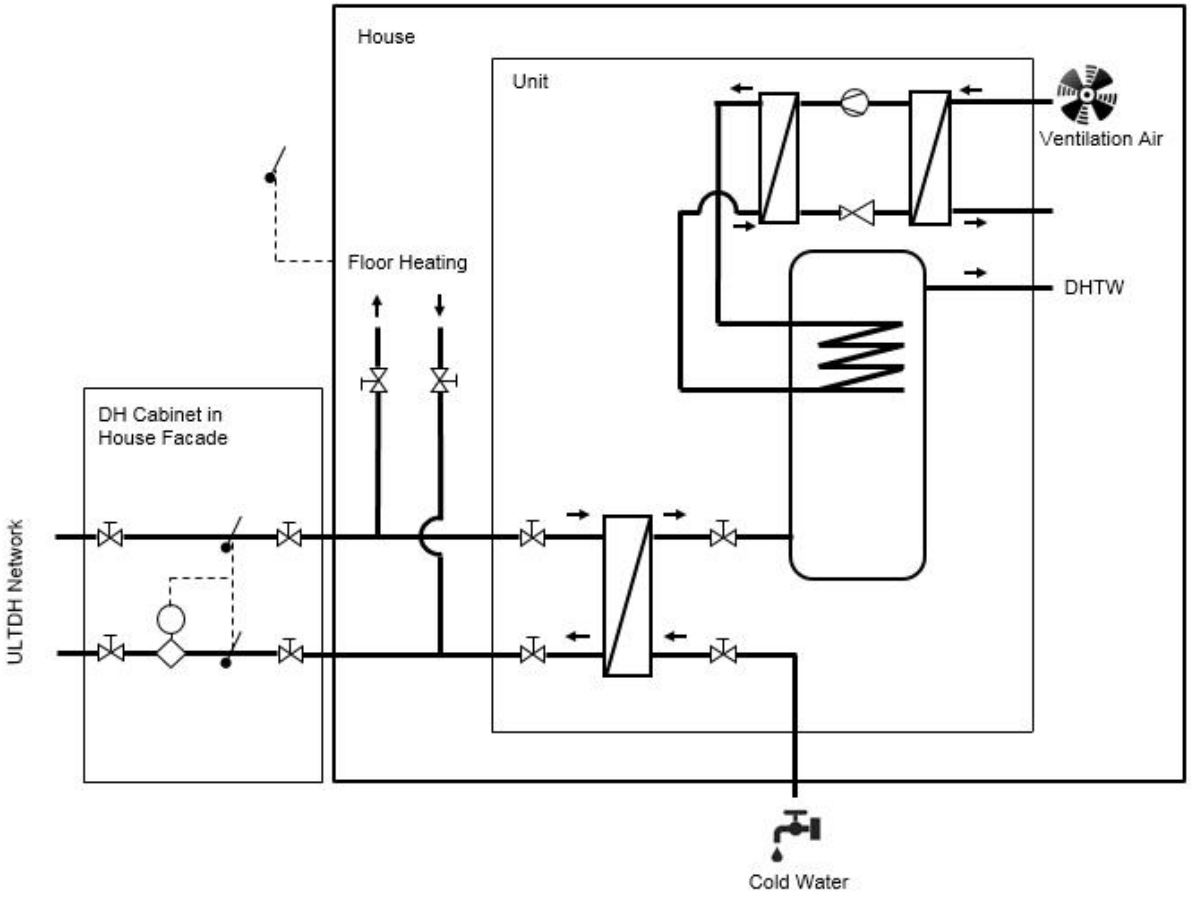
SWECO is managing a new project to demonstrate ultra-low temperature district heating in an area with new family houses (approx. 105 houses)

The project also includes technologies for reducing costs of district heating grids by applying prefab flexible plastic pipes.

Project partners:

- SWECO (Project Manager)
- I/S Norfors (utility company)
- Thermaflex (pipe supplier)
- Demonstration host

DH Unit – Simplified diagram



Thermaflex network

SWECO

Main Benefits

- Significantly reduced heat loss (30-50 %)
- Unlinking temperature requirement for space heating and domestic hot water respectively
- The legionella issue is dealt with
- 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, CHP elec. efficiency)

Some disadvantages

- In some concepts a more expensive and complex unit
- Systems with DHTW tanks requires more space
- Lower ΔT results in reduced capacity in the district heating grid
- Electricity consumption for the heat pump

The technology is available and proven reliable

Commercial breakthrough well underway

Really supports utilisation of RE sources and technologies

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