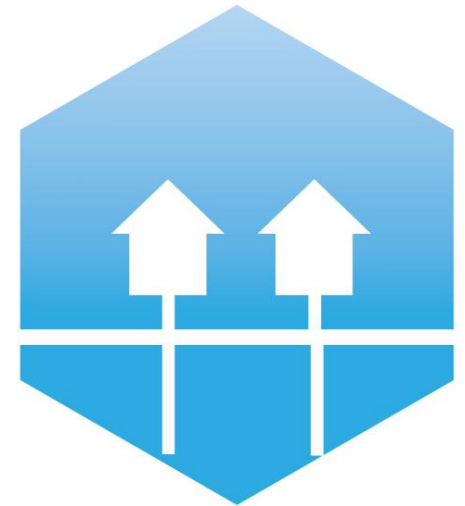
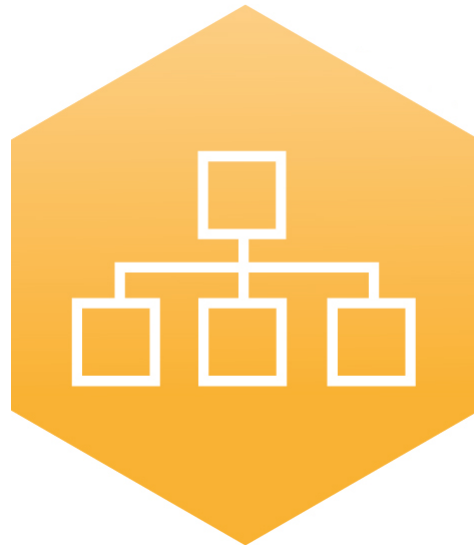


2<sup>nd</sup> International Conference on Smart Energy Systems and 4<sup>th</sup> Generation District Heating  
Aalborg, 27-28 September 2016

# ENERGY + COMMUNITIES



**AALBORG UNIVERSITY**  
DENMARK

# 4DH

**4th Generation District Heating  
Technologies and Systems**

# Energy Plus Communities



# ELFORSK



BUILDING

>

SUPPLY



**AALBORG UNIVERSITY**  
DENMARK

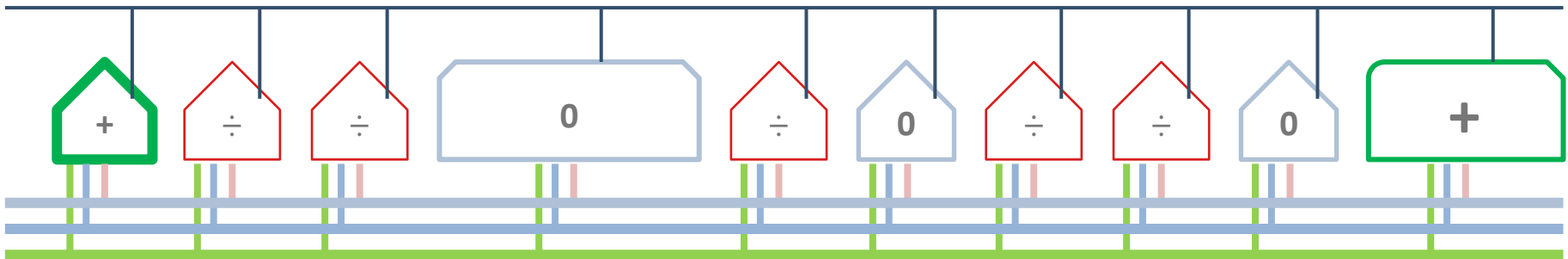
2<sup>nd</sup> International Conference on Smart Energy Systems and  
4<sup>th</sup> Generation District Heating, Aalborg, 27-28 September 2016



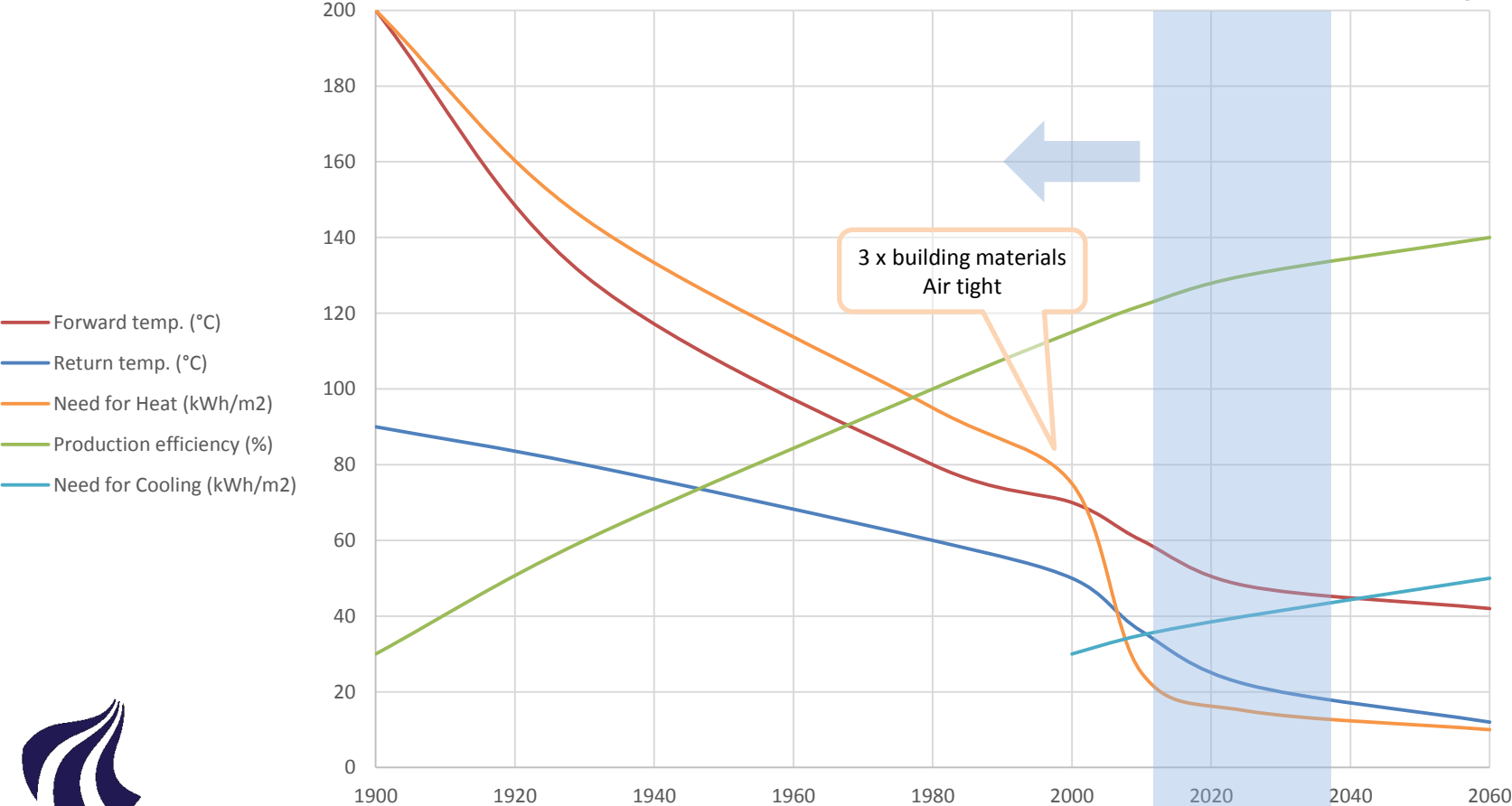
# Energy+Community. What is that?



- A connected geographic area, that over a period of a normal year, shows a surplus of energy, when comparing measured energy consumption with measured energy production within the area.
  - An energy plus community is developed over time
  - Energy needs are minimized over time
  - Energy consumption is balanced over time
  - 100 % renewable, “local” energy production



# A shift in paradigm



# Lower DH temp. vs. Energy Efficiency



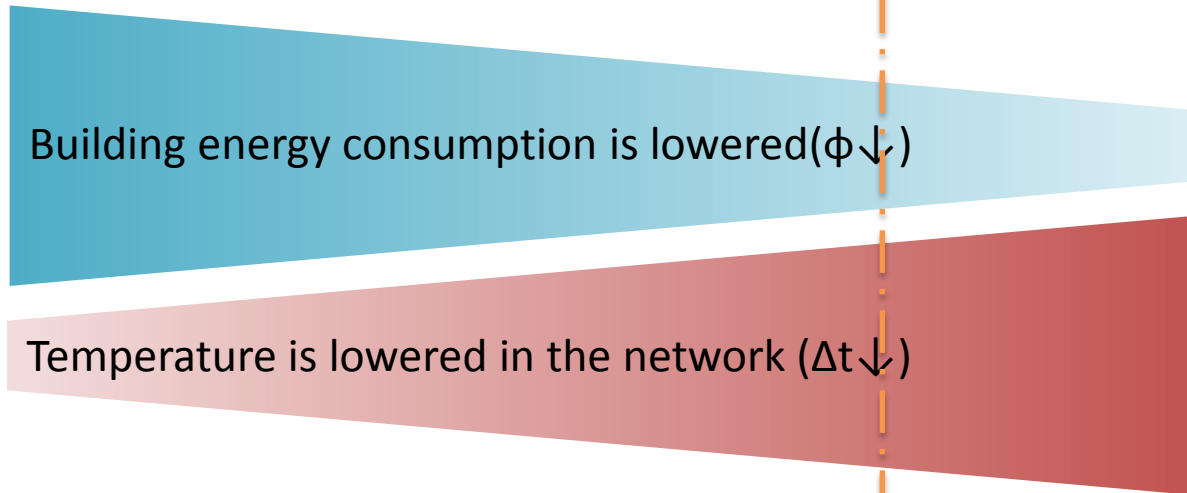
*effect*

*flow*

$$\phi = \underbrace{\rho \cdot c_p}_{\text{constant}} \cdot Q \cdot \Delta t$$

*temperatur*

The pipe dimensions  
Of the network:



*Smaller pipes*

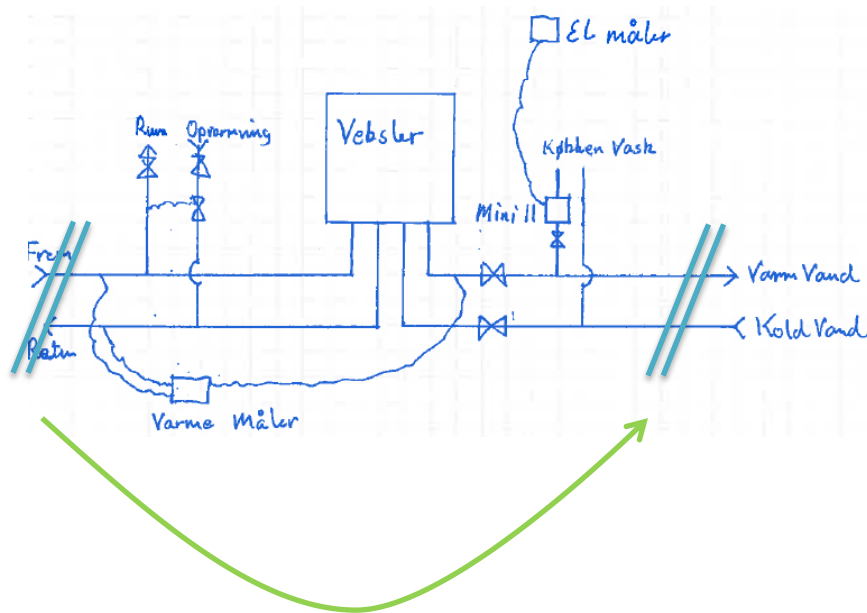
*Larger pipes*

*Are kept constant*



# Lowering temperature to existing buildings

- HEX metro mini 11



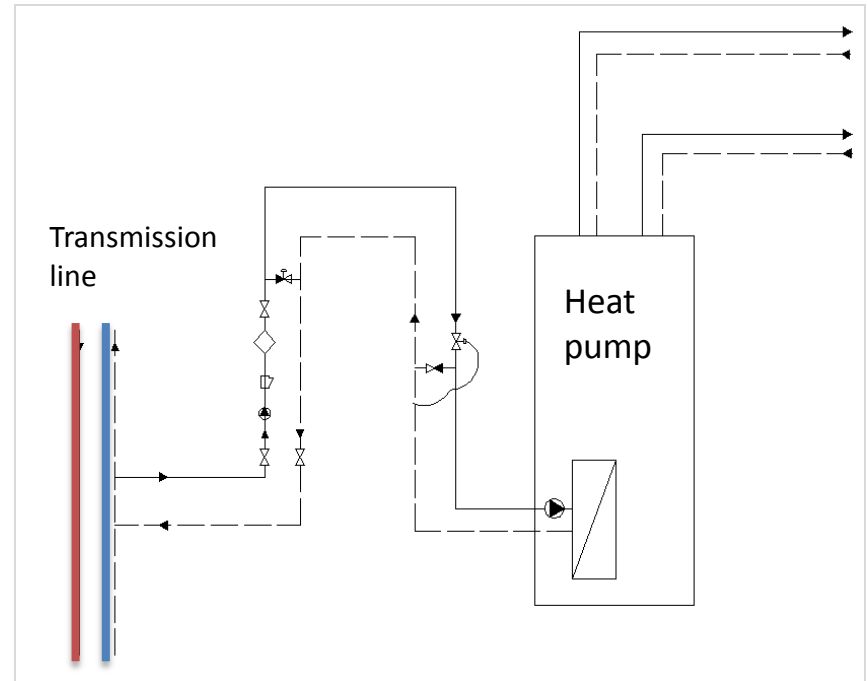
- The Bjerringbro DH Tyttebjergvej project
  - 21 houses from the 1990's
  - 5 different low temperature substations was installed
  - Buildings surveyed by plumber prior to installation
    - 2-3 radiators changed/added
  - Temperature lowered to 46 C
    - From 60-70 C normal



# Using the return heat

Aars DH Company > Aars Golf Club House (2014)

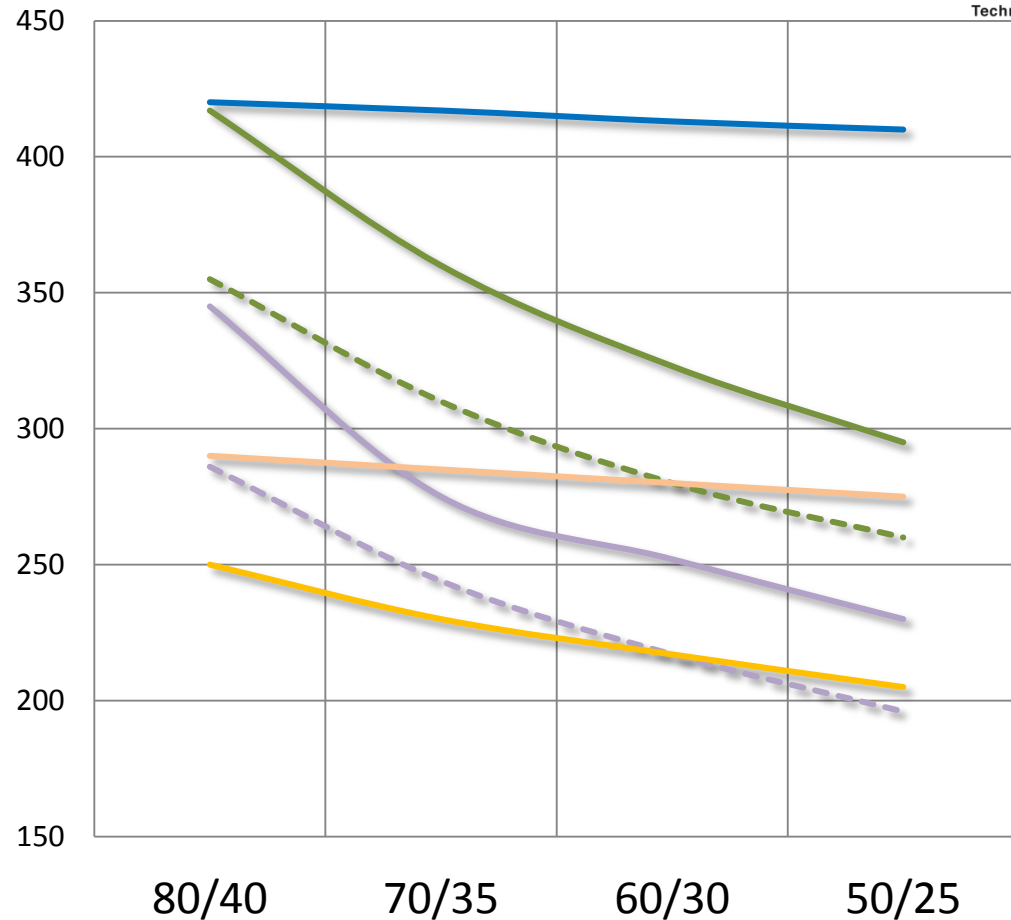
- 8 km transmission line between Aars and Hornum
- DVI 16 kW heatpump connected to the return



# Heat production price at varied temperature sets



- Gaskedel
- VP Overskudsvarme inkl PSO
- - - VP Overskudsvarme ekskl. PSO
- EL VP VE kilde inkl. PSO
- - - EL VP VE kilde ekskl. PSO
- Fliskedel
- Solvarme





# The interactions

Correlation between implementation of energy efficiency in:

- Building
- DH networks
- Renewables production costs

