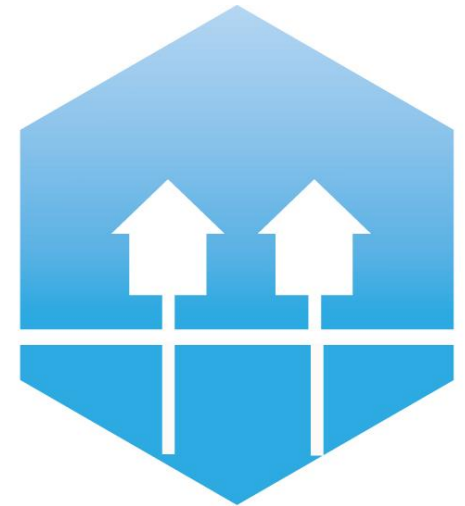
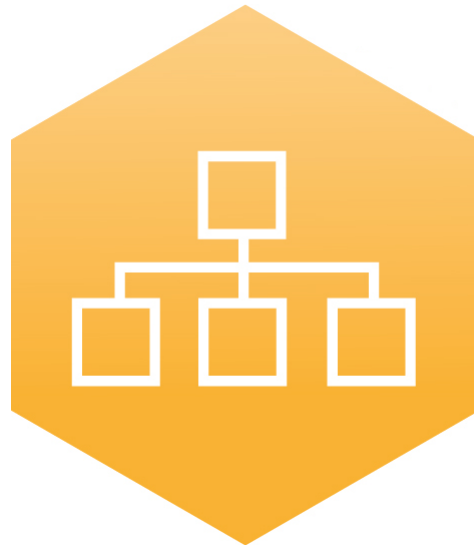


Cost efficiency of district heating

-Christian H. Hansen,
Grøn Energi



AALBORG UNIVERSITY
DENMARK

4th International Conference on Smart Energy
Systems and 4th Generation District Heating 2018
#SES4DH2018

4DH

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

Purpose of study



- Does district heating have a future?
- What about low energy buildings?



Analysis method



- Calculate heating cost per household for a new district heating system (area)
- Compare to individual heating alternatives
- Results compared for standard house of 130 m²
- Heat demand varying from 13,8 MWh/year to 4,9 MWh/year



Area under investigation

- Neighborhood of Fredericia, Denmark
 - 1.800 consumers
- New district heating network
- System design:
 - 4th generation district heating



Area under investigation

- New district heating network
- System design:
 - 4th generation district heating
 - Forward temperature: 65 C, return: 30 C



Assumptions



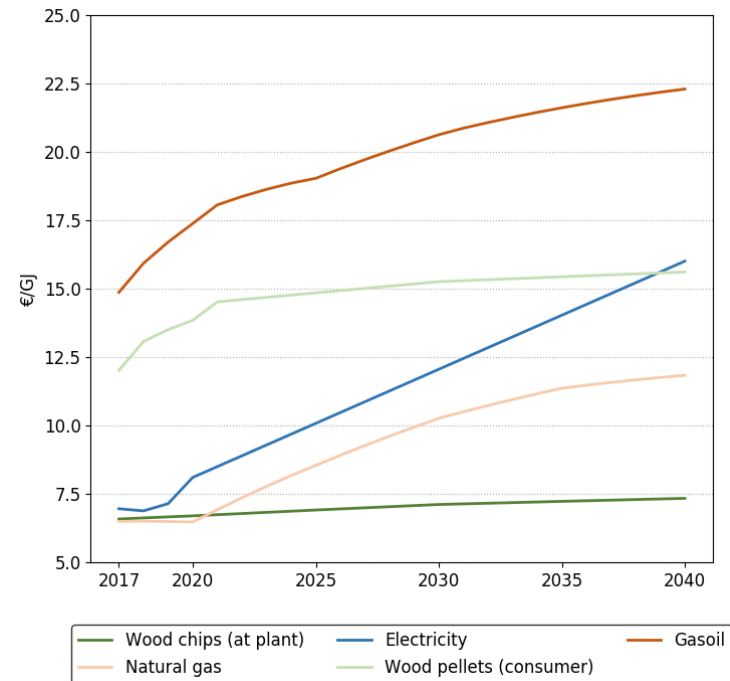
Type of heating	Investment [€]	Efficiency[%]	Lifetime [years]	Maintenance [€/year]
District heating unit	6175	100	25	65
Oil boiler	7515	92	20	295
Wood pellet boiler	10 740	80	20	605
Natural gas boiler	6440	92*	19*	255
Electrical panel/radiators	4965	100	30	65
Air-to-water heat pump	12 485	233*	15*	360
Ground source heat pump	20 000	263*	20	360

Table 2: Assumptions for the individual technologies and the district heating unit



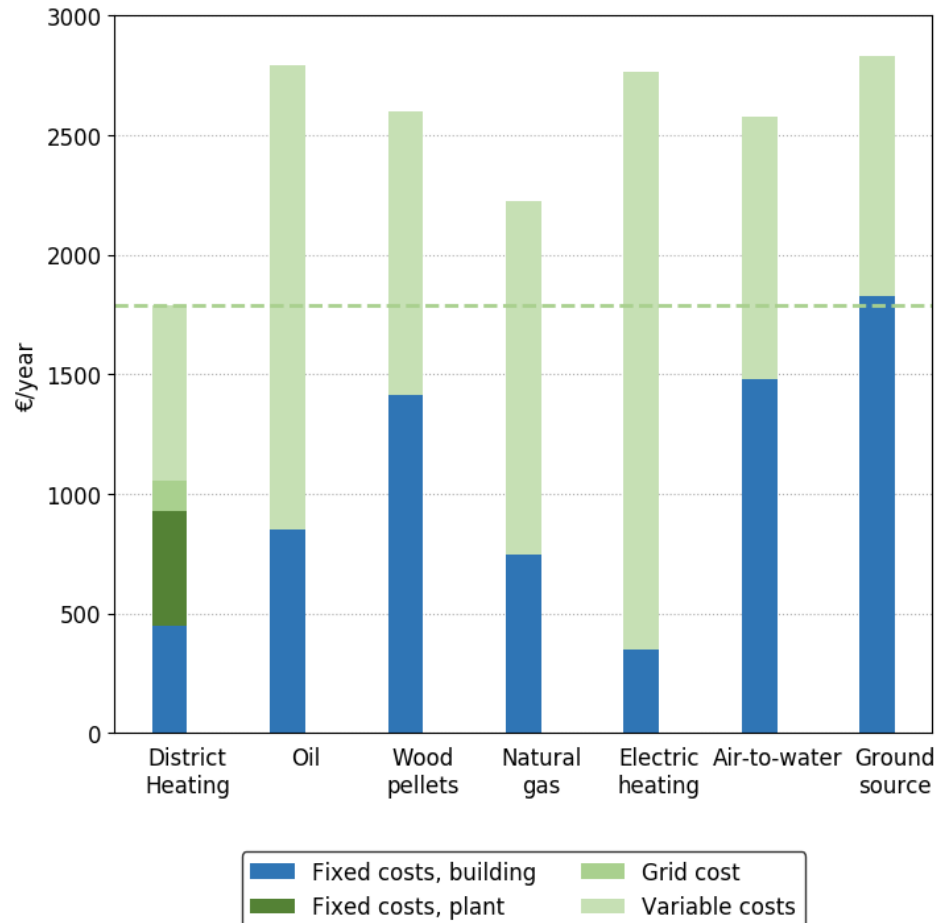
Assumptions

- Raw fuel prices from DEA
- Danish taxes added



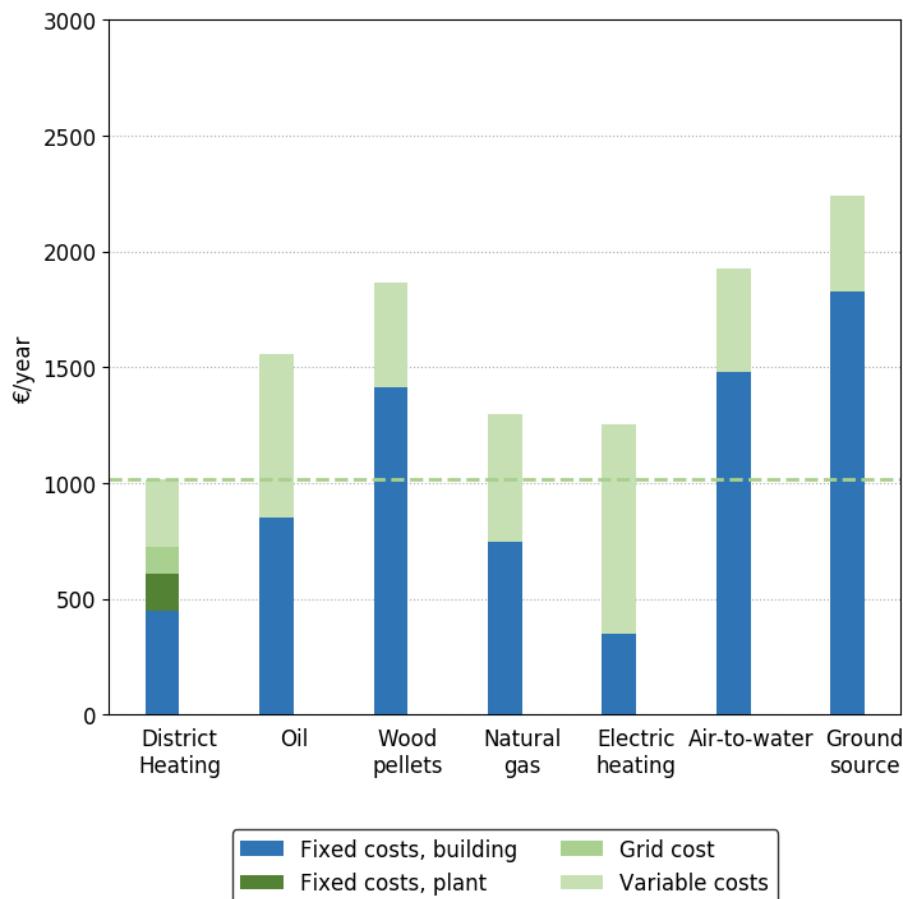
Cost comparison (results)

**13,8 MWh/year
Woodchip boiler
at DH plant**



Cost comparison

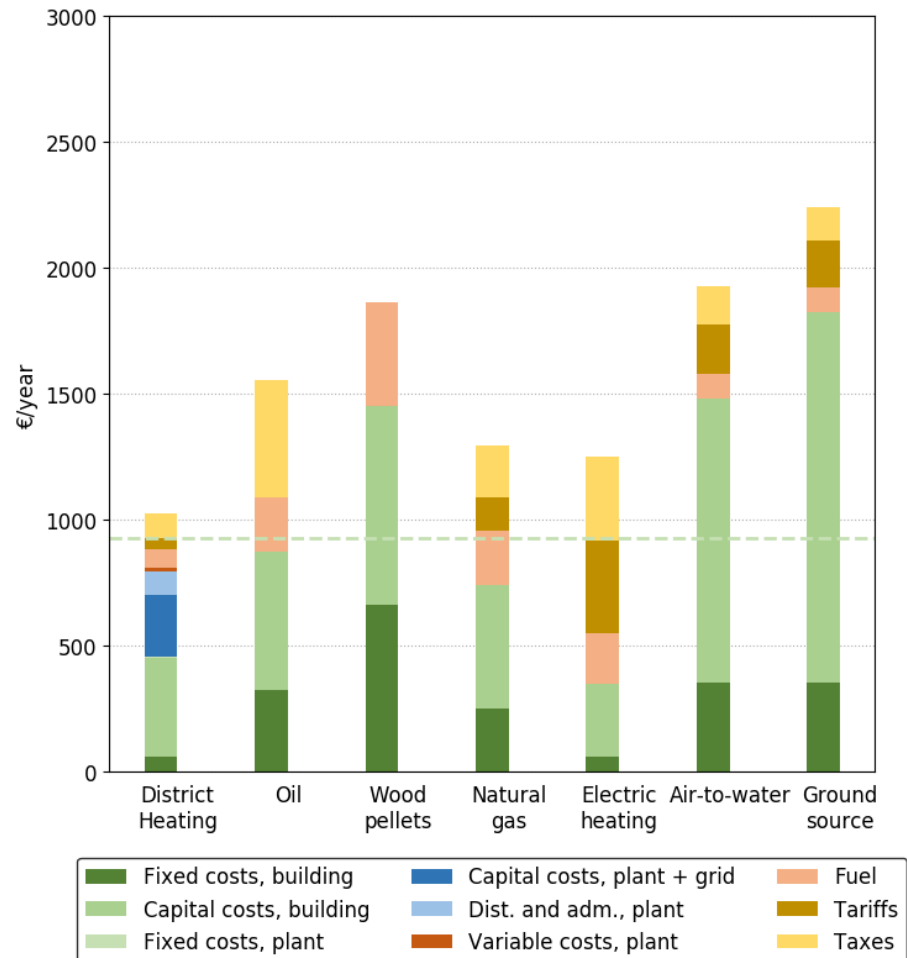
**4,9 MWh/year
Woodchip boiler
at DH plant**



Cost comparison



4,9 MWh/year
Electric heat pump
at DH plant



Conclusions



- **District heating is competitive compared to individual alternatives**
- **Both for traditional buildings and low energy buildings**

Key factors:

- **Efficiency and low investments costs (both pr. MW and number of MW)**

Besides the economic competitiveness comes flexibility, easy transition to CO2 neutrality, security of supply and so on

