

District heating and future low energy buildings?

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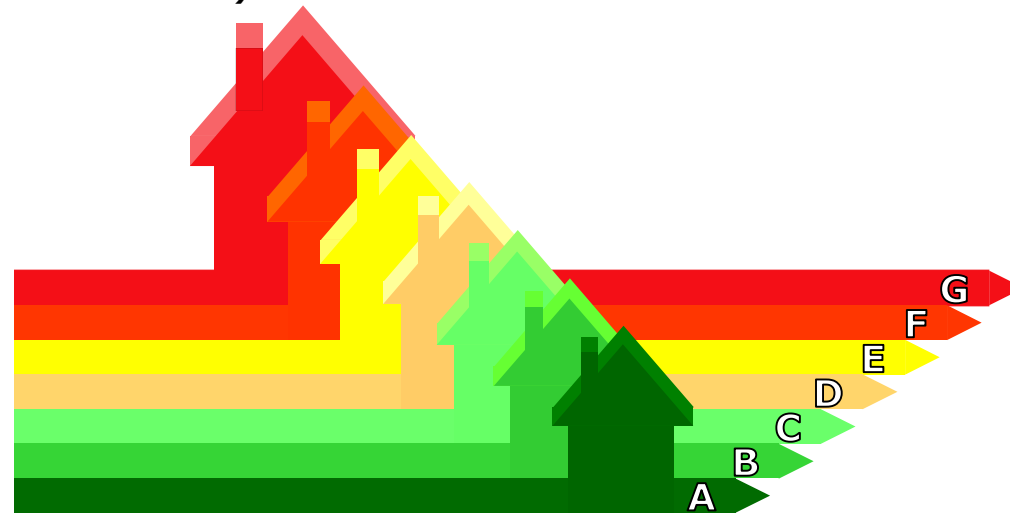


Purpose of study:

Does district heating have a future if all new buildings become low energy buildings?

Building trends

- Buildings are changing
 - New windows
 - New doors
 - New energy efficient heating control equipment
 - Increased energy awareness
 - Increased insulation levels
 - Total renovation (tear and rebuild)

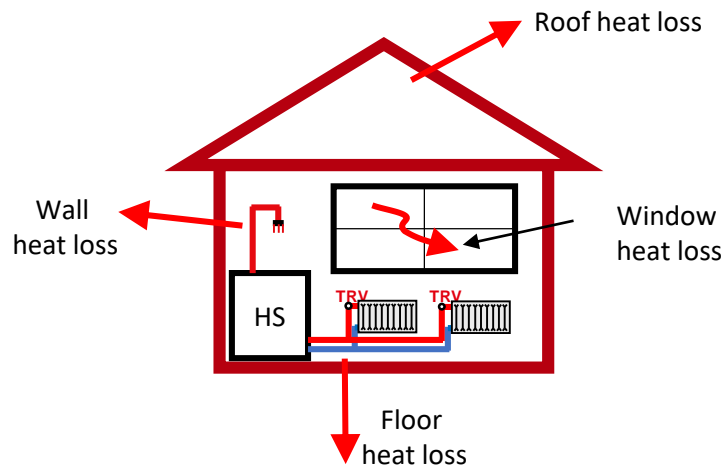


Impact of energy renovation on the cost of heating

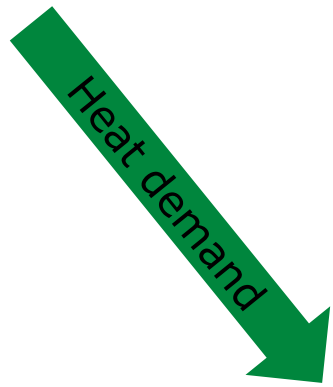
Heat demand

Capacity demand

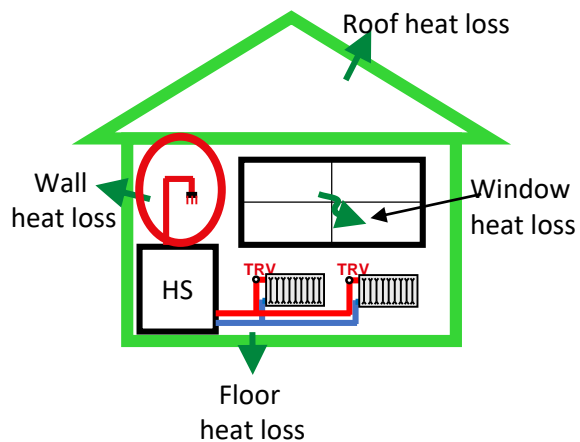
Investment cost



Impact of energy renovation on the cost of **individual** heating



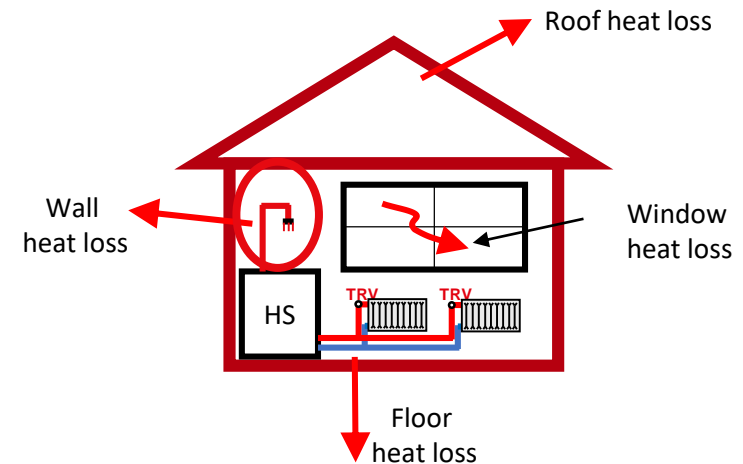
Reduced heat demand
=
Reduced fuel consumption
=
Reduced cost of heat



Capacity demand is dominated
by domestic hot water demand
=
Limited impact



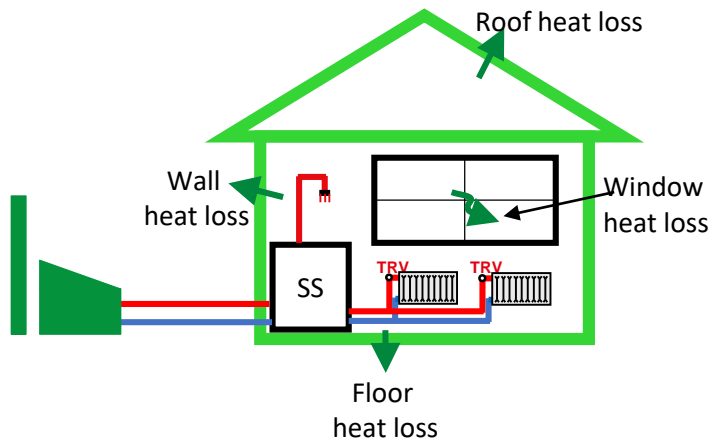
Investment cost is **"lightly"**
dependent on the capacity



Impact of energy renovation on the cost of **district** heating

Heat demand

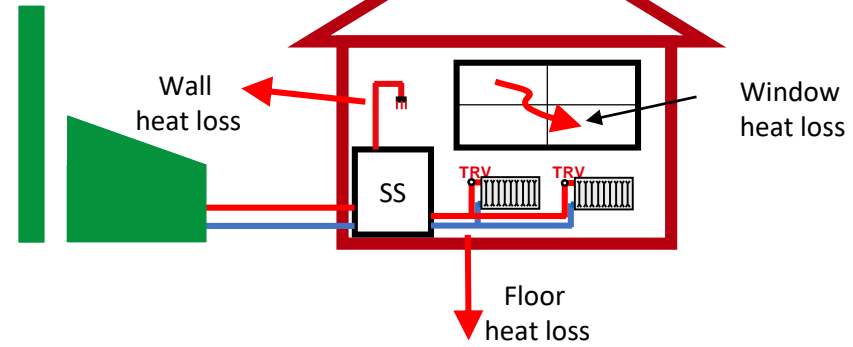
Reduced heat demand
= Reduced fuel consumption
= Reduced cost of heat



Capacity demand

Since DHW demand is aggregated in DH any reduction of space heating capacity demand can be addressed at heat plant
= Big impact

New



Substation cost

Distribution cost

Heat plant cost

Heat plant investment cost is **strongly** dependent on the capacity

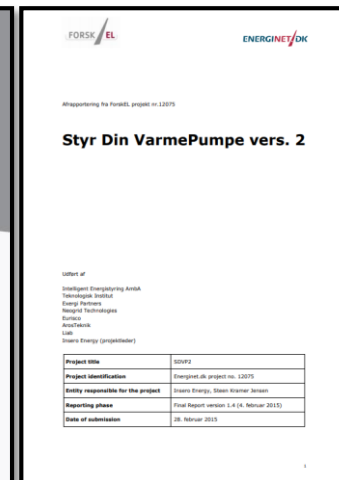
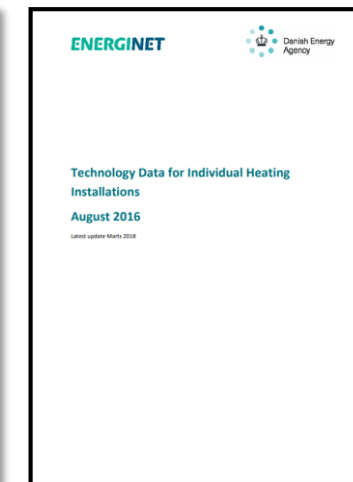
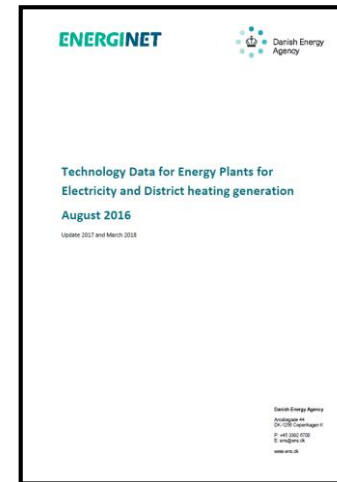
Information sources

- **Baseline data source:**

- *Danish Energy Agency technology catalogues*

- **Experience from the field:**

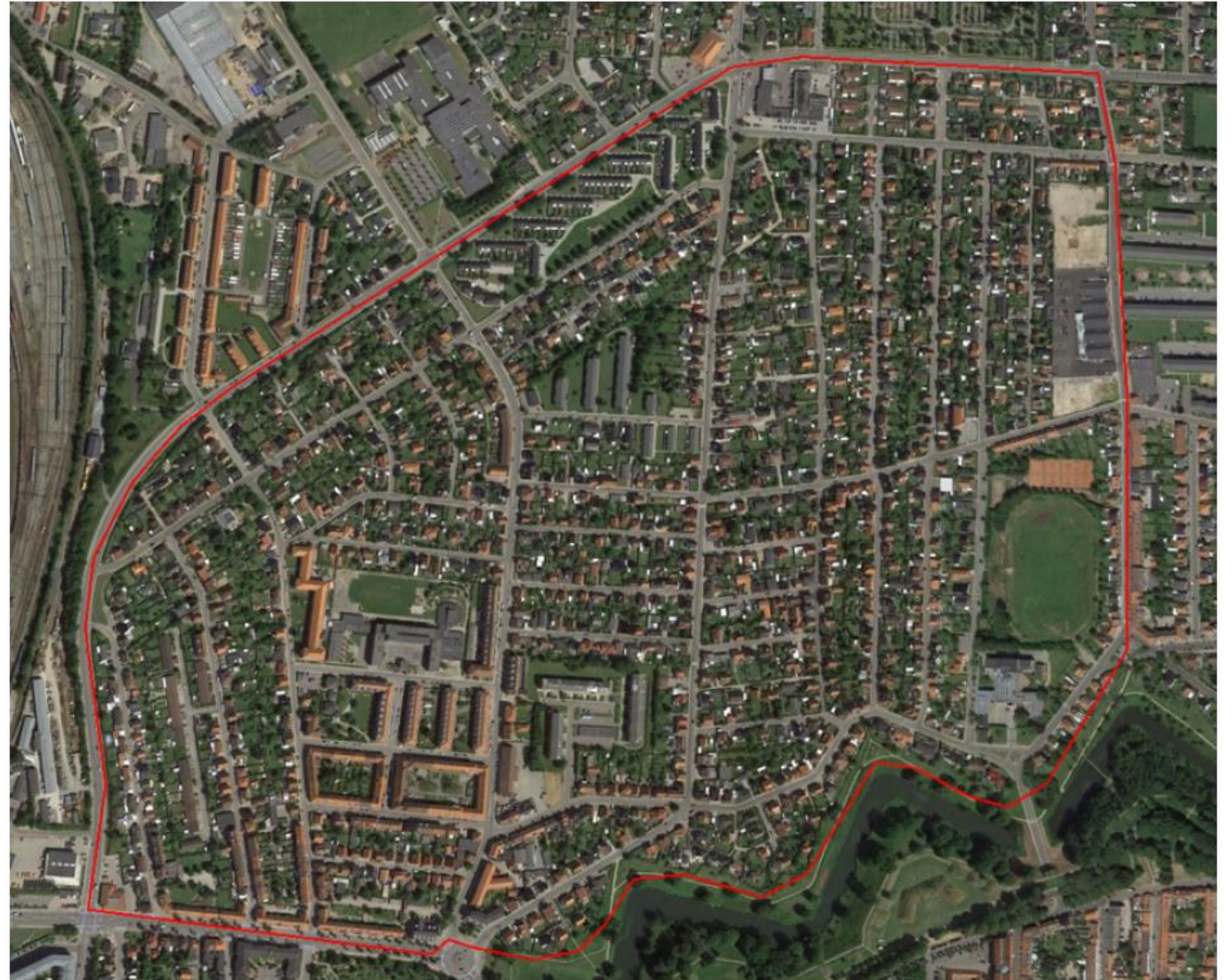
- Danish Technology Institute
 - Reports on heat pumps
- Danish Gas Technology Center
 - Report on individual gas boilers
- District heating project experience



Your Output is Only as Good as Your Inputs

Area under investigation

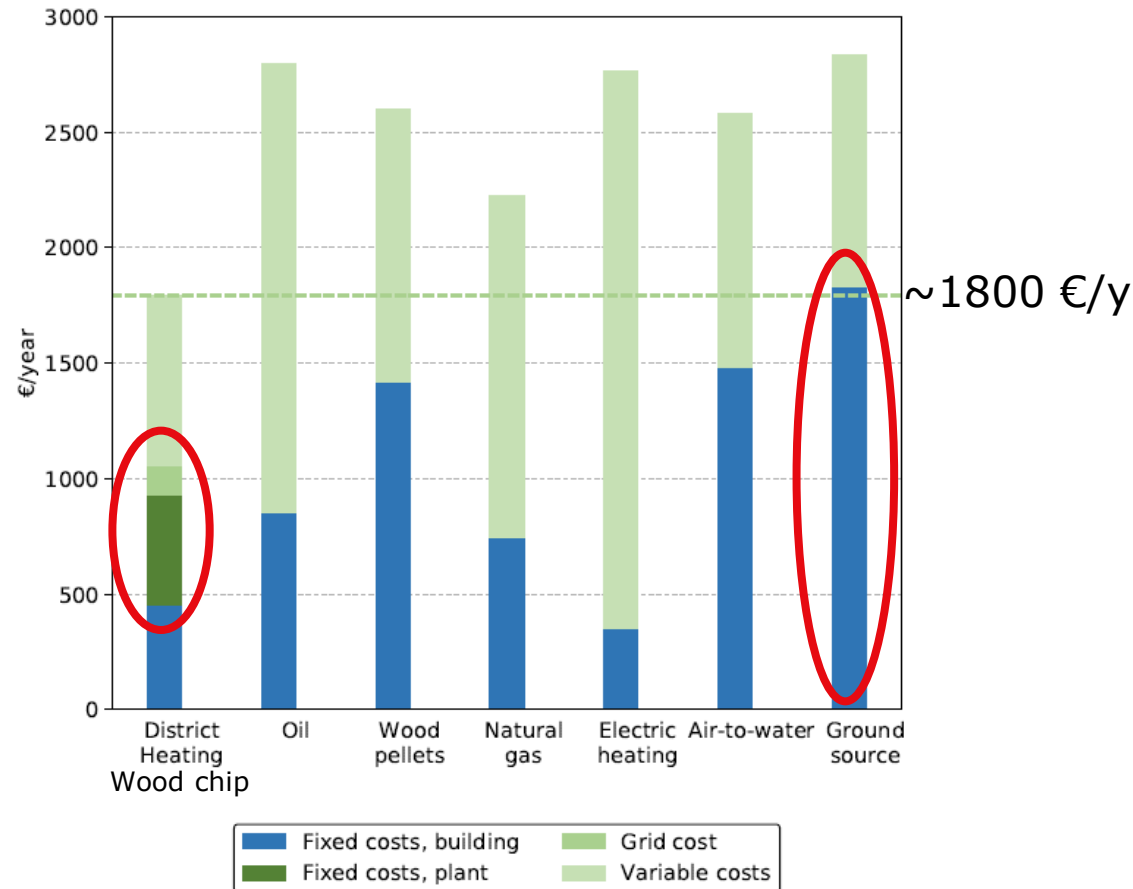
- Neighborhood of Fredericia, Denmark
 - 1.800 consumers
- New district heating network
- System design:
 - 4th generation district heating



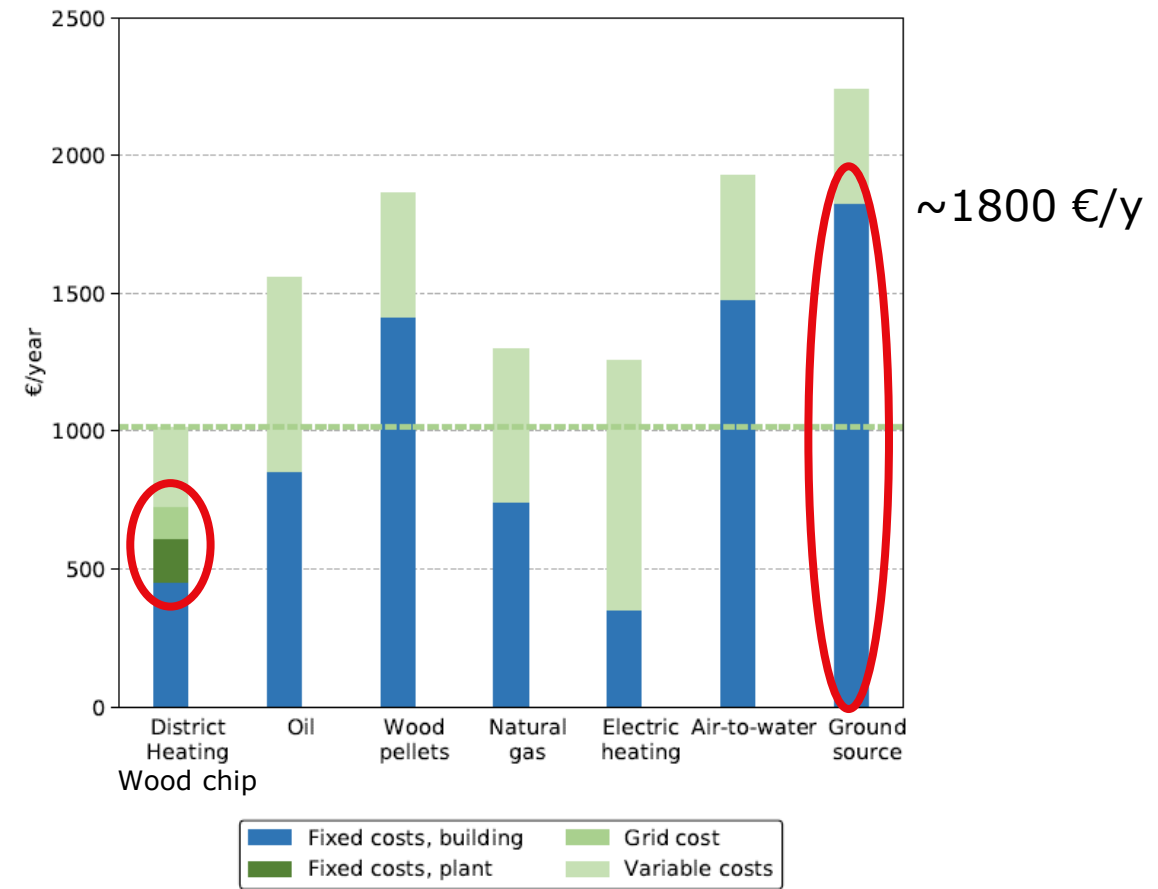
Cost comparison

- New district heating vs individual heating solutions

- Traditional single family building
 - Heat demand of 13,8 MWh per year



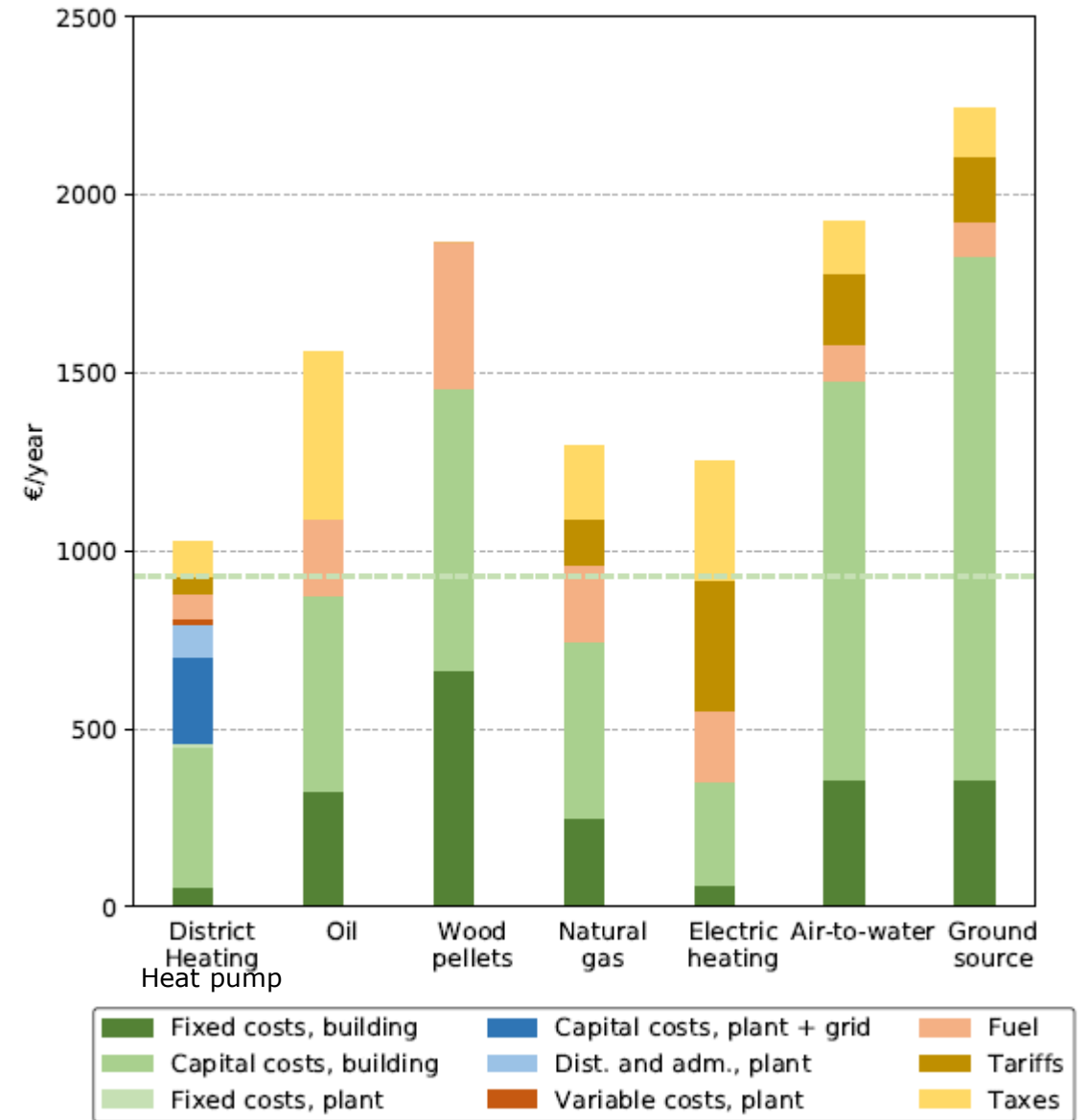
- Low energy single family building
 - Heat demand of 4,9 MWh per year



Cost comparison

- New district heating vs individual heating solutions

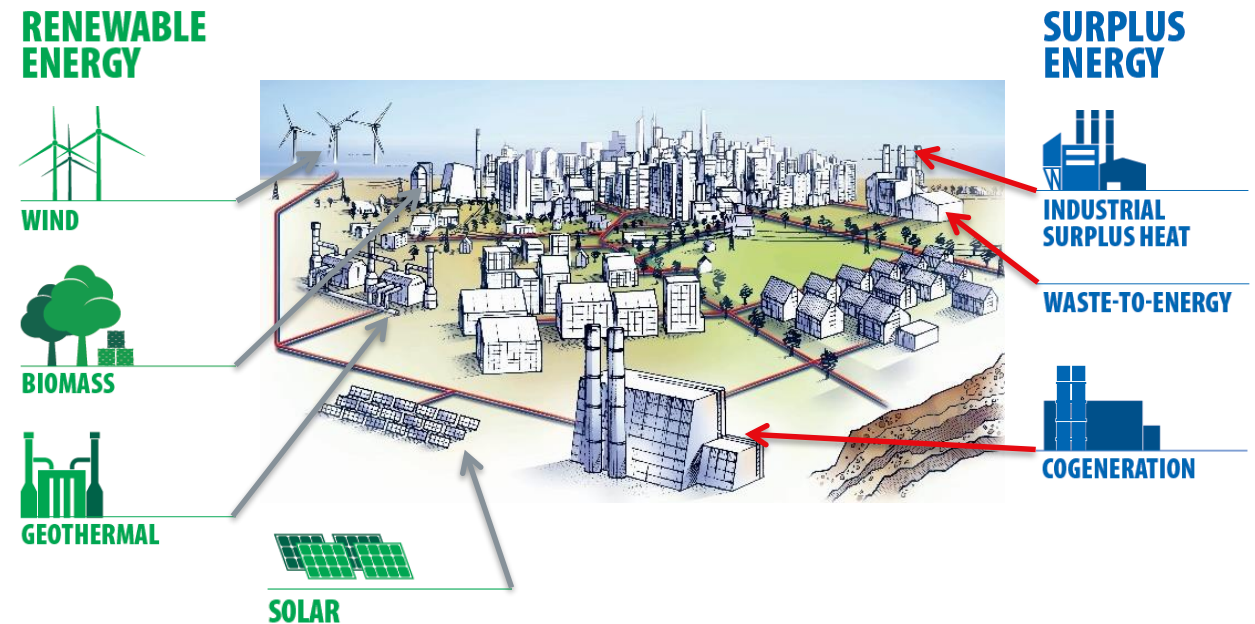
- Identical analysis but district heating heat source changed to a centralized heat pump
- Low energy single family building
 - Heat demand of 4,9 MWh per year
- The affordability of district heating in Denmark **is not** a tax issue!



District heating

- Multi-heat source operation

- Smart district heating systems have it in common that they apply multiple and different heat sources, spread around the distribution network
- Benefits include:
 - Maximum security of supply in terms of availability as well as delivery
 - Ability to optimize in relation to:
 - Renewable energy
 - Economics
 - GHG emissions
 - ...
 - In combination with thermal storages district heating can absorb endless amount of surplus renewable power



Thank you for your attention

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