Cost efficiency of district heating

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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 m^2
• 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

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

*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