District heating distribution in areas with low heat demand density

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Objective

to propose and to analyse measures for improving the economy of heat distribution in areas with low heat demand density.
The main problem

- Heat losses
- Costs

**Relative Pipe Heat Losses**

250 DH networks, influence from heat line-density

Heat line-density GJ/m, yr. (from DFF statistics 2001-2)

Critical area
Working approach

- Analysis of existing systems in order to define reference systems
- Analysis of new techniques with potential of lowering system costs
- Analysis of new district heating applications for more efficient use of existing structures
Reference systems

Example Neidonkallio:
31 buildings, 2500 m, 1.4 MWh/m, yr

Supply temperatures for pipe system with series 1 insulation

Days of February 2007
Cost analysis of alternative distribution techniques

Smaller size of anything reduces costs and heat losses

- Single pipe
- Twin
- Triple pipe
- Twin with Booster
- EPESPEX-system
- Substation with Ackum.
Reference systems

Example
Nykøbing, Falster, Dk
16 houses
574 m
0.56 MWh/m, yr
Cost comparison Nykøbing

- Annual installation cost with annuity
- Annual maintenance and losses cost

<table>
<thead>
<tr>
<th>System</th>
<th>Cost Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single (Old net)</td>
<td>€14,000</td>
</tr>
<tr>
<td>Single (new system)</td>
<td>€12,000</td>
</tr>
<tr>
<td>Single HWtank</td>
<td>€10,000</td>
</tr>
<tr>
<td>Twin (existing)</td>
<td>€8,000</td>
</tr>
<tr>
<td>Twin HWtank</td>
<td>€6,000</td>
</tr>
<tr>
<td>Twin HWHEX</td>
<td>€4,000</td>
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<td>Booster</td>
<td>€2,000</td>
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<tr>
<td>Triple pipe</td>
<td>€0</td>
</tr>
<tr>
<td>EPS PEX</td>
<td>€0</td>
</tr>
</tbody>
</table>
Increased use of district heating instead of electricity - Demo Göteborg
Göteborg - house - comparison
Electrical energy vs. District heating

5550 kWh electricity replaced by 7500 kWh district heating
DH-systems in areas with low heat demand – Main conclusions

- Simpler design for lower costs → low pressure, low temperature recommended
- Smaller pipe dimensions such as to be achieved with twin-and triple pipes are important cost factors
- Degree of connection is an important factor → marketing
- House-to-house trassing should be applied if possible
- Examples of cost reduction: 25 resp 40 % in two reference cases
Conclusions continued

• New loads such as for washing and dishing equipment can improve the utilisation of the district heating net

• Use of primary energy can be reduced by 35 % with the new loads in the Göteborg demonstration