THE SOCIO-ECONOMIC PERSPECTIVE OF CONVERSION OF INDIVIDUAL HEATING TO DISTRICT HEATING

Sustainable Energy Planning and Management
Thesis
June 2016

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Agenda

- Purpose of the project
- Methods and theoretical background
- Results
  - Fuel balance
  - CO2 emissions
  - Socio-Economic results
- Recommendations
Purpose of the project

Danish political goals: low emission society by 2050
  • Integration of different energy sectors
  • Heating planning
    • District heating or individual heating?
    • In a Socio-Economic perspective
  • Case: Aabybro
Case: Aabybro
Current production facilities
Scenarios

- Wood chips boiler
- Wood chips boiler and heat pump
- Solar thermal
- Solar thermal, pit storage and heat pump
- Geothermal, absorption heat pump
- Geothermal, elec. heat pump
Methods and theoretical background

- Interviews
- Modelling tool: energyPRO
- Socio-Economic
  - Guidelines by the Danish Energy Agency
  - An institutional economic approach

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<tr>
<th>Parameters</th>
<th>Guidelines</th>
<th>Alternative</th>
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<td>0%, 2% or 4%</td>
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<td>Included (20%)</td>
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<td>Based on the Guidelines</td>
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Results

FUEL BALANCE AND CO2 EMISSIONS

Natural gas consumption [Nm3]

- Reference
- Scenario 3A (wood chips)
- Scenario 3B (wood chips and heat pumps)
- Scenario 2A (solar)
- Scenario 2B (solar, pit storage and heat pumps)
- Scenario 5A (geothermal and heat pumps)
- Scenario 3B (geothermal and heat pumps, elec.)

CO2-emissions (incl. CH4 og N2O)

- Present value, 20 years [t CO2]
- Regular model
- Alternative Socio-Economic Model
- Reference
- Scenario 3A (wood chips)
- Scenario 3B (wood chips and heat pumps)
- Scenario 2A (solar)
- Scenario 2B (solar, pit storage and heat pumps)
- Scenario 5A (geothermal and heat pumps)
- Scenario 3B (geothermal and heat pumps, elec.)
CO2-emissions (incl. CH4 og N2O)

Present value, 20 years [tonnes]

- Reference
- Scenario 1A (wood chips)
- Scenario 1B (wood chips and heatpump)
- Scenario 2A (solar)
- Scenario 2B (solar, pit storage and heatpump)
- Scenario 3A (geothermal and heatpump)
- Scenario 3B (geothermal and heatpump, elec.)
Results

Socio-Economic Results - Regular Model

Socio-Economic Results - Alternative Model
Socio-Economic results - regular model

Present value, 20 years (2016 - M.DKK)

Rate: 4%  Rate: 2%  Rate: 0%

Reference  Scenario 1A  Scenario 1B  Scenario 2A  Scenario 2B  Scenario 3A  Scenario 3B
Socio-Economic results - alternative model

Present value, 20 years (2016 - M.DKK)

- Rate: 4%
- Rate: 2%
- Rate: 0%

Legend:
- Reference
- Scenario 1A
- Scenario 1B
- Scenario 2A
- Scenario 2B
- Scenario 3A
- Scenario 3B
Conclusion
Recommendations

- No tax distortion loss
- The cost for the damaging effect of CO2 emissions instead of CO2 quotas prices
- Lower/(no) calculation-rate
- Concord between business-economic and socio-economic results
- Clarify the consumers wishes
- Illustrate the employment effect
- Cost-effectiveness analysis.
Cost-effectiveness

Cost-benefit analysis: Prices on all advantages and costs
  - Calculation rate: Less value to the descendants
  - Brundtland report: Leave the Earth in same condition.

Already a political decision:

Translated:
"How much the world has to reduce emissions of greenhouse gasses is ultimately a political question. [...] If a climate strategy is based on [...] an upper limit on how much the global temperatures is allowed to rise, a further discussion of using a discount rate will become unnecessary. [...] When a target for a maximal temperature increase has been set, the remaining climate politic will be reduced to a question on how to reach the target as cheap as possible."
(The Economic Council - Economy and Environment, 2010)

- Cost-effectiveness analysis: how these goals can be achieved most effective!
Thank you for your attention!