



INFORSE-EUROPE
International Network for Sustainable Energy

Stirling Engine, Solar & Efficient Heating for Eco-village in Hjortshøj, Denmark

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http://www.inforse.org/europe/seminar09_Artefact.htm

- An outstanding heating system
- For an eco-village of 105 households
- With wood-chip and wood pellet boilers,
- A small (35 kW electric) combined heat and power plant with a stirling engine,

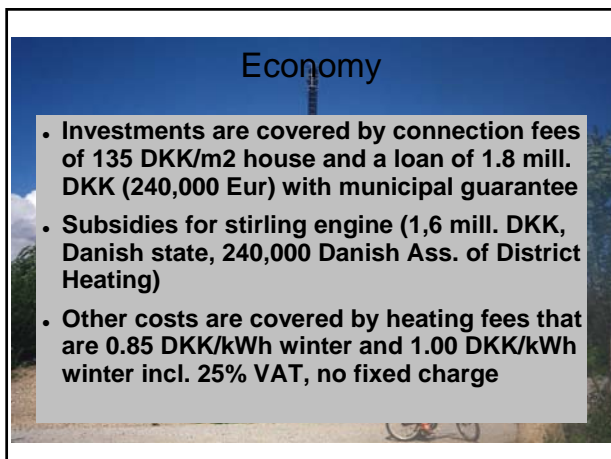
- Solar heating in houses, turn off central heating in summer
- For 23 houses also pulsating district heating to reduce heat losses in the network.
- Houses are low-energy houses and passive houses

- Started in 1991, intentional community
- Organised a heating cooperative, interconnects the house groups of the eco-village with a heat network
- Operation is automatic, while adjustments, smaller maintenance, and solving of smaller problems is done by a group of volunteers,
- A chimney sweeper has the overall responsibility and cleans boiler(s) weekly
- Fuel is delivered by wood-chip supplier with lorry



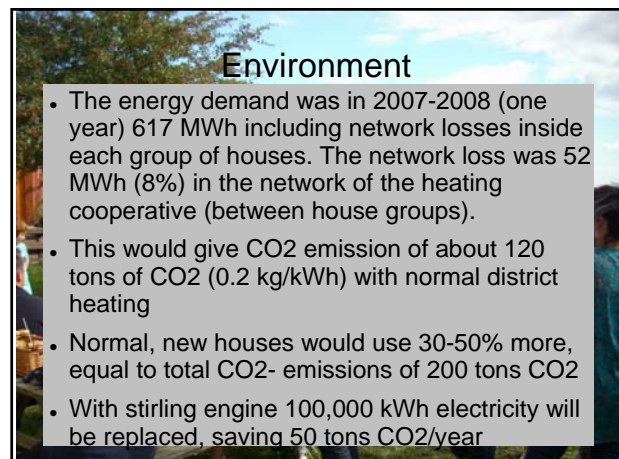
Special Solutions

- 35 kW stirling engine provides electricity and 130 kW heat from wood chips, new technical solution under testing
- 23 houses in an extension of the eco-village is only supplied with part of the day. During that period a heat tank in each house is charged to store heat for the rest of the day. This saves up to 50% of the heat loss in the network. All are de-tatched, low-energy houses.



Economy

- Investments are covered by connection fees of 135 DKK/m² house and a loan of 1.8 mill. DKK (240,000 Eur) with municipal guarantee
- Subsidies for stirling engine (1,6 mill. DKK, Danish state, 240,000 Danish Ass. of District Heating)
- Other costs are covered by heating fees that are 0.85 DKK/kWh winter and 1.00 DKK/kWh winter incl. 25% VAT, no fixed charge



Environment

- The energy demand was in 2007-2008 (one year) 617 MWh including network losses inside each group of houses. The network loss was 52 MWh (8%) in the network of the heating cooperative (between house groups).
- This would give CO₂ emission of about 120 tons of CO₂ (0.2 kg/kWh) with normal district heating
- Normal, new houses would use 30-50% more, equal to total CO₂- emissions of 200 tons CO₂
- With stirling engine 100,000 kWh electricity will be replaced, saving 50 tons CO₂/year