

Samsøe, Denmark's Renewable Energy Island

- Goals, Status and Examples

By: Aage Johnsen, Samsøe Energy Company and Soeren Hermansen, Samsøe Energy- and Environmental Office.

In 1997 Samsøe was chosen as "Denmark's Renewable Energy Island", and the objective is, that the total heating-, process- and electricity consumption is meant to be covered by Renewable Energy (RE).

It's not possible to cover the transport energy by RE, but it's an objective, to save 20 % of the consumption. As a compensation it's an objective, to establish an off shore wind-farm in the year of 2002. In the long term it can be a possibility to use electrical cars. Other possibilities is to use hydrogen and bio-gas as transport energy. But we don't know yet, how to deal with the ferries and the heavy transport.

Status and possibilities

Heating:

The heating systems in 1996 was:

- 13 % District heating based on straw,
- 2 % Individual heating based on straw and wood,
- 85 % Individual heating based on oil and electricity.

The possibilities is:

To save 20 % and supply the rest by RE:

- 65 % District heating based on straw, wood-chips, bio-gas, solar-heating and surplus heat from the ferries,
- 35 % Individual heating based on straw, wood, wood-pellets, solar-heating, heat-pumps and (wind)electricity.

Electricity:

The electricity supply in 1996 was:

- 5 % based on 8 small Windmills
- 95 % based on coal.

The possibilities is:

To save 25 % and supply the rest by RE:

- 75 % based on 13 large windmills (to be established in 2000) and 5 small existing windmills,
- 25 % based on combined heat- and power-plants (bio-gas).

Activities and organisation

The overall project started up in the late summer '98. As mentioned we are planning to establish land-based and off-shore wind-farms in the period of year 2000 – 2002.

Just now we have an intensive planning, in co-operation with two groups of "consumers represents" and the regional utility company ARKE, to establish two new district heating systems. It's the plan to supply the four villages involved from two plants. One wood-chip/solar-heated and the other straw/bio-gas heated. The projecting shall begin in this autumn and the district heating supply is

meant to start up in the year of 2001 and 2002. That means, that the district heating supply in the year of 2002 will be increased from 13 % to approximately 27 % of the total heat requirement

We have made campaigns for individual solar heating systems co-operation with the blacksmiths of the island. The results will be, that we in '98 and '99 have installed nearly fifty smaller solar plants. In the same period a lot of the islands buildings has been re-constructed with new thermal windows, insulation and so on.

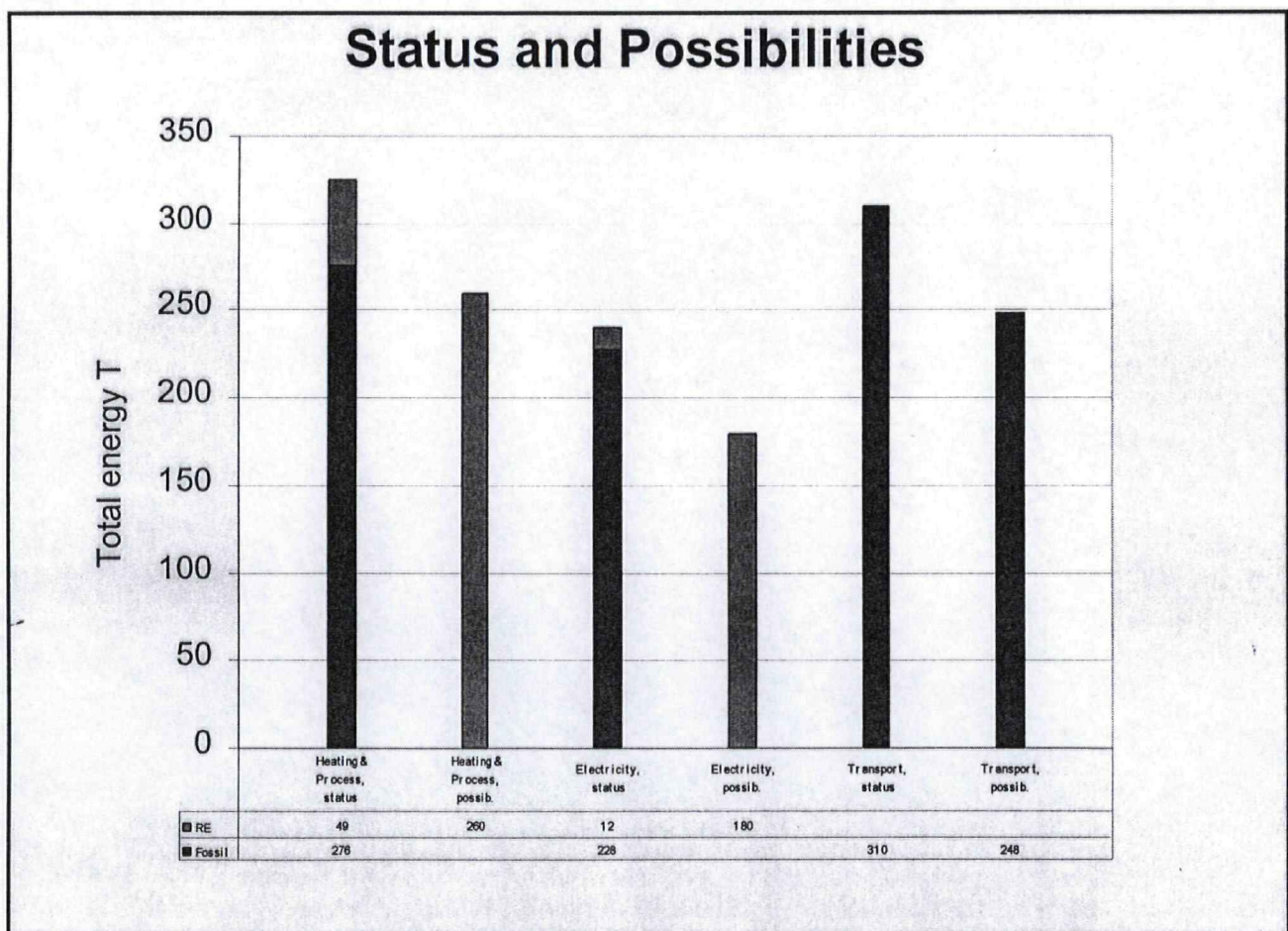
Economy and jobs

To day the situation is, that we use round 50 million d.kr. pr. year importing fossil energy to Samsoe. Its an objective, that a great part of this money shall stay on the island to strengthen the local economy. In the same way its an objective to create up to 30 new jobs on the island.

Information

For more and further information, You could look at our Homepage:

<http://www.samso.com/ve/uk/>



Activities

DISTRICT HEATING PROJECTS

in Ballen and Nordby districts

Citizen energy groups from two of the district heating areas:

- Nordby/Mårup and
- Ballen, Brundby, Ørby and Permelille

have discussed alternative supply systems and contractors for several months during the fall and winter of 98/99. Ballen district has also been offered free energy reports, and approximately 115 houses have been examined.

The decision to ask the local electric utility company, ARKE, to establish the district heating in these areas was made by the citizen groups in March, 1999. The Municipality of Samsø has agreed to guarantee the loans ARKE will need to plan, build and implement the new district heating systems.

The citizen groups visited three of ARKE's district heating plants on the mainland in April, and the trip culminated with a presentation of the following scenario:

- Market analyses of the local interest for joining a district heating scheme will run simultaneously in both districts. This will take place in the course of the coming three months: May – July, 1999.
- Further specification of the projects, including negotiations with the Danish Energy Agency and the Municipality will be completed by the end of 1999.
- Detailed specifications and the call for tenders for the first district heating system can take place in January – April, 2000.
- Construction and final implementation will be completed in the course of the year 2000.

The second system can be ready for final implementation a year later. It has not been decided which system will be completed first. One important factor will be the amount of interest the homeowners express when asked if they will sign up.

The two citizen groups encouraged ARKE to begin this process as soon as possible, so that the citizens of each area can be asked if they will sign up.

The Nordby/Mårup district heating system will use wood chips and a central solar heating plant as suggested in Energy Plan '97.

The ground load of the Ballen area district heating system will most likely be based on bio-gas from the waste disposal site and the liquid manure from several local pig farms. This can be combined with a straw-fired plant and perhaps a connection to the existing straw-fired plant in Tranebjerg. Because of the shut-down of an outdated bio-gas plant in the Ballen district, a recently conducted detailed analysis of available resources has clearly shown a concentration of unutilised bio-gas potential just south of Ballen. In the original Energy Plan '97, this bio-gas potential was reserved for the so-called "String of pearls" system along the west coast of the island, but this will be amended. The proposed bio-gas plant in the Besser area will not be affected by this amendment.

Provisional Result

In co-operation with the consumers represents, the utility company ARKE has contacted all potential consumers in the two new district heating areas. For a price of 100 d.kr. they could be pre-registered as future consumers.

In Nordby/Mårup 80 % of the consumers, that use oil for heating, has signed this pre-registration. In Ballen, Brundby, Ørby and Permelille the similarly amount is 71 %, 67 %, 57 % and 45 %. Therefore ARKE now is making analysis over the total heating consumption in the six villages for that purpose, to start the real projecting.

Barriers to overcome

Some of the 20 – 30 % of the consumers (that won't participate in the new district heating systems) has "a cheap access to wood for furnaces". In the same way, some of the consumers wish to continue their "independence" with their individual heating systems. Maybe they are worried for future "taxes" on district heating.

And then there are big difference in need for phasing out existing individual heating equipment.

Sept. 27, 1999

A SOLAR HEATING CAMPAIGN in the rural districts

There are approximately 850 permanent residences and 750 summer cottages which lie outside the existing and proposed district heating districts. These houses are now heated individually with oil furnaces, with straw or wood boilers, or with electric heating. There are also a few heat pumps. Many of these 1600 housing units supplement their primary heating systems with a wood burning stove.

A large number of the permanent residences shut down their primary heating systems in the summer months. Hot water is then supplied by electric heaters. Almost all summer cottages have electric water heaters.

The Campaign

A campaign to promote the transition to renewable energy was conducted in April and May of 1999. With the co-operation of the local post office a campaign pamphlet was distributed to the houses and cottages outside the district heating areas. The pamphlet included a calendar of events, and advertisements in the local media also promoted the campaign activities: several open house arrangements, an exhibition and a public meeting. Homeowners could also draw on the services of an energy consultant who could make specific suggestions about total or partial transitions to renewable energy resources after a consultation in their home. About 50 homeowners visited one or more of the seven open house arrangements, and half of these have requested a free energy consultation. At the request of these homeowners, the energy consultants have prepared digital photographs and sketches to assist the local tradesmen, as well as cost evaluations of diverse installations. The homeowners have requested advice on solar energy, biomass furnaces and heat pumps. As a result of the campaign, some of the rural houses will be heated 100% with renewable energy.

The campaign also promoted "neighbour" heating systems, where two or more houses share a RE heating unit. The energy generated is distributed in a small scale district heating network. The RE heating unit can be based on the energy forms normally used in single dwelling homes, but they can also use wood chips, straw, or in some instances bio-gas CHPS (combined heat power systems) established on local farms. One potential private neighbour heating system has been examined.

Collaborators

The island's 7 plumbing firms will continue to play a key role as the tradesmen who sell and install the units. The manufacturers of the efficient, competitively priced RE units in trade on the island are also active parties in solar heating campaigns.

This campaign has been planned and implemented in co-operation with the following: Solar Energy Centre in Denmark; Test Laboratory for Small Biomass Burners; Centre for Biomass Technology; Approved Heat Pump Scheme; and the electric utility company ARKE. Consultants from PlanEnergi did the on-site consultations.

Financing schemes for RE investments were provided by ARKE and the two local banks.

The campaign was funded by the Danish Energy Agency and by EU's ALTENER II program – "Promoting the Use of Renewable Energy"

Provisional Results

There was already "solar-activities" in '98. The plumbing firms were certificated to install solar heating plants through education courses. And in October there was arranged a RE Exhibition on Samsøe where the plumbers and the national test stations were central elements. The activities mend, that there were installed 17 individual solar heating plants on the island in '98.

The campaign in '99 has resulted, that 18 solar heating plants are installed in the period January – June. We expect that further about 10 plants will be installed in the remaining year of '99.

Barriers to overcome

The price for solar heating plants is rather high, and the payback time is often more than ten years. That seems to be a problem, a specially for elderly house-owners. And over one third of the inhabitants on Samsøe are elderly people.

Samsø Energiselskab, Work Package 2

<u>Content of work</u>	<u>Work undertaken: 1/1-1/10 1999</u>	<u>Quantitative goals achieved</u>	<u>Qualitative goals achieved</u>	<u>Barriers to overcome</u>
<ol style="list-style-type: none"> 1. The establishment of 4 village district heating systems based on biomass, two of the CHP schemes 2. The establishment of co-operatives who shall own and operate the district heating systems 3. The development of financial models and the organisation of loan agreements with local banks 4. The organisation of a gradual phasing out of existing individual heating units together with economic compensation for individual consumers 	<p>Discussions with citizen energy groups. Establishment of individual energy reports. Negotiations with the local utility company ARKE concerning the establishment of district heating systems. Visits of district heating plants on mainland for technology decision. Establishment of implementation plan.</p> <p>In the period June – September the heat consumers in two of the new district heating areas have had the possibility, to make a pre-registration, if they would like to join the new systems.</p>	<p>Energy reports established for 115 houses.</p> <p>Establishment of 4 citizen groups who shall form the basis for future co-operatives.</p> <p>Market analyses, technical specifications, preparation for call for tenders for 4 district heating systems on stream but not completed.</p> <p>In September '99 round 70 % of the consumers in the new district heating areas have signed the pre-registration. That means, that the utility company will continue the planning for the new areas.</p>	<p>Detailed discussions with local citizens who shall form the basis for future co-operatives.</p> <p>Detailed discussions on planning issues with the Municipality and with the Danish Energy Agency to prepare for project implementation.</p> <p>The Municipality has guaranteed the amount of money, that is needed for the establishing of the two new systems. And the Energy Agency has given grants to the continuing planning of the new systems.</p>	<p>Some of the 30 % of the consumers (that won't participate in district heating) has "a cheap access to wood for furnaces". In the same way some of the consumers wish to continue their "independence" with their individual heating systems. Maybe they are worried for future "taxes" on district heating?</p> <p>And then there are big difference in need for phasing out existing individual heating equipment.</p>

<u>Work Programme</u>	<u>Work undertaken: 1/1-1/10 1999</u>	<u>Quantitative goals achieved</u>	<u>Qualitative goals achieved</u>	<u>Barriers to overcome</u>
<p>Establishment of 'solar heating package'.</p> <p>The package will contain:</p> <ol style="list-style-type: none"> 1. The technical options including in some cases heat pumps 2. A loan agreement with local banks 3. Installation of equipment 4. Service and maintenance for a 10 years period 5. Insurance <p>Training programmes for local tradesmen will be organised as part of the project</p> <p>It is the aim that the package shall be sold to approximately 1000 households on the island in a 10 years period.</p> <p><u>General information:</u> There are app. 850 permanent residences and 750 summer cottages which are now heated Individually with oil furnaces, straw, wood boilers or with electric heating. A large number of permanent residences shut down primary heating systems in the summer months. Hot water is the supplied by electric heaters as for summer houses</p>	<p>Approach:</p> <p>Direct contact to potential house owners. Dissemination material. Exhibitions.</p> <p>The operation:</p> <p>A campaign brochure was produced and distributed in April-May. 7 open house events in Energy Office. Advertisement in local media. Energy consultants prepared and distributed digital photographs and sketches to assist local tradesmen. Cost evaluation of installations established and distributed.</p> <p>External parties involved:</p> <p>Solar Energy Centre DK; Test Lab. for small Biomass Burners; Centre for Biomass Tech; Utility Company ARKE; Energy consultant PlanEnergi; Local banks.</p> <p>Financing of campaign:</p> <p>Danish Energy Agency The ALTENER project 350/99</p>	<p>850 permanent households and 750 holiday house owners received campaign material.</p> <p>App. 50 house owners visited one or more of the seven open house arrangements.</p> <p>25 house owners have requested a free energy consultation.</p> <p>In the first six month of '99, 18 owners of rural houses have installed solar heating systems.</p>	<p>Important dialogue with potential future users.</p> <p>Promotion of 'neighbour' heating systems where two or more houses share a RE heating unit.</p> <p>Support to the islands' 7 plumbing firms who will continue to play a key role as the tradesmen who sell and install the units.</p> <p>Important awareness by the manufacturers of efficient, competitive RE units who are also active parties in the solar heating campaigns.</p>	<p>Especially for holiday house owners, the initial investment in new RE units is rather high compared to the number of days the house is used on a yearly basis.</p> <p>The average age of owners of rural houses in focus concerning the solar heating package is rather high, and the motivation to invest in a new heating unit proportionally low.</p> <p>It's also a barrier, that the payback normally is more than 10 years.</p>

Samsø Energiselskab, Work package 4

<u>Content of work</u>	<u>Work undertaken: 1/1-1/10 1999</u>	<u>Quantitative goals achieved</u>	<u>Qualitative goals achieved</u>	<u>Barriers to overcome</u>
<ol style="list-style-type: none"> 1. The establishment of co-operatives for ownership of 15x750 kW wind turbines on the island and 15x1.5 MW wind turbines in the shallow water outside the island. 2. Training activities for co-operatives on procedures concerning the management of wind energy projects. 3. Establishment of financial schemes for individuals and local firms etc. to invest in wind turbines. 4. Training programmes for local tradesmen to operate wind turbines. 	<p>In may 1999 the Municipality and the County authorities have agreed to designate four areas for wind farms with 3-5 turbines in each.</p> <p>The selling of co-operative shares have started. One co-operative will dismantle three existing small turbines and replace such turbines with two 1 MW units.</p> <p>A public meeting is planned for in June 1999 in order to support the process of establishing new co-operatives.</p> <p>Establishment of expert working group to investigate technical and non-technical barriers concerning the establishment of the offshore based wind farm. The Danish energy authorities have financed phase 1 of the work undertaken.</p>	<p>2 windturbines , both 1MW divided in 3750 shares have been sold. An old co-operative has converted old windturbines and 900 shares into the new project. (1 share = 1000kW)</p> <p>1 new co-operative is fully established and will be subject for training activities.</p>	<p>An important collaboration between Municipality and County authorities, private investors and potential co-operative representatives have been established.</p> <p>Representatives from private investors have offered to reserve sites for co-operative owned turbines to whatever extend wanted.</p> <p>Such representatives have also offered to deposit 1% of the net income in a public energy fund which can issue grants to other energy projects on the island.</p> <p>Essential financial support from Danish authorities to prepare for offshore based wind farm.</p>	<p>We succeeded in selling shares to all the interested inhabitants on Samsø and establish a co-operative, based on local investments.</p> <p>The County would not allow the erection of 15 750 kW turbines in 4 sites. Therefore they recommended 11 1MW turbines in 3 sites.</p> <p>The productionrate will be the same with bigger but fewer turbines.</p> <p>The barrier to overcome now is a public hearing till the 30. of September.</p> <p>The 11 land based turbines shall compete with the planned offshore based wind farm close to Samsø, also planned to be partly owned on a co-operative basis.</p>