

The Pellworm experience

The present primary energy consumption of the island is 7,940 MWh in electricity and 21,897 MWh in fuels. On the other side of the balance, the island generates 15,000 MWh a year from wind power.

Renewable Energy Plan

In 1997, a renewable energy plan for Pellworm was drawn up. The title of the plan is "Energy Supply on the Basis of Renewable Energy Sources Using the Example of the North Sea Island Pellworm - A Local Development Plan". The goal of the development plan was to present model concepts for energy supply based on renewable energies and to access a broad spectrum of applications. Special emphasis was given to wind power and biomass and to ways of storing energy.

Pellworm's strategy for the future is based on fully exploiting its main sources of renewables: wind, sun and biomass.

The island of Pellworm, with an area of 32 km² and a population of 900 inhabitants, is an excellent case of an energy 100% RES project. The island economy is based on farming and tourism, with an overwhelming predominance of the services sector. Because of the acute seasonality of the tourist industry, its energy needs are one of the major conditioning factors of the energy self-sufficiency project. Another essential aspect that defines the case of Pellworm is the fact that the island is currently connected to the mainland electricity grid in Germany via submarine cables. The idea is to break this connection in the immediate future and create a self-sufficient, 100% RES system.



for the island is 91,500 MWh, which leaves a wide enough margin for the projects of the future.

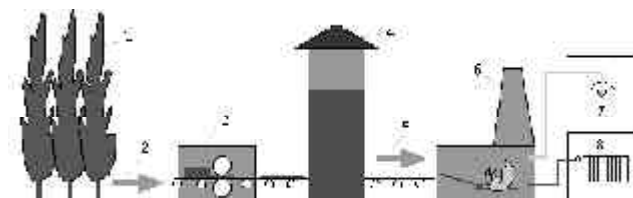
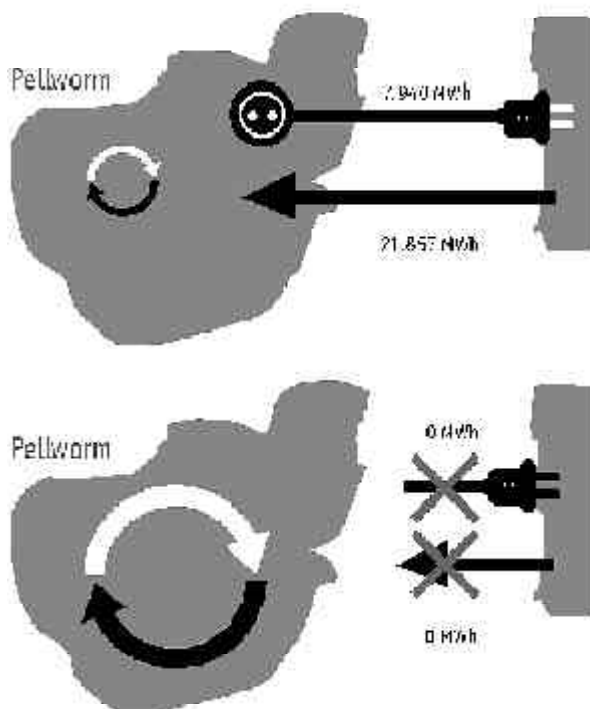
With regard to becoming self-sufficient in energy, and for the purposes of calculating storage margins, studies carried out indicate that the longest periods of recorded calm (with no wind) do not exceed 74 hours.

Wind power for Pellworm

Wind power has, by far and away the greatest potential of the island's renewable energies. In the late 70's, experiments were started on Pellworm with wind generators. There are presently 16 wind generators on the

Biomass resources

Basic biomass resources are focussed on harnessing energy from straw and manure to offer a perfect energy complement to cover the eventuality of variable winds. The inventory of available biomass even includes harnessing grass cuttings from the edges of the roads. The renewable energy plan calculates biomass potential at



island, which represent an installed power of 5.9 MW. These give an annual output of 15,100 MWh. The estimated potential of wind power

7,000 MWh/year, which could be used for producing moderate heat and for supplying electricity. The proposal is based on a power station with a capacity to produce around 1 MW of heat and 200 kW of electricity.

Photovoltaic Energy

The island also has a long tradition of harnessing photovoltaic solar energy: there are currently nearly 8,000 m² of photovoltaic panels installed. In 1983, the first plant was installed (300 kW). This photovoltaic field stopped operating in 1989 and is presently undergoing re-organisation. In 1992, the new photovoltaic plant was installed. This has exactly the same power and records an annual production of 225 MWh.

Understanding the photovoltaic plant as a combined system with a wind farm, we have one of the largest hybrid systems installed in Europe.



Heat pumps and the increase in energy efficiency

One of the aims of the plan is to bring heat pumps into general use in at least 500 of the 674 residential buildings of Pellworm, which consume 13,000 MWh/year in heat. By generalising the use of heat pumps, electricity requirements could be cut drastically, bringing it down to around 4,300 MWh/year; an essential step in the design of a model of energy self-sufficiency.



Solar thermal

Advances in the studies done for Pellworm suggest that almost half of the hot water



requirements could be met by solar thermal energy. This evidently means an increase in the number of solar installations. There are 28 at the moment, with a total area of 318 m². By producing hot water this way, there would be an approximate energy saving of 127 MWh/year. The Plan intends to install solar thermal energy in 270 of the 674 buildings on the island, which would provide 390 MWh/year in heat.

Biogas

Available liquid manure (slurries), based on the possibility of concentrating the effluents of 70% of the livestock holdings, is around 11,000 m³/year. Cost analysis suggests that the generation of biogas would only be feasible with a centralised system using methane digestors. Within the context of the concept of 100%RES for Pellworm, two biogas production scenarios have been analysed (46 kW_{el} and 200 kW_{el}). The smaller version gives better continuous performance, whereas the larger version would provide greater stored power, with sufficient capacity to cover windless days.

