DENMARK ASKS

WHERE DOES YOUR ENERGY COME FROM?

Energy is all around us: In the wind and waves, in solar rays, in agricultural by-products. The challenge is to harness this energy to make it a viable alternative to fossil fuels.

Although energy can be obtained in many forms, including mechanical, electrical and nuclear, one particular form has dominated industrial history – heat energy from burning fossil fuels.

Today, fossil fuels such as oil, coal, and natural gas account for 85% of Danish energy consumption. Although fossil fuel supplies remain plentiful, the threat posed by global warming makes it imperative to focus on renewable energy sources in order to reduce CO2 emissions.

Visionary energy policy

To that end, the Danish government has formulated an ambitious energy strategy to 2025, one of the main objectives of which is to reduce the use of fossil fuels by at least 15% compared to today.

Renewable energy is set to play a central role in meeting the country's future energy needs. It already accounts for over 15% of Denmark's gross energy consumption and about 27% of the electricity generated. The goal is for renewable energy to account for at least 30% of total Danish energy consumption by 2025.

Promoting renewables

Renewable energy sources have an advantage over fossil fuels in that they do not increase atmospheric CO2 levels. Wind and wave power for example are intrinsically CO2 free, while combusting biomass releases the same amount of CO2 that was absorbed from the air to create it – a neutral process overall. Hence, investing in renewable energy technologies is an effective way to combat global warming.

Denmark's renewable energy options include wind, waste, biomass, geothermal and solar energy. Biomass (including waste) is the most important source of renewable energy in Denmark accounting for approximately 70% of renewable energy consumption.

The Danish government is signalling its broad-ranging support for transitioning to renewables through a range of promotional programmes involving wind energy, biogas, waste exploitation, heat pumps etc, as well as further improving its renewable energy subsidy scheme to make the unit cost of renewables increasingly competitive.

Pioneering wind power

Denmark pioneered commercial development of wind power during the 1970s and today almost half the world's wind turbines are produced by Danish manufacturers.

Denmark was among the first in the world to establish offshore wind farms. Existing offshore capacity is planned to be doubled by 2010/2011– bringing it up to 825 MW.

Harnessing hydrogen

Denmark is currently exploring a range of Hydrogen Society initiatives. The country's first full-scale Wind-Hydrogen energy plant began operation on the island of Lolland in May 2007. It is the EU's first full-scale demonstration facility for residential fuel cell driven Combined Heat and Power (CHP).

Hydrogen is produced by using surplus wind power to electrolyze water.

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CASE

SAMSOE RENEWABLE ENERGY ISLAND

In November 1997 the island of Samsoe won a competition between five Danish islands. The challenge was to convert the island's energy system to renewable energy within a period of 10 years. Today, Samsoe is almost entirely independent of fossil fuels and a 100% self-sufficient in terms of electricity supply.

In 1997, the energy supply on Samsoe was based almost entirely on fossil energy sources. Today, the island's 11 onshore wind turbines supply enough energy to meet the island's entire electricity needs. About 70% of island heating needs are met by way of renewable energy based on straw, solar power and woodchips, and energy used for transportation is 100% compensated by the electricity production from the island's 10 offshore wind turbines.

Implementing the plan
In 1998 Samsoe Energy Company was set up to implement the 10 year energy conversion plan, which included:

- Erecting land-based and offshore wind turbines to cover electricity consumption
- Reducing total energy consumption
- Increasing energy efficiency
- Adjusting people's patterns of behaviour
- Expanding district heating combined with utilization of biomass resources
- Expanding use of small wind turbines, solar panels etc for individual homes

A key element in the successful implementation of the plan has been the strength of commitment from both the islanders themselves and local companies, many of whose businesses have benefited. The project has also created new business opportunities for the island such as eco-tourism.

While renewable energy technologies such as wind turbines have become increasingly reliable and accepted, the transport sector continues to lack robust sustainable solutions. Samsoe's residents are working towards a number of possible solutions, including powering motor vehicles with rapeseed oil and hydrogen fuel. Some foresee a future where cars and trucks will be powered by hydrogen generated by wind turbines.

Samsoe Energy Academy
In 2007 the Samsoe Energy Academy was inaugurated. The academy utilises knowledge acquired on renewable technologies and their successful implementation on Samsoe in displays, demonstrations, workshops and trials.

The Academy offers a unique meeting point for businesses, academic institutions, energy organisations and politicians, in an island setting which exemplifies the aim and idea of energy self-sufficiency.

Samsoe's Energy Office, housed in the Academy, now receives more than 1,000 visitors annually including ministers, ambassadors, civic delegations, school groups and individual researchers.

The 10 wind turbines off the shore of Samsoe each have a capacity of 2.3 MW.
Photo: Courtesy of Samsø Renewable Energy Island

The walls and windows of the Energy Academy are highly insulated to minimize energy consumption and the building is heated by the local straw-fired district heating plant.
Photo: Samsø Energy Academy