

WIND ENERGY

Demonstration plant

KOTKA

Finland

Wind energy is not the energy source that immediately comes to mind when thinking about renewable energy in cities. Few cities have enough space within their area to build large wind farms. You may rather find small wind turbines on suitable locations within the city's area or see cities doing feasibility studies on this subject. The City of Kotka took advantage of its sea side location by installing two wind turbines at the sea border close to the city centre. A nature trail named "wind trail" has been built on a length of 1.5 km to attract citizens and tourists to visit the site.

THE CITY

The City of Kotka was founded in 1878, in south-east Finland in the Kymijoki river delta. It is situated on an ancient waterway on the Gulf of Finland. The area which is covered by the city is 38 square kilometers with Kotkansaari island as the heart of the city. The City population is about 56 000 inhabitants.

"The City by the Sea" as it is called has become an international seaside and harbour town. With a port traffic around 7 million tons the City of Kotka has the biggest port in Finland. The most important branch of business is paper industry. The tradition and role of Kotka were created by the sea and the port.

Climatic data:

Average mean wind speed: 6.5 m/s



CONTEXT

The wind power capacity in Finland has been situated in the coastal areas of Western Finland and on the fells in Lapland. The local energy company Kotka Energy Ltd's wind farm is first wind farm with commercial-sized wind turbines which has been constructed beside the Gulf of Finland. Kotka Energy Ltd is 100 % owned by the city of Kotka.

EXPERIENCE OF KOTKA

As far as Kotka was concerned, the best places for wind mills were on the open sea and in the archipelago. The construction costs of wind mills built on the open sea are considerably higher than on the mainland, which is why the wind power analysis focused on the area adjacent to the industrial site situated close to the Mussalo Deep-Water Harbour. This area is highly interesting in terms of profitability because of its good location for construction and maintenance purposes.

The wind farm is situated close to Kotka city centre, enabling citizens to visit the site. The Mussalo area is also an environmentally sensible solution. The area already has houses and a harbour and adjacent to the area is the Mussalo Power Plant using coal and natural gas as fuel. For these reasons, the wind mills "softens" the image of the area in the eyes of a traveller and provide Kotka with an increasingly environmentally friendly appearance. Wind power



suits Kotka also because the city often likes to use the slogan "Wind in the Sails". Moreover, wind power will contribute to the programme for sustainable development followed by Kotka. To implement Kyoto climate agreement in local level Kotka city has committed itself to Finland's communes climate agreement so that the aim is to decrease CO₂ - emissions by practical actions.

Technical and financial information on the Kotka Energy Ltd's wind farm

Start of the work	February 1999
Height (to top of mast)	60 m
Rotor diameter	54.2 m
Manufacturer	Bonus
Maximum wind speed	25 m/s
Annual production in 2000	4 300 MWh

Emissions avoided/year	
SO ₂	7 tons
NO _x	6 tons
CO ₂	4 000 tons
Total investments	2,1 MEUR
Grants	0,7 MEUR

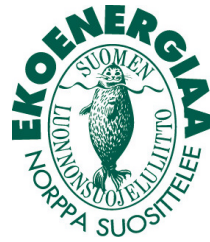
The profitable analysis financed by European Commission provided basis on which Kotka Energy Ltd decided to build two wind power stations. The Finland's Ministry of Trade and Industry supported the project too. After a bidding procedure and negotiations, Bonus Energy A/S of Denmark was chosen as a supplier. The Kotka Mussalo wind farm comprises two 1 MW turbines, each with a 60 m tower and a rotor diameter of 54.2 m. Construction work on the site started in February 1999 and the turbines were erected at the end of August. They were connected to the grid within a week.

The harsh Northern conditions in wintertime have been taken into account in the design of the project. The wind mills specifically designed for arctic conditions have been developed in Finland; in these mills, it is possible to prevent the freezing of blades and mill equipment.

Each turbine has: a three-bladed up-wind rotor with stall regulation and constant rotor speed; an asynchronous generator which is coupled directly to the grid; and failsafe safety systems

with automatic air brakes and hydraulic disc brakes. The turbine starts generating when the wind speed is 3 m/s and reach maximum output at wind speeds of 15 m/s, after which the power is limited by stalling the rotor. If the continuous wind speed exceed the limit 25 m/s the turbine is stopped by safety reasons. Calculated annual energy production is around 2 000 MWh/unit. First year's total electricity production for the both units were 4 300 MWh, which is about 7 % more than calculated.

Kotka Energy Ltd arranged a competition for children to name the wind mills. They got names "Ilona" and "Ilmari".



WIND
ELECTRICITY

EVALUATION AND OUTLOOK

Kotka Energy Ltd has establish a "Nature Ilona" - brand to sell the electricity produced by the wind mills. The Finnish Association for Nature has granted "Eco Energy" – label to "Nature-Ilona". The wind mills have produced more than 5,7 GWh "Ilona" -electricity till the end of the year 2000.

The city of Kotka and Kotka Energy Ltd have paid attention to the landscaping of the Wind farm area. In the area there are several works of art designed by the students of the University of Industrial art.

The nature trail has been built and the length is 1,5 kms. The Kotka city park department and South-East Finland's Environment Centre have built a series of nature trails and this is one of them. The nature trail got a name "Wind trail" because it leads to the wind park. On the way there are rocks, causeways and even couple of bridges. The trail is covered by birch chaff, which is born in producing process of xylitol.

The causeways and bridges are tarred wood. The Kotka nature association has been involved too. They have marked along the way 10 objects relating to the typical nature of this area and the signs are giving more information. They also arrange guided tours for groups by request. The People can also have rest in the pick-nick posts. Kotka Energy Ltd has published a brochure "Wind park of Mussalo" and it is distributed freely. There is also a feedback book in the beginning of the nature trail and the feedback have been really positive.



FOR FURTHER INFORMATION

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