

# WIND ENERGY

# WIERINGERMEER (The Netherlands)

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. Besides the erection of wind turbines, there are many other ways that cities can promote this renewable energy source. These include applying procurement procedures that favour a certain technology or giving support to organisations that buy or run wind energy plants. The municipality of Wieringermeer has recently approved a local plan providing for a large number of wind turbines.

## GENERAL ASPECTS

Wieringermeer is an area of Polderland reclaimed from the sea in the 1930s as the first stage of the Zuiderzee Plan. The area is situated very close to the North Sea coast and its open, flat landscape is ideally suited to wind energy projects. The municipality (Gemeente) of Wieringermeer has approximately 12,000 inhabitants. The area is primarily agricultural with a small market town, Wieringerwerf, and three other authorities. The total area is 20,000 hectares.

### Climatic data:

Average mean wind speed: 6.5 m/s  
Annual Mean Temperature: 9.5 °C



## CONTEXT

Wieringermeer is ideally suited to wind energy and by 1996, there were already forty four wind turbines scattered through the area with a total capacity of 12.3 MW. Thirty five of these are small, privately owned turbines with an approximate size of 80 kW. There has been considerable resistance throughout the Netherlands to the erection of a large number of turbines in this flat and open landscape. Therefore the opportunity was taken to review the plans for wind energy during the renewal of the *bestemmings plan* (local plan). In particular it was felt that a review was needed of the implications in landscape and wind resource terms of policies giving preference to different sizes of wind turbines. The municipality has tried to stop further "anarchic" development through its planning scheme for wind energy. The scheme only deals with planning for turbines. There are no direct incentives, but the municipality actively helps citizens in their applications to erect wind turbines.

Apart from their trail-blazing wind energy plan, the municipality will probably be host to large scale tests on the latest wind turbines taken care of by ECN (The Netherlands Energy Research Foundation). In addition some individual citizens have installed solar panels for space heating and domestic hot water.

# EXPERIENCE OF WIERINGERMEER

The municipality had originally prepared a special wind energy plan, the *Inrichtingsplan Windenergie Wieringermeer*. As wind energy technology developed, this became increasingly out of date and a study was commissioned from a consultancy, (ir. r hajema and partners b.v.) based in Assen, which looked at the impact of different control policies on the potential wind energy capacity of the area with a view to proposing a formal *bestemmingsplan* (local plan). The study noted that the area could provide the following theoretical capacity taking account of regulations but ignoring landscape constraints:

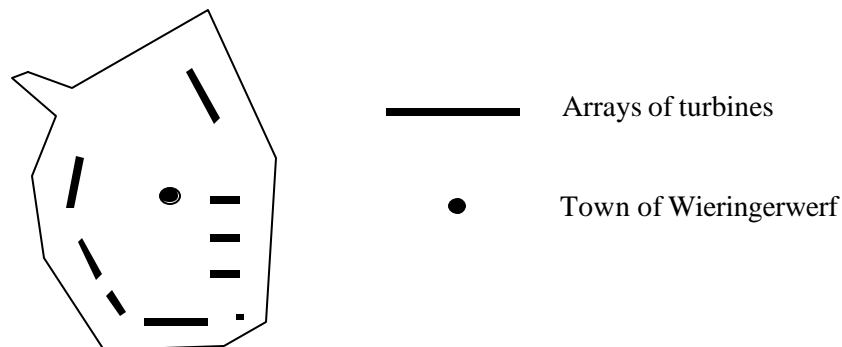
<i>Size of turbines</i>	<i>Number of turbines</i>	<i>Total generating capacity</i>
250-300 kW	820	205-246 MW
500 kW	228	114 MW
1 000 - 1 500 kW	77	77-115.5 MW

It will be seen that the maximum capacity is obtained with smaller turbines but that this presupposes an enormous number of individual turbines with a very significant landscape impact.

The study appraised different forms in lines, clusters, double clusters and so on. However, all the proposals were regular arrays of turbines since this is a man made landscape based on straight lines. When landscape considerations were taken into account the capacities observed were as follows:

<i>Size of turbines</i>	<i>Number of turbines</i>	<i>Total generating capacity</i>
250-300 kW	225	55-67.5 MW
500 kW	92	46 MW
1 000 - 1 500 kW	15	15-22.5 MW

However, when a combination strategy was adopted which proposed a mixture of the turbine sizes, it became possible to propose a plan which provides for a capacity of 61 to 69 MW in total.



*Sketch diagram of the allocations for wind turbines in the Bestemmingsplan.*

In the preparation of the *bestemmingsplan* the municipality drew on this study to propose 8 areas for wind turbine development. Taking a cue from the very geometric landscape of the polder, the municipality proposed restricting new development to large MW size turbines in a series of five linear arrays along drainage channels and at three sites in smaller groups of turbines.



*An artist's impression of one of the lines of turbines proposed in the plan.*

Turbines may not be erected outside these zones but existing turbines may be replaced by new, modern ones. New regulations identify the characteristics of these replacement turbines and limit their mast height to 46 metres instead of earlier 40 metres and rotor diameter to 31 metres. The change of maximum mast height means an increase in possible nominal power from approximately 225 kW to approximately 600 kW. The plan was finally published in December 1997.

In the light of public reaction it has been decided that only five of the total of 8 sites will, in fact, be developed.

## EVALUATION AND PERSPECTIVES

This plan demonstrates the potential to develop a wind energy plan which reconciles the fears of the local population regarding the impact of wind turbine development on the landscape and the desire to maximise the yield from the area in wind energy terms. The municipality has accepted the erection of 35 turbines (1.65MW) which were included in the planning scheme at the end of 1998.

In this windy part of The Netherlands, it can be assumed, that the yearly electricity output from a wind turbine equals the nominal power times 2000 hours. This means, that a 1.65 MW turbine will produce on average 3,300 MWh and thereby save 1880 tonnes in CO<sub>2</sub>-emissions. This is based on calculations on the entire electricity production in The Netherlands which give an average of 0.57 kg CO<sub>2</sub> produced per kWh electricity. This figure is quite low because of the extensive use of natural gas and combined heat and power.

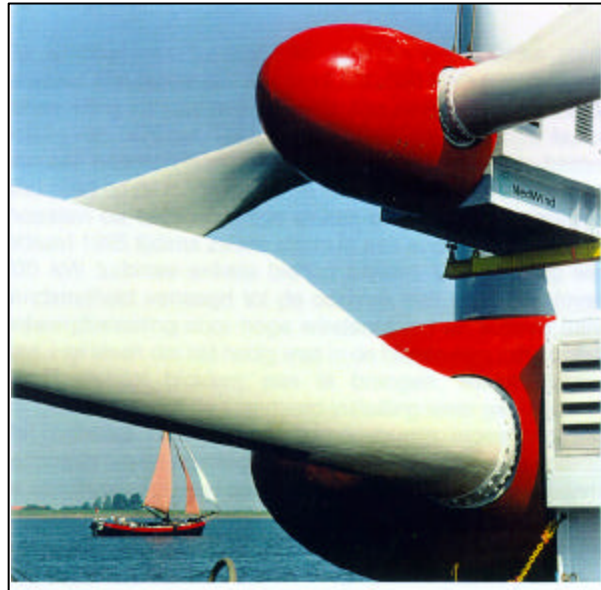
The owners of the existing small wind turbines (80 kW) are mostly farmers who have erected them on their farms. The bigger turbines are owned by the national power company, local land owners, and some investment companies.

Every turbine in the plan is now the subject for an application for a permit. By the end of 1999, the process of considering these turbines should be completed. Nevertheless, there has been local resistance to the proposals due to the fear of falling property values. This has caused a very long application process, which is foreseen to last until the year 2001.

If all the planned wind turbines are installed, the electricity production would be sufficient to supply approximately 50,000 normal households. This should be compared with the total number of households in the municipality, which is approximately 4,600.

No real problems result if electricity production is higher than local demand. The Netherlands has a well developed grid network, so power produced in the west can easily be consumed in the east. This means that all regions can contribute to the governments objectives for decreasing CO<sub>2</sub>-emissions from fossil fuel.

There are currently proposals for a 300 MW wind farm in the IJsselmeer in shallow water, near to the Afsluitsdijk. This project is regarded as an onshore wind farm because it is supposed to be placed within the land boundaries. This proposal is undergoing an environmental appraisal and will prove to be a test case for the future of wind power in the Netherlands.



*Assembling of an off shore wind turbine.*

## FOR FURTHER INFORMATION

Marco Kerssens  
Head of Section of Local Planning  
Gemeentehuis  
Loggersplein 1  
Postbus 1  
NL - 1770 AA Wieringerwerf  
Tel: +31 227 60 64 19  
Fax: +31 227 60 35 60

This case study was prepared by Energie-Cités in co-operation with the municipality of Wieringermeer. It received funding from the ALTENER Programme of DGXVII of the European Commission.

