

WIND ENERGY

AACHEN/HEERLEN (Germany/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 two border cities of Aachen and Heerlen have decided to build a joint industrial park that is to be powered by wind energy (from existing and future wind turbines).

GENERAL ASPECTS

Aachen [Aix-la-Chapelle], with 240,000 inhabitants, lies five kilometres from the German-Dutch-Belgian border. Many of its historic monuments have been preserved; but it is also a spa, an industrial city, and the seat of research establishments.

Heerlen is on the Dutch side of the border. A former coal-mining centre with 95,000, today it has become a regional shopping and government centre.

Climatic data:

Mean wind speed: 6 m/s



CONTACT

Aachen is considered throughout Germany as a leader in promoting electricity from renewable sources. The 'Aachen Model' for subsidizing renewable energy has existed since 1994. It is intended to provide payments for electricity from renewable sources fed into the grid that cover the costs, eliminating the drawback that renewable power is measured against the prices of fossil fuels, but their social and external costs are not included in the calculation. The starting point for this was two feasibility studies which showed that Aachen's overall wind-energy potential was sufficient to cover 10-12% of the city's electricity consumption. And utilizing all the south-facing roofs by means of efficient solar panels could supply 55% of it.

Owners of wind or photovoltaic equipment receive a guaranteed payment per kilowatt-hour for 15 or 20 years. The size of this payment is redetermined each year on the basis of the technical possibilities. The cost of this subsidy is included in the cost calculations of the municipal power utility, and is thus passed on to all customers. As yet, this has only resulted in one increase in the tariffs: by 0.005 eurocents per kWh for standard-rate customers.

EXPERIENCE OF AACHEN / HEERLEN

The trans-border Aachen-Heerlen industrial park named Avantis that has been established is located directly on the A314 autobahn from Aachen to Antwerp. It is scheduled to be completed this year, and 12,000 jobs are expected to be created there. It is the first industrial park in Europe that extends over two countries: 60% of its area of 100 hectares lies in the territory of the City of Aachen, and 40% in that of Heerlen. Due to this transnational and innovative character, it has been subsidized by the European Commission.

Both cities hope to meet high standards with this industrial park.

- They want companies with an international orientation, or with high technological or innovative aims, and research institutes to locate here, as well as banks and other service enterprises.
- Excellent transport links are to be established, with metro rail connections to the two town centres and the near-by Maastricht airport.
- The power supply to the entire industrial park is to be CO₂-neutral, and the manufacturing facilities there are also intended to be low-energy and environmentally compatible.

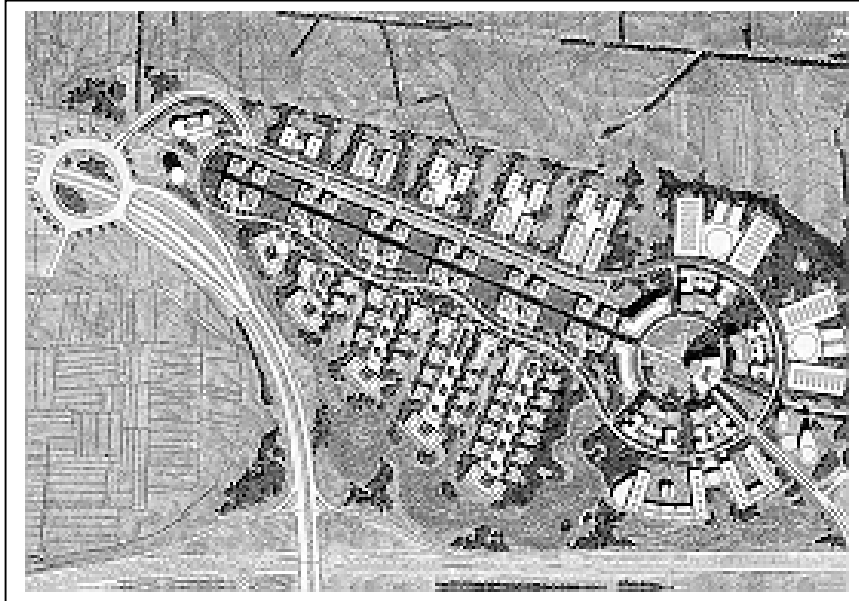
Four items are to contribute to achieving the goal of a CO₂-neutral industrial park:

- In the development plan itself, the buildings were already arranged with a view to energy savings. In addition, high standards were set for the construction of the buildings: they must do 25% to 30% better than the current thermal-insulation regulations require.
- A local piped-heating system is being set up to heat the buildings. Its provision and use, as well as the strict thermal-insulation levels, must be ensured by covenants in the deeds of sale for the properties. Gas is only to be supplied if it is needed for manufacturing.
- A biogas plant which the City of Aachen plans to build in the vicinity of the industrial park is to be incorporated into the heat supply system to the park. This plan would thus become an important supplier of heat, while the surplus of electricity generated is to be fed into the mains. The same applies to the electricity to be produced by a photovoltaic facility with a capacity of 330 kW_p that is to be installed on the roof of the biogas plant. Once the thermal capacity of the biogas plant is all in use, additional small combined-heat-and power plants are to be built, burning either gas or wood chips.
- The CO₂ neutrality of the power supply is to be guaranteed mainly by generating as much electricity from renewable sources of energy in or near the industrial park as is consumed by the companies locating there. This involves not only the planned biogas plant, but also the wind farm planned next to the industrial park, which is to have nine large wind turbines with a capacity of 1.5 MW each, and a planned annual output of 22 GWh).



The Aachen-Vetschau wind farm

The conception and setting up of this wind farm, of which one wind turbine has already been in service since 1997, is described below.



The selection of the site was done upon completion of a wind-energy feasibility study for the City of Aachen in 1994. This study showed that many existing general wind-speed atlases were unusable for assessing the economic viability of individual inland locations. Indeed, at certain exposed locations, wind speeds of 6 m/s were demonstrated at a height of 50 m.

The areas shown to be of above-average quality in the study were then evaluated by experts with respect to potential conflicts in the areas of bird conservation, landscape protection, and recreation activities. The 50-hectare Vetschauer Berg area was found to be especially suitable for setting up a wind farm. It was declared a "Wind Farm Special Area" for regional planning purposes, and since December 1996 a "Special Area Zone for Wind-Energy Exploitation". The area of the wind farm is located directly on the Dutch-German frontier, and is bounded by the A4 autobahn. Subsequently, further studies on noise, microclimate, and shadows cast were undertaken. With the necessary revisions to the regional development plan in the autumn of 1997 and 1998, the Aachen-Vetschau wind farm achieved legal approval. At the same time, the locations of the individual wind turbines and a maximum height of 100 metres were specified, in order to prevent uncontrolled design of individual units.

Participants

The participants in the planning include, besides the City of Aachen, which was and is the main party responsible for the planning, and the "representatives of public interests" who have a right to be heard in the planning process (such as environmental groups, the government environmental agency, and aviation safety authority), in particular the municipal power utilities STAWAG and ASEAG (e.g. on connection to the grid) and private investors. Much credit is due to the role of the environmental groups, whose commitment has been very laudable.

The investors in the wind farm include, besides the power utilities STAWAG and ASEAG, private companies of various types (private limited companies, non-profit companies, and co-operatives). In addition, provisions have been made to allow the citizens of Aachen to participate financially, as local politicians had desired. Shares of about 2500 • or more can be purchased via STAWAG, or of about 250 • or more via the transnational co-operative Energie 2030, which has offices in Eupen, Belgium and Aachen.

Status of the project as of December 1999

A maximum of nine 1.5 MW units can be erected in the Aachen-Vetschau wind farm. Three wind generators with a capacity of 4.5 MW were already on line at the end of 1999. The first of these was already put into operation in 1997 (even before the planning procedure for the

wind farm was completed) by the municipal power utility ASEAG, with financial support from the European Union.

The three turbines already installed are a Tacke TW 1.5 and two Enercon E 66s. The expected average annual output of these three units is about 8,000 MWh. The electricity generating costs for wind energy, without subsidies, are about 0.1 • per kWh.

Construction of up to four more units is planned in 2000; in 2001-2002, the final units of the wind farm are to be erected.

EVALUATION AND PERSPECTIVES

Aachen's experience to date shows that wind energy inland can indeed be a cost-efficient climate-protection measure. However, in view of the limited areas available in the greater Aachen area, there are spatial limits to the expansion of wind power here. So a share of the total domestic, commercial, and industrial electricity consumption in Aachen from wind power of only 2%-4% is probably a realistic maximum in the near future, rather than the technically feasible proportion of 10%-15%.



A decisive factor in the success of expanding wind power in inland areas in the Federal Republic of Germany will be the decision on revision of the law on mandatory payment rates for electricity inputs into the grid that is due in early 2000. The City of Aachen, like many other investors in wind power, expects to see a clear set of conditions, preferably ones that will favour the continued existence and expansion of this technology.

FOR FURTHER INFORMATION

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