

DEVELOPMENT OF WIND TECHNOLOGY IN EUROPE

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1. Community projects for large Wind Turbines In the frame of the European Communities R&D programme on Non- Nuclear Energy, sub-programme Wind Energy, three large wind turbines will be developed and built:

- a 2 MW wind turbine at Esbjerg (Denmark) with a 60 m rotor diameter, horizontal axis, on a 51 m tower;
- a 1.2 MW wind turbine to be installed at Cabo Villano in Galicia (Spain), also horizontal axis with a 60 m diameter rotor on a 46 m tower;
- a 1 MW wind turbine for Richborough in Kent (England), also horizontal axis, with a 55 m diameter rotor, on a 45 m tower.

All three projects will be completed by the end of 1988, feeding wind generated power into grids.

The Commission contractors will be 3 electricity utilities in Denmark (ELSAM), Spain (ASINEL) and England (CEGB) respectively. Actual development and realisation will be sub-contracted to small and medium size companies in the three countries. In the case of the Spanish project there is also an important participation of the German company MAN.

The three installations are being co-sponsored by the National Wind Programmes in Denmark, the United Kingdom and the Federal Republic of Germany.

2. Rationale for the development of large Wind Turbines Since 1980, about 1500 MW of wind turbine capacity have been installed in California. About 1/4 of them were imported from Europe, mainly Denmark. In Europe the installed total capacity is about 100 MW, but growing rapidly with plans in some Member states aiming at a significant contribution to electricity generation by year 2000.

Over the last 3 years the installation costs could be reduced from \$ 3000/kW to about \$ 1000/kW. At the same time, the unit size has been increased from 50 to about 250 kW per turbine.

Today the 250 kW size constitutes an optimum in terms of cost and reliability while on the other hand, large scale implementation of wind power would rather be based on megawatt-size machines.

At present, only very few prototypes of such large machines exist around the world. They are much more expensive per unit power than the smaller ones, and show big reliability problems. Hence it is essential to devote extensive R&D on this key technology which is a bottleneck for future implementation.

In a former study under the Commission's Wind Energy R&D programme, it has been shown that the market potential for such large machines, once they have become cost effective, will be tremendous in Europe. All European Countries are concerned because the wind resource is equally as large in Northern Europe as in the Mediterranean area.

3. Special features of the 3 turbines to be developed within the Commission's R&D programme In Europe today only two MW machines are operating (Sweden). Their design goes back to the end of the 70's. More recently, machines in the MW range are being built within various programmes (a 3 MW machine within the UK programme, an Italian machine, several machines in Lower Saxony, Germany, several machines in the Commission's demonstration programme and the PIM).

The 3 wind turbines to be developed now within the Commission's R&D programme have the following particular attractions:

- all 3 machines are of similar size. This made it possible to pool the projects in one concerted action: the technical work programme are coordinated by the Commission and duplications will be avoided;

- the technology of the 3 machines is reasonably innovative but involves no unnecessary risks: it rather represents an upgrading and further development of the technologies currently employed on the market;

- the Commission has achieved to pool into a single action of European dimension R&D budgets from the 4 member countries United Kingdom, Denmark, Spain and Germany;

- prime contractors are all utilities. Utility involvement is of prime importance because they will be the eventual users of such machines in their networks. It is the first time in Europe that 3 important utilities decide to take, together with the Commission, direct control of the development of these crucial technologies;

- actual development and construction of the machines will be performed by small and medium size industries acting as sub-contractors. In the perspective of a large European market (Single Act), cooperation between European wind manufacturers is essential because there will not be room for too many groups. The agreement of European wind industry from 4 different member countries to work together on this technology is a unique feature in the current development;

- there will be a joint measurement and monitoring programme with an exchange of all data between contractors. This will follow internationally recommended practices and will help to create a European market for such projects right from the beginning.

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4. Other activities of the Commission's Wind Energy R&D programme. The development of the 3 large wind turbines is part of a comprehensive European R&D programme on Wind Energy which was started by the Commission in 1980. The administrative frame of the current 4 year programme (85-88) is the Non-Nuclear Energy R&D programme which was adopted by the Council of Research Ministers in March 1985.

Main research activities are the following:

- development of a European Wind Atlas. This is a concerted action involving several specialist groups in all member countries. The first version of the Atlas will be published in Spring 1987;

- development of European standards for the analysis of Wind Turbine performances;
- development of a data base on European Wind Energy technology;
- computer modelling of Wind Energy penetration in utility networks of the EC Member countries;

- concerted research actions on aerodynamics, fatigue problems, wake effects, modelling, new materials and components, etc.;

- development of advanced Wind Energy turbines in the 300 to 600 kW range;

In total, the current programme includes more than 50 contracts with European industry, universities and other research establishments.