

INTERNATIONAL ENERGY AGENCY
Programme of Research and Development
on Wind Energy Conversion Systems
(IEA R&D WECS)

ANNUAL REPORT 1981

A report of the IEA R&D WECS Executive Committee

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FOREWORD

This report summarizes the progress during 1981 of the IEA Programme for Research and Development on Wind Energy Conversion Systems (IEA R&D WECS). It is submitted to the IEA Secretariat by the IEA R&D WECS Executive Committee and is intended to meet the requirements of Level 2 type information as set forth by the IEA Committee on Research and Development.

Louis V. Divone
Chairman

Bengt Pershagen
Secretary

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Executive Summary

The IEA R&D WECS program was initiated in 1977 with the objective of performing cooperative research, development and demonstration, and of exchanging information in the field of wind energy utilization. Originally, the program had four Tasks:

- I Environmental and meteorological aspects of WECS
- II Evaluation of numerical models for siting of WECS
- III Integration of wind power into national electricity supply systems
- IV Investigation of rotor stressing and smoothness of operation of large-scale WECS.

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The first phase of Task III was completed in 1979 and was followed by a second phase, called Task IIIa running through 1982. Task IV was completed in 1980. A new Task V "Study of wake effects behind single turbines and in wind turbine parks" was initiated in 1980 and is scheduled for completion in 1983.

Task I was finished in 1981. The main objectives were fully realized although there was a considerable delay in completing the Task, partly due to the complex structure with eight different Sub-Tasks carried out in three different countries.

The detailed results of Task I have been published in more than 10 technical reports. The main results can be summarized as follows:

- a manual for structural safety analysis of WECS has been prepared
- co-location of biomass and wind energy farms will have marginal advantage at best
- the optimum power output from a limited array of WECS could be 9W per square meter ground area at a mutual distance of about 6 rotor diameters
- an inventory of the conditions and requirements to be placed on the siting of WECS with regard to telecommunication disturbances has been made
- the visual impact of large-scale WECS has been investigated by means of perception theory, field observations and case studies
- the accuracy of present wind forecasting methods was found to be inadequate for daily scheduling and hourly dispatching of WECS operation
- recommendations were made for defining and calculating load cases for WECS design.

Considerable progress was made during 1981 by the two study groups set up by the Executive Committee on

- Offshore siting of WECS
- Recommended practices for wind turbine testing.

The comparative study on offshore siting was completed with the main conclusion that it seems technically feasible to install a large, multi-unit WECS station offshore. Further studies are required to assess the economic viability and to develop a plan for the design and construction of a prototype offshore WECS.