

## BOREAS V: Summary of the Fifth Cold Climate Conference in Levi, Finland

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After five BOREAS conferences it can already be called a tradition that experts in the field of cold climate operation of wind turbines meet every two years to exchange knowledge and experience. It is a tradition, too, that the conference is held in northern Finland, in Lapland at a time where cold temperature and icing can be felt and observed practically. Furthermore it is a tradition that the BOREAS conference gradually changes from a forum for discussion of researchers to an international conference for experts from research institutes, manufacturers, utilities, project developers and certification bodies interested in wind turbines operating in cold climate. And finally it is a tradition that the Finnish Meteorological Institute organises the BOREAS conferences in an excellent way, always guaranteeing a warm and friendly atmosphere during the meetings.

Figure 1 clearly demonstrates an increase of participants from industry and wind energy application to 74 per cent during the last BOREAS conferences. In the same diagram the annually installed capacity at inland sites in Germany - which typically is more affected by icing than coastal regions - is plotted. A connection to the increasing interest of the various groups can be supposed. However, this is only an example for one of the 14 participating countries. In total 64 experts met between 28 November and 2 December 2000 in Levi in northern Lapland.

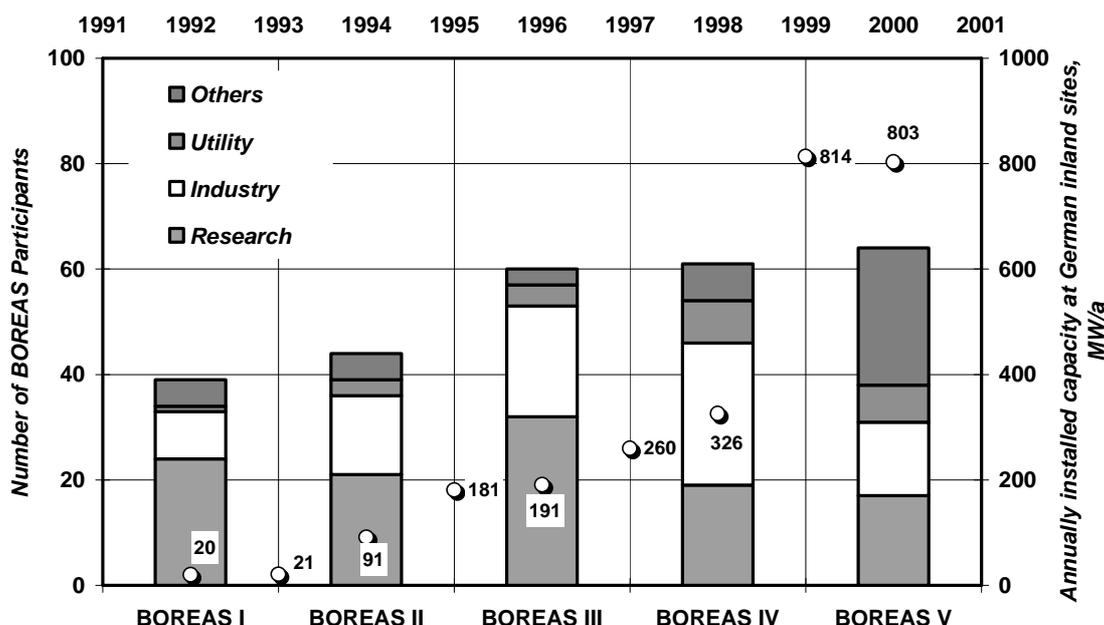


Fig. 1: Shares of the various groups participating in all BOREAS conferences.

One of the main objectives of the conference was to transfer and disseminate results and information of research projects to industry and operators of wind farms in hostile terrain, and to be a forum for information exchange between experts concerned. Within the 6 sessions about wind energy prediction in cold climates, icing of rotor blades, measuring wind and operating wind turbines under icing conditions, arctic wind power in the 21st century, and a closing session summarising the results of the conference, 18 papers were presented and widely discussed.

In the introductory part a report was given about the implementation of the EU-WECO-project and about the statistical evaluation of icing failures in Germany's "250 MW Wind"-Programme. Also the EU wind energy program was presented by a representative of the European Commission.

Within the technical sessions papers about the experience of ice free wind instruments and heated blades were discussed. Earlier concerns about the danger that electrical blade heating systems might be damaged by lightning strokes could be dispelled, as one participant reported about lightning strokes hit-

ting the blades where the heating elements were not affected. Furthermore reports were given about modelling and measuring the wind climate in a mountain valley in northern Sweden and about wind energy predictions in European mountains. Also operational results of arctic wind farms were presented. Compared to the previous BOREAS conferences the emphasis moved more to the practical part of operating wind farms in cold climates than on new results from scientific work. Finally, it was discussed how cold climate operation of wind turbines can be addressed in the international standards and recommendations.

In the closing session the conference's results were summarised: It was noted that with increasing application of wind turbines in hostile terrain such as cold and icy locations, more applied research is needed to help the industry in exploiting this potential world wide. Namely there is a need for improved models to predict wind distributions in mountains, and for "ice-products" like low cost ice detectors, reliable ice free wind sensors for wind potential assessment and as control instruments, and economic and reliable blade heating systems. In the field of "ice-service" and "ice-tools" there is a need for optimised and verified prediction tools for ice throw, power reduction by icing, and loads and dynamics of iced rotor blades. Ice throw reports are necessary at some mountainous sites if roads are passing too close to wind farms. A combined wind potential map and the ice map introduced in the WECO-project [1] could assist wind farm planners for better site prediction. It was unclear for example if power curves measured according to the international standards are still valid at temperatures below 0°C. For the operation of the wind turbines it is important to know that the rotor blades are iced, which means an automatic ice detection. As more and more large turbines are erected at ice endangered sites there is a need to understand the influence of icing on the safety and economics in as much detail as possible.

Most of the participants still needed more information about cold climate operation of wind turbines. A next BOREAS conference will be one solution and Figure 2 depicts the "BOREAS Conference-Network" of information. However, further applied research projects together with the industry, project developers, certification bodies and research institutes should start earlier.

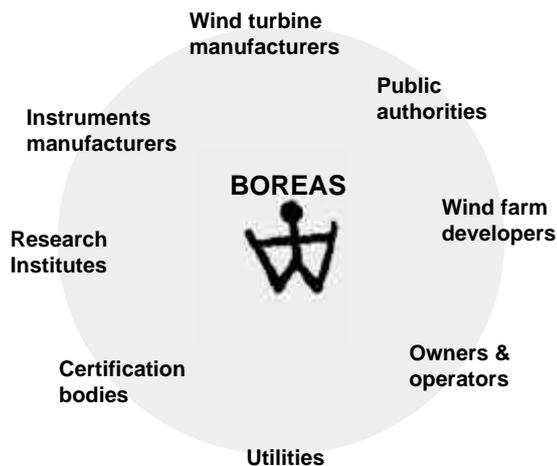


Fig. 2: The BOREAS "Network" of information



Fig. 3: Conference Chairman (lowest) with representatives from the Commission and from Spain in front of the sign pointing to the Olos wind farm during in cloud icing. Photo: Shigeo Kimura

The technical visit to the 3 MW wind farm on Olos fell (500 m a.s.l.) during heavy icing conditions demonstrated clearly the problems of cold climate operation of wind turbines as can be seen in Figure 3. The wind turbines were totally iced and in clouds, no pictures could be taken.

More information about the BOREAS V conference is available at:

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[1] Bengt Tammelin, e.a.; Wind Energy Production in Cold Climate, Meteorological Publications No. 41; ISBN 951-697-518-6, Finnish Meteorological Institute, Helsinki, Finland, Feb. 2000.