

## BOREAS VII Conference

Impact of Icing on Wind Energy Production and Other Field of Activities

K. Sääntti, Finnish Meteorological Institute (FMI)



On 7- 8 March 2005 Finnish Meteorological Institute will host the BOREAS International Experts' Meeting for the seventh time at Saariselkä, Finnish Lapland. Since our first BOREAS meeting in 1992 interest in icing problems for structures has grown strongly. In past 12 years icing has become a relevant issue in activities related to wind energy production, where the icing of blades and control wind gauges significantly reduces the power production and causes a severe environmental safety problem. The potential for icing of structures is also a problem affecting power network equipment, telecommunication masts, ships, aircrafts and meteorological observations etc.

There are several on-going activities in the research field of icing and impact of icing and cold climate. In the EU-project New Icetools the overall objective is to develop and improve the tools suitable for industry to exploit wind energy utilisation in hostile terrain and ice-endangered sites. The goal of IEA R&D Wind Annex XIX is to gather and provide information about wind turbine icing and low temperature operation. The main objective of the COST727 Action is to develop the understanding of icing events in the atmospheric boundary layer and their distribution over Europe as well as to improve the potential to observe, monitor and forecast them. The aim of the BOREAS VII conference is to offer a forum for participants from wind industry, R&D community, meteorological services, authorities and certification bodies to discuss their evolving ideas and experiences and to present their research and development results related to impact of icing on wind energy production and other field of activities.

The meeting will bring together about 60 participants from 12 different countries. We will have presentations e.g. from Austria, Italy, Norway, Germany, Switzerland, UK and Japan.

The proceedings will be available after the meeting on CD-ROM.

### For further information please contact:

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## Preliminary BOREAS VII - Programme

### Sunday, 6 March

Technical visits – see Information package

20:00 – 21:30 Get Together Party in bar Linnanvintti at the Hotel Riekkonlinna

### Monday, 7 March

08:00 – 10:00 Registration

09:00 – 09:15  
**OPENING SESSION**

#### Chairman's opening

Bengt Tammelin, Organizing committee

09:15 – 10:30

#### **SESSION A : National and International activities.**

#### **IEA Wind R&D – Recommendations for the Development of Wind Energy Projects in Cold Climates**

Peltola Esa<sup>1)</sup>, Laakso Timo<sup>1)</sup>, Ronsten Göran<sup>2)</sup>, Tallhaug Lars<sup>3)</sup>,

Horbaly Robert<sup>4)</sup> and Baring-Gould Ian<sup>4)</sup> and Lacroix Antoine<sup>5)</sup>

<sup>1)</sup>VTT Processes Finland, <sup>2)</sup>FOI, <sup>3)</sup>Kjeller Vindteknik A/S, <sup>4)</sup>ENCO, <sup>5)</sup>NREL and Natural Resources Canada<sup>5)</sup>

#### **NEW ICETOOLS project - executive summary of the EU project: Wind Turbines in icing environment: Improvement of tools for siting, certification and operation**

Bengt Tammelin<sup>1)</sup>, Hartwig Dobesch<sup>2)</sup>, M. Durstewitz<sup>3)</sup>, Georg Kury<sup>4)</sup>, E. Peltola<sup>5)</sup>, G. Ronsten<sup>6)</sup> and K. Sääntti<sup>1)</sup>

<sup>1)</sup>FMI (FIN), CIMG<sup>2)</sup> (A), ISET<sup>3)</sup> (D), ENAIRGY<sup>4)</sup> (A), <sup>5)</sup>VTT (FIN), FOI (S) <sup>6)</sup>

#### **A Statistical evaluation of icing failures in Germanys "250 MW Wind" –Program – Update 2005**

Michael Durstewitz, Inst. für Solare Energieversorgungs-technik e.V. (D)

#### **Wind Energy in Cold Climates - the Swiss Experience**

Robert Horbaly, Manager of the Swiss wind energy program, ENCO Energie-Consulting AG (CH)

11:00 – 12:30

**Possible first-rate large-scale wind parks at Kola Peninsula and their impact on the regime of power system**  
Valery Minin and Grigory Dmitriev, IEN Kola Science Center of RAS (RUS)

**Measurements under harsh conditions: synergies between international organizations and future activities**  
Alain Heimo, MeteoSwiss (CH)

**COST727 Action “Measuring and forecasting atmospheric icing on structures” - Status of WG1, WG2 and WG3**  
Bengt Tammelin<sup>1)</sup>, Lasse Makkonen<sup>2)</sup>, Svein M. Fikke<sup>3)</sup> and Hartwig Dobesch<sup>4)</sup>  
<sup>1)</sup>FMI (FIN), <sup>2)</sup>VTT Building and Transport (FIN), <sup>3)</sup>Consultant (N) and <sup>4)</sup> Central Institute for Meteorology and Geodynamics, CIMG (A)

**Atmospheric icing on overhead electric power lines – Overview and international collaboration**  
Svein M. Fikke, Meteorological Consultant (N)

Discussion

13:30 – 14:45

**SESSION B: Icing effects on wind turbine operation**

**Results of the New Icetools inquiry on operator’s experiences with turbine icing**  
M. Durstewitz, Inst. für Solare Energieversorgungstechnik e.V. (D)

**Wind Turbine performances under icing conditions**  
Cinzio Arrighetti and Giovanni Maria De Pratti, Università degli Studi di Roma (I)

**Ice risk assessment for wind turbine rotors equipped with de-icing system**  
Lorenzo Battisti, Francesco Biral, Michele Rialti, University of Trento (I).

Discussion

15:15 – 16:00

**Aeroelastic simulations of a MW-class wind turbine with an iced Rotor**  
L. Battisti <sup>1)</sup>, M.O.L. Hansen <sup>2)</sup>, G. Soraperra<sup>1)</sup>  
<sup>1)</sup>University of Trento (I), <sup>2)</sup>Techn. University of Denmark (DEN)

**Certification requirements for wind turbines operating under cold climate conditions**  
Jochen Gasser and Torsten Muuss, Germanischer Lloyd WindEnergie, (D)

Discussion

16:00 – 17:00

**SESSION C: Technical development**

**Review on blade heating technology and its prospects**  
Laakso Timo, Peltola Esa, VTT Processes (FIN),

**A method for the evaluation of anti-icing energy requirement for wind turbines in cold climates**  
L.Battisti, A.Brighenti, S.Dal Savio, S.Dell’Anna, University of Trento (I)

Discussion

18:00 Conference dinner

**Tuesday, 8 March**

09:00 – 10:15

**SESSION D: Measurement methods and techniques**

**Ice-free wind sensors**  
Bengt Tammelin, FMI (FIN)

**Experience with wind measurements in Cold Climate in Norway**

Lars Tallhaug and Finn Nyhammer, Kjeller Vindteknikk (N)

**Humidity in icing conditions**

Lasse Makkonen <sup>1)</sup>, Timo Laakso<sup>2)</sup> and Kristiina Sääntti<sup>3)</sup>  
<sup>1)</sup>VTT Building and Transport (FIN), <sup>2)</sup>VTT Processes (FIN) and <sup>3)</sup>FMI (FIN)

Discussion

10:45 – 11:45

**Detectors for atmospheric icing**

Svein M. Fikke<sup>1)</sup>, Timo Laakso<sup>2)</sup> and Kristiina Sääntti<sup>3)</sup>  
<sup>1)</sup>Consultant (N), <sup>2)</sup>VTT (FIN) and <sup>3)</sup>FMI (FIN)

**Icing wind tunnel test for a new ice detector**

Shigeo Kimura <sup>1)</sup>, Takeshi Sato<sup>2)</sup>, Holger Freitag<sup>3)</sup> and Bengt Tammelin<sup>4)</sup>  
<sup>1)</sup>Kanagawa Institute of Technology, (JP), <sup>2)</sup>National Institute of Earth Science Disaster Prevention (JP), <sup>3)</sup>Infralytic GmbH (D) and <sup>4)</sup>FMI (FIN)

Discussion

12:45 – 14:00

**SESSION E: Modelling and simulation techniques of atmospheric icing**

**The Onset of heterogeneous Ice Nucleation and Growth: Structural and Chemical Factors**

Ch. Delval and M. J. Rossi, Laboratoire de Pollution Atmosphérique et Sol (LPAS), Ecole Polytechnique Fédérale de Lausanne (EPFL), (CH)

**Validation of ice loads predicted from meteorological models**

Anthony Veal <sup>1)</sup>, Alasdair Skea<sup>1)</sup> and Brian Wareing<sup>2)</sup>  
<sup>1)</sup>UK Met Office and <sup>2)</sup>Brian Wareing.Tech Ltd (UK)

**Ice accumulation observed by use of web camera and modelled from meteorological parameters**

Knut Harstveit <sup>1)</sup>, Lars Tallhaug<sup>2)</sup> and Audun Fidje<sup>3)</sup>  
<sup>1)</sup>Norwegian Meteorological Institute, <sup>2)</sup>Kjeller Vindteknikk and <sup>3)</sup>Institute for Energy Technology

Discussion

14:30 – 16:00

**SESSION F: Icing Meteorology**

**Icing forecast for aviation and possibilities to start ice load forecasts in Finland**

Kari Ahti, Finnish Meteorological Institute (FIN)

**Icing measurements and model results for Oberstrahlbach, Austria**

Hartwig Dobesch<sup>1)</sup> and Dimitar Nikolov<sup>2)</sup>  
<sup>1)</sup> Central Institute for Meteorology and Geodynamics (A) and <sup>2)</sup>National Institute of Meteorology and Hydrology (Bul)

**Icing measurements in northwestern part of the Czech Republic**

Jiri Hosek and Jaroslav Chum, Institute of Atm. Physics (CZ)

**A Survey of Icing Measurements in Germany**

Bodo Wichura, German Meteorological Service, (D)

**Icing periods in the Nordic countries according to climate scenario data**

Timo Laakso and Hannele Holttinen, VTT Processes (FIN)

Discussion

16:00 – 17:00

**CLOSING SESSION**

**Barriers of wind development in cold climates – Summary of the meeting**