



# Winterwind

INTERNATIONAL WIND ENERGY CONFERENCE



Program  
Winterwind 2019  
Umeå • Feb 4-6

**INTERNATIONAL WIND  
ENERGY CONFERENCE**

# WELCOME TO THIS YEAR'S WINTERWIND CONFERENCE IN UMEÅ!

I TAKE GREAT PRIDE in welcoming all of you to the 11th Winterwind International Wind Energy Conference. The expansion of wind power in cold climates is taking place at an increasingly rapid pace so it is important to continue to keep up to date with the latest development.

Winterwind offers, besides a techno-social field trip, two days of highly interesting presentations and discussions about how we best take on the challenges. It will be an inspiring and useful program with international experts in place who will highlight challenges, consequences and opportunities in innovation, research and development.

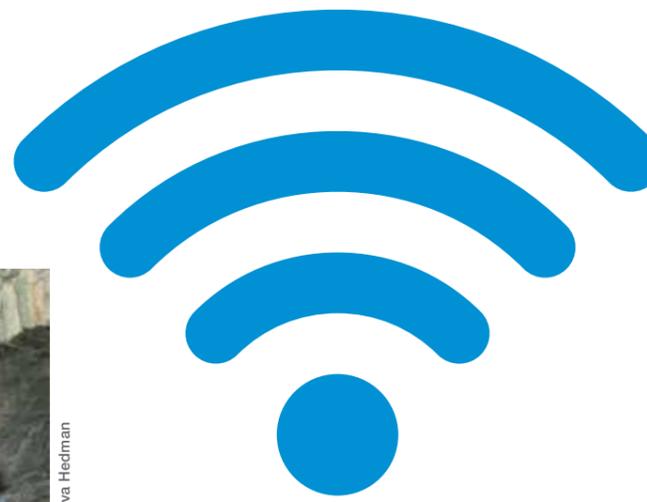
You will also have plenty of time to network and create valuable relationships with both industry colleagues and other players in the industry, so please make the most of your participation and take this fantastic opportunity to socialize with representatives from leading companies, organizations and institutions.

Welcome!

Ulla Hedman Andrén *Director of Operations Swedish Windpower Association  
Project Manager Winterwind International Wind Energy Conference*



Photo: Eva Hedman



# FREE WIFI

## P5 EVENT & CONFERENS

Network: KONFERENS-GUEST Open network no code required

## EXHIBITION AREA

Network: KONFERENS-GUEST2 Code: konferens1234

## VÄVEN SCENEN (MAIN STAGE)

Network: \_UK\_Guest

Open your browser User name: wp51 Code: 4496

## SWEDISH WINDPOWER ASSOCIATION

### About

Swedish Windpower Association represents all producers. The association has over 30 years of experience. It started with the visionary entrepreneurs, landowners and others, who invested in one or a few turbines, but today we represent everything from the smaller to the big actors. We are an established referral body and a committed party in energy Sweden who believes in the power of collaborations. Our main purpose is to promote the development of wind power at reasonable economic and financial conditions. We are involved in wind power related projects and educations, we inform about research results and technological development, often in close collaboration with both authorities, organizations and the business community.

### Members benefits

We have contract partners for specially made member benefit offers for example; a customized wind power insurance developed by the broker Marsh, specially written to cover a wind turbine and its special activities. For electricity trading we offer a framework agreement via NEAS energy A/S. By negotiate an agreement for our members as a group we can offer an agreement that is at the top of the market. Also, in collaboration with MAQS, we offer our members an hour of free advice in connection with having a case you want to discuss, and a discount on following hours, if needed. MAQS has many years of experience in handling wind power projects that span all phases. And if you have an interest in the Nordic renewable market, don't miss this opportunity to take part of the most important price effecting news and forecasts. Bodecker Partners electricity certificate report contains the latest updates on politics, growth and price forecasts in Sweden and Norway. This comprehensive report is much appreciated among windpower owners, banks and energy companies. It is available in English and published 5 times per

year. As a member you have a discount on the report.

### We publish the magazine; Tidningen Svensk Vindkraft

The magazine aims to work for continued development and dissemination of knowledge-enhancing information on wind power. To nuance the debate, to convey research findings and information on technical development, to monitor and review the wind power industry as well as the work of government and politicians.

### We are an experienced conference organizer

We annually arrange conferences and informative seminars as:

- **Winterwind International Wind Energy Conference.** Winterwind found early its own niche in wind energy in cold climate and gathers every year the world's wind energy professionals. Organized by Swedish Windpower Association since 2008.
- **RE-Scandinavia.** A conference about energy power purchase agreements, corporate PPAs. Organized by the Swedish Windpower Association in cooperation with the Danish Wind Energy Association who collectively represent more than 5,000 MW of operating wind power capacity. In partnership with Re-Source.

Members of the Swedish Windpower Association receive a discount on standard prices at our events.

The association is open to everyone. Among our members are besides producers, both private individuals, suppliers and wind power developers among others.

More about members benefits and the association at: [www.svensk-vindkraft.org/eng](http://www.svensk-vindkraft.org/eng)

## SWEDISH ENERGY AGENCY SUPPORTS RESEARCH

As Sweden's primary wind power R&D funding agency, the Swedish Energy Agency finances research conducted by universities and industries through several R&D programmes.

We also help companies to develop and commercialize energy technology. The overarching goals are to achieve Sweden's targets and national objectives for a renewable energy system, contribute to business development, and increase jobs and export.

The Swedish Energy Agency deals with many different issues that affect the wind energy expansion. We host the web portal vindlov.se, which gathers the regulations regarding the permit process, and we also finance research on wind power's environmental effects through the R&D programme Vindval. The initiative Nätverket för Vindbruk is a network that aims to increase knowledge about wind power and to work for local development where wind power is being expanded. The R&D programme VindEI and the Swedish Wind

Power Technology Centre support technology-oriented research within prioritized areas defined in Sweden's strategy for wind power. We support larger demonstration projects through our programme Pilot- och demonstrationsprojekt. The agency also provide specific support to SMEs to promote Swedish energy technology and energy innovations both nationally and internationally.

The agency has also, together with the Swedish Environmental Protection Agency, initiated the work to define a national strategy for a sustainable wind energy expansion in Sweden.

Internationally, the agency is active within IEA Wind TCP and supports the Swedish involvement in the European project NEWA.



## WE SUPPORT GIVEWATTS

We do not share any gifts to our presenters. Instead, we donate money to those who need it better. Givewatts is a non-profit organisation bringing clean and safe energy to people in developing nations. They distribute renewable energy solutions to school children and their families that live in areas without access to electricity. Solar energy lights replaces dirty kerosene and wood, allows children to read their homework and doctors to operate after dark and much more.



### ORGANIZER



### SUPPORTIVE PARTNER



### MEDIA PARTNERS



### SPONSORS



JOB

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EDUCATION

## EDUCATION & JOBS

Take the opportunity to present in writing your company and the job opportunities that you offer, during Winterwind! You will reach both senior professionals who are seeking for new challenges and students. The Job Corner is located in the exhibition hall.

NOTE: Job ads must specify where/how to apply or a contact person incl. contact information, as we do not handle any documents at the booth.



MONDAY

FIELD TRIP DAY

10:00-18:00 Field trip day (The time of return in Umeå is approx.)

18:00-20:00 Poster and exhibition set-up

18:00-20:00 Registration



TUESDAY

08:30-10:30 Registration and Exhibition

Main Hall

OPENING SESSION

Moderator: Linda Vikström

Welcome Ulla Hedman Andrén, Director of Operations Swedish Windpower Association

KEYNOTE PRESENTATIONS

Joint efforts towards a fossil free future

Daniel Gustafsson, Head of Development, Sweden Vattenfall (55)

Why we do all the things we do

Karin Bodin, CEO Polarbröd (56)

OPEN INNOVATION CONTEST

Open Innovation Contest

Jury Linus Palmblad, Åsa Elmqvist, René Cattin & Ville Lehtomäki.

led by Tanja Tränkle, RISE Research Institutes of Sweden (57)

Short introduction Göran Ronsten, Program coordinator

11:30-13:00 Lunch

12:30-12:55 Poster presentations moderated by Ingvar Bartholdsson and Carl-Arne Pedersen

Clear air in cold climates: performance of continuous-wave ground-based lidar

Wulstan Nixon, ZX Lidars (33)

Wind-farm-scale blockage in stable regime associated with cold climates

Till Beckford, DNV GL, Netherlands (42)

Verification of numerical weather model predictions and wind turbine production-loss due to ice using ceilometer measurements

Niklas Sondell, Modern Energy, Sweden (44)

Load monitoring and lifetime assessment for wind turbine towers

Carsten Ebert, Wölfel Wind Systems GmbH, Germany (49)

Icing Predictions for the Canadian Wind Energy Industry

Simon-Philippe Breton, Environnement et Changement Climatique Canada (ECCC), Canada (54)

Väven

P5 Event

P5 Room 1

13:00-14:30 Health, Safety and Environment (HSE) incl. ice throw and noise

IEA Wind Task 19: International Recommendations for Ice Fall and Ice Throw Risk Assessments

Andreas Krenn, Energiewerkstatt e.V. (20)

De-/anti-icing including new technologies, ice detection & control incl. standards

Unmanned aerial vehicles (UAVs) in cold climate and wind energy applications, Richard Hann

Norwegian University of Science and Technology (NTNU), Norway (3)

Forecasting cloud physics and aerodynamics

Chairs: Emelie Bolin and Sten Lillienau

Forecasting of atmospheric icing - validation and applications within wind energy

Leon Lee, Kjeller Vindteknikk (25)

Importance sampling for ice throw in QBlade

Matthew Lennie, Technische Universität Berlin (18)

Using 1Hz data to monitor turbine integrity

Carla Ribeiro, DNV GL (39)

Numerical Weather Prediction of Supercooled Low Stratus Clouds over Heterogeneous Surfaces using the MUSC One-Dimensional Model: First Results

Erik Janzon, Uppsala Universitet (9)

Uncertainties and choices in ice risk assessments - How to get the results you want

Markus Drapalik, Institute of Safety and Risk Research, University of Natural Resources and Life Sciences, Vienna, AT (15)

Proof of concept of a tower based blade icing detection system for low to moderate icing sites

Pieter Jan Jordaens, OWI-Lab (17)

Improving short-term forecasting of turbine icing using machine learning

Till Beckford, DNV GL, UK (6)

Probabilistic forecasting of wind power production losses due to icing

Esbjörn Olsson, SMHI (31)

14:30-15:30 Break

15:00-15:25 Poster presentations moderated by Bengt Göransson

Nabralift Tower: Challenges of Icing Conditions in Open Tower Structures

Emilio Rodriguez Saiz, Nabrawind Technologies, Spain (48)

On the formation of an icing atlas in Austria

Heimo Truhetz, Wegener Center for Climate and Global Change (WEGC), University of Graz, Austria (38)

A new approach for the assessment of ice induced power losses

Patrice Roberge, Université Laval (7)

The effect of atmospheric aerosol particles on cloud icing rate

Antti Ruuskanen, Finnish Meteorological Institute, FI (32)

15:30-17:00 Health, Safety and Environment (HSE) incl. ice throw and noise

Chairs: Olivia Andrén and René Cattin

Pre-construction site assessment, measurements, models and standards

Chairs: Jeanette Lindeblad and Sven-Erik Thor

Commercial

Chairs: Eva Sjögren and Matthew Wadham Gagnon

A cross-comparison of the IceThrower database with 10 years of SCADA and meteorological forecast data - What can we learn?

Rolv Bredesen, Kjeller Vindteknikk, NO (35)

WICE 2.0 - The new generation of ice loss models

Stefan Söderberg, DNV GL, SE (23)

Blade based ice detection - knowledge base for efficient operation in cold climate conditions

Timo Klaas, Wölfel Wind Systems GmbH (47)

R.Ice: Risk Analysis of Wind Turbine Icing

Alexander Stökl, Energiewerkstatt e.V. (21)

Validation of pulsed Lidar as ice detector

Timo Karlsson, VTT, FI (11)

Presenting ice detector research results from wind turbine field tests and icing wind tunnel tests

Tatu Muukkonen, Labkotec Oy, FI (43)

State of the art risk reduction of wind power facilities

Daniel Swart, Lloyd's Register Consulting (28)

Effective validation for time series icing modelling using operational SCADA data

Christian Jonsson, ABO Wind, DE (8)

fos4X experience improving the performance of wind farms installed in cold climate

Christian Lindemann, fos4X GmbH (19)

Cold climate test center in Sweden

Martin de Maré, RISE Research Institutes of Sweden (52)

Increased turbine efficiency during icing conditions by means of pre-emptive blade heating control

Michael Moser, eologix sensor technology gmbh, AT (45)

Field Validation of a Hot-Air Blade Deicing Retrofit

Daniela Roeper, BorealisWind, Canada (12)

Is wind industry ready for disruptive solutions?

Martins Ummers, Aerones, Latvia (2)

To heat or not to heat?

Xavier VANWIJCK, XANT, Belgium (46)

		<p><b>Case study; controlled environment in up-tower blade repairs</b> Ville Karkkolainen, Bladefence Oy (14)</p> <p><b>Clear air in cold climates: performance of continuous-wave ground-based lidar</b> Wulstan Nixon, ZX Lidars (33)</p> <p><b>Nabralift Tower: Challenges of Icing Conditions in Open Tower Structures</b> Emilio Rodriguez Saiz, Nabrawind Technologies, Spain (48)</p>
17:00-	<p><b>Mingle and poster presentations in exhibition hall.</b> Open innovation awards, based on presentations in Session 1, will be presented by Ville Lehtomäki at 17:30.</p>	
19:00-	<p><b>Networking dinner - only for pre-booked</b></p>	



**WEDNESDAY**

	Väven	P5 Event	P5 Room 1				
09:00-10:30	<p><b>Wind turbine manufacturers (commercial)</b> Moderator: Linda Vikström</p> <p><b>Technology retrofit and service approach for performance optimisation in cold climates</b> Graeme Wyse, Siemens Gamesa Renewable Energy (41)</p> <p><b>Nordex advanced Anti-Icing System for N149/4.0-4.5</b> Konrad Sachse, Nordex Energy GmbH, DE (5)</p> <p><b>ENERCONs strategies for minimizing and assessing icing losses</b> Julian Schödler, ENERCON, DE (27)</p> <p><b>Vestas Cold Climate Solutions</b> Brian Daugbjerg Nielsen, Denmark (53)</p>						
10:30-11:30	<p><b>Break, Poster presentations moderated by Jeanette Lindeblad</b></p> <table border="1"> <tr> <td> <p><b>Blade based ice detection – knowledge base for efficient operation in cold climate conditions</b> Timo Klaas, Wölfel Wind Systems GmbH (47)</p> </td> <td> <p><b>Presenting ice detector research results from wind turbine field tests and icing wind tunnel tests</b> Tatu Muukkonen, Labkotec Oy, FI (43)</p> </td> <td> <p><b>fos4X experience improving the performance of wind farms installed in cold climate</b> Christian Lindemann, fos4X GmbH (19)</p> </td> <td> <p><b>Field Validation of a Hot-Air Blade Deicing Retrofit</b> Daniela Roeper, Borealis Wind, Canada (12)</p> </td> </tr> </table>			<p><b>Blade based ice detection – knowledge base for efficient operation in cold climate conditions</b> Timo Klaas, Wölfel Wind Systems GmbH (47)</p>	<p><b>Presenting ice detector research results from wind turbine field tests and icing wind tunnel tests</b> Tatu Muukkonen, Labkotec Oy, FI (43)</p>	<p><b>fos4X experience improving the performance of wind farms installed in cold climate</b> Christian Lindemann, fos4X GmbH (19)</p>	<p><b>Field Validation of a Hot-Air Blade Deicing Retrofit</b> Daniela Roeper, Borealis Wind, Canada (12)</p>
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	Benchmarking	Design and construction	Laboratory and full-scale testing, small wind turbines				
11.30-13:00	<p>Chairs: Tanja Tränkle and Andreas Krenn</p> <p><b>How efficient is your blade heating?</b> André Bégin-Drolet, Canada (4)</p> <p><b>Performance benchmark analysis of four Ice prevention system</b> Timo Karlsson, VTT, FI (10)</p> <p><b>Benchmark of four Blade-based Ice Detection Systems</b> Paul Froidevaux, Meteotest AG, CH (36)</p> <p><b>Wind turbine rotor icing detectors performance evaluation</b> Charles Godreau, Nergica, Canada (22)</p>	<p>Chairs: Helena Wickman and Stefan Söderberg</p> <p><b>Construction of wind farms in cold climates areas – Owner's Engineer experiences</b> Joachim Binotsch, Ramboll, Germany (30)</p> <p><b>Design features of wind diesel hybrid power plants in Russian Arctic climate, Viktor Elistratov, Science-education center «Renewable energy sources»</b> Peter the Great St. Petersburg Polytechnic University, Russia (16)</p> <p><b>Icing alleviation for wind turbines with no ice-protected blades</b> Masafumi Yamazaki, Kanagawa Institute of Technology (34)</p>	<p>Chairs: Carla Ribeiro and Martin de Maré</p> <p><b>Validation of Droplet Size in the VTT Icing Wind Tunnel Test Section</b> Tuomas Jokela, VTT Technical Research Centre of Finland Ltd (24)</p> <p><b>Siemens Gamesa test case: extreme cold start-up validation of a wind turbine gearbox by the use of a large climatic test chamber</b> Pieter Jan Jordaens, OWI-Lab (51)</p> <p><b>Industrial research on the design of wind turbines for icing conditions</b> Inken Knop, Technische Universität Braunschweig, DE (40)</p> <p><b>EFAFLU test case: cold start-up validation of transformer pumps by the use of a large climatic test chamber</b> Daniele Brandolisio, OWI-Lab, BE (50)</p>				
13:00-14:00	<p><b>Lunch</b></p>						
13:30-13:55	<p><b>Poster presentations moderated by Fredrik Lindahl</b></p> <table border="1"> <tr> <td> <p><b>Case study; controlled environment in uptower blade repairs</b> Ville Karkkolainen, Bladefence Oy (14)</p> </td> <td> <p><b>To heat or not to heat?</b> Xavier VANWIJCK, XANT, Belgium (46)</p> </td> <td> <p><b>Increased turbine efficiency during icing conditions by means of preemptive blade heating control</b> Michael Moser, eologix sensor technology gmbh, AT (45)</p> </td> <td> <p><b>Is wind industry ready for disruptive solutions?</b> Martins Ummers, Aeronex, Latvia (2)</p> </td> </tr> </table>			<p><b>Case study; controlled environment in uptower blade repairs</b> Ville Karkkolainen, Bladefence Oy (14)</p>	<p><b>To heat or not to heat?</b> Xavier VANWIJCK, XANT, Belgium (46)</p>	<p><b>Increased turbine efficiency during icing conditions by means of preemptive blade heating control</b> Michael Moser, eologix sensor technology gmbh, AT (45)</p>	<p><b>Is wind industry ready for disruptive solutions?</b> Martins Ummers, Aeronex, Latvia (2)</p>
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14:00-15:00	<p><b>Grand finale Next?</b> Moderator: Linda Vikström</p> <p><b>IEA Wind Task 19 – key results from 2016-2018 and future plans 2019-2021</b> Ville Lehtomäki, KjellerVindteknikk, FI (26)</p> <p><b>Q&amp;A from the audience</b></p>						
14:40-14:50	<p><b>Summary of Conference,</b> Matthew Wadham Gagnon</p>						
14:50-15:00	<p><b>Final words</b> Ulla Hedman Andrén, Director of Operations Swedish Windpower Association</p>						

# MEET OUR SPONSORS AND EXHIBITORS

In the exhibit hall you'll meet interesting companies and organizations offering services and products specific to your business within renewables.

See here our sponsors and exhibitors for the 2019 conference. Please visit their stands, websites and social media channels.

## Supportive partner:



The Swedish Energy Agency works for a sustainable energy system, combining ecological sustainability, competitiveness and security of supply. The Agency finances research for new and renewable energy technologies, smart grids, and vehicles and transport fuels of the future. The Agency supports commercialization and growth of energy related cleantech.

## Sponsors:



Join our journey towards a fossilfree future. We are one of the leading actors in the European energy transition and with approximately 3000 MWs of installed capacity we are among the leading developers and operators of wind and solar in Europe. In Sweden this includes ambitious investments in Blakliden&Fåbodberget and other future projects, many with cold climate challenges.

We are also proud being active in: climate smart solutions for homes and cities, partnerships with industry explore fossilfree solutions for steel, cement and datacenters, charging infrastructure for electrification of transport sector. Our message is therefore clear; we at Vattenfall want to enable our customers a fossilfree living within one generation.



Kjeller Vindteknikk is one of the leading service providers within meteorology on infrastructure in the Nordics. Within wind power, we provide measurements, analysis and modeling for all stages of the wind power

project. We have calculated icing and losses due to icing for over a hundred wind farms. In addition, we have been validating the performance of the de-icing systems and anti-icing systems for several of the large manufacturers and also assisted in the development of warranties connected to icing and de-icing systems. Kjeller Vindteknikk has more than 20 years of experience with wind in complex terrain and cold climate.



ENERCON products are known for their innovative technology, outstanding reliability and excellent returns on investment, worldwide. With their tried and tested drive system, constant technological sophistication and high quality standards, the company has been setting benchmarks in the wind energy industry for more than 30 years now. Currently, the product catalogue includes turbines ranging from 800 kW to 4.500 kW. ENERCON has already installed more than 29.000 turbines worldwide with a total rated power of 49,9 gigawatts.



WPS is one of Sweden's largest ISP for service and maintenance of wind turbines.

We are flexible, efficient and our skilled technicians with a local presence make us the best choice for a reliable partner. In our booth you will also find our cooperating partners: Blade solutions; leading the way in repair and development of blade heating systems for wind turbines in arctic and sub-arctic locations. We use state of art patented repairing methods. BRS Sweden AB; an ISP for blade inspection and repair. Our IRATA certified technicians perform their work from a suspended platform and via rope.



InnoEnergy is the innovation engine for sustainable energy across Europe supported by the EIT. We support and invest in innovation at every stage of the journey – from classroom to end-customer – to accelerate the development of market-ready solutions. We work in three essential areas: Education to help create an informed and ambitious workforce; Innovation Projects to create commercially attractive technologies that deliver real results to customers; Business Creation to support entrepreneurs and start-ups growing their innovative offerings. With our network of 380+ partners, we build connections across Europe, bringing together inventors and industry, graduates and employers, researchers and entrepreneurs, businesses and markets, and create a fertile environment in which we can sell the innovative results of our work. [www.innoenergy.com](http://www.innoenergy.com)



Connected Wind Services Welcome to a truly connected world where you get everything you need from one professional, experienced and service-minded Independent Service Provider. Our highly skilled service technicians provide you with unrivalled knowledge and dedication. For more than 25 years, we have focused on getting the best possible yield for the full lifetime of your assets. As Europe's first Independent Service Provider, we apply best practices gained from decades of work with operators and owners at a wide array of locations – from the single standing turbine to the largest wind farms.

EnBW is one of the largest energy suppliers in Europe, supplying electricity and energy solutions to around 5.5 million customers. EnBW aims to expand renewable energies

to make them one of the main businesses by 2020. EnBW offers planning, construction, operation, maintenance and servicing for wind turbines from one source. EnBW plans to invest more than five billion euros by 2025 in the further expansion of renewable energies, and Sweden is among the target markets for onshore wind.



Nordex Group offers reliable and high efficient multi-megawatt wind turbines for nearly all geographical regions. Also part of the Nordex Group's offer are solution-driven innovations, a dense service network, preventive maintenance, an anti-icing system with warranted performance, and end-to-end modernization. Nordex Group has installed more than 22 GW worldwide and has offices in more than 25 countries around the world. The Swedish subsidiary is located in Uppsala.



Wicetec Oy is wind turbine blade heating technology provider. Our technology prevents ice to accumulate on blade surface and therefore enables continuous turbine operation throughout the winter when the winds are high and energy demand and price is peaking. The patented technology is available for new turbines as well as retrofit to existing turbines with field proven lifetime of 20 years. Wicetec staff consists of highly skilled professionals with firm experience of wind power in cold climate environment.



DNV GL delivers world-renowned testing and advisory services to the energy value chain including renewables and energy efficiency. Our expertise

spans onshore and offshore wind power, solar, conventional generation, transmission and distribution, smart grids, and sustainable energy use, as well as energy markets and regulations. Our experts support customers around the globe in delivering a safe, reliable, efficient, and sustainable energy supply. Our testing, certification and advisory services are delivered independent from each other.

## Sponsors:



VTT Technical Research Centre of Finland is a visionary research, development and innovation partner. We drive sustainable growth and tackle the biggest global challenges of our time, turning them into growth opportunities. We go beyond the obvious to help the society and companies to grow through technological innovations. We have over 30 years of cold climate wind energy experience, and a successful commercialisation of blade ice prevention technology. Wind energy activities cover the value chain from resource assessment, system integration, turbine technology to O&M. We serve our customers through direct contract research, but also through national and transnational R&D collaboration.



Tensar International can provide cost-, carbon- and time-saving solutions to any wind farm project. We are a world-leading manufacturer and provider of subgrade stabilisation and soil reinforcement solutions to overcome common ground engineering problems in construction and civil engineering. With expert technical services and an international network of partners, Tensar provides professional support and impartial advice for projects, from product selection and engineering design, to on-site construction guidance. Tensar's innovative and high-performance geogrid and geotextile products offer professional methods that have benefitted thousands of access-roads, working platforms, crane hard standings, embankments, railways and other infrastructure projects around the world.

## Exhibitors:



Neas Energy is an international energy asset management company owned by Centrica plc. Neas Energy provides physical and financial optimization of renewable and conventional energy assets, for independent power producers, on all major energy markets in Europe. The headquarter is located in Aalborg, Denmark and it has offices in London, Hamburg, Düsseldorf, Stockholm, Oslo and Gothenburg.



Bladefence is a specialist for wind turbine blade condition analysis, repairs and maintenance. The company utilises advanced skylift equipment and UV-curing blade repair method in its operations. In combination, these enable operations in harsh weather conditions, cutting-edge efficiency and minimise turbine downtime. The company was certified by Germanischer Lloyd for blade repairs in 2012 as the first company in the Nordic countries.



Wölfel Wind Systems is focused on Structural Health Monitoring of the complete wind turbine. We deliver reliable data analysis (Structural Intelligence) for lifetime assessments, increase of energy yield as well as ice and damage detection for rotor blades. Additionally we manufacture systems for reduction of vibrations and structure-borne noise.



FT Technologies are the leading manufacturer of ultrasonic wind sensors for turbine control. At Winterwind we are introducing our new FT742 wind sensors with, enhanced measurement range & accuracy now available with acoustic air temperature output. The FT sensors are easily heated, which helps to improve AEP and reduce LCoE.



Uppsala University Campus Gotland provides capacity building and research communication in the Swedish National Wind Utilization Network, and offers a large selection of multi-disciplinary wind power courses and a Master programme in Wind Power Project Management.



Vindval collects and provides scientific knowledge of wind power's impacts on humans and nature. The program is a cooperation between the Energy Agency and the Swedish EPA.



Vindforsk is a technical research programme run by Energiforsk – the Swedish Energy Research Centre and financed by the Swedish industry. The aim is to hoard and share knowledge to strengthen the knowledge base of the Swedish wind power industry and the energy sector.



CUE DEE was founded 1978 and since 2001 we have been supplying masts to the wind energy sector. Cue Dee has been a market leader in the Nordic countries for many years and developed a complete range of masts and accessories quality designed to be the best choice for the wind industry.



eologix produces flexible, retrofittable smart sensor solutions. Founded in 2014, a team of 14 is dedicated today to energy self-sustaining, wireless sensors. eologix' key product - installed on more than 150 turbines - is designed for ice detection and temperature measurement on rotor blades, minimizing downtimes caused by ice accretion or de-icing.



Labkotec ice detectors are specially designed for wind turbines in icy conditions. LID-3300IP Ice Detector improves turbine production reliability and reduces risks caused by ice formation. LID warning light system is designed for protecting people and property. The system warns people for icing conditions by giving an ice alarm.



Nibe Element Wind Solutions, NEWS, are supplying heating solutions for turbines erected in cold climates. It means, heating of all critical applications in the nacelle to make it possible to start up, after a stand still situation. We make de-icing systems based on hot air as well as heating blankets for curing of blade repair.



Ramboll is a leading engineering, design and consultancy company employing 14,000 experts globally. Based on more than 30 years of experience in the wind industry, we offer a full range of services that cover the entire life cycle of a project, from planning and project development to design, procurement, implementation and follow-up on operation, maintenance, and finally to decommissioning. Our portfolio includes the successful completion of projects in 21 countries in offshore wind and 60 countries onshore.



DEKRA is working for increased safety in a variety of industries through independent inspection, testing and certification. DEKRA is Europe's leading expert organization with 40 000 employees in more than 50 countries. With our long experience from the wind energy industry, we can support the customer to reach high safety both during construction of a new plant and in operation of existing plants.

Exhibitors:



EMD International A/S is a software and knowledge centre supplying companies and institutions worldwide with software, consultancy services, training and know-how within the fields of project design, planning, documentation and operation of environmentally friendly energy projects.



As an independent research institute RISE offers a wide range of cutting-edge research and innovation services. Customers and partners will find us dedicated in developing value-creating future solutions within a range of technology areas. Our test and demonstration facilities are important for innovations before entering the market – so is the full-scale test station in northern Sweden. Focusing on measurements, test, validation and certification activities for the cold climate wind industry we offer the arena for technology verification in demanding conditions.



Enetjärn Natur helps companies, authorities and organizations in challenging land use issues to combine business with sustainable solutions for nature and biodiversity. We help our customers make timely decisions through field inventory, impact assessments, strategies and consulting. We are also hired to “clean up” environmental trials where natural environment issues have not been analysed enough. When the operator is affected by supplementary requirements and delays, we help to move the process forward.



Our company Aeronos invented heavy-lift drone and developed technology for wind turbine maintenance (deicing, cleaning, coating). Aeronos Nordic will start service operations in Sweden and Scandinavia in the first quarter this year.



Opatina works with safety. We work as safety or HSE representatives in different projects, heavy construction and wind-craft. Opatina help you in planning or execution of your project as HSE and BAS P/U and HSE manager. We have a wide range of experience and we work to give you the full range of expertise in your project.



SOMMER is focusing on environmental measuring for the past 30 years. Our Ice Detection System (IDS) for the recognition and measurement of icing conditions the IDS helps to optimize the operation and reduce maintenance costs on wind turbines and blades, by recognizing and measuring ice as early as possible.



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The magazine is published 5 times a year by the Swedish Windpower Association.

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# SAILING INTO THE WIND POWER BUSINESS

The interest in sailing was one of the reasons why Canadian Matthew Wadham-Gagnon, part of the Winterwind program committee, ended up in the wind power industry.

“I wanted to travel after finishing my Master’s Degree in Mechanical Engineering, and I am a passionate sailor so I went to Australia for a year where I hoped to get a fix of both traveling and sailing. I ended up working as a Structural Engineer doing finite element analysis jobs for a variety of industries and applications. I also managed to do quite a bit of sailing too!” says Matthew Wadham-Gagnon.

After the year in Australia he went to the UK and did more FEA mostly for high-performance composite sailing yachts (and did more sailing). The same company had a wind energy business unit and there was an opportunity for Matthew to continue working for them while based in Quebec, in his home country Canada. “At this point I was no longer doing FEA, instead, I was implementing new composite materials and composite processing methods in wind turbine blade manufacturing plants in North and South America.”

“There are a lot of jobs in wind energy in Quebec, and fortunately for me, in my hometown of Gaspé.”

In 2011, he started working for Nergica, a center of applied research in renewable energies, in Gaspé, Quebec, as a project manager in research and innovation about seven years ago. He is now Nergica’s business development manager.

Canada has, according to Matthew Wadham-Gagnon, incredible onshore wind resources which translates to high capacity factors (CF) often in the 35-40 percent range. High average wind speeds and high air density due to low temperatures in the winter contribute to these high CFs.

“Wind turbines, particularly in Eastern Canada, are often placed on the tops of hills and mountains and are often exposed to icing conditions. Our climate is very similar to the Scandinavian climate, although we probably have more freezing rain.”

During the Winterwind conference he expects to exchange best practices regarding wind power challenges and solutions in cold climate.

“If something works in Europe it doesn’t mean it will

work in Canada. But it doesn’t mean it’s a bad idea and maybe it just requires a small adaptation... That’s part of what we like to do at Nergica; technology adaptation,” says Matthew Wadham-Gagnon.

This will actually be his sixth time attending the conference in the last seven years.

“Winterwind has a great balance between the scientific community and the industry. It is the conference to get up to date on wind energy in cold climate. I also love how the conference has been held in different cities across Northern Sweden, I get to discover new places every time and a bit of local culture.”

“I look forward to seeing familiar faces and meeting new ones, as well as finding out what are the latest developments and innovations – but also how we are getting closer to standardization. I expect to learn and to have fun,” he says.

One of the innovations that he is really looking forward to seeing will, most likely, not be presented at the 2019 conference.

“I always hope to find out about new technologies or methods that might change the way we think about ice protection systems. And one day, maybe this year, maybe next year, maybe in ten years, there will be an icephobic coating that will revolutionize the industry!”

*This article has been fact checked by Göran Ronsten, researcher and project coordinator of the Winterwind Conference in Åre.*

Text: Peter Wiklund

## FACT BOX

**NAME:** Matthew Wadham-Gagnon

**WORK:** Business development manager at Nergica, Gaspé, Canada and member of the program committee for Winterwind.

**AGE:** 38

**LIVES:** Gaspé, Québec, Canada.

**FAMILY:** Married, three children.

**CURRENT PROJECTS:** “Lately, we’ve been working on projects involving operational icing forecasts at Nergica. Operational forecasts combined with observational data and ice detection technologies have the potential to improve certain types of ice-prevention systems as well as be useful for operation and maintenance planning. We are also planning on releasing a study on a rotor ice detection benchtest that was conducted on our test site.”

**LEISURE TIME ACTIVITIES:** “Skiing (backcountry and with kids at local hill), hockey, did I mention sailing?”





# WINTERWIND

## - AN INTERNATIONALLY ESTABLISHED MEETING PLACE

Winterwind is probably the world's largest cold-climate-focused windpower conference. In addition to being a very important meeting place for industry representatives, the goal is to contribute to solving the practical problems that, among other things, low temperatures, icing, large distances and complex terrain cause.

Low temperatures are not as big a challenge in Sweden as in countries with inland climates. In these places special versions of steel, welding joints, seals, component heating, operating parameters and lubricants have to be developed and used. For the staff, the working conditions can be so severe that one only has 15 seconds to carry out a task outdoors without gloves. When the temperature drops below minus 20 degrees, the output power may need to be reduced so as not to damage components that become brittle at low temperatures. We have recently seen indications from Sweden that lubricants in gearboxes are too viscous even at such high temperatures as around zero degrees. This means that the low temperature problems can occur more frequently than we previously expected.

Iced up wind turbine blades do not only reduce production but they also pose a danger to staff and the public who are in their vicinity. At the time of Winterwind 2008, only one manufacturer was able to deliver de-icing systems and the de-icing capability was, for de-icing power and personal safety reasons, limited to de-icing on stationary wind turbines on one downward-facing blade at a time. A lot has happened since then.

Today, several wind turbine manufacturers can deliver de-icing systems with the capability to prevent ice from building up on the blades. With hot air circulating in the blades, a manufacturer is able to de-ice wind turbines in operation under light to moderate icing conditions. To counteract severe icing, high heat output is required on the leading edge of the blade. For this purpose, electrically heated elements are mounted just below the blade surface, which saves energy by not having to heat the entire blade volume. The development is driven by the fact that the end users are requesting guarantees also for severe icing conditions.

A special challenge has previously, for the fear of

lightning strikes, been to install heating elements mounted on the blade surface all the way out to the blade tip, from where ice can be thrown at high speed. One manufacturer has solved this problem by designing the lightning protection system so that it by itself is used to power the heating elements.

In the large wind farms in northern Sweden, major investments are required in new roads and grid extensions. Once these have been built, there must not only be suitable conditions for service personnel to stay within reasonable distance from the new workplaces, there must also be service personnel. Since the courses for technicians have been downsized for a few years, the lack of trained service technicians is now great. Targeted training initiatives are underway but how well does the industry succeed in attracting students?

Several of the presentations at Winterwind 2019 address work environment issues and risks in connection with ice-throw. At the conference and in the exhibition room, we also get the opportunity to ask researchers and manufacturers what solutions they have on the drawing board. Are split blades and towers a possible and cost-effective solution to handle transports in complex terrain? Do not miss the opportunity to help develop and even take over technology that is not yet commercialized through the Open Innovation Contest!

*Göran Ronsten, program coordinator  
Winterwind 2008-2019*

Photo: Janne Persson, Salabim



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# NEW MODEL MAKES ICE FORECASTS MORE ACCURATE

Ice accretion on rotor blades is caused by several factors. A new model that takes account of the water content of the air has allowed consulting firm DNV GL to improve the forecasting further.

A previous model, launched in 2015 by the Norwegian consulting firm, was based on a modified variant of the Finnish scientist Lasse Makkonen's 20-year-old model. The older model was based on wind speed, moisture level, atmospheric pressure, solar radiation and the shape and speed of the rotor blades.

Makkonen's model gave relatively good predictions of the amount of ice accretion on rotor blades during a limited time period and its effect on production.

But an important piece of the puzzle was missing: the liquid water content of the air when it hits the blade.

"We have now updated the model with new algorithms and improved the accuracy of when ice accretion occurs," says Beatrice Brailey of DNV GL.

Ice accretion on rotor blades may cause severe production losses for wind turbines in cold climates. Previous studies have shown that ice may cause production losses by up to 13 percent in a year. In certain months, when conditions are particularly likely to cause ice accretion, more than half of the expected production may be lost. In extreme cases, ice may cause production to stop for days, or even months.

Already in 2003, DNV GL began its work on models aimed at predicting when and how much ice would accrete in the short term (looking at hours, not days). The company's models were introduced in more than 50 GW of installed capacity.

The 2015 forecasting model allowed wind energy companies to improve the accuracy of their production forecasts with one percentage point in an entire year. In the coldest months of the year, the improvement was up to five percentage points. The new model improves this result by an additional 0.6 percentage points.

"These figures may seem insignificant, but an increase of one percentage point in the accuracy of the production forecast for a 30 MW wind farm may result in a SEK 60,000 revenue increase in a single winter. For many wind farms, this could make the difference between profit and loss," Beatrice Brailey explains.

The forecasts from the model can provide information on ice accretion within an hour,

or even within 30 minutes. The data obtained from measurements from the wind farm can be sent directly to the model's algorithms and be processed immediately. That way, measurements and analyses are made in close to real time.

At present, DNV GL is on its way to deliver the new model to customers in Turkey and Scandinavia.

But you need more than just a good ice model, Beatrice Brailey emphasises:

"To make it work, you need a proper baseline for comparisons, i.e. you need to start with a good production forecast. Otherwise you have no way of knowing the size of the loss caused by ice accretion and how much you have to gain by using our ice formation model."

Text: Jonas Hällén Photo: DNV GL

## ABOUT THE NEW MODEL:

The new icing model uses the ability of machine learning classification models to find patterns in multivariate data sets, improving the accuracy of the prediction of icing conditions between 1 hour and 2 days in the future.

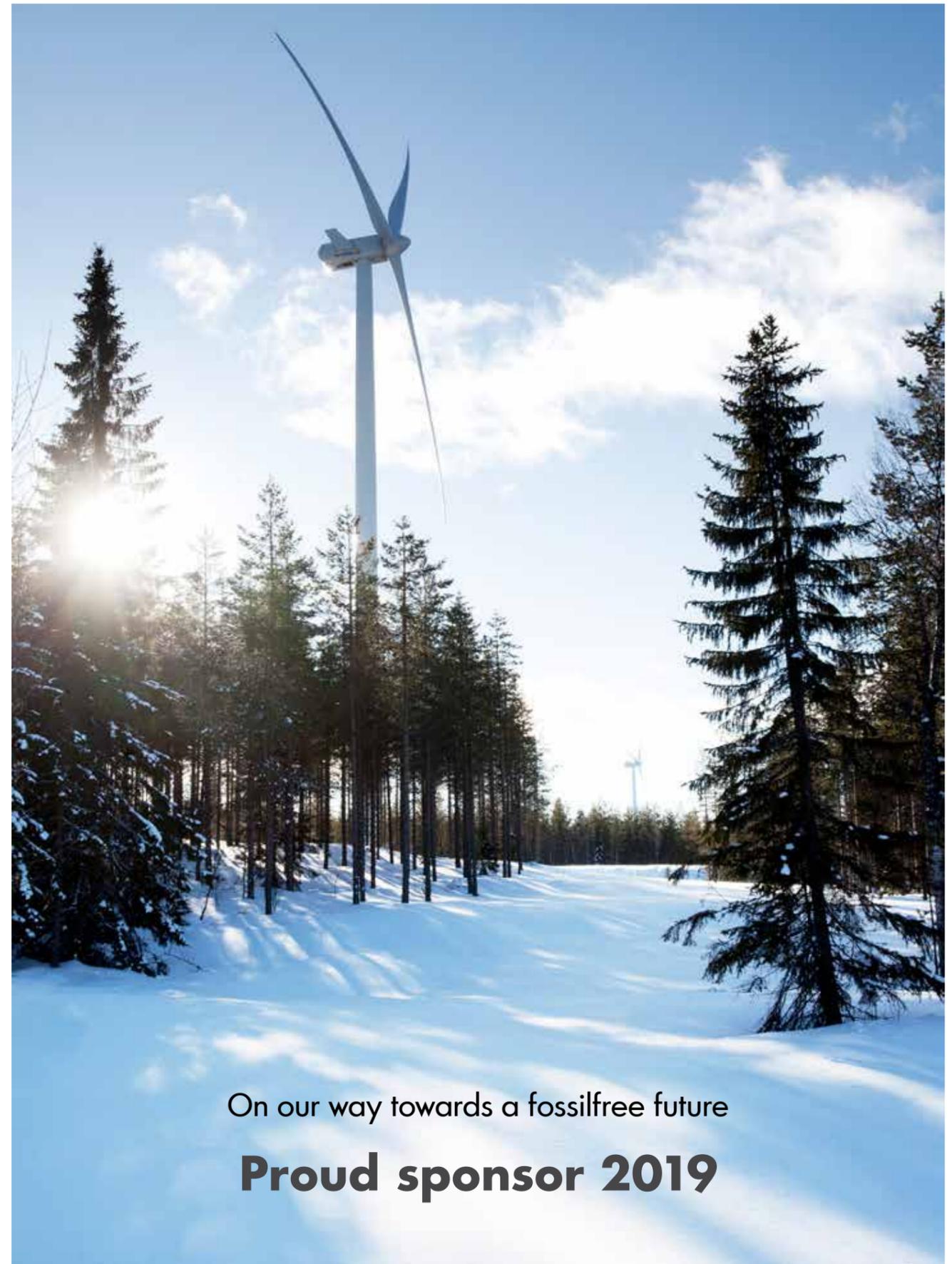
The new model also introduces liquid water content into the ensemble of meteorological forecasts, where previous models have used only forecasts of relative humidity as a proxy for water content. An adapted Makkonen model is then used to calculate ice load on turbine blades, and a power reduction model makes icing corrections to the forecast energy production.

## ABOUT

### BEATRICE BRAILEY:

Having obtained her MSc in physics and sustainable energy, Beatrice Brailey joined DNV GL in 2008 as a forecasting analyst. She now has ten years of experience in analysing the company's weather forecasts and the methods used to create them. Her focus is on conditions in the Nordic region and Scandinavia.

Beatrice Brailey has specialised in improving the wind forecasting models provided by DNV GL to customers worldwide. In recent years, she has therefore worked on DNV GL's short-term forecasting of ice accretion.



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