Winterwind

INTERNATIONAL WIND ENERGY CONFERENCE

THIS YEAR:
Blade repair, production losses, noise, new de-icing systems

Conference Program 2015

Cold climate wind energy solutions

Together against risks

Wind power in cold climates is growing rapidly all over the world. Here, in Sweden, several major projects were inaugurated last year, and several more are on the way. Cold-climate projects used to be a niche market, but today they comprise 25% of the world wind market, according to consultancy BTM. But wind power in cold climates also involves greater risks for those who develop and own the projects. One of the industry's major challenges is to reduce those risks.

This year, Winterwind will dedicate an entire session to a discussion about the financial risks involved in cold climate establishments. Icing is still the most significant risk. Ice creates a more dangerous work environment, reduces production, wears down the turbines and may damage rotor blades. We need better systems for warning against icing and for de-icing blades. Several new de-icing systems, including a dual system from China (see a separate article), are on their way into the market, and they will be discussed at Winterwind. Transports are another important element of risk reduction. Decent roads are needed so that the wind farms can be reached all year around.

An increasing number of companies are also looking to employ service engineers that live close to the wind power plants. Reliable and fast weather reports are important to allow preparations for weather changes that may cause increased icing and difficult road conditions in general, and above the tree limit in particular.

Having learned its lesson following its experiences in the challenging climate at Stor-Rotliden in northern Sweden, Vattenfall is now seeking the assistance of its engineers that otherwise are active within hydroelectric power and distribution, to make a joint effort to reduce the problems caused by ice and cold temperatures.

This form of cooperation leads the way forward. We believe in more joint initiatives between companies. Let us start at Winterwind 2015. Welcome to yet another conference imbued with the sharing of information and knowledge.

/Johanna Olesen
Chairman Swedish Windpower Association

Content

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VATTENFALL, NORDEX, ENERCON ENERGY FOR THE WORLD, SIEMENS, JEMTSKA, SEU Skellefteå EnergiUnderhåll, VTT, WICETEC Ice Prevention Systems, Rexroth Bosch Group, Scandinavian Terrain Vehicles

JUNE 15

Global Wind Day is an annual global event for discovering the potential of windpower and the possibilities it offers for changing our world. On dates around June 15 you can visit wind farms, meet experts, attend events and take action in support of wind energy.
The day was launched by the Swedish Windpower Association in 2003 and went global in 2009.
www.globalwindday.org

Let's Connect!

Stay connected
The Winterwind group on Linkedin is where you stay in touch with colleagues, clients and friends between conferences. Find your new contacts, and make sure that they find you!
winterwind

Mingle on Facebook
In our Facebook group you will find pictures, discussions and trivia. All the photos from the conference will be posted here. Go to our profile, click the "like"-button – and you're in!
winterwind

Presentations and newsletter
You can watch and download the presentations on the Winterwind website. Also, you can sign up for the newsletter from the organization behind the conference, the Swedish Windpower organization.
winterwind.se

WWEC2015

14th World Wind Energy *Conference & Exhibition*

Every year World Wind Energy Association, WWEA, invites in cooperation with local Wind Energy Associations, the Windpower Community from around the world to join the World Wind Energy Conference, WWEC. Find out more info about the upcoming conference in Jerusalem at www.worldwindconf.net.

WWEC2017 in Sweden

WWEC2017 will be held in Malmö, Sweden, with Swedish Windpower Association as host. If you are interested in sponsor opportunities please contact Ulla Hedman Andrén at **ulla@svensk-vindkraft.org**

Soulcruisin' – a fiendishly catchy trio!

Soulcruisin' sing covers and own songs, play fun songs, rhythmic songs and sing dynamic and high on stage! They promise a mixed repertoire with lots of energy!

soulcruisin'

Job Corner

Take the opportunity to present your company and the job opportunities that you offer, during Winterwind! As exhibitor or sponsor you have the possibility to present your company at the Job Corner during the Winterwind Conference. You will reach both senior professionals who is seeking for new challenges and students.

The Job Corner is located in the reception area at Pite Havsbad, February 3rd & 4th. Send your vacancies to **jens.sperens@norrvision.se**

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

Host for mingle in exhibition hall February 3

- Neas Energy A/S
- Svenska Vindkraftkonsulterna AB
- Advise Risk & Försäkring AB

3 FEB

Catching up with noise

Wind turbines do not sound the same at all times. Ice, wear and tear of blades and turbine mechanics may change the level of noise.

TEXT: **Jonas Hållén** PHOTO: **APL Systems**

Changes in the way a turbine sounds may indicate a build-up of ice or some other kind of mechanical failure. Ice build-up can cause a significant increase in noise levels. The emitted noise level may increase by as much as 10dB(A).

To detect changes over time, one has to make long term noise measurements. Finnish company APL Systems has developed a long-term noise monitoring system for wind parks.

"Our online monitoring system provides immediate feedback on noise level changes in a third of the octave bands within a wind park," says Antti Leskinen, CEO and co-founder of APL Systems.

"Online monitoring tools can be used to follow-up on noise levels for turbines according to warranties, maintenance of turbines, ice detection on blades and to monitor the noise level in local residential areas." Changes in noise can occur in the low frequency noise (LFN) area or at higher frequencies, depending on the origin of the noise. It is therefore important to measure the complete sound frequency content and store the full spectrum signal. Every wind park has its own distinctive sound spectrum.

"Our monitoring system offers tools needed to monitor a wind turbine's noise emissions and immissions online," says Antti Leskinen. The noise monitoring system sends the noise levels online via GPRS or a broadband connection.

The system is also equipped with the possibility to add alarms, so that a message is sent if any unwanted changes in the overall sound levels or specific bands are observed.

When APL obtains the data, the company uses its own proprietary service and software to compare and analyse the noise data from a specific wind park to the "normal" sound spectra from similar turbines in other locations.

"The ability to collect the full sound spectrum for a long period in several locations at the same time gives us a unique ability to analyse actual noise emission and immission levels," says Antti Leskinen.

ABOUT THE PRESENTER

Antti Leskinen is the CEO of APL Systems Inc. He has 20 years of experience in international business in different sectors. He has developed new noise monitoring service platform with leading corporate partners.

NORDEX ANTI-ICING SYSTEM
Higher yields in icy climates

- Maximum yield even at sites prone to severe icing
- Avoiding ice formation on blades during operation ensures high availability levels
- Low power consumption of the system equates to even higher power output for the turbine
- Resilient solution integrated into the blade structure

The system is available for the turbines **N117/3000** and **N131/3000.**

www.nordex-online.com

NORDEX
We've got the power.

4 FEB

New de-icing systems go live

This winter, Vestas' and Siemens' new de-icing systems are put to the test. And next winter, the moment of truth will arrive for Dongfang's untested double de-icing system.

TEXT: **Lars Anders Karlberg** PHOTO: **Dongfang Electric**

Just a few years ago, the world's turbine manufacturers considered de-icing to be too challenging. But as there has been a dramatic increase in investments in new major wind farms in cold climates, turbine manufacturers must meet these new requirements.

"We refuse to buy unless we are given guarantees," says Daniel Gustafsson, project manager for windpower in cold climates at Vattenfall, to Winterwind.

Vattenfall recently ordered Siemens' new direct drive 3.3 MW turbines for the new Juktan wind farm in Sorsele Municipality in Sweden. This is the first stage of Vattenfall's new giant project in Sorsele. The blades have been fitted with electrically heated carbon fibre foil.

The same technique is used by Statkraft SCA Vindkraft AB in the Mörttjärnberget wind farm. But the strongest interest is aimed at Glötesvålen, IKEA's newly opened wind farm in Sweden. The farm has 40 V90 turbines equipped with Vestas' new VDS de-icing system, which sends hot air through the blades. An electricity-powered 150kW hot air fan distributes heat in tunnels in the rotor blades to prevent ice formation. If ice builds up anyway, the turbine will shut down, and one blade at a time will be de-iced. Vestas' de-icing system is new and has not yet been tested on a commercial scale. Glötesvålen is the first major commercial project to try this system, and the industry is waiting with great interest to see if the production losses will be large or small this winter.

The same goes for Chinese Dongfang Electric's new de-icing system, which uses hot air in the blades and electrically heated carbon fibre film on the blades.

This double anti-/deicing technology was developed by Dongfang Electric in cooperation with Skellefteå Kraft, which owns 50% of the large Blaiken wind farm. 30 new "ice-proof" turbines will be installed there later this year. Hans Kreisel, CEO of Skellefteå Kraft, is very confident.

"Preventing icing and reducing the time of de-icing are major challenges for the industry. I believe we will succeed. We have invested in a lot of research on this issue," he explains. •

GETTING RID OF ICE

There are a good number of reasons to buy wind turbines equipped with de-icing systems. The risk of ice throw can be decreased by de-icing the blades. To be cost-effective, a de-icing system can't be expected to remove all ice during all conditions. A de-icing system does not only enable operation to restart after an icing period, it also decreases the noise, vibrations and damages to the blades.

Windpower in cold climates

The planned global expansion of windpower in cold climates is several times larger compared to similar plans for offshore windpower. So why are there so many conferences covering offshore windpower, while the interest in windpower in cold climates remains rather tepid?

TEXT: **Göran Ronsten** PHOTO: **AnnaKarin Drugge**

Part of the answer depends on the fact that at sea, as opposed to in cold climates, the long established, large-scale oil and shipping industry seeks alternative things to do. If the remediation of an oil field can be postponed by constructing an offshore wind farm, this can be highly profitable.

Another important reason for the large interest in offshore is that in many leading European windpower nations – such as Denmark, Germany and Spain, which all produce and export windpower plants – cannot understand us when we, in the Nordic region, try to discuss windpower in cold climates in general and icing in particular. The knowledge gathered in recent years about the impact of icing on the production from plants without de-icing systems has been bought dearly. Why do wind turbine makers sell standard turbines to locations that are so far from standard? And why do developers construct and sell standard plants for use in such locations? I believe we all know the answer to that. Money. Well, greed is rarely as lucrative as suggested by the old joke from the school of economics: "Greed is good!" Not even for the manufacturers and developers.

So why did the manufacturers and developers not wait until the manufacturers could offer de-icing systems? Two reasons are worth mentioning. Prior to the financial crisis in August 2008, it was more profitable for manufacturers to sell standard turbines for standard locations. After the financial and the subprime crises, it has taken the manufacturers years to develop de-icing systems. It will most likely take several more years before the manufacturers are able to offer sufficient de-icing power and functionality guarantees. Other challenges created by iced wind turbines in cold climates include personal safety, noise, higher grid balancing costs and loads.

Ice throw from blades, nacelles and towers is a hazard for service engineers and members of the general public who find themselves within the risk zone. In this respect, wind turbines are no different from masts, towers and other tall buildings from where ice may drop into the risk zone and reach terminal velocity (i.e. the speed of a falling object if the drag force and the gravitational force are equal).

Lately, the requirement on risk analyses has increased from a simple, conservative formula for risk distances: 1.5 (D+H) where H=the height of the hub and

D=turbine diameter, to more advanced calculations that take topography, the distribution of wind velocity and the distribution of wind direction into account. In the future, service personnel will be able to rely on fixed roofs that protrude horizontally from the doors of the wind turbines, protecting vehicles and personnel against ice throw and ice fall.

According to several studies, based on both measurements taken in the field and model estimates, the noise level from a wind turbine may increase by up to 10dB(A) if the blades are iced. In the winter season, inversion – particularly in valleys, on cloudless days – may cause increased noise, as the noise is not muffled in the same way as in a normal atmosphere.

It is increasingly common to query whether iced wind turbines should be allowed to operate if they meet the noise requirements the rest of the year. As an increasing number of manufacturers have began to offer de-icing systems, it is likely that the concerns regarding ice throw and high noise levels will abate in the future. However, these concerns may never be fully eliminated.

The compensation paid for electricity production in the two northern bidding areas is lower. This is not only due to the limitations in transmission capacity to more densely populated areas; the compensation is also lower due to the high grid balancing cost caused by icing.

IEC 61400-1, the current standard that governs the design of wind turbines, does not deal with protracted loads on iced wind turbines. An updated version of the standard is currently being reviewed. This is a unique opportunity for Sweden to prevent manufacturers and developers from selling standard turbines to locations that are affected by significant icing. Smaller manufacturers will most likely try to prevent these more rigorous design requirements.

I do hope they will fail, as it is only reasonable that wind turbines designed for use in icing climates must be suited to such conditions.

Just like the risk of ice throw and the higher noise levels, grid balancing and load issues may be resolved by improved de-icing systems.

Welcome to the exciting Winterwind 2015 conference, to be held at Pite Havsbad on 2–4 February! •

ABOUT THE PRESENTER

Göran Ronsten, Programme Coordinator for Winterwind 2008–2015, on behalf of the Swedish Windpower Association.

4 FEB

Breaking the ice with colleagues

It's been another challenging year at the Stor-Rotliden wind farm. Icing, cracked blades and electrical problems have been costly for Vattenfall. Now the utility company's engineers are teaming up to solve these problems.

TEXT: **Jonas Hållén** PHOTO: **AnnaKarin Drugge**

Vattenfall has century-long roots in hydropower. Most of its hydropower plants are in the north of Sweden.

That means that Vattenfall's engineers have long experience in icing, extreme cold and the management of transports, safety and equipment such as transformers, switches and cables in harsh climates.

"We're using our combined experience and knowledge to overcome the problems in our wind farms," says Alberto Mendez, vice President Windpower at Vattenfall, one of Sweden's largest wind energy operators. Stor-Rotliden, built 2009–2010 and one of the largest Swedish wind energy projects in cold climate, has suffered heavy production losses due to icing.

The ice has in all likelihood also caused the large amount of cracks in the rotor blades and other structural damage.

In a keynote at last years Winterwind Alberto Mendez said:

"In some wind farms, we have experienced up to 20% in lost annual production due to icing."

He went on to conclude that a 20% loss annually implies 40% loss of production during winter. Even though the situation is "frustrating", according to Alberto Mendez, the utility is planning another large-scale wind energy project with 100 new turbines in the municipality of Sorsele in Swedish Laponia.

This time, the turbines will be equipped with modern de-icing systems and come with production guarantees from the manufacturers.

"With new technology and our combined experience I'm confident we can overcome the challenges," says Mendez.

"Anyway, there's really no turning back. Sweden has an ambition to go 100% green, and then wind energy in the north will play an important role; Vattenfall will be an important player." Alberto Mendez points out that Vattenfall is not just the largest provider of wind energy and hydropower in Sweden. The utility company is also the largest regional grid operator in the north of Sweden.

"We connect most of the wind farms being built here," says Mendez.

All in all, that means Vattenfall has a large stake in the new green energy system.

"Solving the issues with wind energy in cold climates is not just a technical question for an individual company. To be ahead in this progress, close cooperation is required between windpower developers, wind turbine manufacturers, grid operators and hydropower producers," concludes Alberto Mendez. •

ABOUT THE PRESENTER

Alberto Méndez Rebollo joined Vattenfall in 2009 and heads the Wind business for the Nordics. Prior to joining Vattenfall he worked for Gamesa.

MONDAY 2 FEBRUARY

2 FEB

09.00–11.00

Starting location Hotel Nordkalotten, Luleå
Study visit to SSAB steel mill or SKF
Morning arrivals

11.00–12.30

Lunch at Hotel Nordkalotten The bus departs to Markbygden as soon as lunch is complete, at the latest 12.30 p.m.

12.30–17.00

Study visit to Markbygden wind farm

17.00–18.00

Arrival to Pite Havsbad

18.00–19.30

Winterwind registration
Study visit to Piteå Concert Hall Sponsor: Foyen Law Firm

TUESDAY 3 FEBRUARY

3 FEB

08.00–11.00

Registration

09.00–10.30 **SESSION 1**

TROMBONEN
Study visit presentations **SKF, SSAB Steel mill, Markbygden wind farm**
Chairs: Staffan Engström (Ägir konsult), Jakob Van den Broecke (Delft University of Technology)

10.30–11.00 **BREAK**

11.00–12.30 **SESSION 2 – GRAND OPENING**

KONGRESSHALLEN
Inauguration and keynote presentations
Chairs: Johanna Olesen (Chairman of the board, Swedish Windpower Association), Göran Ronsten (WindREN)
01. R&D as a prerequisit for successfully utilising the cold climate wind energy market opportunities — Jos Beurskens, SET Analysis, NL
02. A proposed standardised blade inspection method — Orla Sørensen, Blade Care Consulting, DK
03. With a little help from my friends — Alberto Méndez Rebollo, Head of Vattenfall Wind Power Nordic, SE

12.30 – 14.00 **LUNCH**

13.30 – 14.00 **POSTER SESSION**

01. Combitech - when it comes to monitoring — Björn Ollars, Combitech AB, SE
02. Lidar as ice detector — Timo Karlsson, VTT – Technical Research Centre of Finland, FI
03. Efficiency and influence of heating device on wind turbine blades — Jan-Olov Aidanpää, Luleå Universiy of Technology, SE

14.00–15.30 SESSION 3

KONGRESSHALLEN
R&D programs

Chairs: Angelica Pettersson (Swedish Energy Agency) and Sven-Erik Thor (Wind for Energy)

— **De-icing of windpower blades using microwaves and CNTcoatings**
Joachim Karthäuser, Re-Turn AS, NO

— **Airborne de-icing solution for wind turbines**
Hans Gedda, H Gedda Consulting, SE

— **Vindforsk IV - update of ongoing projects**
Göran Dalén, Vindforsk, SE

— **Ultrasonic guided waves approach for ice detection on wind turbines**
Siavash Shoja, Chalmers University of Technology, SE

TROMBONEN
Energy production

Chairs: Richard Hann (Richard Hann Consulting), Kristina Lindgren (OX2)

— **Quantification of energy losses caused by blade icing and the development of an energy loss climatology using SCADA data from Scandinavian wind farms**
Staffan Lindahl, DNV GL Energy, UK

— **Estimating energy losses caused by blade icing from preconstruction wind data and DNV GL Energy's experience analysing scada data from Scandinavian wind farms**
Till Beckford, DNV GL Energy, UK

— **Power production losses due to icing and their relation to icing conditions and operation mode**
Silke Dierer, Meteotest, CH

VIOLINEN
Finance, risk

Chairs: Rebecka Klintström (Meventus) and Matthew Wadham Gagnon (TechnoCentre éolien)

— **Challenges and possibilities of handling more windpower in the power system – conclusions from Denmark**
Jens Tang, Neas Energy, DK

— **Challenges with financing windpower in cold climate**
Paul Stormoen, OX2, SE

— **Insurability of cold weather risk and damages**
Anders Orebrandt, Marsh, SE

15.30–16.00 POSTER SESSION

04. Detection of different phases of water on a wind turbine blade using NIR camera
— Lavan Kumar Eppanapelli, Luleå university of Technology, SE

05. Experiences from blade-mounted ice detector development
— Tatu Muukkonen, Labkotec Oy, FI

06. Breaking the ice using passive anti-icing coatings
— Lessons learned from the Nordic TopNANO research project
— Agne Swerin, SP Technical Research Institute of Sweden, SE

16.00–17.30 SESSION 4

KONGRESSHALLEN
De-/anti-icing

Chairs: René Cattin (Meteotest), Helena Wickman (Meventus)

— **1,500 years of Icing on wind turbines — a long term study**
Dietmar Tilch, Bosch Rexroth Monitoring Systems GmbH, DE

— **Icing monitoring for R&D projects**
Dominic Bolduc, TechnoCentre Éolien (TCE), CA

— **On the variability of temperature and icing status over the blades of a wind turbine**
Michael Moser, eologix, AT

— **Experiences with different ice-detections**
Kimmo Palmu, WestWind, FI

TROMBONEN
Noise

Chairs: Jos Beurskens (SET Analysis), Jennie Persson Söderman (Uppsala University)

— **Benchmark of ice noise modelling**
Max Muckermann, E.ON Climate & Renewables, DE

— **Long-term online sound monitoring in wind parks**
Antti R. Leskinen, APL Systems Ltd, FI

— **Simulating iced wind turbine noise**
Richard Hann,
Richard Hann Consulting, DE

VIOLINEN
Resource

Chairs: Øyvind Byrkjedal (Kjeller Vindteknikk), Beatrice Brailey (DNV GL Energy)

— **Case study of Lidar measurements in southeast Finland — Lidar performance and wind conditions in cold climate and complex terrain**
Katja Hynynen, Lappeenranta University of Technology (LUT), FI

— **Wind tunnel ice growth on a blade profile and representative cylinders** Neil Davis, DTU Wind Energy, DK

— **Towards an increased understanding of icing conditions within a wind farm through visualisation of SCADA data in a topographic context**
Magnus Baltscheffsky, WeatherTech Scandinavia, SE

17.30–19.00 MINGLE IN EXHIBITION HALL

Sponsored by Svenska Vindkraftkonsulterna, Advise Risk & Försäkring and Neas Energy

WEDNESDAY 4 FEB

4 FEB

08.30–10.00 SESSION 5

KONGRESSHALLEN
Icewind

Chairs: Niels-Erik Clausen (DTU), Benjamin Martinez (Vattenfall)

— **Investigation of nacelle temperature measurements**
Neil Davis, DTU Wind Energy, DK

— **Analysis of spatial and temporal variability in icing conditions and production losses due to icing using a new long-term icing climate database**
Stefan Söderberg, WeatherTech Scandinavia, SE

— **Validation of icing and windpower forecasts at cold climate sites**
Øyvind Byrkjedal, Kjeller Vindteknikk, NO

— **On the influences of icing on regional forecast errors**
Jari Miettinen, VTT - Technical Research Centre of Finland, FI

TROMBONEN
Health, safety and environment

Chairs: Dag Haaheim (Statkraft), Saara Kaija (VTT)

— **Methods for evaluating risk caused by ice throw from wind turbines**
Helge Ausland Refsum, Lloyd's Register Consulting, NO

— **Influence of wind conditions under icing conditions on the result of a risk assessment**
Felix Storck, TÜV NORD SysTec GmbH & Ko. KG, DE

— **Operation of wind parks under icing conditions — a balancing act between production and safety**
René Cattin, Meteotest, CH

VIOLINEN
Wind potential & de- icing performance

Chairs: Jan Olov Aidanpää (LTU), Till Beckford (DNV GL Energy)

— **High resolution forecast maps of production loss due to icing**
Esbjörn Olsson, SMHI, SE

— **Performance assessment of ice protection systems for wind turbines**
Esa Peltola, VTT Technical Research Centre of Finland, FI

— **Windpower Icing Atlas (WIceAtlas) — icing map of the world**
Simo Rissanen, VTT Technical Research Centre of Finland, FI

10.00–10.30 POSTER SESSION

07. Influence of ice accretion on the noise generated by an airfoil section — Robert Szasz, Lund University, SE
08. Assessment of ice throw and ice fall risks nearby wind energy installations — Michaela Kaposvari, TÜV SÜD Industrie Service GmbH, DE
09. Three-dimensional numerical simulation of a model wind turbine, Narges Tabatabaei — Luleå University of Technology, SE

10.30–12.00 SESSION 6

KONGRESSHALLEN
Forecasting

Chairs: Måns Håkansson (Statkraft), Elina Heed (Foreca)

— **Validation of new model for short-term forecasting of turbine Icing**
Jonathan Collins, DNV GL Energy, GB

— **Probabilistic forecasting of icing and production losses**
Jennie Persson Söderman, Uppsala University, SE

— **A generic model for ice growth and ice decrease process**
Saara Kaija, VTT, FI

— **Measuring air liquid water content by shadowgraph image analysis for wind turbine icing detection**
Staffan Rydblom, Mid Sweden University, SE

TROMBONEN
IEA TASK 19 Cold climate workshop

Chairs: Carla Ribeiro (DNV GL Energy), Ville Lehtomäki (VTT)

— **Ice throw guidelines**
Matthew Wadham-Gagnon, TechnoCentre Žolien, CA

— **IEA Task 19: Standardized method to evaluate production losses due to icing using only SCADA data**
Ville Lehtomäki, VTT Technical Research Centre of Finland, FI

VIOLINEN
Inspection and repair

Chairs: Brian Domino (OX2), Jenny Longworth (Vattenfall)

— **Why performing climatic chamber testing on wind turbine applications?**
Pieter Jan Jordaens, Sirris - OWI-Lab, BE

— **Blade heat system repair**
Greger Nilsson, Blade Solutions, SE

— **New approaches on rotor blade repairs in winter conditions**
Ville Karkkolainen, Bladefence, FI

12.00–13.30 LUNCH

13.30–15.00 **SESSION 7 – MANUFACTURERS' VIEW**

KONGRESSHALLEN

Plenary session

Chairs: Göran Dalén (Dalén Power AB), Åsa Elmqvist (Arwen konsult)

— **Siemens turbines in cold clime**
Bo Birkemose, Siemens Windpower, DK

— **Anti-icing system on Nordex wind turbines — lightning protection and operating experience**
Jochen Birkemeyer, Nordex Energy GmbH, DE

— **ENERCON rotor blade heating system (RBHS) and icing measurement campaign**
Alexander Winter, Enercon GmbH, DE

— **GAMESA solutions for cold climate conditions**
Erik Åslund, GAMESA Wind, SE

— **Vestas cold climate offerings**
Brian Daugbjerg Nielsen,Vestas Wind Systems, DK

FINAL CONLUSIONS: SVEN-ERIK THOR (WIND FOR ENERGY), JOS BEURSKENS (SET ANALYSIS)

Meet our Exhibitors

Some of the industries most interesting companies ranging from contractors, operators and specialists – all eager to show their latest innovations.

1. VATTENFALL

Vattenfall's vision is to create a strong and diversified European energy portfolio with sustainable and increased profits, significant growth options and will be among the leaders in developing environmentally sustainable energy production. The geographic focus is our main markets the Nordic countries, Germany and the Netherlands, the three main products are electricity, heat and gas.

2. NORDEX

The Nordex Group is one of the world's leading suppliers of wind turbines.
The principal focus is on units with a high capacity – above all in the megawatt range, the strongest growth segment in the sector.

3. ENERCON

ENERGY FOR THE WORLD

ENERCON products are known for their innovative technology, outstanding reliability and excellent returns on investment, worldwide. With it's tried and tested drive system, constant technological sophistication and high quality standards, the company has been setting benchmarks in the wind energy industry for 30 years now.

4. SIEMENS

Siemens is one of the world's leading suppliers of offshore and onshore windpower solutions, including services throughout the entire life cycle of the wind turbines.
Nearly 13,000 wind turbines around the globe with a total capacity of 21 GW help to provide the world with clean, renewable energy.
Siemens has long experience of working with turbines in cold climate areas. Welcome to our booth where we will tell you more about our solutions.

5. VTT

VTT Technical Research Centre of Finland Ltd is the leading research and technology company in the Nordic countries. We develop new smart technologies, profitable solutions and innovative services. Wind power is an important part of VTT's R&D in energy and we have over 20 years of cold climate experience. Our activities cover the whole value chain from resource assessment, system integration, wind turbine technology to wind power production and O&M. We serve the needs of our customers through direct contract research and development, but also through active national and international R&D collaboration with universities, research centres and industries.

6. WICETEC

Ice Prevention Systems

Wicetec is a company established 2014 to sell the proven Finnish wind turbine blade ice prevention system. Wicetec has acquired the IPR of the technology from VTT Technical Research Centre of Finland where ice prevention and cold climate technologies have been developed over the last 25 years. More than 200MW of windpower is currently operating equipped with the technology. We provide high quality ice prevention systems for our customers to increase availability over the lifetime of their turbines.
➔ www.wicetec.com

7. Rexroth Bosch Group

The Bosch Rexroth Monitoring Systems GmbH develops, manufactures, markets and operates condition monitoring systems for wind turbines. The systems facilitate the reliability of wind turbines. With the early detection of rotor blade damages directly on the rotor blade the company's BLADEcontrol system increases the availability of turbines. BLADEcontrol is certified by Germanischer Lloyd. The company's latest system ACoS (Advanced Condition Monitoring System) offers an intelligent and holistic system solution for the condition monitoring of the whole wind turbine –from the tip of the rotor blade to the gear box and the generator.

8. JEMTSKA

Jemtska is a full-service partner for people/companies who are establishing wind farms. We are jointly owned by Skanska and Jämtkraft, so we have all the necessary experience and expertise for project managing and building your wind farm.
We will coordinate all the contracts and control the subcontractors to work in a safety manner. We also install electricity and fiber optics, build electrical grid and substations, fell forest, construct roads and foundations- to name just a few examples. Come to stand no. 4 and we´ll tell you more about our latest wind farm project Mullbergs wind farm and our ongoing project Fäbodliden wind farm.

9. Scandinavian Terrain Vehicles

STV is manufacturing tracked vehicle for heavier loads that is perfectly suitable for service and maintenance at the wind mill park. These types of tracked vehicles are extremely suitable in sensitive environments, and can be used on both bare ground, marshes, swamps and as over snow vehicles. With the most modern engines they also meet the environmental requirements of our customers. Maintenance work in winter climate may be associated with the risk of falling ice. Our Ice ArmorTM has met great interest from our customers. With it installed, staff can travel safely at the wind mill park. The vehicles can be equipped with platforms, cranes, fuel tanks and work shop modules to make your service and maintenance easy. STV has delivered tracked vehicles all over the world to work in the most demanding conditions.

10. SEU Skellefteå EnergiUnderhåll

Skellefteå EnergiUnderhåll. SEU provides maintenance services for companies within the fields of wind and hydroelectric power, heating, industry and electricity networks. SEU's experienced staff offer contract services, project management and consultancy services for new construction or conversion of power plants. SEU has developed specialist services within mechanics, hydraulics, electrical power and control installations. SEU has solutions for both occasional maintenance work and long-term service and maintenance contracts. SEU is a wholly-owned business area within Skellefteå Kraft.

11. KJELLER

Kjeller Vindteknikk offers services within wind measurement, wind analysis, and production estimate, adapted to projects under development and to operational wind farms. We have high expertise in measuring, analyzing and modeling the wind in cold climate sites. We use state-of-the-art methods for wind data analysis and energy calculation.

12. FT

FT Technologies is the world's leading manufacturer of ultrasonic wind sensors for turbine control. Featuring their advanced patented Acoustic Resonance wind sensing technology, FT sensors provide reliable wind speed and direction data. With no moving parts to degrade or wear out, FT anemometers help reduce costly turbine down-time and maintenance visits.

13. SENVION wind energy solutions

Senvion, a wholly owned subsidiary within the Suzlon group, is one of the world's leading manufacturers of onshore and offshore wind turbines. Senvion develops, produces and markets wind turbines for almost any location – with rated outputs of 1.8 MW to 6.15 MW and rotor diameters of 82 metres to 152 metres.

14. METEK

METEK GmbH develops and manufactures various meteorological sensors and systems for wind energy all offering high accuracy and reliable function even under harsh environmental conditions: ultrasonic anemometers uSonic-2 and uSonic-3, Doppler Sodar PCS.2000, Doppler Lidar Stream Line, environmental data logger mLogo8, Micro-Rain-Radar MRR-2, Cloud-Radar MIRA-35.

15. VAISALA

Vaisala. When you fully understand your environment, you make confident, accurate decisions. As experts in weather for over 75 years, Vaisala is committed to helping you understand the risks associated with the impact of weather. With the acquisitions of 3TIER and Second Wind, Vaisala has created an integrated suite of renewable energy assessment, forecasting, asset optimization, and measurement solutions to help customers around the globe make the right decision when it comes to weather. With this combination, Vaisala offers products and services for all phases of a wind project.

16. CUE DEE

Cue Dee AB develops & supplies Masts, Towers and Support for antennas & measurement equipment to customers globally in the Telecom and Wind industries. As one of the leading companies in its area, Cuedee are focusing on Quality, customer relationship and long-turn development. With a focus on increase Quality and reduce environment effects.

17. NEAS ENERGY

NEAS is an independent energy trading and management company specializing in renewable power generation. NEAS covering physical and financial responsibility and offers balancing responsibility, trading, electricity certificates, LECs etc. We've now become one of the leading players in northern Europe with a portfolio of more than 3700 MW production capacity.

18. BLADEFENCE

Bladefence is a specialist for wind turbine blade inspections and repairs. Bladefence utilizes skylift equipment and UV-curing blade repair method for operations in adverse weather conditions with minimum turbine downtime. The company was certified by Germanischer Lloyd for blade repairs in 2012 as the first company in the Nordic countries. The company offers services throughout Europe.

19. Svenska Vindkraftkonsulterna AB

Svenska Vindkraftkonsulterna AB is an independent, third part, company in the Nordic region for wind turbine owners.
In total we have over 15 years' experience in technical work with wind turbines. We have conducted more than 300 inspections on wind turbines of different models since its launch Oct 2011. We work with all established brands in the market.

20. Canada

Canadian Embassy. One of Canada's 40000 exporters and research & development institutes may have exactly what you are looking for. The Canadian Trade Commissioners will introduce you to the Canadian organization best suited to meet your needs.
We also provide information on investment advantages and how to establish a business in Canada.

21. Alpine Helicopter

Alpine Helicopter Sweden AB.
With a helicopter and hot water, Alpine Helicopter AB has made it their business idea to spray the blades rather than waiting for thaw. Until now, there has been no other alternatives than to wait for the ice to melt if the wind turbine isn't equipped with a de-icing system. Founder Mats Widgren has developed this cost effective no chemicals solution, using regular water and a helicopter to efficiently remove snow and ice from the wind turbine's blades.

22. WeatherTech

WeatherTech Scandinavia AB offers qualified consultancy services such as customized wind and weather related reports, icing studies and weather forecast services for the power industry and actors on the energy market.
We have broad meteorological competence from university and wind industry including many years of experience from modelling atmospheric processes.

23. SP

SP Technical Research Institute of Sweden is a leading international research institute. We work closely with our customers to create

Exhibitors

value and to deliver high-quality input in all parts of the innovation chain. We play an important role to support the competitiveness of industry and its evolution towards sustainable development.

24.

In Situ Instrument AB, located in the scenic Ockelbo, has over 30 years of experience in measuring techniques in meteorology, hydrology, plant physiology and geology. In Situ has delivered over 300 wind measurement systems, both nationally and internationally. The measurement systems are custom-made according to the customer's specific needs, and we also develop our own products.

25.

Eologix sensor technology gmbh was founded in 2014 and developed a wireless icing detection and temperature measurement system for retrofit application on rotor blades. The measurement data obtained from multiple points on the blade surface can be used to reduce stand-still time as well as to effectively control anti- and de-icing equipment.

26.

Advise is an independent broker in insurance and risk management. We specialize in insurance for the windpower industry and can offer a customized approach for investors, owners, designers and manufacturers of wind turbines.

27.

Hydac: Your Professional Partner for Wind Turbines. We take care of: Condition monitoring of oil cleanliness, Electronic measurement of pressure, temperature and flow, Energy efficiency and Cooling Systems, Filter optimisation, Accumulators, Service and troubleshooting.

28.

Blade Solutions AB inspect and repair wind turbine blades. The company uses rope access as primary access method. Specific knowledge of blade heat system repairs and cold climate solutions. Frequently using advanced composite methods such as vacuum infusion and UV-curing systems. The company is based in Piteå, located in northern Sweden.

29.

SSAB offer high strength steel solutions for structures in cold climate. Our clean steel have excellent toughness and strength and meet the demands for cold though environments. At winterwind we will show new advanced steel materials suitable for fixing the towers to the fundaments. We will show possibilities of how new innovative design solutions enable weight reduction in towers as well as in the upper turbine part of the windmill. In relation to the conference we offer you to come and see our steel mill in Luleå, most welcome.

30.

Strömsund Municipality. Hjalmar Strömerskolan- YH-vindkraftteknikerr -Qualified Higher Vocational Education, Windpower Technicians, Service, Operation and Maintenance. Network for wind utilization with Labour Supply, Operation and Maintenance. Commission by the Swedish Energy Agency.

31.

Vindkraftcentrum. Our mission is that the large investments made – as much as possible – should benefit the population in the forms of jobs and businesses. We identify the possibilities and facilitate contacts.

- Company database – 2700 addresses
- Matching tools
- Industry knowledge
- Business development
- Business advise
- Inspirational meetings, seminars, fairs Website, newsletter
- Factual information to the public and decision makers

32.

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.

33.

Vindforsk is a technical research programme run by the Energy Agency in cooperation with the Swedish industry. The project's aim is to increase knowledge and strengthen the Swedish wind power industry's knowledge base.

34.

The Network for Wind Power Utilization. The Network spreads knowledge and information about wind power and supports related regional initiatives of national importance.
The Network was founded in 2008 and is a part of the Swedish Energy Agency's work to promote the expansion of wind power.

35.

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.

36.

Nibe Wind Components – Heating solutions and equipment for wind turbine erected in cold climates. Heating blankets for blade repair as well as nacelle fan heaters and other related heating products for maintenance on site, is our focus! NWC offer all kind of heaters for cold climate turbine applications. Ask us!

37.

Fos4X GmbH specializes in fiber-optic sensor technology. The measurement instruments are based on fiber Bragg grating technology. This technology uses optical interference filters inscribed in optical fibers. The sensors stand out due to their long life (more than 10^8 load cycles), large measurement amplitude, small overall size, long transmission ranges, and electromagnetic insensitivity.

38.

APL Systems provides comprehensive services on noise monitoring for wind power. We offer the wind industry full range of service for the whole life cycle of wind parks. We investigate the soundscape from background noise levels to ice detection, pre-maintenance and guaranteed noise level investigations in wind parks.

The Swedish Windpower Association

Promoting the development of windpower in Sweden and internationally.

Swedish Wind Power association is a non-profit and apolitical association open to both individuals, wind turbine owners and wind power developers. The approximately 2 000 members consists mainly of private individuals, wind turbine owners and developers. With the vision to make wind energy a social movement, Swedish Windpower Association is active in Sweden as well as internationally, promoting the economically and environmentally sound development of windpower.

OUR FOCUS AREAS

1. Education
2. Acceptance
3. Member values
4. Cold Climate
5. Next practice

MEDIATING KNOWLEDGE

- We promote trends in technological development, completely front edge.
- We are active through referrals to influence improved economic and financial conditions.
- We cooperate with authorities, institutions, organizations and industry.
- We continuously attempt to learn something new that will benefit the members.

SUPPORT OUR WORK - BECOME A MEMBER!

Swedish windpower Association is an active participant in the debate on windpower conditions and development in Sweden. As a member do you support our work against politicians, authorities and other stakeholders. For more info about our members benefits and how to become a member, visit our booth during Winterwind or our website: svensk-vindkraft.org/bli-medlem.

SWEDISH WINDPOWER ASSOCIATION

is a member of World Wind Energy Association. WWEA is a global association embracing the wind sector worldwide, with more than 600 members in around 100 countries.
WWEA works for the promotion and worldwide deployment of wind energy technology.

CONTACT

Ulla Hedman Andrén, Director of Operations.
ulla@svensk-vindkraft.org.
Mobile: 00 46 76 71 60 550
www.svensk-vindkraft.org

SWEDISH windpower ASSOCIATION


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