Wind Power Research in Focus 2020
Conference abstracts

INTRODUCTION SESSION
MODERATOR: CHARLOTTE UNGER LARSON

9:00-9:10   Welcome (conference team and moderator)

9:10-9:30   Wind Europe's outlook – The impact of Covid-19 and the future green restart – *Pierre Tardieu, chief policy officer, WindEurope*

The EU is now moving forward on increasing climate ambition for 2030 as a key milestone towards climate neutrality. Ultimately that would mean growing wind from today's 15% to about half of Europe's electricity by 2050. This is both a tremendous challenge and a great opportunity for Europe to get the most from its globally competitive wind industry. The wind industry has been resilient in the COVID-19 crisis attracting €14b investments in the first semester. But making this sustainable will need policy changes: visibility for investors and streamlining permitting today's top challenge to accelerating wind deployment.

9:30-9:50   The Swedish national strategy in wind energy – *David Newell, analyst, Swedish Energy Agency*

As part of the work of the Swedish Council on Environmental Objectives, the Swedish Energy Agency and the Swedish Environmental Protection Agency have decided to develop a National Strategy for Sustainable Wind Power Development. The strategy aims to produce wind power planning tools for the municipal and regional levels. In addition to the Swedish Energy Agency and the Swedish Environmental Protection Agency, the Swedish Armed Forces, the Swedish Sami Parliament, Svenska kraftnät, as well as other public and private actors are involved in the strategy.

9:50-10:10   Wind energy as the backbone of future electricity systems – *Hannele Holttinen, operating agent, Task 25 of IEA Wind, Recognis Oy*

The pathways for decarbonization show many power systems moving towards 100% renewables, and countries with no access to hydro power becoming dominated by wind and solar energy. What are the challenges faced when some days, weeks or months almost all of the electricity demand will be produced by wind and solar? What is the status of the technologies, and knowledge gaps with research needs for future power and energy systems?

10:10-10:30   Panel discussion

PARALLEL SESSION A – 1 INNOVATION AND ENTREPRENEURSHIP
MODERATOR: PIERRE-JEAN RIGOLE

10:45-11:05   The future wind turbine tower is higher, climate positive, and built with wood –
Maria-Lina Hedlund, Modvion AB

Higher wind turbines improve cost efficiency and enables wind power growth.
Building wind towers in wood instead of steel reduces the lifecycle CO_2 emissions by
more than 25%. By building tall, modular wooden towers, wind power has the
potential to become carbon neutral, more cost-efficient, and built where the
electricity is needed.

11:05-11:25   Innovative IoT connectivity to clamp load by TensionCam – *Christer Lundh,
TensionCam Systems AB*

New IoT connectivity to clamp load of bolts innovation offered by TensionCam. Secure
right clamp load at installation of a wind turbine. Remote monitoring of stresses
during operation, significantly reduce or eliminate onsite reoccurring inspections and
retightening.

11:25-11:45   Floating wind designed for offshore – *Martin Rosander, SeaTwirl AB*

SeaTwirl is developing a vertical axis floating wind turbine. Floating wind power is
projected to contribute significantly to the necessary change of the world's energy
systems towards a more sustainable future. SeaTwirl is unique in that the complete
system consisting of the turbine, the generator and the floater are developed
together simultaneously - with the special challenge of producing energy far offshore
in mind. The presentation will focus on the technical challenges and the chosen
solutions.

11:45-12:00   Open discussion

PARALLEL SESSION A – 2 INTEGRATION OF WIND POWER INTO THE ELECTRICITY GRID
MODERATOR: SARA FOGELSTRÖM

10:45-11:05 Frequency services from wind power in the Swedish power system – *Ola Carlson, Chalmers Tekniska Högskola*

To keep the power system stable we need to have an almost constant frequency by controlling the electric power production. In Sweden this is done by hydro power today. But the wind turbines are also able to do this power production control. This project will investigate and develop frequency control by wind turbines, make a survey of how this is done worldwide, operate Chalmers wind turbine with the developed frequency control algorithms and operate commercial wind turbines in frequency control mode as well as be a part of the frequency control market.

11:05-11:25 Let wind power support power system restoration! – *Olof Samuelsson, Lund University*

Today wind turbines are inactive in the event of a blackout. But wind turbines are actually very capable to provide various types of power system support. A recently started project will develop automation and operational procedures that permit wind power to support power system restoration, which will substantially improve resilience of rural electricity supply.

11:25-11:45 On harmonic interaction in offshore wind power plants – *Massimo Bongiorno, Chalmers*

An increasing amount power-electronically interfaced renewable energy sources, especially wind power, are being connected to the power systems. However, the complex interaction between the interfaces of the wind turbine generators (particularly their converter controls), cable systems and other controllable devices connected to the grid can give rise to unwanted harmonic and resonance phenomena as well as in-proper control or protection action. The aim of this project is to provide an insight of harmonic stability in power-electronically dominated systems and to suggest design guidelines and recommendations to minimize the risk for system instability. This will ease the interoperability of multivendor systems, thereby facilitating large penetration of wind power without compromising the secure operation of the power system.

11:45-12:00 Open discussion

PARALLEL SESSION A – 3 THE CLIMATE'S IMPACT ON WIND ENERGY
MODERATOR: STEFAN IVANELL

10:45-11:05   A complete model chain for icing – *Johan Revstedt, Lund University*

The presentation will focus on the modeling of blade ice and its resulting issues. The project presented is focusing on the full model chain, i.e., meteorological conditions for icing (SMHI) to ice accretion on the blades (LTH) to finally modeling of the full rotor with ice (UU).

11:05-11:25   Experiences from stage 2 of the de-icing project **–** *Sven-Erik Thor & Kjell Lindskog, Lindskog innovations.*

This presentation will give information about the latest development of the new and innovative anti-icing system. It has a potential for being a system for retrofitting existing blades as well as to be incorporated in initial production of blades. The project has contributed to the development of the different sub-systems and interaction between them. The system now meets TRL level 7, at least.

11:25-11:45   Klimpen - The climate's impact on the energy system **–** *Gustav Strandberg, SMHI*

The project comprises the impact of climate change on the energy system, including e.g. wind, hydro, solar, nuclear and the power grid. The subproject that will be presented focuses on the climate's impact on wind power and what measures can be taken to manage them.

11:45-12:00   Open discussion

PARALLEL SESSION B – 1 WIND RESOURCES AND CFD MODELLING
MODERATOR: STEFAN IVANELL

13:00-13:20 Towards Efficient High-fidelity Simulations of Wind Farms **–** *Henrik Asmuth, Uppsala University*

The presentation will focus on novel model approaches for farm modeling. The so called lattice Boltzmann method (LBM) has become a promising alternative to classical computational fluid dynamics approaches. This is largely due to its excellent computational performance. Recent efforts show that the method can facilitate a wider applicability of high-fidelity fluid dynamics simulations, particularly large-eddy simulations, in the field of wind energy.

13:20-13:40 Validation of forest modelling – NEWA **–** *Stefan Ivanell, Uppsala University*

Experience of wind resource modelling in forested areas, development and verified within the NEWA project, will be presented. In addition, the latest development results of non-neutral boundary layer modelling of wind energy in forested areas will be shown.

13:40-14:00 Recent reanalyses: a tight race over the Baltic Sea for low level jet **–** *Christoffer Hallgren, Uppsala University*

The winds over the Baltic Sea are strongly affected by the surrounding land, creating mesoscale conditions that are important to take into consideration when planning for new offshore wind farms. Using LiDAR data from four sites we have analyzed the performance of four state-of-the-art reanalyses (MERRA2, ERA5, UERRA, NEWA) in terms of general wind characteristics and with special focus on low-level jets, a mesoscale phenomenon that is very frequent over the Baltic Sea during late spring.

14:00-14:15 Open discussion

PARALLEL SESSION B – 2 SOCIETAL AND ENVIRONMENTAL IMPACTS OF WIND POWER
MODERATOR: ÅSA ELMQVIST

13:00-13:20   A democratic foundation for windpower planning – *Karin Hammarlund, Samskapet*

13:20-13:40   Windpower and caipercaillie – *Julia Taubmann & Henrik Andrén, SLU*

We will describe the influence of wind turbines on capercaillie. We have used radio-marked capercaillies to study resource selection. Capercaillies were less likely to use areas close to wind turbines. We have also done a presence – absence surveys of capercaillie in control areas (i.e. without wind turbines) and impact area (i.e. with wind turbines) and found no general difference between the two area, but presence of capercaillie decreased close to wind turbines. We could not detect any differences in productivity (chicks per hen) in capercaillie between the control and impact areas.

13:40-14:00   Eagle Watch – intelligent technology eliminates collisions between large birds and wind turbines – *Andreas Wickman, Wickmann Wind AB*

The presentation will briefly describe the installation of and the first eight months experience of a camera-based bird protection system. The system is delivered by the US company IdentiFlight International LLC and located in the heart of the 30 years old windfarm at Näsudden on the Swedish island Gotland. By recognizing a protected bird with a flight direction towards or proximity to a close by turbine the system can shut down the specific turbine in sufficient time and consequently avoid a collision.

14:00-14:15   Open discussion

PARALLEL SESSION B – 3 WIND POWER TECHNOLOGY AND OPERATION
MODERATOR: SARA FOGELSTRÖM

13:00-13:20 Sustainability and buildability considerations for the design of wind turbine foundations – *Alexandre Mathern, CTH, NCC AB; Jesús Armesto Barros, NCC AB*

Wind turbine foundations are very large structures, which are associated with significant sustainability impacts and construction challenges. A tool to optimize the design of reinforced concrete wind turbine foundations is being developed, which allows to take into account sustainability and buildability aspects in the early-design process. The tool integrates parametric FE calculations, verification of Eurocode structural design requirements and multi-criteria decision-making.

13:20-13:40 Cleaner, cheaper, faster, smaller – Dynamic transformer rating to improve the wind energy future – *Kateryna Morozovska, KTH Royal Institute of Technology*

Dynamic rating of substation component has a potential to minimize need in investment for new wind farm projects as well as expand existing ones using already installed infrastructure. We work towards collecting more knowledge and develop better methods for planning and operation of wind farms connected to the grid with dynamic capacity using weather and load data.

13:40-14:00 ANM4L – Sun and wind for all – *Emil Hillberg, RISE*

Alternatives to traditional network expansion are needed to ensure sustainable development of the power grids. The objective of the project Active Network Management For All (ANM4L) is to demonstrate how alternative solutions can support integration of renewables. Solutions will exploit flexible network assets, enabling a secure increase in grid utilization, to avoid overload and maintain voltages in limits.

14:00-14:15 Open discussion

PARALLEL SESSION C – 1 THE ELECTRICTY MARKET – WHAT CAN WIND ENERGY OFFER?
MODERATOR: STEFAN IVARSSON

14:30-14:50 Electricity from new power plants – what does it cost? – *Mattias Wondollek, Energiforsk*

Electricity from new plants 2020 is an updated cost study that compares the cost of building new electricity production in Sweden. A difference compared to previous studies is the focus on system costs. The study is expected to have a great public interest and previous reports have been frequently referred to in the political debate on the future energy mix.

14:50-15:10 Agent-based modeling of wind farm bidding in electricity markets – *Priyanka Shinde, KTH*

Renewable energy sources are inherently stochastic in nature and as a result might lead to high balancing costs. Allowing trade closer to the time of delivery of electricity is a potential solution. Intraday electricity markets provide this possibility to the market participants to trade in the market based on the updated forecast. Therefore, we have proposed an agent-based approach to model the behavior and interaction of different market participants in the intraday electricity markets.

15:10-15:30 Potential and costs for wind power of providing system services to the electricity grid – *Anders Wickström, RISE*

Results from the project Wind power's potential and costs for system services for the electricity grid show that there may be a power reserve of more than 1,000,000 kW that wind power, in less than one second, could supply to support the electricity grid when needed. That rapid power increase can be maintained for five seconds. Thereafter, the wind turbines need to return to normal production. The secret lies in adapting the control algorithms and running the turbines at a slightly higher rotor speed than normal.

15:30-15:45 Open discussion

PARALLEL SESSION C – 2 RECYCLING AND REPOWERING
MODERATOR: ÅSA ELMQVIST

14:30-14:50   State of the art within recycling of turbine blades – *Liu Yang, University of Strathclyde*

Developing a commercially viable route to recycling end-of-life wind turbine blades is one of the most important challenges facing wind industry. This presentation provides an overview of different options that have been investigated and the most recent development in this area by the Advanced Composites Group at the University of Strathclyde.

14:50-15:10   Circular economy and the management of end-of-life wind turbines blades – *Tanja Tränkle, RISE*

An overview on today's circular economy actions for wind turbine blades made of glassfibre reinforced polymer composites all the way from maintenance and repair to recycling, including an estimate on expected volumes in Sweden. The presentation closes with strategies for an increased sustainability of wind turbine blades in the future.

15:10-15:30   Chemical recycling of end-of-life wind turbine blades by solvolysis/HTL – *Cecilia Mattsson, RISE*

The focus of this contribution is to highlight the challenges of chemical recycling of End-of-Life glass fiber composite (GFRP) waste from wind turbine blades utilizing solvolysis/HTL (hydrothermal liquefaction) methods based on subcritical water as solvent. In the present study, the solvolysis process for GFRPs based on sub/supercritical water at 250-370 °C and 100-170 bar process conditions with catalyst (acid and base) and additives (alcohols and glycols) was studied and optimized. The samples used are representative for End-of-Life wind turbine blades.

15:30-15:45   Open discussion