

New and Ongoing Wind Power Research in Sweden 2016

A compilation of Swedish research programs and
new scientific publications on wind energy



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Front page: *Wind power plants at Näsudden on Gotland were replaced in 2011. The new wind turbines from Vestas have a capacity of 3MW, with a hub height of 80m and a rotor diameter of 90m.*

Photo: Maria Klemm.

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www.natverketforvindbruk.se

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1. Introduction

Uppsala University Campus Gotland annually publishes a summary of current wind power research in Sweden. The summary is published in both printed form and on the website of the National Network for Wind Utilization.

This compilation is divided into two sections. The first is a presentation of the research centers and research programs active in wind power research in Sweden. Then a topic-based list of wind power research published in 2016 follows where at least one of the authors is active at a Swedish university. Here you will also find doctoral and licentiate theses as well as theses at the bachelor's and master's levels that have been published during the year. All have direct online links to the publications. This year this report also includes tables which compile the new publications and their comments.

The data for this report is taken from various databases and websites, and also from direct contact with universities, researchers and representatives of the various programs. We would like to take this opportunity to thank everyone for your contributions and help. To complete this report for the coming year, we would like to receive more tips and contributions.

Uppsala University Campus Gotland is the node with responsibility for education and competence building within the National Network for Wind Utilization which is financed by the Swedish Energy Agency. The 2016 summary of current wind power research is part of this task.

All editions of *New and Ongoing Wind Power Research* are published on the website of the Network for Wind Utilization, where both the English and Swedish versions are available.

2. Research programs and research centres

In Sweden there are several universities and colleges engaged in research related to wind power. The research is broad and deep and covers technical development, operational solutions, environmental impacts, acceptance and power issues and applies to both onshore and offshore wind power. This summary describes the 2016 operations at two research centres and three state programs that provide funding for wind power research. The aim is to provide a clear picture of Swedish wind power research in 2016.

2.1. Vindval

Vindval is a program whose research is focused on wind power's impacts on the marine environment, plants, animals and landscape. The program is a co-operation between the Swedish Energy Agency and the Swedish Environmental Protection Agency and is led by a board with representatives from both authorities. The board is assisted by a reference group with experts in the focus areas covered by the program.

The program started in 2005 and is now in its third stage which runs until the 30th of June 2018. The projects within this phase continue with the goal of knowledge building and follow up and convey experiences from parks that are in operation. Vindval also works to increase contact with other countries in order to achieve an effective international knowledge transfer. In previous phases, Vindval had a total of thirty research projects, four synthesis projects and sixteen films. Projects within the program were mainly conducted in four areas: people's concerns when wind power is established, impact on birds and bats, marine life and finally on land living mammals. The results of this research can be used as a basis for environmental impact assessments and in planning and approval processes for wind power. Booklets and short information films that are developed refer to a broad audience and can be used, for example, in consultation.

In stage three, the current research is being conducted on how people experience sound in two research projects, both of which will be ready by the end of 2017. Four projects related to wind power and bats which started from 2016 will continue in 2017.

Below are the current projects from Vindval:

[Vindval's progress report 2016: Wind power in society](#)

The 2016 progress report presents new research projects decided in 2015. It also provides insight to issues outside the Vindval program which are connected to wind power and the environment: technical solutions aimed at reducing the risks for birds, energy systems and environmental impacts as well as international work on wind power and the environment. The report was published in February 2016.

[The importance of social affluence in the permission application for wind power](#)

This report analyses how community benefits are valued in wind power licensing processes. According to the report, there is clearer scope in the legislation to take into account the negative effects of wind power than to take into account the positive effects. The authors propose a change of rules so that the environmental benefits of wind power, and other similar activities, must also be done in the application of permits.

Authors: Kristina Ek, Associate Professor in Economics, Lars Bäckström, File Dr. and Scientific Researcher, and Maria Pettersson, Professor of Law. The authors are active at the Luleå University of Technology. The project was completed in 2016 and the report was published in January 2017, report no. 6738.

[Cumulative effects of exploitation on reindeer husbandry - what needs to be done in permission processes](#)

The report contains a case study with Vilhelmina Northern Sami which shows a significant loss of grazing area, measured in the overall disturbed area. The project also included a participatory policy analysis with contributions from officials from licensing authorities. The purpose was to identify proposals for measures to improve the consideration of the cumulative effects in the permission processes. Authors: Rasmus Kløcker Larsen (SEI), Kaisa Raitio, Per Sandström, Anna Skarin, (SLU) Marita Stinnerbom, Jenny Wik-Karlsson (SSR), Stefan Sandström (SLU), Carl Österlin (SU), Yann Buhot (SLU). Report No. 6722 (2016).

The report is part of the project “How does wind power affect the choice of pasture area in the operational phase - consequences for the reindeer and Sami reindeer husbandry”. The report is published in SLU's report series; see [Reindeer and Wind Power II - wind power in operation and effects on reindeer and reindeer husbandry](#)

[Underwater sound control regulation](#)

Sweden currently has not set regulations for underwater noise levels, the point when the noise levels become so high and it can injure animals in the ocean. In the report *Underwater sound control regulation* (Report No. 6723, 2016), the authors provide suggestions on noise levels for injury and negative impacts that can be used to establish limit values for subsea noise adapted for Swedish waters and species.

The report contains technical descriptions of pile activities, underwater acoustics, sound propagation and impact on porpoises, cod and herring, fish eggs and fish larvae. Authors: Mathias H. Andersson (FOI), Sandra Andersson, Jimmy Ahlsén (Marine Monitoring), Brodd Leif Andersson (FOI), Jonathan Hammar (Marine Monitoring), Leif KG Persson, Jörgen Pihl, Peter Sigray (FOI), Andreas Wikström Monitoring).

[Control program for wind power in water - compilation and review, as well as recommendations for the design of control programs](#)

The information from existing control programs for wind power in water with a focus on Sweden, Denmark, Great Britain, the Netherlands and Belgium is used in the report to make recommendations for the design of wind power control programs in water. Authors: Carolina Enhus, M.Sc. Aquatic Ecology, Hanna Bergström, B.Sc. Biology, Roger Müller, fil.dr limnology, Martin Ogonowski, file. Dr. Aquatic Ecology, as well as Martin Iseus, File. Dr. Marine Ecology. All of which worked at the Aquabiota Water Research center. The project ended in 2016, the report was published in January 2017, report no. 6741.

[Significance of habitats of the golden eagles, biotope selections and movements - Stage 2](#)

The report describes biotope selection, flight altitude and movement patterns for golden eagles with GPS transmitters studied during 2011-2015 in northern Sweden. Detailed studies showed that the eagles flew higher when near wind turbines than when they were outside the park, though they

seem to continue to use the area after the establishment of wind power. Authors: Navinder J Singh, SLU Umeå, Tim Hipkiss, SLU Umeå and Enviroplanning AB, Frauke Ecke, SLU Umeå and SLU Uppsala, and Birger Hörnfeldt, SLU Umeå. The project ended in 2016, the report was published in January 2017, report no. 6734-2.

The project “Study of control programs of noise at wind power turbines” has investigated and categorized control programs and reports relating to immune and emission measurements of wind noise. The study also includes producing checklists on what should be included in sound control programs. Project leader is Karl Bolin, KTH. Project Reporting: September 30, 2016, the report was published in March 2017, Report No. 6739.

Vindval also publishes a newsletter six times a year and is available on homepage.

[Sign-up for the Vindval newsletter](#)

[Vindval Homepage](#)

[Ongoing research projects 2017-2018 \(pdf\)](#)

[Videos of Vindval's full-day seminar in November 2016 with presentations of current projects](#)

2.2. Vindforsk IV

The program Vindforsk IV is set to run between 2013 and 2017. The aim of this program is to contribute to the skills and knowledge needed to plan, build and operate wind farms and to adapt the facilities and power system to a situation with an increasing share of wind power.

Vindforsk is a joint program between the Energy Agency and companies' active in the wind power field through the non-profit company Elforsk. The program has been funded 50 % by the industry and 50 % by the Swedish Energy Agency.

Vindforsk IV is structured into three business areas: Wind Resources; Project development and Establishment; Operation and Maintenance. The program also addresses wind power in the electrical system. At present 18 research projects are being conducted in areas that include wind turbine de-icing, gearbox maintenance, frequency regulation and synthetic inertia.

These ongoing projects include studies of how the topography of the surrounding landscape as well as how other wind turbines affect the production and the long-term maintenance needs for both individual turbines as well for wind power farms. For instance, how does one predict how production is effected by surrounding forested land? What wind conditions actually have the greatest impact on individual components of a wind turbine? Another issue that may affect production and maintenance needs is the formation of ice on the rotor blades. One of the ongoing research projects examines whether hot water dispersed from a helicopter can be used to remove ice from rotor blades.

Vindforsk IV, in addition to the above mentioned activities, also includes research on how wind turbines and electrical systems can be adapted to cope with a larger proportion of wind power in the Nordic electrical grid.

Vindforsk IV has its roots in the wind power research started in 1975 with funding from a Swedish government energy research program. Research has continued in a number of different programs

and with different focuses. Vindforsk IV has the same main focus areas as its predecessor Vindforsk III, which ran between 2009 and 2012.

Reports from the wind research projects in Vindforsk are available via their homepage where it is also possible to sign up for their newsletter.

From 2017, Vindforsk will be part of the Energy Agency's new wind power research program VindEL. You can read more about VindEL in chapter 2.4 of this report.

There is also a plan for an industrial consortium that would form industrial and academy cooperation after Vindforsk IV ends.

[Vindforsk via Elforsk](#)

[Vindforsk via Energiforsk](#)

[Report 2016:311. Projects in Vindforsk 2015 \(pdf\)](#)

2.3. Wind Power in Cold Climate

In the program Wind Power in Cold Climate (Vindkraft i kallt klimat), the Swedish Energy Agency funds research on wind turbine icing. This research includes development of methods to predict ice coverage on wind turbines, how icing influences production and technical developments aimed at preventing icing. The program also includes research on environmental and safety concerns related to wind power in cold climates. The Wind Power in Cold Climate program started in 2013 and continued through 2016.

The long-term goals of the program have been to encourage and simplify the transition of the Swedish energy system, that Swedish research should be at the forefront of developing special knowledge in wind power in cold climate, facilitate the establishment of larger wind power parks in northern Sweden during the next decade and to address the challenges that arise when managing wind power in colder areas.

Accumulation of ice on turbine blades can lead to production losses, safety hazards and increased sound emissions. Low temperatures mean increased demands on construction materials. These factors lead to relative uncertainty when predicting energy costs and operational reliability in areas with a cold climate.

Production losses and ice accumulation caused by a combination of low temperatures and high humidity is not only a problem in northern Sweden but can occur in all of northern Europe. Even from a wider international perspective there is a need for more knowledge about the planning and management of wind power in cold climates. Even though nearly 20 GW of wind power capacity has been installed around the world in areas with a cold climate the knowledge about how to tackle these challenges are still mainly based on experience rather than scientific study.

The program has also been aimed at promoting the building of appropriate academic skills which will contribute to a necessary knowledge base for continued progress, primarily in research and development, in collaboration between academia and industry in cold climate application areas. It also aimed to promote the development of technical solutions that correspond to the issues which make it difficult and delay the establishment of wind power in cold climate.

In the fall of 2014 the Swedish Energy Agency decided to fund 10 projects focused on wind power in cold climates. From 2017, the program will continue within VindEL, which is the Energy Agency's new program for wind power research projects. Read more in Chapter 2.4.

[More on Wind Power in cold climate](#)

During 2016, the following projects were completed in the Wind Power in Cold Climate Program:

[ICETHROWER - Mapping and tools for risk analysis](#)

Project time 2013-10-01--2016-09-30. The project aimed to develop calculation models which can be used by wind power stakeholders in Sweden to analyse the risks of staying in or near a wind farm during wintertime when ice throw and ice crash can occur. The project consists partly of gathering empirical data from three wind farms in Sweden and partly by developing a physical and statistical model for risk calculation.

[Sound impact of ice on wind turbines – Long term measurements of sound for verification](#)

Project time 2013-09-01--2016-03-31. The project concerned long-term measurement of noise emissions from wind turbines, by measuring wind turbine noise with or without de-icing systems in four different wind farms. The overall purpose is to verify how rotor blade degradation affects the noise emission, i.e. the sound impact experienced by nearby real estate. Reliable values of noise emission are important for projectors and operators as well as designers of de-icing systems.

[Imaging method for determining the air content of liquid water particles](#)

Project time 2013-09-01--2016-12-31. The project intended to provide a direct method for determining the air's content of liquid water, LWC, and droplet size, MVD. These parameters are critical to the meteorological conditions which control the icing process, and tools to directly determine them are missing today. By measuring the parameters, both calculations of icing and new ice-measurement tools can be obtained. The method will utilize imaging technology and advanced sensors, and also will be tested in a climate chamber within the project framework. The aim is that the instrument should work in real conditions and be able to commercialize. Sponsors are Mittuniversitetet and Combitech, which manufactures wind turbine measuring instruments. The project contributes to more reliable measurement methods than those which are currently available.

[Wind turbines in cold climate: Current mechanics, ice formation and terrain effects](#)

Project time 2013-09-01--2018-06-30. The project aims to increase knowledge about how degradation affects noise from wind turbines, as well as how noise diffusion is affected by snow or ice formation on the ground, the nature of the terrain and temperature variations. The project will also investigate whether acoustic measurements can be used to detect the degree of icing. The results of this research will be used to develop freely available simulation tools and models implemented in open source tools.

[Ice detection for smart de-icing of wind turbines](#)

Project time 2013-09-01--2016-12-31. The project aimed to develop a new technology based on acoustic waves and laser (AWL), for detecting ice formation on rotor blades. The technology is based on combining two different methods of ice detection, thus enabling more efficient de-icing. An executive group consisting of persons from Chalmers University of Technology, the Chalmers Industrial Engineering Foundation and WindVector AB will develop theoretical models, methods and algorithms as well as build a demonstrator for an AWL based sensor system.

[Active de-icing of wind turbine blades with advanced surface coatings](#)

Project time 2013-09-01--2015-08-31. The project aimed to develop a new de-icing technology for wind turbine blades. The technology is based on the heating of a thin surface layer through the absorption of microwaves. The microwave absorbent layer is covered by a surface coating with good characteristics for passive de-icing. The display system is said to provide significantly lower energy consumption than conventional de-icing systems. The project also includes tests and documentation regarding compliance with safety requirements regarding, for example, level of radiation at ground level. Final report published 2016.

[Vibration and loads of wind turbines with ice load](#)

Project Time 2013-09-01--2017-10-31. The project concerns research in ice formation, flow mechanics, structural dynamics and load monitoring to contribute to the development of technical solutions for cost-effective construction, operation and maintenance of wind power in cold climate. Through national and international collaboration, the research team will develop methods for the simulation of ice growth, flow of ice-rudder blades, linear and nonlinear dynamics as well as cargo monitoring.

[Modeling of icing and production losses](#)

Project Time 2013-09-01--2018-02-28. Weather models used by Sweden's meteorological and hydrological institutes, WeatherTech Scandinavian AB and Uppsala University will be refined with focus on parameterization of cloud physics and turbulence. The aim is to optimize the models' ability to calculate depletion and production loss of wind turbines operating under de-icing conditions. The project is expected to contribute to safer assessments of ice events and production losses.

2.4. VindEL

VindEL is the Swedish Energy Agency's new research and innovation program in wind power. The program starts in 2017 and it indicates that the Agency is taking a holistic approach to wind farm operations. The program can also be seen as a continuation of the previous programs Wind power in cold climate and Vindforsk IV which, together with Vindval, are the primary research efforts in wind power that are sponsored by the Swedish Energy Agency.

The program's goal is to contribute to the wind energy impact targets that the Energy Agency points out in its wind power strategy:

- Wind power is an important part of the Swedish electricity supply.
- Wind power contributes to the climate, business development and stability of the electricity system.
- The operation and expansion of wind power takes into account social, ecological and economic sustainability.

VindEL aims to contribute to the transition to a sustainable and renewable energy system through research and development of technologies, systems, methods and issues related to wind power. The program has three overall priority areas of action:

1. Wind power in Swedish conditions
2. Long-term sustainability
3. Integration into the electrical system

VindEL has funding of 133 million SEK which is spread over five years, ending 2021. As with the Energy Agency's other research and innovation programs, a large portion of the programs funding will be distributed to projects through research calls. The first announcement will be for approximately 50 million SEK and has the closing date of the 20th of June 2017. Accepted research projects will begin in November 2017 at the earliest and could continue until 31 December 2021.

[The first announcement in VindEL](#)

[More about VindEL](#)

2.5. STandUP for Wind

STandUP for Wind is a research center for the establishment and development of wind energy in Sweden. The center is a collaboration between the Royal Institute of Technology KTH, Uppsala University, Luleå Technical University and the Swedish University of Agricultural Sciences within the framework of the government's strategic research area STandUP for Energy.

STandUP for Energy was formed in 2009, following a government decision to allocate funds to universities and colleges for the development of 24 research areas which were considered strategically important. One of these areas was renewable electricity generation on a larger scale and its integration into the power grid. Within this framework, wind farms were gathered in the research center STandUP for Wind, where the goal is to facilitate the development towards a larger proportion of electricity from wind power in the grid through interdisciplinary working methods.

Researchers from the respective higher education institutions meet regularly and exchange knowledge and experience. Within the framework of STandUP for Wind, there is also a knowledge exchange with companies in the wind power industry. The aim is to ensure that research is done on the issues which are most important for industry to solve and that the research results reach relevant recipients.

STandUP for Wind, which aims to facilitate the conversion to renewable energy sources and the development of the needed network conditions, has profiled itself a leader in project development and planning of wind farms in Sweden. The Center's research topics range from how the wind is generated to how electricity is integrated into the Swedish grid.

In an evaluation initiated by the Swedish Energy Agency, STandUP for Wind has been identified as a strong research environment with special strengths around both project development and grid conditions.

Projects are currently underway in the following areas:

- Wind mapping and cold climate
- Current mechanics for wind turbines in parks and forests
- Electrical systems
- Sound
- Vertical wind power systems
- Generators and control systems
- Landscape and participatory planning
- Operation and maintenance

[STandUP for Wind](#)

2.6. Swedish Wind Power Technology Centre

Swedish Wind Power Technology Centre (SWPTC) was founded in 2010 with the goal of strengthening competence in wind power technology in Sweden, at a time when the international market for wind power technology was rapidly expanding. Today SWPTC focuses on improving the construction of wind turbines in ways that optimize the costs of manufacturing and maintenance. The center also seeks to gather sufficient knowledge about components and systems that will make possible the development and production of both components of wind turbines as well as entire wind turbines in Sweden.

SWPTC assists the wind power industry with knowledge about construction questions and the education of engineers. SWPTC is led by Chalmers Technical University and run in cooperation with Luleå Technical University as well as companies in the wind power industry.

At present, stage 2 of the Centre is ongoing. This second stage has funding until September 2018 when the current projects should be completed. Planning for stage 3 is in progress and it will begin in October 2018.

The research at SWPTC is focused on major wind farms in forested, mountainous and offshore areas and it is conducted within six thematic groups reflecting the design and operation of wind turbines. These are:

- Electricity and control systems
- Turbine and wind load
- Mechanical power transmission and system optimization
- Ocean-based
- Maintenance and reliability
- Cold climate

In 2016, the following six new SWPTC projects began:

- Wind turbines with difficult operating conditions
- Wind power in forests - Impact of forest glades
- Driving dynamics modelling based on data from monitoring systems,
- Analysis of floating wind farms
- Optimal maintenance of wind turbines
- Increased availability of de-icing equipment on wind turbine blades.

In two of the projects, life-time calculations for components and wind turbines as a whole are included.

[SWPTC via Chalmers](#)

2.7. Summary

The various research programs and research centers presented in this report provide a picture of what is happening in wind power research in Sweden. The Swedish Energy Agency is a main financier for Vindval, Wind power in cold climate, for the new VindEL program and provides partial financing for Vindforsk IV.

Vindval is collaboration between the Swedish Energy Agency and the Swedish Environmental Protection Agency with a focus on the impacts of wind power on people, nature and the environment. Vindforsk IV has a technical focus and is financed by the Swedish Energy Agency and the wind power industry through Energiforsk. Wind power in cold climate has a clear focus on the challenges for wind power in cold areas.

In 2017 the Swedish Energy Agency will collect its wind power research into the new VindEL program. This will provide a holistic approach to the continuation of previous Vindforsk and Wind power program in cold climate. There is also a plan for an industrial consortium for industry-academic cooperation that can take place after completion of Vindforsk IV.

STandUP for Wind is a research center which is collaboration between the Royal Institute of Technology, Uppsala University, Luleå Technical University and the Swedish University of Agricultural Sciences. Here, wind energy research targets a goal of facilitating development towards a larger proportion of electricity from wind power in the grid through interdisciplinary approaches.

SWPTC is run by Chalmers Technical University in collaboration with Luleå University of Technology. Its research aims to strengthen expertise in wind power technology to meet the needs of the rapidly expanding global wind power industry. The focus of the Centre is on the development of wind turbine construction that optimizes the cost of both manufacturing and maintenance.

3. Published scientific articles and reports

3.1. Financing, electricity market

[Business Model Innovation for Internationalization: The Case of the Chinese Wind Turbine Manufacturer Envision](#)

Danilovic, M. et al. Asia Pacific Journal of Advanced Business and Social Studies, ISSN 2205-6033, Vol. 2, no 3, 57-68 p. Halmstad University 2016

[Invention, innovation and diffusion in the European wind power sector](#)

Grafström, J. et al. Technological forecasting & social change, ISSN 0040-1625, E-ISSN 1873-5509, Vol. 114, 179-191 p. Luleå University of Technology 2016

[Mapping key economic indicators of onshore wind energy in Sweden by using a geospatial methodology](#)

Siyal, S. et al. Energy Conversion and Management, ISSN 0196-8904, E-ISSN 1879-2227, Vol. 128, 211-226 p. Royal Institute of Technology 2016

[Techno economic and environmental assessment of wind assisted marine propulsion systems](#)

Talluri, L. et al. Ocean Engineering, ISSN 0029-8018, E-ISSN 1873-5258, Vol. 121, 301-311 p. Cranfield University, United Kingdom 2016

3.1.1. Conference

[Forecasting Balancing Market Prices Using Hidden Markov Models](#)

Dimoukias, I. et al. 13th International conference on the European Energy Market (EEM), IEEE conference proceedings, 2016. Royal Institute of Technology 2016

[Economic Impact Assessment of using Congestion Management Methods to enable increased Wind Power Integration on Gotland, Sweden](#)

Gliniewicz, V. et al. Conference paper. Vienna, Austria: Wind integration workshop, Vattenfall R&D 2016

[On the flexibility of electricity consumers: Introducing notice time](#)

Herre, L. et al. Conference paper. 13th International Conference on the European Energy Market (EEM). Royal Institute of Technology 2016

[On the flexibility of electricity consumers: Modelling, Quantification and Analysis of Notice Time](#)

Herre, L. et al. Conference paper. Swedish Association for Energy Economics (SAEE) Conference 2016, Luleå. Royal Institute of Technology 2016

3.2. Wind resources, energy calculations

[Statistics of LES Simulations of Large Wind Farms](#)

Andersen, S.J. et al. Journal of Physics: Conference Series Vol. 753, (3), 032002, 2016. doi: 10.1088/1742-6596/753/3/032002. DTU 2016

[A linearised numerical model of wind-farm flows](#)

Ebenhoch, R. et al. Wind Energy. doi: 10.1002/we.2067. University of Stuttgart 2016

[Wind Turbine Wake Modeling – Possibilities with Actuator line/disc approaches](#)

Ivanell, S. & Mikkelsen, R. Book chapter in: Alternative Energy and Shale Gas Encyclopedia. DOI: 10.1002/9781119066354.ch12. Wiley series on energy, 2016

[A Linearized k – e Model of Forest Canopies and Clearings](#)

Segalini, A. et al. Boundary-Layer Meteorology. (2016) 161: 439–460, doi: 10.1007/s10546-016-0190-5. Royal Institute of Technology 2016

[The actuator disc concept in PHOENICS](#)

Simisiroglou, N. et al. Energy Procedia / [ed] Tande, JOG; Kvamsdal, T; Muskulus, M, 2016, Vol. 94, 269-277 p. Uppsala University 2016

3.2.1. Conference

[Development of free vortex wake model for wind turbine wake aerodynamics under yaw condition](#)

Abedi, L. et al. 34th Wind Energy Symposium, 4-8 January 2016 San Diego, USA

[Wind Flow Resource Analysis of Urban Structures: A Validation Study](#)

Aihara, A. et al. 12th EAWE PhD Seminar on Wind Energy in Europe. Uppsala University 2016

[Validation of an Actuator Line Model Coupled to a Dynamic Stall Model for Pitching Motions Characteristic to Vertical Axis Turbines](#)

Mendoza, V. et al. STandUP for ENERGY Conference Uppsala, Uppsala University 2016

[Long-wave instabilities of two interlaced helical vortices](#)

Quaranta, H. et al. Journal of Physics; Conference Series, ISSN 1742-6588, E-ISSN 1742-6596, Vol. 753, no 3, 032022. Royal Institute of Technology 2016

[Validation of the actuator line and disc techniques using the New Mexico measurements](#)

Sarmast, S. et al. Journal of Physics; Conference Series, ISSN 1742-6588, E-ISSN 1742-6596, Vol. 753, no 3, 032026. Royal Institute of Technology 2016

[Validation of the actuator disc approach in PHOENICS using small scale model wind turbines](#)

Simisiroglou, N. et al. Journal of Physics; Conference Series, 2016, Vol. 753, 032-028 p. Uppsala University 2016

3.3. Design and loading of wind turbines

[Examination of the mechanism behind observed canopy waves](#)

Arnqvist, J. et al. Agricultural and Forest Meteorology, ISSN 0168-1923, E-ISSN 1873-2240, Vol. 218, 196-203 p. Uppsala University 2016

[Influence of Icing on the Modal Behaviour of Wind Turbine Blades](#)

Gantasala, S. et al. Energies, ISSN 1996-1073, E-ISSN 1996-1073, Vol. 9, no 11, 862. Luleå University of Technology 2016

[Improved design of tubular wind tower foundations using steel micropiles](#)

Matos, R. et al. Structure and Infrastructure Engineering, ISSN 1573-2479, E-ISSN 1744-8980, Vol. 12, no 9, 1038-1050 p. ISISE, University of Coimbra, Faculdade de Ciências e Tecnologia da Universidade de Coimbra 2016

[Noise Emission of a 200 kW Vertical Axis Wind Turbine](#)

Möllerström, E. et al. *Energies*, ISSN 1996-1073, E-ISSN 1996-1073, Vol. 9, no 1, 19. Halmstad University 2016

[Turbulence influence on wind energy extraction for a medium size vertical axis wind turbine](#)

Möllerström, E. et al. *Wind Energy*, ISSN 1095-4244, E-ISSN 1099-1824, Vol. 19, no 11, 1963-1973 p. Halmstad University 2016

[Observations of turbulence in a Kelvin-Helmholtz event on 8 September 2015 by the Magnetospheric Multiscale mission](#)

Stawarz, J. E. et al. *Journal Of Geophysical Research-Space Physics*, ISSN 2169-9380, Vol. 121, no 11, 11021-11034 p. Imperial College London 2016

[Dynamic Line Rating for Wind Power](#)

Talpur, S. et al. *Journal of Renewable and Sustainable Energy*, ISSN 1941-7012, E-ISSN 1941-7012, Vol. 8. S. Royal Institute of Technology 2016

[Wind turbine gearboxes: Maintenance effect on present and future gearboxes for wind turbines](#)

Ukonasari, J. & Bennstedt, N. Vattenfall & Autoinvent. ISBN 978-91-7673-279-3. Rapport 2016:279. Vindforsk 2016

[Extreme water-hammer pressure during one-after-another load shedding in pumped-storage stations](#)

Zeng, W. et al. *Renewable energy*, ISSN 0960-1481, E-ISSN 1879-0682, Vol. 99, 35-44 p. Wuhan University, China 2016

3.3.1. Conference

[Actuator line simulations of a Glauert and Tjereborg rotor using spectral element and finite volume methods](#)

Kleusberg, E. et al. *Journal of Physics: Conference Series* 753 (8), 082011, 2016. doi: 10.1088/1742-6596/753/8/082011. Royal Institute of Technology 2016

[Dynamic performance of the standalone wind power driven heat pump](#)

Li, H. et al. *Applied Energy Symposium and Forum, REM2016: Renewable Energy Integration with Mini/Microgrid*, Mälardalen University 2016

[Turbulence influence on optimum tip speed ratio for a 200 kW vertical axis wind turbine](#)

Möllerström, E. et al. *Journal of Physics; Conference Series*, ISSN 1742-6588; 753. Halmstad University 2016

[Aerodynamic noise prediction for a wind turbine using numerical flow simulations and semi-empirical modelling approaches](#)

Rasam, A. et al. 22nd AIAA/CEAS Aeroacoustics Conference, American Institute of Aeronautics and Astronautics, Trinity College Dublin Ireland 2016

[Detached-eddy simulation of a horizontal-axis wind turbine](#)

Rasam, A. et al. 6th Symposium on Hybrid RANS-LES Methods, Trinity College Dublin Ireland 2016

[Frequency analysis of tangential force measurements on a vertical axis wind turbine](#)

Rossander, M. The 6th international conference on “The Science of Making Torque from Wind”, Munich. Uppsala University 2016

[Approximate Bayesian Computation by Subset Simulation for Parameter Inference of Dynamical Models](#)

Vakilzadeh, M. K. et al. Model Validation and Uncertainty Quantification. Conference Proceedings of the Society for Experimental Mechanics Series. 34th IMAC Conference and Exposition on Structural Dynamics, Orlando, Florida 2016. (2191-5644). Vol. 3, p. 37-50. Chalmers University of Technology 2016

[Stochastic Finite Element Model Updating by Bootstrapping](#)

Yaghoubi, V. et al. Model Validation and Uncertainty Quantification, vol 3. Conference Proceedings of 34th IMAC Conference and Exposition on Structural Dynamics, Orlando, Florida, 2016 (2191-5644). p. 117-130. Chalmers University of Technology 2016

3.4. Electrical grids, integration into electrical grid, electrical power

[Study of Centralized and Distributed Coordination of Power Injection in Multi-TSO HVDC Grid with Large Off-shore Wind Integration](#)

Babazadeh, D. et al. Electric power systems research, ISSN 0378-7796, E-ISSN 1873-2046, Vol. 136, 281-288 p. Royal Institute of Technology 2016

[A Simplified Model for Predicting Primary Control Inadequacy for Nonresponsive Wind Power](#)

Chavez, H. et al. IEEE Transactions on Sustainable Energy, ISSN 1949-3029, E-ISSN 1949-3037, Vol. 7, no 1, 271-278 p. Royal Institute of Technology 2016

[Virtual Power Plant for Grid Services using IEC 61850](#)

Etherden, N. et al. IEEE Transactions on Industrial Informatics, ISSN 1551-3203, E-ISSN 1941-0050, Vol. 12, no 1, 437-447 p. STRI AB 2016

[An Importance Sampling Technique for Probabilistic Security Assessment in Power Systems with Large Amounts of Wind Power](#)

Hamon, C. et al. Electric power systems research, ISSN 0378-7796, E-ISSN 1873-2046, Vol. 131, 11-18 p. Royal Institute of Technology 2016

[Variability in Large-Scale Wind Power Generation](#)

Kiviluoma, J. et al. Wind Energy, ISSN 1095-4244, E-ISSN 1099-1824, Vol. 19, no 9, 1649-1665 p. Smart Energy and System Integration 2016

[Network-Constrained AC Unit Commitment Under Uncertainty: A Benders' Decomposition Approach](#)

Nasri, A. et al. IEEE Transactions on Power Systems, ISSN 0885-8950, E-ISSN 1558-0679, Vol. 31, no 1, 412-422 p. Royal Institute of Technology 2016

[Restoring the missing high-frequency fluctuations in a wind power model based on reanalysis data](#)

Olauson, J. et al. Renewable energy, ISSN 0960-1481, E-ISSN 1879-0682, Vol. 96, 784-791 p. Uppsala University 2016

[Simulating intra-hourly wind power fluctuations on a power system level](#)

Olauson, J. et al. Wind Energy, ISSN 1095-4244, E-ISSN 1099-1824. Uppsala University 2016

[Determining demagnetisation risk for two PM wind power generators with different PM material and identical stators](#)

Sjökvist, S. et al. IET Electric Power Applications, ISSN 1751-8660, E-ISSN 1751-8679, Vol. 10, no 7, 593-597 p. Uppsala University 2016

[A Comprehensive Review of Smart Energy Meters in Intelligent Energy Networks](#)

Sun, Q. et al. IEEE Internet of Things Journal, ISSN 2327-4662, Vol. 3, no 4, 464-479 p., 7365417. Mälardalen University 2016

[Simplified analysis of balancing challenges in sustainable and smart energy systems with 100% renewable power supply](#)

Söder, L. Wiley Interdisciplinary Reviews: Energy and Environment, ISSN 2041-8396, E-ISSN 2041-840X, Vol. 5, no 4, 401-412 p. Royal Institute of Technology 2016

[A Phase Measurement Unit Based Fast Real-Time Oscillation Detection Application for Monitoring Wind Farm-to-Grid sub-synchronous Dynamics](#)

Vanfretti, L. et al. Electric power components and systems, ISSN 1532-5008, E-ISSN 1532-5016, Vol. 44, no 2, 123-134 p. Royal Institute of Technology 2016

[Data Mining via Association Rules for Power Ramps Detected by Clustering or Optimization](#)

Yildirim, N. et al. Transactions on Computational Science XXVIII: Special Issue on Cyberworlds and Cybersecurity / [ed] Gavrilova, ML; Tan, CJK; Sourin, A, Springer Berlin/Heidelberg, 2016, 163-176 p. Uppsala University 2016

[Decompositions of harmonic propagation in wind power plant](#)

Yang, K. et al. Electric power systems research, ISSN 0378-7796, E-ISSN 1873-2046, Vol. 141, 84-90 p. Luleå University of Technology 2016

3.4.1. Conference

[Optimization and Experimental Validation of Medium-Frequency High Power Transformers in Solid-State Transformer Applications](#)

Bahmani, A. et al. 2016 IEEE Applied Power Electronics Conference, 2016, 8 p. RISE, SP – Sveriges Tekniska Forskningsinstitut, SP Mätteknik, Elektricitet 2016

[Hosting capacity of the grid for wind generators set by voltage magnitude and distortion levels](#)

Cundeva, S. et al. IET Conference Publications, CP711, 2016. 73-80 p. University of St Cyril and Methodius 2016

[The Influence of PM Material Properties on Choice of Generator Magnetic Circuit Topology](#)

Eklund, P. et al. Manuscript, XXII International Conference on Electrical Machines (ICEM), Uppsala University 2016

[Frequency Characterization of Type-IV Wind Turbine Systems](#)

Espinoza, N. et al. IEEE Energy Conversion Congress and Exposition (ECCE), Milwaukee, WI, 2016

[Short-term planning of hydro-thermal system with high wind energy penetration and energy storage](#)

Khastieva, D. et al. IEEE Power and Energy Society General Meeting, IEEE, 2016 Conference paper. Royal Institute of Technology 2016

[A Comparative Study of Techniques Utilized in Analysis of Wind Turbine Data](#)

Mazidi, P. et al. 7th China International Conference on Electricity Distribution (CICED 2016). Royal Institute of Technology 2016

[Harmonic mitigation in wind power plants: Active filter solutions](#)

Schwanz, D. et al. 17th International Conference on Harmonics and Quality of Power. Luleå University of Technology 2016

3.5. Operation and maintenance

[Effects of load variation on a Kaplan turbine runner](#)

Amiri, K. et al. International Journal of Fluid Machinery and Systems, ISSN 1882-9554, E-ISSN 1882-9554, Vol. 9, no 2, 182-193 p. Luleå University of Technology 2016

[Wind turbines' end-of-life: Quantification and characterisation of future waste materials on a national level](#)

Andersen, N. et al. Energies, ISSN 1996-1073, E-ISSN 1996-1073, Vol. 9, no 12, 999, Energi Funktion Komfort Skandinavien AB, 2016

[Airborne de-icing solutions for wind turbines](#)

Gedda, H. et al. Gedda Consulting AB & Alpine Helicopter AB. ISBN 978-91-7673-300-4. Rapport 2016:300, Vindforsk 2016

[Frequency Control Operation of Frequency Control Schemes in Power Systems with Large Amounts of Wind Power](#)

Hamon, C. et al. KTH. ISBN 978-91-7673-278-6. Rapport 2016:278. Vindforsk 2016

[Quantification of icing losses in wind farms Assessment and optimization of the energy production of operational wind farms: Part 3](#)

Hansson, J. et al. Kjeller Vindteknikk. ISBN 978-91-7673-299-1. Rapport 2016:299. Vindforsk 2016

[Post-construction production assessment of wind farms: Assessment and optimization of the energy production of operational wind farms: Part 1](#)

Lindvall, J. et al. Kjeller Vindteknikk. ISBN 978-91-7673-297-7. Rapport 2016:297. Vindforsk 2016

[Wind Turbine Prognostics and Maintenance Management based on a Hybrid Approach of Neural Networks and Proportional Hazards Model](#)

Mazidi, P. et al. Journal of Risk and Reliability, ISSN 1748-006X, E-ISSN 1748-0078. Royal Institute of Technology 2016

[Net load variability in Nordic countries with a highly or fully renewable power system](#)

Olauson, J. et al. Nature Energy, ISSN 2058-7546, Vol. 1, 1-8 p., 16175. Uppsala University 2016

[Liquid Water Content and Droplet Sizing Shadowgraph Measuring System for Wind Turbine Icing Detection](#)

Rydbloom, S. et al. IEEE Sensors Journal, ISSN 1530-437X, E-ISSN 1558-1748, Vol. 16, no 8, 2714-2725 p., 7384444. Mittuniversitetet

[Use of remote sensing for performance optimization of wind farms Assessment and optimization of the energy production of operational wind farms: Part 2](#)

Turkyilmaz, U. et al. Kjeller Vindteknikk. ISBN 978-91-7673-298-4. Rapport 2016:298. Vindforsk 2016

[On the Shaker Simulation of Wind-Induced Non-Gaussian Random Vibration](#)

Xu, F. et al. Shock and Vibration, ISSN 1070-9622, E-ISSN 1875-9203, 5450865. Beihang University 2016

3.5.1. Conference

[Analysis of SCADA data for early fault detection with application to the maintenance management of wind turbines](#)

Bangalore, P. et al. presented at Cigre Session 46, Paris, August 2016

[A Performance and Maintenance Evaluation Framework for Wind Turbines](#)

Mazidi, P. et al. International Conference on Probabilistic Methods Applied to Power Systems (PMAPS), Oct. 16-20, 2016 Beijing, China. Royal Institute of Technology 2016

3.6. Combinations of wind power, solar power and hydrogen production

3.6.1. Conference

[Evaluation of Solar PV and Wind Alternatives for Self Renewable Energy Supply: Case Study of Shrimp Cultivation](#)

Nookuea, W. et al. CUE2015-Applied Energy Symposium and Summit 2015: Low carbon cities and urban energy systems. Mälardalen University 2016

3.7. Planning

[Spatial optimization of residential urban district - Energy and water perspectives](#)

Campana, P. et al. Energy Procedia, ISSN 1876-6102, E-ISSN 1876-6102, Vol. 88, 38-43 p. Mälardalen University 2016

[Offshore wind farms' decommissioning: a semi quantitative Multi-Criteria Decision Aid framework](#)

Kerkvliet, H. & Polatidis, H. Sustainable Energy Technologies and Assessments, ISSN 2213-1388, E-ISSN 2213-1396, Vol. 18, 69-79 p. Uppsala University 2016

[Kumulativa effekter av exploateringar på renskötseln - vad behöver göras inom tillståndsprocesser](#)

Kløcker Larsen, R. et al. SEI, Vilhelmina norra sameby, SSR, SU, SLU. Rapportnr 6722 (2016). Vindval 2016

3.7.1. Conference

[GIS-based methods for sustainable wind power planning](#)

Byström, G. et al. Conference paper, Poster. Energy Dialogue. Royal Institute of Technology 2016

3.8. Regional development, public benefits

[A geospatial assessment of the techno-economic wind power potential in India using geographical restrictions](#)

Mentis, D. et al. Renewable energy, ISSN 0960-1481, E-ISSN 1879-0682, Vol. 97, 77-88 p. Royal Institute of Technology 2016

[The benefits of geospatial planning in energy access - A case study on Ethiopia](#)

Mentis, D. et al. Applied Geography, ISSN 0143-6228, E-ISSN 1873-7730, Vol. 72, 1-13 p. Royal Institute of Technology 2016

[Correlation between wind power generation in the European countries](#)

Olauson, J. et al. Energy, ISSN 0360-5442, E-ISSN 1873-6785, Vol. 114, 663-670 p. Uppsala University 2016

[Sustainable Energy Transitions in China: Renewable Options and Impacts on the Electricity System](#)

Sun, X. et al. Energies, ISSN 1996-1073, E-ISSN 1996-1073, Vol. 9, no 12, 980. China Univ Petr, Peoples R China 2016

3.8.1. Conference

[Introducing Multi-Criteria Decision Analysis for Wind Farm Repowering A Case Study on Gotland](#)

Bezbradica, M. et al. Proceedings of the 2016 International Conference Multidisciplinary Engineering Design Optimization (MEDO), Uppsala University 2016

[Framework for System Analyses of Smart Grid Solutions with Examples from the Gotland Case](#)

Wallnerström, C. et al. 2016 International Conference on Probabilistic Methods Applied to Power Systems (PMAPS), IEEE. Royal Institute of Technology 2016

3.9. Acceptance

[Objectively best or most acceptable? Expert and lay knowledge in Swedish wind power permit processes](#)

Larsson, S. et al. Journal of Environmental Planning and Management, ISSN 0964-0568, E-ISSN 1360-0559, Vol. 59, no 8, 1360-1376 p. Blekinge Institute of Technology 2016

3.10. Climate impacts

[Wind energy and green economy in Europe: Measuring policy-induced innovation using patent data](#)

Lindman, Å. et al. Applied Energy, ISSN 0306-2619, E-ISSN 1872-9118, Vol. 179, 1351-1359 p. Luleå University of Technology 2016

[Wind power activism: epistemic struggles in the formation of eco-ethical selves at Vattenfall](#)

Skoglund, A. et al. Towards a Cultural Politics of Climate Change / [ed] Harriet Bulkeley, Matthew Paterson, Johannes Stripple, Cambridge: Cambridge University Press, 161-173 p. Uppsala University 2016

[Climate change impacts on the power generation potential of a European mid-century wind farms scenario](#)

Tobin, I. et al. Environmental Research Letters, ISSN 1748-9326, E-ISSN 1748-9326, Vol. 11, no 3, 034013. SMHI, Research Department, Climate research - Rossby Centre 2016

3.11. Others

[Underlag för reglering av undervattensljud vid pålning](#)

Andersson, M. H. et al. FOI & Marine Monitoring. Rapportnummer 6723. Vindval 2016

[Decentralized desalination of brackish water using an electro dialysis system directly powered by wind energy](#)

Malek, P. et al. Desalination, ISSN 0011-9164, E-ISSN 1873-4464, Vol. 377, 54-64 p. The University of Edinburgh, United Kingdom 2016

[Capacity value assessments of wind power](#)

Milligan, M. et al. Wiley Interdisciplinary Reviews: Energy and Environment, ISSN 2041-8396, E-ISSN 2041-840X. Royal Institute of Technology 2016

[Increasing the applicability of wind power projects via a multi-criteria approach: methodology and case-study](#)

Polatidis, H. et al. International Journal of Sustainable Energy, ISSN 1478-6451, E-ISSN 1478-646X, Vol. 35, no 10, 1014-1029 p. Uppsala University 2016

[Renar och vindkraft II: Vindkraft i drift och effekter på renar och renskötsel](#)

Skarin, A. et al. Rapport/Sveriges lantbruksuniversitet, Institutionen för husdjurens utfodring och vård, ISSN 0347-9838 ; 294. Sveriges lantbruksuniversitet 2016

[Study on a hypothetical replacement of nuclear electricity by wind power in Sweden](#)

Wagner, F et al. The European Physical Journal Plus, ISSN 2190-5444, E-ISSN 2190-5444, Vol. 131, no 5, 173. Royal Institute of Technology 2016

[Simulation of Wind Speed in the Ventilation Tunnel for Surge Tanks in Transient Processes](#)

Yang, J. et al. Energies, ISSN 1996-1073, E-ISSN 1996-1073, Vol. 9, no 2, UNSP 95. Wuhan University China 2016

3.12. Reviews

[A Review of Research on Large Scale Modern Vertical Axis Wind Turbines at Uppsala University](#)

Apelfröjd, S. et al. Energies, ISSN 1996-1073, E-ISSN 1996-1073, Vol. 9, no 7, 570, Uppsala University 2016

[Wind and solar energy curtailment: A review of international experience](#)

Bird, L. et al. Renewable & sustainable energy reviews, ISSN 1364-0321, E-ISSN 1879-0690, Vol. 65, 577-586 p. 2016

[Power production and environmental opinions: Environmentally motivated resistance to wind power in Sweden](#)

Haikola, S. et al. Renewable & sustainable energy reviews, ISSN 1364-0321, E-ISSN 1879-0690, Vol. 57, 1545-1555 p. Linköpings University 2016

3.13. Summary of published scientific articles and reports

Table 1. Number of scientific articles and reports published in 2016, including papers and contributions to conferences, compiled by New and ongoing wind power research from 2015 and 2016.

Subject areas	2015	2016
Financing, electricity market	5	8
Wind resources, energy calculation	5	11
Design and loading of wind turbines	4	17
Electricity grid, integration into electricity grid, electric power	7	21
Operation and maintenance	4	13
Combinations of wind power, solar power and hydrogen production	2	1
Planning	2	4
Regional development, public benefits	5	6
Acceptance	1	1
Impact on birds	1	-
Climate impact	3	3
Sound or noise from wind turbines	1	-
Others	-	7
Reviews	2	3
Total	42	95

According to Table 1, the number of publications in wind power research has doubled since 2015, with 42 publications in 2015 and 95 in 2016. In the year 2016, a special sub-heading has been added for conference contributions.

The large increase in the number of publications may be due to the fact that more research has been published during the year and partly because this compilation has been extended to searches in more sources and databases.

In the number of published articles, the subject categories Wind Resources and Energy Calculation, Design and Loads on Wind Power, Power Grids, Power Grid and Power, Operations and Maintenance have increased the most. Within these areas there are strong research environments in Swedish universities today. In social science research most publications are in the categories Regional Development, Social Benefits and Planning.

Several research projects will be reported in 2017 for both impacts on birds and noise from wind turbines.

The category *Others* has been added for articles that could not be placed in previous subject categories.

4. Academic dissertations and theses

4.1. Doctoral dissertations

[Development of Vortex Filament Method for Wind Power Aerodynamics](#)

Abedi, H. PhD thesis in Thermo and Fluid Dynamics, Department of Applied Mechanics, Chalmers University of Technology 2016

[Experimental investigation of a Kaplan runner under steady-state and transient operations](#)

Amiri, K. Doctoral thesis. Luleå University of Technology 2016

[Grid Connection of Permanent Magnet Generator Based Renewable Energy Systems](#)

Apelfröjd, S. Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology, ISSN 1651-6214; 1436, Uppsala University 2016

[Load and risk based maintenance management of wind turbines](#)

Bangalore, P. PhD thesis in Electric Power Engineering, Department of Energy and Environment, Chalmers University of Technology 2016

[Strategies, Methods and Tools for Solving Long-term Transmission Expansion Planning in Large-scale Power Systems](#)

Fitiwi, Desta Zahlay. Doctoral thesis. Royal Institute of Technology 2016

[Storskalig vindkraft i skogen: Om rationell planering och lokalt motstånd](#)

Gradén, M. Doctoral thesis. Uppsala University 2016

[Biodiversity Protection in an Aspiring Carbon-Neutral Society: A Legal Study on the Relationship between Renewable Energy and Biodiversity in a European Union Context](#)

Malafry, M. Doctoral thesis. Uppsala University 2016

[Vindkraft och lokala förankringsprocesser: Perspektiv på deltagande, förståelse och acceptans](#)

Mels, S. et al. Doctoral thesis. Karlstad University 2016

[Modelling Wind Power for Grid Integration Studies](#)

Olauson, J. Doctoral thesis. Uppsala University 2016

[On stability and receptivity of boundary-layer flows](#)

Shahriari, N. Doctoral thesis. Royal Institute of Technology 2016

[Demagnetization and Fault Simulations of Permanent Magnet Generators](#)

Sjökvist S. et al. Doctoral thesis. Uppsala University 2016

[Stochastic model updating and model selection with application to structural dynamics](#)

Vakilzadeh, M. K. PhD thesis, 2016, Chalmers University of Technology 2016

[Optimal bidding of a hydropower producer in sequential power markets with riskassessment: Stochastic programming approach](#)

Vardanyan, Y. Doctoral thesis. Royal Institute of Technology 2016

4.2. Licentiate dissertations

[Drive Train System Dynamics Analysis: Application to Wind Turbines](#)

Asadi, S. Thesis for the degree of Licentiate Engineering, 2016:01, ISSN 1652-8565, Department of Applied Mechanics, Chalmers University of Technology 2016

[Rare Earth Metal-Free Permanent Magnet Generators](#)

Eklund, P. Licentiate thesis. Uppsala University 2016

[Blade force measurements and electrical torque ripple of a vertical axis wind turbine](#)

Rossander, M. Licentiate thesis. Uppsala University 2016

[A body force method for high precision offshore wake modelling simulations](#)

Simisiroglou, N. Licentiate thesis. Uppsala University 2016

4.3. Master theses (two years)

[Modeling the optimal energy mix in 2030: Impact of the integration of renewable energy sources](#)

Arthur, C. Royal Institute of Technology 2016

[Improving the Design of Wind Turbine Plants: Future Design of Wind Turbine Plants](#)

Chaath, A. Halmstad University 2016

[The performance of CFD RANS models in predicting wind loads on flat plates: A comparative study with DNS](#)

Dahlqvist, E. Royal Institute of Technology 2016

[Simulation of thermal tests in the climatic wind tunnel CD7 at Scania Master thesis project in fluid mechanics](#)

De Laval, J. Royal Institute of Technology 2016

[Building predictive models for dynamic line rating using data science techniques](#)

Doban, N. Royal Institute of Technology 2016

[The impact of wind conditions on wind turbines](#)

Eriksson Petersen, L. Royal Institute of Technology 2016

[Development of Business Models for Electrical Energy Storage in Europe - Techno-economic evaluation of combining storage services](#)

Esser, K. Royal Institute of Technology 2016

[Assessment of simulation codes for offshore wind turbine foundations](#)

Faruk, Ö. & Mutungi, H. Master's Thesis in the Master's Programme Structural Engineering and Building Technology, Chalmers University of Technology 2016

[Economic Impact Assessment of using Congestion Management Methods to enable increased Wind Power Integration on Gotland: Performed in collaboration with Vattenfall R&D](#)

Giliniwicz, V. Royal Institute of Technology 2016

[Modeling the Future Wind Production in the Nordic Countries](#)

Granberg, V. Royal Institute of Technology 2016

[Risk assessment of marine energy projects](#)

Gueguen, S. Royal Institute of Technology 2016

[The challenges in installation of offshore wind farms, A case of Lillgrund and Anholt wind farms](#)

Habakurama, I. & Baluku, J. Institutionen för bygg- och miljöteknik, nr: BOMX02-16-104), Chalmers University of Technology 2016

[Balancing an Increasing Share of Intermittent Wind Power Production: A comparison between the characteristics of wind power variations in Sweden and the technical flexibility of a major district heating utility](#)

Hartman, A. Royal Institute of Technology 2016

[Evaluating the Potential for Floating Offshore Wind Power in Skagerrak: The Golden Triangle](#)

Jonsson, F. Uppsala University 2016

[Development of EMT Simulation Model to Use RMS Control Model](#)

Kalikavunkal, P. Royal Institute of Technology 2016

[Application for Wind Farm Integration Complying with the Grid Code by Designing an Outer Control Strategy for the Converter](#)

Kapidou, A. Royal Institute of Technology 2016

[Rating of Power Cables for Dynamic Load Situations](#)

Kitimbo, A. Royal Institute of Technology 2016

[Forecasting Maximum Wind Speed at Offshore Sites](#)

Letellier, B. Royal Institute of Technology 2016

[Distribution On Load Tap Changer Control Using IEC61850 Client/Server Architecture](#)

Maneikis, A. Royal Institute of Technology 2016

[Generation of wind speed and solar irradiance time series for power plants with storage](#)

Mauger, L. Royal Institute of Technology 2016

[Application of dynamic rating to improve transportation capability of the power systems connected to wind power plants](#)

Merante, M. Royal Institute of Technology 2016

[Photovoltaic power potential on Gotland: A comparison with load, wind power and power export possibilities](#)

Zaar, E. Uppsala University 2016

4.4. Master theses (one year)

[Application of SCADA Data Monitoring Methodology and Reliability Analysis of Wind Farm Operational Data](#)

Alavanja, B. Uppsala University 2016

[Study Of Requirements For Post-Construction Automated Bird Mitigation Systems From Stakeholder's Perspective](#)

Crasilšcic, V. Uppsala University 2016

[Wind Energy Utilization in Arctic Climate – Racmo 2.3 Greenland climate runs project](#)

Da Silva Soares, J. Uppsala University 2016

[Investigating Dimming Of Obstruction Lights In A Swedish Wind Farm](#)

Jansson, A. Uppsala University 2016

[Development of a pitch based wake optimisation control strategy to improve total farm power production](#)

Jun Liang T. Uppsala universitet 2016

[Defining the Wake Decay Constant as a Function of Turbulence Intensity to Model Wake Losses in Onshore Wind Farms](#)

Kollwitz, J. Uppsala University 2016

[The Battle in the Wind Energy Industry: The Case of Envision Energy](#)

Lind, C. Halmstad University 2016

[A stochastic analysis of Turbulence Intensity influence over various sizes of HAWT: *Study of hypothetical relationship between Rotor Diameter and influence level of Turbulence Intensity*](#)

Nicholas, A. Halmstad University 2016

[Development and application of framework of suitability assessment for onshore wind farm foundations](#)

Stale, L. Uppsala University 2016

[Investigation of Potential Reasons to account for the Underperformance of an Operational wind farm](#)

Tücer, R. Uppsala University 2016

[Quantifying the Shadow Effect between Offshore Wind Farms with Idealized Mesoscale Models and Observed Wind Data](#)

Werner, D. Uppsala University 2016

4.5. Bachelors theses

[Wind Power Integration and Operational Challenges](#)

Alnaami, Z., Duenas, J. Royal Institute of Technology 2016

[Vindkraftverk med trätorner: Miljöpåverkan och kostnad jämfört med ståltorner](#)

Andersson, M. Royal Institute of Technology 2016

[Study and Analysis of the Electrical and Mechanical Parts in a Wind Turbine Authors](#)

Bin Bai. et al. Blekinge Institute of Technology 2016

[Wind Power Integration and Operational Challenges](#)

Duenas, J. Royal Institute of Technology 2016

[European Wind Power Development, Factors That Influenced Change and What Can Be Learned](#)

Gillies, J. Uppsala University 2016

[Development of an Energy Management System for HVDC Grids](#)

Jarnehammar, F. Royal Institute of Technology 2016

[Övervakningssystem för vindkraftverk: Monitoring system for wind turbines](#)

Jebur, M. Halmstad University 2016

[Risk Identification, Analysis & Response Planning of a Typical Wind Power Project in Greece](#)

Liapodimitris, D. Uppsala University 2016

[Wind power plants integration to the power grid](#)

Shames, S. Royal Institute of Technology 2016

[Specification and Classification of Wind Power Plants](#)

Tamadon, N. Royal Institute of Technology 2016

4.6. Summary of academic dissertations and theses

Table 2. Number of doctoral, licentiate, master and bachelor theses from 2016. Summary of this report and *New and ongoing wind power research in Sweden 2015*.

Level	2015	2016
Doctoral theses	11	13
Licentiate theses	3	4
Master theses (2 years)	17	22
Master theses (1 year)	16	11
Bachelors theses	10	10
Total	57	60

It is noted that the number of doctoral and licentiate theses increased during the year and a small increase in the number of total theses and papers in 2016 compared with 2015.