New and Ongoing Wind Power Research In Sweden 2015

UPPSALA UNIVERSITET

NÄTVERKET FÖR VINDBRUK

Contents

Front page photo: Magnus Sjöberg

1. Introduction

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

The summary describes the research centers at Swedish universities and state funded research programs that conduct wind power research. It also contains a subject catalogue of published research where at least one author is active at a Swedish university. New this year is that the catalogue has been expanded with more subjects. Doctoral, master and bachelor theses that have been published during the year are also listed.

An increase in generated wind power leads to new demands on the capacity and functionality of the grid. The 2015 summary shows that these challenges are currently a focus for wind power research in Sweden. Current research also mirrors the need for better methods to analyze wind wakes, choices of construction materials and optimal maintenance; all of which follow the needs of the ever increasing size of wind power plants in new environments.

The research published 2015, both concerning the current conditions for and impacts of wind power, also shows an increasing tendency towards dealing with larger regional and global perspectives.

Uppsala University Campus Gotland is the node that has the responsibility for education and competence building within the National Network for Wind Utilization which is financed by the Swedish Energy Agency. The 2015 summary of current wind power research is part of this task.

Visby in October 2016

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2. Research programs and research centers for wind power in Sweden

Research about wind power is conducted at several universities in Sweden and concerns technical development, management and environmental impacts of installing wind power both onshore and offshore. Three government programs provide research funding for wind power.

2.1. The Research Program Vindval

The program Vindval gathers and spreads information about research concerning wind power's impacts on the marine environment, plants, animals and landscape. Vindval also works with how people experience wind power. Vindval spreads research regarding newly installed wind power and power plants that have been in use for a longer time. The control programs that have been required during the last decades according to the Swedish environmental code before installing new wind power parks now give the possibility of following up previous research about environmental impacts over a longer time.

Vindval 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 specialists on wind power.

During the first two phases of Vindval, between 2005 and 2014, research was mainly conducted in four areas: people´s concerns when wind power is established, impact on birds and bats, marine life and land living mammals. In all, a total of thirty research programs and four synthesis reports were produced during the first two phases. The synthesis reports summarized the state of knowledge in their respective fields of research. In 2013 the Swedish Energy Agency and Swedish Environmental Protection Agency hosted an international conference for scientists studying environmental impacts of wind power.

Effects of sound emissions from pile-driving at offshore projects, people's experience of sounds from wind power and public welfare issues in juridical permission cases were some of the research topics that were granted funding from Vindval during 2015. A popular summary of research funded by Vindval was published the same year.

Vindval Reports 2015
Ongoing projects in Vindval 2015-2018
Vindvals Website

2.2. The Research Program Vindforsk IV

Vindforsk-IV is a program run between 2013 and 2017 where the Swedish Energy Agency and the company Energiforsk co-fund research that deals with the planning, building and management of wind power projects. Energiforsk is a non-profit company owned by other companies in the energy sector that initiates and coordinates research programs.

Vindforsk-IV funds research concerned with how wind power plants and the grid can be modified to handle an increase of wind power in the Scandinavian power system. Vindforsk-IV also supports research that decreases capital and maintenance costs and at the same time reduces the uncertainty when estimating these factors. Vindforsk is led by a board of specialists from the Swedish Energy Agency and the wind power industry.

The historical roots of Vindforsk IV can be found in the wind power research that started in 1975 with a government funded energy research program. Since then research has continued within a number of different programs focused on different aspects of wind power. The main emphasis of Vindforsk IV is the same as its predecessor program, Vindforsk III, which ran from 2009 to 2012.

An overall goal of Vindforsk is that Swedish universities and companies should have sufficient competence regarding wind power to safeguard knowledge both in academic undergraduate studies and at a research level. One aim is to strengthen the recruiting base for the wind power industry.

Current projects within Vindforsk include studies of how the surrounding environment influences the production and long term maintenance needs both for individual wind turbines and in wind power parks. Such factors can be the topography of the surrounding landscape and the location of other wind turbines. For instance, how does one predict how production is effected by surrounding forested land? What wind conditions have the greatest impact on specific components in a wind turbine? Another factor that can influence production and maintenance needs is rotor blade icing. One project funded by Vindforsk investigates if warm water spread from a helicopter can be used to remove ice on blades.

Vindforsk website
Reports from Vindforsk

2.3. The Research Program 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 will continue through 2016. The goal of the program is to 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.

In the fall of 2014 the Swedish Energy Agency decided to fund 10 projects focused on wind power in cold climates. Some of the topics covered in these projects are studies of what vibrations ice accumulation cause, de-icing methods, improved methods to measure humidity, modeling of ice coverage and ice being thrown off or falling off wind power plants.

More on Wind Power in cold climate

2.4. STandUP for Wind

In 2009 the Swedish government decided to approve funding to universities for the development of 24 fields of research that were considered of strategic importance. One of these fields was energy.

Funding for energy research was divided between the following areas: electric shaft systems and hybrid vehicles, alternatives to fossil fuels, climate friendly production of biomass and renewable energy production in a larger scale and its integration into the grid. In order to focus on renewable energy production in a larger scale and its integration into the grid the research center STandUP for Wind was founded. This research center’s goal is to facilitate a greater integration of wind energy into the grid through collaborative multidisciplinary research.

STandUP for wind is led by the Royal Institute of Technology and Uppsala University. Luleå Technical University and the Swedish University of Agricultural Sciences are also part of the co-operation. Researchers from the respective universities meet on a regular basis to exchange knowledge and experiences on interdisciplinary work related to wind power.

STandUP for Wind does not grant funds for research about wind power and scientists involved in STandUP for Wind must apply for funding externally.

STandUP for Wind works closely with companies in the wind power industry to guarantee that the research done concerns questions that are important for industry and to ensure that the results of research reach them.

Several institutions at the Royal Institute of Technology and Uppsala University participate in STandUP for Wind. Some topics studied by the participants are to what extent wind power parks effect each other at long distances, how the wind is slowed and spreads within wind power parks and how nearby residents can avoid being negatively impacted by sound from wind turbines. A number of projects also focus on technical components inside wind turbines, for example on permanently magnetized generators. Questions concerning how the landscape is changed by wind power parks, and different planning processes connected to their development, are also a part of STandUP for Wind's research goals.

www.standupforwind.se

2.5. Swedish Wind Power Technology Centre (SWPTC)

Swedish Wind Power Technology Centre (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.

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.

The research done at SWPTC is geared towards wind power parks in forested areas, mountainous areas and offshore. Research is conducted in different thematic groups; electrical and turbine control systems, turbine and wind loading, mechanical systems and structures, offshore, maintenance and cold climate.

Today's wind turbines, where a single rotor blade can have a length of 60 meters and weighs 18 tons, have increased demands in the areas of material strength, technology used and how they are adjusted to the grid. New materials that can decrease the weight of rotor blades, such as lignin based materials, are therefore one important topic included in the research conducted at SWPTC. New types of materials and the increasing size of wind turbines also lead to a demand for improved methods of analyzing maintenance needs. This is the case especially in areas where low temperatures mean greater strains on turbine components.

www.chalmers.se/ee/swptc-sv

3. Scientific Publications 2015

3.1. Financing, energy market

An evaluation of intraday trading and demand response for a predominantly hydro-wind system under Nordic market rules
Amelin, M. Kungliga tekniska högskolan 2015. IEEE Transactions on Power Systems, 30(1), 3-12.

Renewable energy investors in Sweden: A cross-subsector analysis of dynamic capabilities
Darmani, A. Kungliga tekniska högskolan 2015. Utilities Policy, 37, 46-57.

Transmission and wind investment in a deregulated electricity industry
Maurovich-Horvat, L., Boomsma, T. K., & Siddiqui, A. S. 2015. IEEE Transactions on Power Systems, 30(3), 1633-1643. Stockholms universitet 2015.

Now or later? Trading wind power closer to real-time: How poorly designed subsidies can lead to higher balancing costs
Mauritzen, J. Institutet för näringslivsforskning 2015. Energy Journal, 36(4), 149-164.

Exercise of market power on ramp rate in wind-integrated power systems
IEEE Transactions on Power Systems, 30(3), 1614-1623. Moiseeva, E., Hesamzadeh, M. R., & Biggar, D. R. Kungliga tekniska högskolan 2015.

3.2. Wind resources, energy calculations

Wind statistics from a forested landscape
Arnqvist, J., Segalini, A., Dellwik, E., & Bergström, H. 2015. Boundary-Layer Meteorology, 156(1), 53-71. Uppsala universitet och Kungliga tekniska högskolan 2015.

Large-eddy simulations of the Lillgrund wind farm
Nilsson, K., Ivanell, S., Hansen, K. S., Mikkelsen, R., Sørensen, J. N., Breton, S. , & Henningson, D. Uppsala universitet och Kungliga tekniska högskolan 2015. Wind Energy, 18(3), 449-467.

Using the MIUU model for prediction of mean wind speed at low height
Olauson, J., Samuelsson, J., Bergström, H., & Bergkvist, M. Uppsala universitet 2015. Wind Engineering, 39(5), 507-518.

Modelling the Swedish wind power production using MERRA reanalysis data
Olauson, J., & Bergkvist, M. Uppsala universitet 2015. Renewable Energy, 76, 717-725.

Simulation of wind turbine wakes using the actuator line technique
Sorensen, J. N., Mikkelsen, R. F., Henningson, D. S., Ivanell, S., Sarmast, S., & Andersen, S. J. 2015. Uppsala universitet 2015. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 373(2035).

3.3. Design and loading of wind turbines

Spectral tensor parameters for wind turbine load modeling from forested and agricultural landscapes
Chougule, A., Mann, J., Segalini, A., & Dellwik, E. Kungliga tekniska högskolan 2015. Wind Energy, 18(3), 469-481.

Standalone DC microgrids as complementarity dynamical systems: Modeling and applications
Dizqah, A. M., Maheri, A., Busawon, K., & Fritzson, P. Linköpings universitet 2015. Control Engineering Practice, 35, 102-112.

Novel LVRT testing method for wind turbines using flexible vsc technology
Espinoza, N., Bongiorno, M., & Carlson, O. Chalmers tekniska högskola 2015. IEEE Transactions on Sustainable Energy, 6(3), 1140-1149.

Evaluation of a blade force measurement system for a vertical axis wind turbine using load cells
Rossander, M., Dyachuk, E., Apelfröjd, S., Trolin, K., Goude, A., Bernhoff, H., & Eriksson, S. Uppsala universitet 2015. Energies, 8(6), 5973-5996.

3.4. Electrical grids / Integration of wind power into grid / Electrical power

A computational framework for risk-based power system operations under uncertainty. part II: Case studies
Hamon, C., Perninge, M., & Söder, L. Kungliga tekniska högskolan 2015. Electric Power Systems Research, 119, 66-75.

A computational framework for risk-based power systems operations under uncertainty. part I: Theory
Hamon, C., Perninge, M., & Söder, L. Kungliga tekniska högskolan 2015. Electric Power Systems Research, 119, 45-53.

Power system flexibility need induced by wind and solar power intermittency on time scales of 1-14 days
Renewable Energy, 83, 339-344. Saarinen, L., Dahlbäck, N., & Lundin, U. Uppsala universitet 2015.

ATC-based system reduction for planning power systems with correlated wind and loads IEEE
Shayesteh, E., Hobbs, B. F., Söder, L., & Amelin, M. Kungliga tekniska högskolan 2015. Transactions on Power Systems, 30(1), 429-438.

Real-time nonlinear MPC and MHE for a large-scale mechatronic application
Vukov, M., Gros, S., Horn, G., Frison, G., Geebelen, K., Jørgensen, J. B., Diehl, M. Chalmers tekniska högskola 2015. Control Engineering Practice, 45, 64-78.

Impact from dynamic line rating on wind power integration
Wallnerström, C. J., Huang, Y., & Soder, L. Kungliga tekniska högskolan 2015. IEEE Transactions on Smart Grid, 6(1), 343-350.

Supporting security and adequacy in future energy systems: The need to enhance long-term energy system models to better treat issues related to variability
Welsch, M., Howells, M., Hesamzadeh, M. R., Ó Gallachóir, B., Deane, P., Strachan, N., Rogner, H. Kungliga tekniska högskolan 2015. International Journal of Energy Research, 39(3), 377-396.

3.5. Maintenance

An artificial neural network approach for early fault detection of gearbox bearings
Bangalore, P., & Tjernberg, L. B. Chalmers tekniska universitet och Kungliga tekniska högskolan 2015. IEEE Transactions on Smart Grid, 6(2), 980-987.

Wind turbine reliability estimation for different assemblies and failure severity categories
Kaidis, C., Uzunoglu, B., & Amoiralis, F. Uppsala universitet 2015. IET Renewable Power Generation, 9(8), 892-899.

Optimal redundancy and maintenance strategy decisions for offshore wind power converters
Shafiee, M., Patriksson, M., Strömberg, A. , & Tjernberg, L. B. Göteborgs universitet och Kungliga tekniska högkolan 2015. International Journal of Reliability, Quality and Safety Engineering, 22(3).

Developing RCM strategy for wind turbines utilizing e-condition monitoring
Singh, S., Baglee, D., Michael, K., & Galar, D. Luleå tekniska universitet 2015. International Journal of Systems Assurance Engineering and Management, 6(2), 150-156.

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

Wind energy converters and photovoltaics for generation of electricity after natural disasters
Olauson, J., Goude, A., & Bergkvist, M. Uppsala universitet 2015. Geografiska Annaler, Series A: Physical Geography, 97(1),

A preliminary assessment of wind generated hydrogen production potential to reduce the gasoline fuel used in road transport sector of Sweden
Siyal, S. H., Mentis, D., Mörtberg, U., Samo, S. R., & Howells, M. Kungliga tekniska högskolan 2015. International Journal of Hydrogen Energy, 40(20), 6501-6511.

3.7. Planning

Legitimacy and efficiency in planning processes - (how) does wind power change the situation?
Liljenfeldt, J. Umeå universitet 2015. European Planning Studies, 23(4), 811-827.

Wind energy assessment considering geographic and environmental restrictions in Sweden: A GIS-based approach
Siyal, S. H., Mörtberg, U., Mentis, D., Welsch, M., Babelon, I., & Howells, M. Kungliga tekniska högskolan 2015. Energy, 83, 447-461.

3.7. Regional development, public welfare

Techno-economic feasibility of the irrigation system for the grassland and farmland conservation in China: Photovoltaic vs. wind power water pumping
Campana, P. E., Li, H., & Yan, J. Mälardalens högskola och Kungliga tekniska högskolan 2015. Energy Conversion and Management, 103, 311-320.

Wind power, regional development and benefit-sharing: The case of northern Sweden
Ejdemo, T., & Söderholm, P. Luleå tekniska universitet 2015. Renewable and Sustainable Energy Reviews, 47, 476-485

Assessing the technical wind energy potential in Africa a GIS-based approach
Mentis, D., Hermann, S., Howells, M., Welsch, M., & Siyal, S. H. Kungliga tekniska högskolan 2015. Renewable Energy, 83, 110-125.

Corporate social responsibility through cross-sector partnerships: Implications for civil society, the state, and the corporate sector in India
Hede Skagerlind, H., Westman, M., & Berglund, H. Stockholms universitet 2015. Business and Society Review, 120(2), 245-275.

Broadening the national focus in technological innovation system analysis: The case of offshore wind
Wieczorek, A. J., Hekkert, M. P., Coenen, L., & Harmsen, R. Lunds universitet 2015. Environmental Innovation and Societal Transitions, 14, 128-148.

3.8. Acceptance

Valuing the local impacts of a large scale wind power establishment in northern Sweden: Public and private preferences toward economic, environmental and sociocultural values
Ek, K., & Matti, S. Luleå tekniska universitet 2015. Journal of Environmental Planning and Management, 58(8), 1327-1345.

3.9. Impacts on bird life

Trapping success using carrion with bow nets to capture adult golden eagles in Sweden
Bloom, P. H., Kidd, J. W., Thomas, S. E., Hipkiss, T.,
Hörnfeldt, B., & Kuehn, M. J. Sveriges lantbruksuniversitet 2015. Journal of Raptor Research, 49(1), 92-97.

3.10. Climate impact

Climate impacts of large-scale wind farms as parameterized in a global climate model
Fitch, A. C. Sveriges meterologiska institut 2015. Journal of Climate, 28(15), 6160-6180

Nitrogen fertilizers manufactured using wind power: Greenhouse gas and energy balance of community-scale ammonia production
Tallaksen, J., Bauer, F., Hulteberg, C., Reese, M., & Ahlgren, S. Lunds universitet och Sveriges Lantbruksuniversitet 2015. Journal of Cleaner Production, 107, 626-635.

Energy policy: Push renewables to spur carbon pricing
Wagner, G., Kåberger, T., Olai, S., Oppenheimer, M., Rittenhouse, K., & Sterner, T. Chalmers tekniska högskola och Göteborgs universitet 2015. Nature, 525(7567), 27-29.

3.11. Sound emissions

Aggregation and amplification of wind-turbine harmonic emission in a wind park
Yang, K., Bollen, M. H. J., & Larsson, E. O. A. Luleå tekniska universitet 2015. IEEE Transactions on Power Delivery, 30(2), 791-799.

3.12. Reviews

Impacts of wind energy development on bats: A global perspective
Arnett E. B., Baerwald, E. F., Mathews, F., Rodrigues, L., Rodríguez-Durán, A., Rydell, J., Voigt, C.C. Lunds universitet 2015. Bats in the anthropocene: Conservation of bats in a changing world (pp. 295-323).

Variability assessment and forecasting of renewables: A review for solar, wind, wave and tidal resources
Widén, J., Carpman, N., Castellucci, V., Lingfors, D., Olauson, J., Remouit, F., Waters, R. Uppsala Universitet 2015. Renewable and Sustainable Energy Reviews, 44, 356-375.

4. Academic Theses 2015

4.1. PhD theses

Mean Wind and Turbulence Conditions in the Boundary Layer above Forests
Arnqvist, J. Uppsala universitet 2015.

Dynamic Performance and Design Aspects of Compliant Fluid Film Bearings
Cha, M. Kungliga Tekniska högskolan 2015.

Aerodynamics of Vertical Axis Wind Turbines: Development of Simulation Tools and Experiments
Dyachuk, E. Uppsala universitet 2015.

Markets, Interventions and Externalities: Four Essays in Applied Economics
Fogelberg Lövgren, S. Stockholms universitet 2015.

Probabilistic security management for power system operations with large amounts of wind power
Hamon, C. Kungliga tekniska högskolan 2015.

Essays on Renewable Energy Technology Development and Voluntary Carbon Offsets
Lindman, Å. Luleå tekniska universitet 2015.

Modelling, Analysis, and Control Aspects of a Rotating Power Electronic Brushless Doubly-Fed Induction Generator
Malik, N. Kungliga tekniska högskolan 2015.

Numerical computations of wind turbine wakes and wake interaction
Nilsson, K. Kungliga tekniska högskolan 2015.

Design of Electricity Markets for Efficient Balancing of Wind Power Generation
Scharff, R. Kungliga tekniska högskolan 2015.

Efficient Simulation Methods of Large Power Systems with High Penetration of Renewable Energy Resources: Theory and Applications
Shayesteh, E. Kungliga tekniska högskolan 2015.

On Harmonic Emission, Propagation and Aggregation in Wind Power Plants
Yang, K. Luleå tekniska universitet 2015.

4.2. Licentiate theses

Global energy transitions: Renewable energy technology and non-renewable resources
Davidsson, S. Uppsala universitet 2015.

Numerical Computations of Wakes Behind Wind Farms
Eriksson, O. Uppsala universitet 2015.

Vertical axis wind turbines: Tower Dynamics and Noise
Möllerström, E. Högskolan i Halmstad 2015.

5. Master level theses

5.1. Master theses (2 year)

Market opportunities to develop wind power in North Africa
Beauvisage, A. Kungliga tekniska högskolan 2015.

Feasibility Study of a 3D CFD Solution for FSI Investigations on NREL 5MW Wind Turbine Blade
Bernardi, G. Kungliga tekniska högskolan 2015.

Energy cooperatives in Denmark, Germany and Sweden: A transaction cost approach
Bohnerth, J. Uppsala universitet 2015

Linear Modeling of DFIGs and VSC-HVDC Systems
Cao, W. Kungliga tekniska högskolan 2015.

Quantify Change in Wind Turbine Power Performance Using Only SCADA Data
Carlberg, M. Kungliga tekniska högskolan 2015.

Investigation of the potential to implement offshore wind energy technology in Victoria, Australia
Christos, S. Uppsala universitet 2015.

Renewable Energy for Rural Electrification and Development in Mozambique
Come, E. Kungliga tekniska högskolan 2015.

Exploring market forces for transmission expansion and grid storage integration: A technical-economic thesis about variation moderators for intermittent renewable power generation in the developed country of Sweden and the developing country of China
Eriksson, P., Sundell, M. Mälardalens högskola 2015.

Impact of Large Amounts of Wind Power on Primary Frequency Control: A technical and economic study
Farrokhseresht, N. Kungliga tekniska högskolan 2015.

Optimization of export electrical infrastructure in offshore windfarms: Developing an electrical export module in a front-end holistic model for offshore wind plant optimization
Gaillard, H. Kungliga tekniska högskolan 2015.

Implementation of machine learning to model losses from icing of wind turbines
Ihlis, J. Kungliga tekniska högskolan 2015.

Competitive Strategy for Entering Wind Turbine Manufacturing Industry
Kauts, M. Kungliga tekniska högskolan 2015.

Need assessment of electricity in Namibia: Prerequisites for implementation of a small scale wind turbine
Koskela, M. Uman, E. Kungliga tekniska högskolan 2015.

A model for losses and costs predictions in the electrical grid of an onshore wind farm
Ledieu, M. Kungliga tekniska högskolan 2015.

Electricity spot price forecasting in two Swedish regions: Analysis of factors which cause price differences between SE3 (Stockholm) and SE4 (Malmö) price regions
Lysova, E., Sedova, A. Linnéuniversitetet 2015

Shortening time-series power flow simulations for cost-benefit analysis of LV network operation with PV feed-in
López, C. Uppsala universitet 2015.

Industrial Decision Support System with Assistance of 3D Game Engine
Zou, M. Blekinge tekniska högskola 2015.

5.1. Master theses (1 year)

Integration of solar and wind power at Lillgrund wind farm: Wind turbine shadow effect on solar farm at Lillgrund wind farm
Al-Mimar, S. Högskolan i Halmstad 2015.

Wind Turbine End of Life: Characterisation of Waste Material
Andersen, N. Högskolan i Gävle 2015.

Comparison of Lavenberg-Marquardt, Scaled Conjugate Gradient and Bayesian Regularization Backpropagation Algorithms for Multistep Ahead Wind Speed Forecasting Using Multilayer Perceptron Feedforward Neural Network
Baghirli, O. Uppsala universitet 2015.

Wind Farm Repowering: A Strategic Management Perspective
Bezbradica, M. Uppsala universitet 2015.

Offshore wind power investment model using a reference class forecasting approach to estimate the required cost contingency budget
Boquist, P. Uppsala universitet 2015.

Offshore wind resource assessment, site suitability and technology selection for Bligh waters Fiji using Windpro
Dayal, Kunal K. Uppsala universitet 2015.

Wake effect impacts on the energy production of three wind turbines in close configuration
Hekim, M. Uppsala universitet 2015.

Application of a mathematical approach in modeling wind time series: A general survey of the Langevin method
Jalaei, F. Högskolan i Halmstad 2015

Offshore wind farm decommissioning: introducing a multicriteria decision aid approach
Kerkvliet, H. Uppsala universitet 2015.

Wind turbines - a study on the correlation between rotor size and noise characteristics
Larsson, S. Högskolan i Halmstad 2015.

Wind resource assessment and site suitability in Bangladesh using Windpro and Windsim
Maruf, S. Uppsala universitet 2015.

Wind farm decommissioning: a detailed approach to estimate future costs in Sweden
McCarthy, J. Uppsala universitet 2015

Moving towards best practice for bird mortality mitigation in wind power planning, Sweden
McNally, R. Uppsala universitet 2015.

Parametric sensitivity study for wind power trading through stochastic reserve and energy market optimization
Menin, M. Uppsala universitet 2015.

Using refurbished turbines to provide affordable wind energy: A case study in Africa
Montenegro Borbolla, I. Uppsala universitet 2015.

Power deviation analysis of the Rockneby wind farm
Rivero, C., Francisco, J. Högskolan i Halmstad 2015.

6. Bacheolor level theses

Teknoekonomisk analys kring möjligheten att ersätta Ringhals kärnkraftsreaktor II med hållbar elproduktion.
Andersson, F., Lindstrand, N. Kungliga tekniska högskolan 2015.

Vindkraft i Sverige; Nuläge och framtidsutsikter med fokus på energilagring
Berlin, D., Dingle, M. Kungliga tekniska högskolan 2015.

Forsmark – ett måste för framtiden?
Gustavsson, V. Kungliga tekniska högskolan 2015.

"Can´t live without them, can´t live close to them..." : A thesis about valuing the disutility of wind turbines in the vicinity
Gyldberg, M., Pyk, F. Uppsala universitet 2015.

Reala optioner i samband med vindkraftsprojekt
Magnusson, H., Magnusson, M. Högskolan i Halmstad 2015.

Teknoekonomisk analys av alternativ elproduktion till svensk kärnkraft
Mäehans, J. Kungliga tekniska högskolan 2015.

Förstudie för en vindkraftpark på Malmölandet i Norrköping: En undersökning av förutsättningarna för en vindkraftpark på ett sen tidigare planerat område
Mähler, V. Umeå Universitet 2015.

Electrical energy analysis in nine countries of Europe, with focus on wind power and other renewable energy sources
Nariman, G., Farhang, G., Hassan, M. Blekinge tekniska högskola 2015.

Implementering av vertikala vindkraftverk på lyktstolpar
Nilsson, L., Cisneros, A. Kungliga tekniska högskolan 2015.

Lämpliga områden för vindkraftsetablering på land i Norrbottens län
Norlander, J. Stockholms universitet 2015.