

New and Ongoing Wind Power Research in Sweden 2011-2012



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Introduction

Society has a great interest in wind as a renewable energy resource. It is a topic of lively media debate where, among other things, different perspectives on its environmental impact, its approval process and how it relates to climate change and energy politics are presented. It is sometimes difficult to discern which opinions are facts based. Seemingly, there is a need for independent, scientific and factual information regarding wind power.

In order to get an overview of current wind power research, we have created this appendix of recently published and ongoing research in Sweden. In this country, research is being done to study the effects of wind power on society and the environment as well as to develop technology.

This appendix, which is focused on cross disciplinary and social science research, refers to academic articles, reports, dissertations, and theses written during 2011 and 2012. This data comes from different databases as well as from direct contacts with universities and researchers in Sweden. Our aim is to cover as many areas as possible, and we are happy to receive additional submissions. This appendix will be updated twice a year.

Gotland University is the hub responsible for educational and competency related questions in the National Network for Wind Power Utilization and is financed by the Swedish Energy Agency. This appendix has been compiled as part of this assignment.

The report has been compiled by Andrew Barney, Liselotte Aldén and Marita Engberg Ekman

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Center for Wind Power Utilization

The node for education and skills issues in the Network for Wind Power Utilization

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www.cvi.se

Ongoing Research 2012

Havsbaserad vindkraft - ekologiska risker och möjligheter.

Projektledare: Malm, Torleif (Umeå Universitet).

<http://www.naturvardsverket.se/sv/Start/Verksamheter-med-miljopaverkan/Energi/Vindkraft/Vindval/Vindkraft---paverkan-pa-marint-liv/Havsbaserad-vindkraft---ekologiska-risker-och-mojligheter/>.

Akustisk störning på marint liv i anslutning till vindkraftverk – en fortsättning vid Lillgrund.

Projektledare: Sigray, Peter (Stockholms Universitet), Kontaktperson: Andersson, Mathias H (Stockholms Universitet).

<http://www.naturvardsverket.se/sv/Start/Verksamheter-med-miljopaverkan/Energi/Vindkraft/Vindval/Vindkraft---paverkan-pa-marint-liv/Akustisk-storning-pa-marint-liv-i-anslutning-till-vindkraftverk/>.

Svensk-norskt projekt som pågår 2010–2013 som rör renens vinterbetesområde i skogen.

Studieområdena finns i Västerbotten inom Vilhelmina Norra sameby och Stor-Rotlidens vindkraftspark (40 verk) och i Norrbotten i Östra Kikkejaure och projektet i Markbygden (330 verk ingår i studieområdet).

Drivs av Nellemann, Christian (Norut Alta), Skarin, Anna (SLU).

Engagemang och expertis – aktivisters betydelse i vindkrafts- och kärnkraftsfrågor.

Bartholdsson, Kerstin (Göteborgs Universitet), Johansson, Hanna Sofia (Stockholms Universitet).

http://www.goteborgenergi.se/Files/dok/Forskning/10-13_projektbeskrivning.pdf.

GPS tracking of golden eagles at proposed wind farm sites.

Hipkiss, Tim (SLU). Vattenfall Vind R&D Symposium, 27 March, London, UK. 2012.

<http://www.slu.se/en/collaborative-centres-and-projects/wireless-remote-animal-monitoring-wram/about/publications/>.

Planeringsverktyg för vindkraftens effekter på tamren.

Projektledare: Anna Skarin (SLU).

<http://naturvardsverket.se/sv/Start/Verksamheter-med-miljopaverkan/Energi/Vindkraft/Vindval/Planeringsverktyg-for-vindkraftens-effekter-pa-tamren/>.

Researching business models for service and maintenance in Africa.

Planned additional research in Sweden and Africa.

Danilovic, Mike (Halmstad University), Hoveskog, Maya (Halmstad University), Halila, Fawzi (Halmstad University), Campbell, David (Halmstad University).

Future research planned on the cumulative effects of wind power and wind power development in mountain regions and protected areas.

Additional research also planned for gauging peoples experiences with turbine parks.

Bodén, Bosse (Mittuniversitetet).

Valuing Local impacts of Wind Power Establishments: Public and Private Preferences towards Economic, Environmental and Socio-Cultural Values.

A study of how locals value characteristics associated with the planned wind farm at Markbygden in Piteå.

Ek, Kristina (Luleå Universitet), Matti, Simon (Luleå Universitet).

On the wake pressure-footprint and its potential application for wake flow analysis.

A study to establish the pressure plate method as a fast qualitative and quantitative experimental method for the analysis of wake interaction.

Khan, Mubashar (Högskolan i Gävle), Sandberg, Mats (Högskolan i Gävle), Fransson, Jens (Högskolan i Gävle), Wigö, Hans (Högskolan i Gävle).

Numerical Investigation of Icing Effect on the Wind Farm Energy Production.

PhD study to develop a better understanding of how icing affects wind farm production. A part of the IceWind Research Project.

Teneler, Görkem (Gotland University/KTH) .

Numerical computations of wind turbine wakes and farm wake interaction - Optimization and control.

Licentiate thesis to evaluate different aerodynamic methods used for modeling wake flow using CFD.

Nilsson, Karl (Gotland University/KTH)

Large-eddy simulations of the Lillgrund wind farm.

Nilsson, Karl (Gotland University/KTH), Ivanell, Stefan (Gotland University/KTH), Hansen, Kurt (DTU), Sørensen, Jens (DTU), Breton, Simon-Philippe (Gotland University), Henningson, Dan (KTH). 2012.

Keywords: Atmospheric conditions, atmospheric turbulence, CFD, RANS, ACD, LES, ACL

Validation of the actuator line technique using near wake measurements of the MEXICO rotor.

Nilsson, Karl (Gotland University/KTH), Shen, Wen (DTU), Sørensen, Jens (DTU), Breton, Simon-Philippe (Gotland University), Ivanell, Stefan (Gotland University/KTH). 2012.

Keywords: PIV, LES, Navier-Stokes, vortex cores, wake expansion

Study of the effect of the presence of downstream turbines on upstream ones and use of a controller in CFD wind turbine simulation models.

Breton, Simon-Philippe (Gotland University), Nilsson, Karl (Gotland University/KTH), Ivanell, Stefan (Gotland University/KTH), Olivares-Espinosa, Hugo (École de technologie supérieure), Masson, Christan (École de technologie supérieure), Dufresne, Louis (École de technologie supérieure). 2012.

Keywords: OpenFOAM, EllipSys3D, CFD, LES, blade-element method

Methods for strategic environmental assessment of wind power plants.

A KTH subproject of a StandUp-project concerning Energy systems analysis and environmental assessment. The subproject is focused on developing and applying GIS-based multi-criteria analysis methods for integrating different sustainability issues in planning. The project involves both qualitative a review of existing Swedish comprehensive plans on wind power and a quantitative review of the mapping of resources and trade-offs between energy potential and environmental impacts.

www.kth.se/abe/inst/lwr/grupper/ema/research.

The Swedish Research Program Vindval

Vindval is a research program that aims to facilitate development of wind power in Sweden. The program focuses on environmental impacts of wind power; humans and landscapes, the marine environment, birds, bats and other mammals.

The program includes more than 30 individual research projects and four works of synthesis. The results from these projects can be used as a basis for environmental impact assessments as well as in the planning and permitting processes for wind power development.

Vindval is a collaborative project between the Swedish Energy Agency (Energimyndigheten) and the Swedish Environmental Protection Agency (Naturvårdsverket) and has been funded until 1 July 2013.

In its fall budget the Swedish government proposed that Vindval be allocated an additional 10 million SEK per year for four years after 2013. The government wrote that the program should continue and noted that large-scale wind development was new in Sweden and that there were still questions that needed to be examined in terms of wind power's impact on nature, the environment and humans.

Research is conducted in four areas:

1. Marine life
2. Terrestrial mammals
3. Birds and bats
4. Humans

1. Marine Life

Synthesis report:

The effects of wind power on marine life.

Bergström, Lena (SLU), Kautsky, Lena (Stockholm University), Malm, Torleif (Stockholm University), Ohlsson, Hans (wpd Offshore Stockholm AB), Wahlberg, Magnus (Fjord & Balt), Rosenberg, Rutger (Göteborgs University), Åstrand Capetillo, Nastassja (Stockholm University). Report 6512. 2012.

<http://www.swedishepa.se/Documents/publikationer6400/978-91-620-6512-6.pdf>.

Reports:

Bentiska processer på och runt artificiella strukturer i Sveriges kustvatten.

Malm, Torleif (Stockholms Universitet), Engkvist, Roland (Linnéuniversitetet). Rapport 6414. 2011.

<http://www.naturvardsverket.se/sv/Start/Om-Naturvardsverket/Vara-publikationer/ISBN1/6400/978-91-620-6414-3/>.

Ljud från pålning av vindkraftfundament – påverkan på fiskbeteende.

Sigray, Peter (Stockholm Universitet), Andersson, Mathias H. (Stockholm Universitet). Rapport 6437. 2011.

<http://www.naturvardsverket.se/sv/Start/Om-Naturvardsverket/Vara-publikationer/ISBN1/6400/978-91-620-6437-2/>.

Effekter av en havsbaserad vindkraftpark på fördelningen av bottennära fisk.
Bergström, Lena (SLU), Sundqvist, Frida (SLU), Bergström, Ulf (SLU). Rapport 6485. 2012.
<http://www.swedishepa.se/Documents/publikationer6400/978-91-620-6485-3.pdf>.

GIS-baserade metoder för att kartlägga fiskars livsmiljöer i grunda havsområden.
Bergström, Lena (Fiskeriverket), Bergström, Ulf (Fiskeriverket) Carlén, Ida (AquaBiota Water Research AB), Isæus, Martin (AquaBiota Water Research AB). Rapport 6427. 2011.
<http://www.naturvardsverket.se/sv/Start/Om-Naturvardsverket/Vara-publikationer/ISBN1/6400/978-91-620-6427-3/>.

Effekter av havsbaserad vindkraft på pelagisk fisk.
Axenrot, Thomas (SLU), Didrikas, Tomas (AquaBiota Water Research AB/Stockhoms Universitet). Rapport 6481. 2011.
<http://www.naturvardsverket.se/Start/Om-Naturvardsverket/Vara-publikationer/ISBN1/6400/978-91-620-6481-5/>.

Blankålsvandring – Vindkraft och växelströmsfält.
Lagenfelt, Ingvar (Fiskeriverket), Westerberg, Håkan (Fiskeriverket), Andersson, Ingemar (Fiskeriverket). Rapport 6479. 2012.
<http://www.naturvardsverket.se/Start/Om-Naturvardsverket/Vara-publikationer/ISBN1/6400/978-91-620-6479-2/>.

2. Terrestrial mammals

Synthesis report:

The impacts of wind power on terrestrial mammals.
Helldin, Jan Olof (SLU), Jung, Jens (SLU), Neumann, Wiebke (SLU), Olsson, Mattias (SLU), Skarin, Anna (SLU), Widemo, Fredrik (SLU), Edenius, Lars (SLU), Kindberg, Jonas (SLU), Lindberg, Niklas (Enetjärn Natur AB). Report 6510. 2012.
<http://www.swedishepa.se/Documents/publikationer6400/978-91-620-6510-2.pdf>.

Reports:

Spillningsinventering – en metodbeskrivning av datainsamling och analys för att studera renens habitatval i relation till vindkraftutbyggnader.
Skarin, Anna (SLU), Hörnell-Willebrand, Maria (Högskolan i Hedmark). Rapport 6459. 2011.
<http://www.naturvardsverket.se/Documents/publikationer6400/978-91-620-6459-4.pdf>.

Large terrestrial mammals and wind power – is there a problem?
Helldin, J.O. (SLU), Álvares, F (Porto University). Summary of workshop at the Conference on Wind Energy and Wildlife Impacts, Trondheim, Norway. 2011.
<http://www.cww2011.nina.no/LinkClick.aspx?fileticket=eX87Ui8L9rg%3d&tabid=3995>.

3. Birds and bats

Synthesis report:

Vindkraftens effekter på fåglar och fladdermöss.
Rydell, Jens (Lund Universitet), Engström, Henri (Uppsala Universitet), Hedenström, Anders (Lund Universitet), Larsen, Jesper Kyed (Vattenfall Wind Power), Pettersson, Jan (JP Fågelvind, Färjestaden), Green, Martin (Lund Universitet). Report 6511. 2012.
<http://www.swedishepa.se/Documents/publikationer6400/978-91-620-6511-9.pdf>.

Reports:

Småfåglars och sjöfåglars nattflyttning vid Utgrundens havsbaserade vindkraftpark.
 Pettersson, Jan (JP Fågelvind) Report 6413. 2011.
<http://www.swedishepa.se/Documents/publikationer6400/978-91-620-6413-6.pdf>.

4. Humans

Synthesis report:

Vindkraftens påverkan på människors intressen.

Bengtsson Ryberg, Johanna (Natursvårdsverket), Bluhm, Gösta (Karolinska institutet), Bolin, Karl (KTH), Bodén, Bosse (MittUniversitet), Ek, Kristina (Luleå Universitet), Hammarlund, Karin (SLU), Henningsson, Marianne (Linnéuniversitetet), Hannukka, Inga-Lena (Vattenfall), Johansson, Carina (Högskolan på Gotland), Jönsson, Sofia (Linnéuniversitetet), Mels, Sanna (Högskolan på Gotland), Mels, Tom (Högskolan på Gotland), Nilsson, Mats (Karolinska institutet, Stockholms Universitet), Skärbäck, Erik (SLU), Söderholm, Patrik (Luleå Universitet), Waldo, Åsa (Lunds Universitet), Widerström, Ingegärd (Wilark AB), Åkerman, Niklas (Linnéuniversitetet). Rapport 6497. 2012.

<http://www.naturvardsverket.se/Start/Om-Naturvardsverket/Vara-publikationer/ISBN1/6400/978-91-620-6497-6/>.

Reports:

Medborgardialog om vindkraft.

Boverket, Karlskrona. 2011. Vindpilotprojekt.

<http://www.boverket.se/Om-Boverket/Webbokhandel/Publikationer/2011/Medborgardialog-om-vindkraft/>.

Buller i blåsväder: Texter om ljud från vindkraftverk.

Bluhm, G. (Karolinska Institutet), Larsson, S. (Lunds Universitet), Sejer Pedersen, C. (Aalborg Universitet), Pedersen, E. (Högskolan i Halmstad & Lunds Universitet), Skärbäck, E. (SLU), Persson, B. (Bara). Ljudmiljöcentrum, Lunds Universitet. 2011.

http://www.ljudcentrum.lu.se/upload/lmc/vind_rapport_red.pdf.

Kunskapssammanställning om infra- och lågfrekvent ljud från vindkraftsanläggningar: Exponering och hälsoeffekter.

Nilsson, M. (Karolinska institutet), Bluhm, G. (Karolinska institutet), Eriksson, G. (Linköpings Universitet), Bolin, K. (KTH). 2011.

http://www.naturvardsverket.se/upload/07_verksamheter_med_miljopaverkan/Buller/vindkraftverk/Infra-lagfrekvent-ljud/Infra-lagfrekv-vindkraftverk-slutrap-rev20111128.pdf.

Health aspects associated with wind turbine noise—Results from three field studies.

Pedersen, E. (Halmstad University). Noise Control Engineering Journal 59, 47–53. 2011.

http://www.maine.gov/dep/ftp/bep/ch375citizen_petition/pre-hearing/AR-20%20chapter%20375%20-%20r%20brown%20hearing%20submission%20-%20Pedersen%20Health%20Aspects.pdf.

Social-Psychological Factors in Public Support for Local Biodiversity Conservation.

Johansson, M. (Lund University), Henningsson, M. (University of Kalmar). 2011. Society and Natural Resources 24, 717-733.

<http://www.tandfonline.com/doi/abs/10.1080/08941920903530925>.

Boverket 2011. Medborgardialog om vindkraft – exempel från 7 kommuner.

Boverket, Karlskrona.

<http://www.boverket.se/Om-Boverket/Webbokhandel/Publikationer/2011/Medborgardialog-om-vindkraft/>.

The Swedish Research Program Vindforsk III

Vindforsk III is a program for basic and applied wind energy research. The program is half funded by Swedish Energy Agency (Energimyndigheten) and is half funded by energy companies and other industries related to wind energy. The program is planned to last from 2009 until 2012 and have a total budget of approximately 80 million SEK.

The program's focus is primarily technical.

The program aims to strengthen wind energy potential by:

- Producing generalizable results concerning wind power characteristics and opportunities
- Research activities will take place at the international forefront for a number of technologies
- Preserve and strengthen the skills of existing research groups at universities and technical schools
- Strengthen the recruitment base for the Swedish wind power industry
- Highlight wind power research and disseminate the results

The program is also divided into the following research areas:

- The wind resource and establishment
- Cost efficient wind farms and planning
- Optimal operation and maintenance
- Wind power in the electrical grid
- External environment monitoring and standardization

Vindforsk reports: <http://www.elforsk.se/Programomraden/El--Varme/Vindforsk/reports/>

Technical Research Centers

Svenskt VindkraftsTekniskt Centrum

The center was formed to meet the needs of the rapidly expanding global wind power industry and to raise wind power expertise in Sweden. The wind power research center will focus on developing knowledge of the construction of wind turbines and of optimizing maintenance and production costs. Its goal is to be able to build both partial and complete wind power systems in Sweden. The objective of the center is also to supply the Swedish industry with in-depth expertise within the wind power field. By integrating education, research and innovation, it hopes to contribute new knowledge and a transposition of today's industries.

Read more here: <http://www.chalmers.se/ee/swptc-en/>

Uppsala University/Gotland University/KTH

Extensive research is being conducted at these institutions and they have sought to bring together their various fields of wind power research to collaborate on new projects and to seek funding.

Uppsala University:

<http://www2.teknat.uu.se/forskning/uu/beskrivning.php?vetenskapsid=0&hforskomr=5&id=10&lang=en>

Gotland University:

<http://www.hgo.se/energiteknik/150-hgo.html>

KTH:

<http://www.kth.se/en/forskning/forskningsplattformar/2.19406/energy/2.7371/wind-power-1.24178>

Published Research Articles and Reports 2011-2012

Interdisciplinary and Social Science Research

Trätorn: Kan det vara något för svensk vindkraft i skogsmiljö?

Angantyr, Anders (Högskolan Dalarna), Hägerby, Daniel (Högskolan Dalarna). 2011.

<http://urn.kb.se/resolve?urn=urn:nbn:se:du-6146>.

Keywords: vindkraft, torn, trä, limträ, CLT

Vindkraft och samfällighetsförvaltning.

Blomkvist, Pär (KTH), Sandberg, Thomas (KTH). 2012.

<http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-73394>.

Keywords:

Inventering av genomförda karaktärsanalyser.

Nord, Jenny (SLU), Persson, Boel (SLU), Sarlov Herlin, Ingrid (SLU). 2012.

<http://pub.epsilon.slu.se/8604/>.

Keywords: landskapsanalys, landskapskonventionen, storskalig planering

Miljöbedömning av kommunala planer om vindkraft.

Sandström, Ulf G (SLU), Åkerskog, Ann (SLU), Gröndal, Tabita (SLU). 2011.

http://www.boverket.se/Global/Planera/Dokument/planeringsfragor/vindkraft/MKB_Studie_redigerad%202011.pdf.

Keywords: kommuner, planering, vindkraft

Kommuner och klimatåtgärder: En litteraturstudie av det aktuella kunskapsläget om klimatåtgärdernas potentialer och kostnadseffektivitet.

Fahlberg, Kristin (KTH), Johansson, Stefan (KTH), Brandt, Nils (KTH). 2012.

<http://urn.kb.se/resolve?urn=urn:nbn:se:kth:diva-63308>.

Keywords: Kommuner, Klimat, Potential, Kostnadseffektivitet, Klimatåtgärder

Inte på min bakgård! Vad menar vi egentligen?

Kvarnström, Marie (Naptek, Centrum för biologisk mångfald). Reflektioner om en svensk tillämpning av Akwé: kon-riktlinjerna. Pages 47-51. 2011.

<http://www.slu.se/Global/externwebben/centrumbildningar-projekt/centrum-for-biologisk-mangfald/Dokument/publikationer-cbm/cbm-skriftserie/skrift54.pdf#page=48>.

Keywords:

The European Landscape Convention, Wind Power, and the Limits of the Local: Notes from Italy and Sweden.

Olesa, Thomas (Victoria University), Hammarlund, Karin (SLU). 2011.

<http://www.tandfonline.com/doi/abs/10.1080/01426397.2011.582942>.

Keywords: European Landscape Convention, wind power, landscape planning, Italy, Sweden, Sicily, Dalarna, corruption, heritage

Offshore wind power policy and planning in Sweden.

Söderholm, Patrik (Luleå University), Pettersson, Maria (Luleå University). 2011.

<http://www.sciencedirect.com/science/article/pii/S030142151000457X>.

Keywords: Offshore wind power, Planning, Policy

Wind Power Compensation is not for the Birds: An Opinion from an Environmental Economist.

Cole, Scott G (SLU). 2011.

<http://onlinelibrary.wiley.com/doi/10.1111/j.1526-100X.2010.00771.x/full>.

Keywords: Compensatory mitigation, Compensatory restoration, EIA, No net loss, Restoration scaling

Birds in southern Öresund in relation to the wind farm at Lillgrund.

Nilsson, Leif (University of Lund), Green, Martin (University of Lund). 2011.

http://www.vattenfall.se/sv/file/Birds_in_southern_resund_in_relation_to_the_wind_farm_at_Lillgrund_2011-12-08_19524478.pdf.

Keywords: Lillgrund, Vattenfall, Eider, Red-breasted Merganser, Long-tailed Duck, Herring Gull, Cormorant, migration

Cost-optimized allocation of wind power investments: a Nordic–German perspective.

Göransson, Lisa (Chalmers), Johnsson, Filip (Chalmers). 2012.

<http://onlinelibrary.wiley.com/doi/10.1002/we.1517/full>.

Keywords: allocation, wind power investments, transmission investments, Nordic countries

Formation of competences to realize the potential of offshore wind power in the European Union.

Jacobsson, Staffan (Chalmers), Karltorp, Kersti (Chalmers). 2012.

<http://www.sciencedirect.com/science/article/pii/S0301421512000973>.

Keywords: Transformation of the energy sector, Offshore wind power, Competences

Offshore wind power in Sweden—A qualitative analysis of attitudes with particular focus on opponents.

Waldo, Åsa (Lund University). 2012.

<http://www.sciencedirect.com/science/article/pii/S0301421511009104>.

Keywords: Wind power, Attitude, Qualitative case study

Vindkraftsutbyggnaden – vem bestämmer och baserat på vilken kunskap? A comparison between exposure-response relationships for wind turbine annoyance and annoyance due to other noise sources.

Janssen, Sabine A. (Netherlands Organization for Applied Scientific Research), Vos, Henk (Netherlands Organization for Applied Scientific Research), Eisses, Arno R. (Netherlands Organization for Applied Scientific Research), Pedersen, Eja (Halmstad University). 2011.

http://asadl.org/jasa/resource/1/jasman/v130/i6/p3746_s1?isAuthorized=no.

Keywords: acoustic noise, wind turbines

Wind power or uranium mine: Appraisal of two energy-related environmental changes in a local context.

Pedersen, Eja (Högskolan i Halmstad), Johansson, Maria (Lund University). 2012.

<http://www.sciencedirect.com/science/article/pii/S0301421512000845>.

Keywords: Appraisal, Attitude, Psychological factors

Kommunerna och vindkraften.

Waldo, Åsa (Lunds Universitet), Ek, Kristina (Luleå Universitet), Johansson, Maria (Lunds Högskola), Persson, Lars (Umeå Universitet). 2012.

http://mpe.arkitektur.lth.se/fileadmin/miljopsykologi/Miljoeps_mon_2012_22_Kommunerna_och_vinkraften_Waldo_Ek_Johansson_Persson.pdf.

Keywords: ojämna utveckling, ekonometrisk analys, natural resources, social conditions

Particle motion measured at an operational wind turbine in relation to hearing sensitivity in fish.

Sigray, Peter (Stockholm University), Andersson, Mathias H. (Stockholm University). 2011.

<http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-66564>.

Keywords: Sound pressure, neutrally buoyant sphere, Utgrunden wind farm

Wind farms – Where and how to put them?: A choice experiment approach to measure consumer preferences for characteristics of wind power developments in Sweden.

Ek, Kristina (Luleå University), Persson, Lars (Umeå University). 2012.

http://www.usbe.umu.se/digitalAssets/107/107281_ues854.pdf.

Keywords: wind power farm establishment, preferences, choice experiment, public opinion

Correlations Between Large-Scale Solar and Wind Power in a Future Scenario for Sweden.

Widen, Joakim (Uppsala University). 2011.

<http://academic.research.microsoft.com/Publication/51178599/correlations-between-large-scale-solar-and-wind-power-in-a-future-scenario-for-sweden>.

Keywords: variable power generation, time variability, correlation

Renewable Energy and Environment: A Swedish Perspective.

Taherzadeh, Mohammad J. (University of Borås). 2011.

<http://bada.hb.se/handle/2320/10781>.

Keywords: greenhouse gases, Hydropower, Wind power

Near-real time tracking of Golden Eagles in Northern Sweden: GPS data capture, GSM data transmission and GIS visualization.

Conference on Wind energy and Wildlife impacts (CWW), 2-5 May, Trondheim, Norway. Dettki, Holger (SLU), Hipkiss, Tim (SLU), Ecke, Frauke (SLU), Hörnfeldt, Birger (SLU). 2011.

<http://www.slu.se/en/collaborative-centres-and-projects/wireless-remote-animal-monitoring-wram/about/publications/>.

Keywords: eagles, GIS, tracking

Wind power learning rates: A conceptual review and meta-analysis.

Lindman, Åsa (Luleå University), Söderholm, Patrik (Luleå University). Energy Economics, Volume 34, Issue 3, May 2012, Pages 754-761.

<http://dx.doi.org/10.1016/j.eneco.2011.05.007>.

Keywords: Learning curves, Wind power, Meta-analysis

Impact of wind turbine sound on annoyance, self-reported sleep disturbance and psychological distress.

Bakker, R.H. (University of Groningen), Pedersen, E. (Lund University), van den Berg, G.P. (Amsterdam Public Health Service), Stewart, R.E. (University of Groningen), Lok, W. (University of Groningen), Bouma, J. (University of Groningen). Science of The Total Environment, Volume 425, 15 May 2012, Pages 42-51.

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