Danish experiences with offshore wind farms and wildlife

Results of a strategic environmental monitoring programme

Jesper Kyed Larsen
Environmental manager
Vattenfall Wind Power

Wind Wildlife Research Meeting VIII
Colorado, October 19-21, 2010

© Vattenfall AB

VATTENFALL

Outline of talk

- The Environmental Monitoring Programme
- Studies and results
- Lessons learnt
- Publications and further information

© Vattenfall AB

VATTENFALL

The Environmental Monitoring Programme

- Demonstration programme for large-scale offshore wind farms (Horns Rev and Nysted), The Danish Energy Agency
- Budget 11 mill EUR, PSO funded (Energinet.dk)
- Original: 2001(1999)-2006, Follow-up: 2007-2011
- Programme management:
  - Steering committee *The Environmental Group* (The Energy Agency, SNS, Vattenfall, DONG Energy)
  - Advisory panel of international experts in marine ecology (*IAPEME*)
  - NGO following group (*The Green Following Group*)
- Studies contracted and managed by developers

© Vattenfall AB

Danish offshore wind farms

© Vattenfall AB

VATTENFALL

Benthic flora and fauna

- Large increase in biomass and species diversity on turbine positions
- Minor increase in overall biomass on wind farm scale (<10%)
- Fouling communities site specific (species, succession)
- Native benthic communities not affected at wind farm scale, local effects around turbines at Nysted
- Flora and fauna affected close to cable trench, recovering after two years (Nysted)

Fotos: Maks Klaustrup, Jens Christensen

© Vattenfall AB

Fish

- Fish abundance and diversity not found to differ markedly between wind farm and reference areas
- No marked artificial reef effect demonstrated
- Sandeel not adversely affected (Horns Rev)
- No clear effect of electromagnetic fields on fish behaviour or migration (Nysted)

Photo: Maks Klaustrup

© Vattenfall AB

VATTENFALL

Marine mammals

Harbour seal:

- Reduced numbers on haulout site (4 km, Nysted) and apparent avoidance of wind farm area (Horns Rev) during piling
- No general change in numbers or behaviour at sea or on land could be linked to the operation of the wind farms

Foto: Svend Tougaard

Harbour porpoise:

- Substantial but short-lived effects of pile driving; activity affected at 10-15+ km distance, but returning to normal within 4-23 hours
- No effect on numbers/activity during operation at Horns Rev, reduced activity at Nysted but recovering

Foto: Jonas Teilmann

© Vattenfall AB

VATTENFALL

Birds

- Numbers of feeding and resting birds within and around wind farms markedly reduced for some species (red-throated diver, long-tailed duck, and possible common scoter*), while others seemed not to be affected
- Flying birds generally avoided the two wind farms, although responses were highly species specific
- Deflection behavior resulted in extended flight distances, but unlikely to have significant energetic consequences for migrating birds
- Collision risk for migrating waterbirds was relatively small

Foto: Ib Krag Petersen

Foto: Mark Desholm

© Vattenfall AB

Lessons learnt

- Large-scale offshore wind farms can be constructed and operated with (very) little impact on the environment
- Studying effects of wind farms in an offshore environment is notoriously difficult
- Spatial scale of effects varies between construction and operation and between fauna groups
- It may take a number of years for final effects to show
- Learning by doing moves things ahead!

© Vattenfall AB

Publications and further information

Popular summaries (1999-2006 results):

Offshore Wind Farms and the Environment. Danish Experiences from Horns Rev and Nysted (booklet) – http://193.88.185.141/Graphics/Publikationer/Havvindmoeller/Offshore_wind_farms_nov06/index.htm

Danish Offshore Wind – Key environmental issues (book) - http://193.88.185.141/Graphics/Publikationer/Havvindmoeller/index.htm

Scientific reports (1999-):

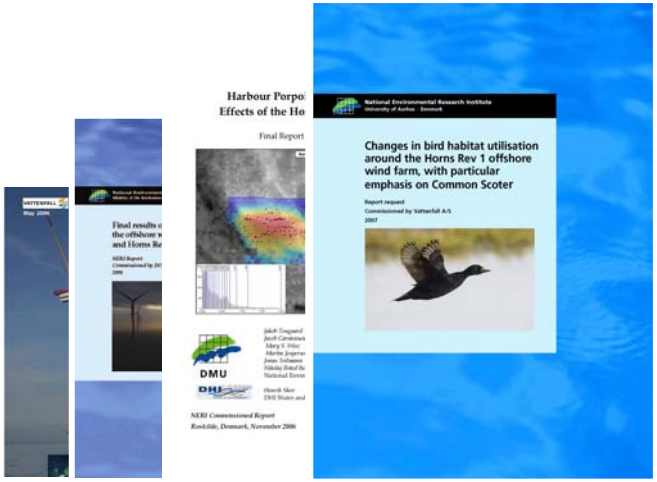
http://www.ens.dk/en-US/supply/Renewable-energy/WindPower/offshore-Wind-Power/Environmental-impacts/env.reports_for_specific_projects/Sider/Forside.aspx

Scientific papers …

Ongoing EMP studies: http://www.ens.dk/da-DK/UndergrundOgForsyning/VedvarendeEnergi/Vindkraft/Havvindmoeller/Miljoepaavirkninger/Documents/Opfølgn.MOP%20projektoversigt%20ekstern%20ENG%20310809%20_2_.pdf

Offshore wind in Denmark:

http://www.ens.dk/en-US/Sider/forside.aspx



© Vattenfall AB

VATTENFALL

THANKS!

The Environmental Group contact details:

Jesper Kyed Larsen, Vattenfall Wind Power (chairman)
Jesperkyed.larsen@vattenfall.com, +45 2787 5857

Rebekka Falk, The Danish Energy Agency
rfa@ens.dk, +45 3392 7572

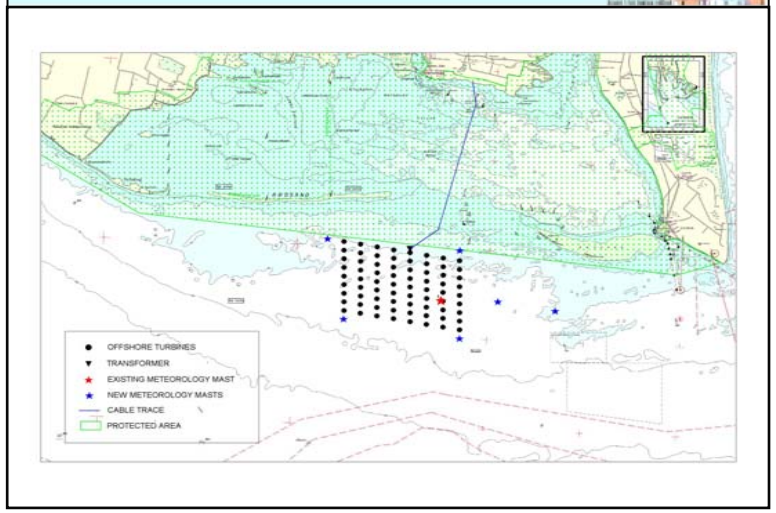
Ulrik C. Berggreen, The Agency for Spatial and Environmental Planning
ucb@blst.dk, +45 7012 0211

Charlotte Boesen, DONG Energy
charb@dongenergy.dk, +45 9955 7644

© Vattenfall AB

VATTENFALL

Horns Rev and Nysted Offshore Wind Farms



Horns Rev 1 (2002)

- Turbines: 80 Vestas V80, 2 MW
- Monopile foundations
- Height to tip: 110 m
- Distance to coast 14 km
- Depth 7-14 m

Nysted (2003)

- Turbines: 72 Bonus, 2.3 MW
- Gravity based foundations
- Height to tip: 110 m
- Distance to coast 10 km
- Depth 6-10 m

© Vattenfall AB

VATTENFALL

DK offshore wind environmental impact studies

with reporting in English, October 2010

- Tunø Knob demonstration project (1995, 10 500kW), seaduck studies 1994-1998 (common eider)*
- Horns Rev 1 (2002, 80 2MW) and Nysted (2003, 72 2.3MW) large-scale wind farm demonstration project – The Environmental Monitoring Programme, 1999-ongoing (range of issues)**
- German studies post-construction studies 2005-2006 (birds, harbour porpoise) at Horns Rev 1 and Nysted***
- Horns Rev 2 (2009, 91 2.3MW) monitoring programme - construction phase studies on harbour porpoise 2008****
- The Habitat Modelling Project (further field studies at Nysted and modelling of effects)*

* (contact jesperkyed.larsen@vattenfall.com for further information and publications)
** (*http://www.ens.dk/en-US/Sider/forside.aspx*)
*** (*http://www.vattenfall.com/en/reports.htm*)
**** (*http://www.dongenergy.com/en/Pages/index.aspx*)

© Vattenfall AB

VATTENFALL