Night-time obstruction lighting of offshore wind farms and birds

- A multi-party project to define the requirements of different interest groups in Germany –

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WinMon.BE 2013 Conference, Brussels, 26-28. Nov 2013

Offshore wind mill with potential markings / lightings

Ship safety: yellow shaft (15 m above sea level
3 x ID markings (letter size 1 m)
illumination of ID markings OR
illuminated ID
5 nm lights (yellow, blinking) at each peripheral wind mill

Air safety: 2 x red blinking on nacelle
4 x obstruction lights (red, permanent) on the mast
3 x blade tip red lights, illuminated 60° before to 60° after the top height

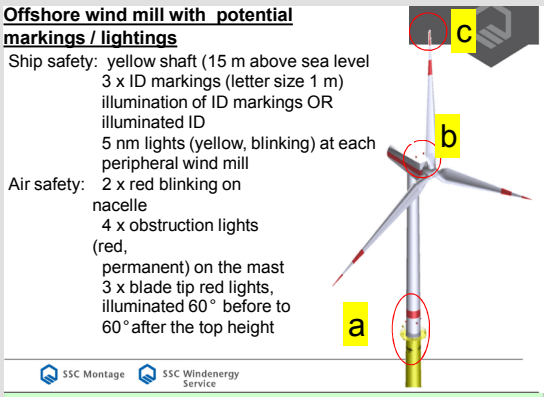


Fig. 1: Obstruction lighting on a model offshore windmill > 150 m in German waters; for smaller wind mills the "4 x obstruction lights" and "blade tip red lights" are not mandatory.

Introduction

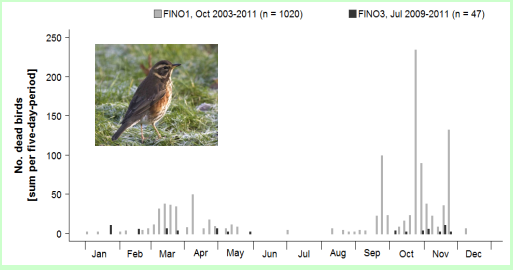
International and national regulations regarding ship and air safety require wind mills to be marked with obstruction lights during night-time.

Migrating birds are known to cross large water bodies - e.g. the North Sea - during night-time; orientation relies on different mechanisms from magnetic compass over polarised light to night cues like sunset and stars. The disturbances of night-migrating birds by artificial lights range from des-orientation to exhaustion and/or collisions.

In this multi-party project each party (ship and air safety, energy providers, legal authorities) and nature conservation provided their needs regarding obstruction lighting.

Do birds collide with offshore structures at night?

They do!



Birds found dead on two North Sea platforms (FINO1/3); (n = 1067); FINO3 is further offshore than FINO1 and has fewer collisions. (R. HILL, AviTech Research, written comm.)

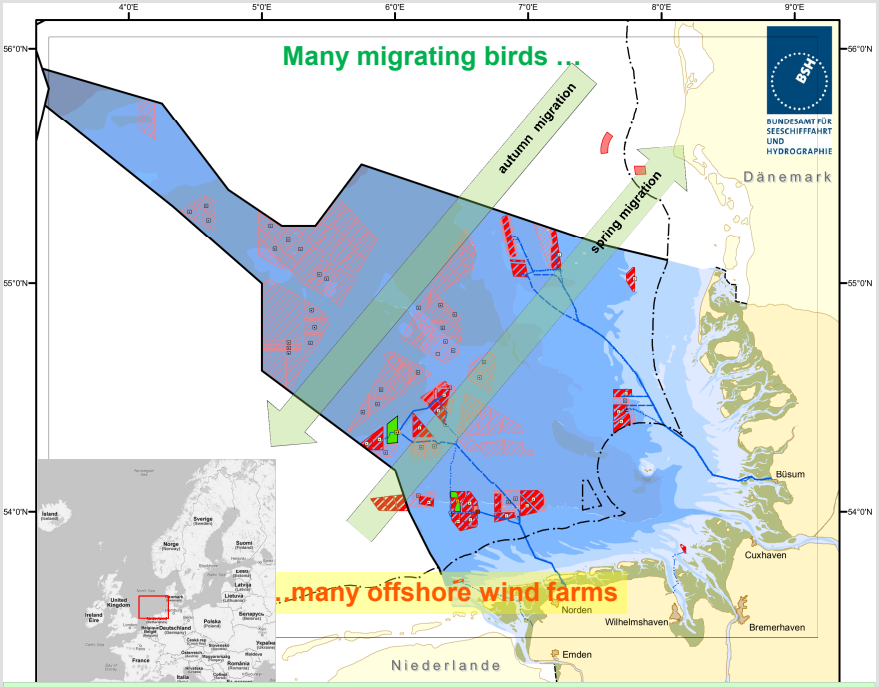


Fig 2: Offshore wind farm planning in German North Sea; green: windfarms existing or under construction; fully red shaded: windfarms consented; light red shaded: wind farms planned (BSH 2012).

Facts:

- Lights attract birds. Worse: inclement weather / reduced visibility attracts birds at close distance, they may become "trapped".
- Permanent lights are worse than blinking / flashing lights.
- White / broad-spectrum lights are worse than green/blue / narrow-spectrum lights; however, the exact effects of light colour are not entirely clear.

Conflict issues:

- Air safety demands red lights on each wind mill; if > 150 m, blade tip lights (Fig 1: a, b, c).
- Ship safety demands illuminated areas on mast / illuminated letters / signs (Fig 1: a).
- Ship and air safety demand obstruction lighting on many, if not all wind mills.
- Providers must fulfill legal obligations, also keep an eye on installation and maintenance costs.

Conclusion from a nature conservation point of view:

The less light, the better!

Solutions / suggestions:

- Replace illuminated areas with self-reflecting letters / numbers (only active, when illuminated by e.g. search lights (Fig. 1: a).
- Do not use blade tip lighting (Fig. 1: c).
- Only install lights for ship safety on corners and every second peripheral wind mill of a wind farm (Fig. 1: a).
- Only activate lighting in wind farm *"on demand"*, i.e. when an airplane or a ship approaches (transponder or radar techniques) (Fig 1: a, b, c).

Talk to each other for compromises!

Organized by SSC-Wind GmbH
Supported by the Federal Ministry of Environment, Nature Conservation and Nuclear Safety, Germany and third-party-funds

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

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