

# Offshore obstruction lighting - Issues and mitigation

Conference on Wind power and Environmental impacts – Stockholm 5-7 Feb 2013



Jan Blew



Georg Nehls

Ursula Prall



# Contents

---

Rules and regulations

Impressions

Some facts

What are we talking about?

Mitigation

Alpha Ventus offshore wind farm North Sea

# Rules and regulations

---

## **Germany: Approval steps, bird issues, denial**

### **§ 7 Seeanlagen-Verordnung (Marine Facilities Ordinance), for offshore areas in the German EEZ:**

“Ground for denying approval exists, if bird migration is threatened.”

#### **Approval documents include:**

- “If mass migration predictably occurs, this evidence has to be registered and to be reported within one week”
- “... potential mass collision events must not threaten the population”
- “... mitigation options are explicitly reserved”
- “... deficits in knowledge are admitted”

# Rules and regulations

---

## **But: can one act on this?**

Definitions do not exist, e.g.

- mass bird migration
- mass collision
- species specific thresholds of additional mortality etc.

Offshore monitoring during operation may not be sufficient,  
also

mitigation options are not explicitly defined.

# Impressions



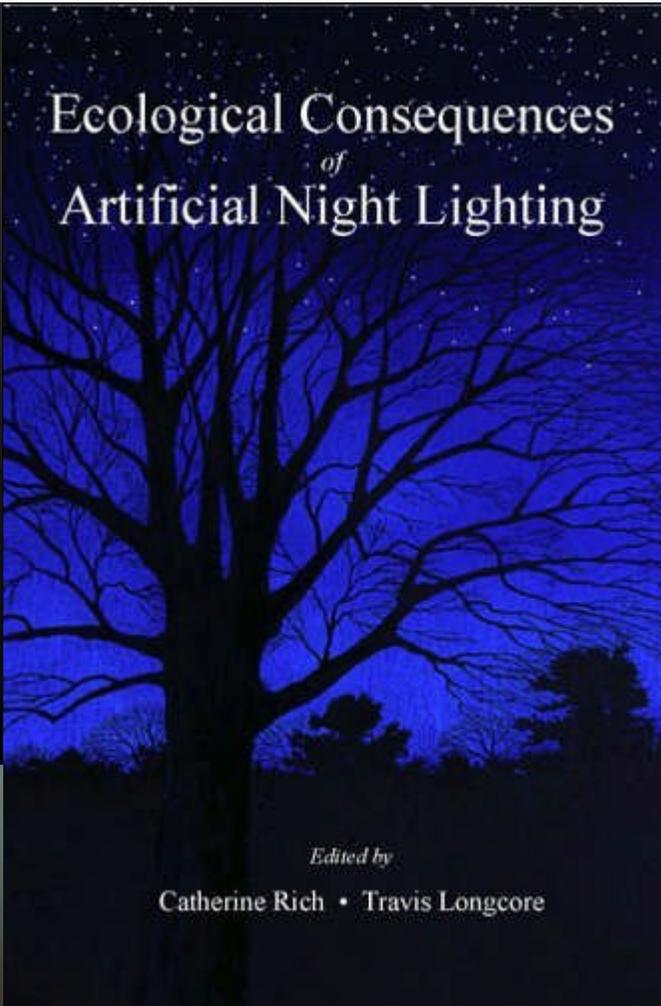
bill boards



indirect lights



Ecological Consequences  
*of*  
Artificial Night Lighting



*Edited by*

Catherine Rich • Travis Longcore

Skybeamer



For birds it may look like this:



Alphaventus offshore wind farm North Sea

... or like this?



Alphaventus offshore wind farm North Sea

... or like this?



Alphaventus offshore wind farm North Sea

... or more like this?

in a formerly pitch dark environment ...

... we simply don't know!

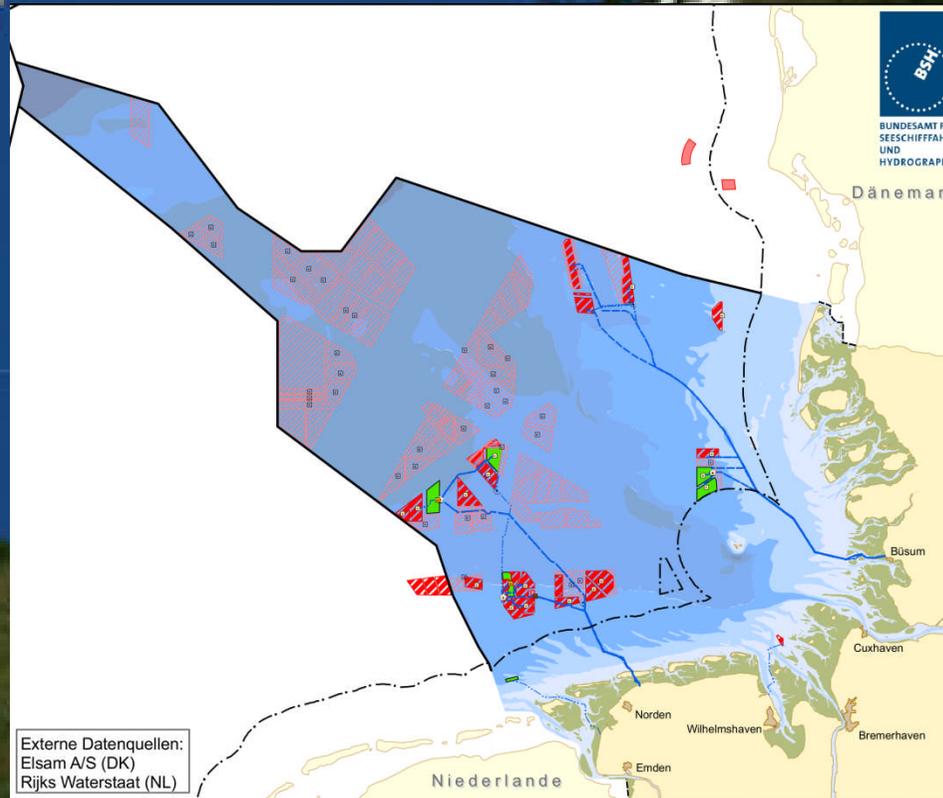


# Some facts

---

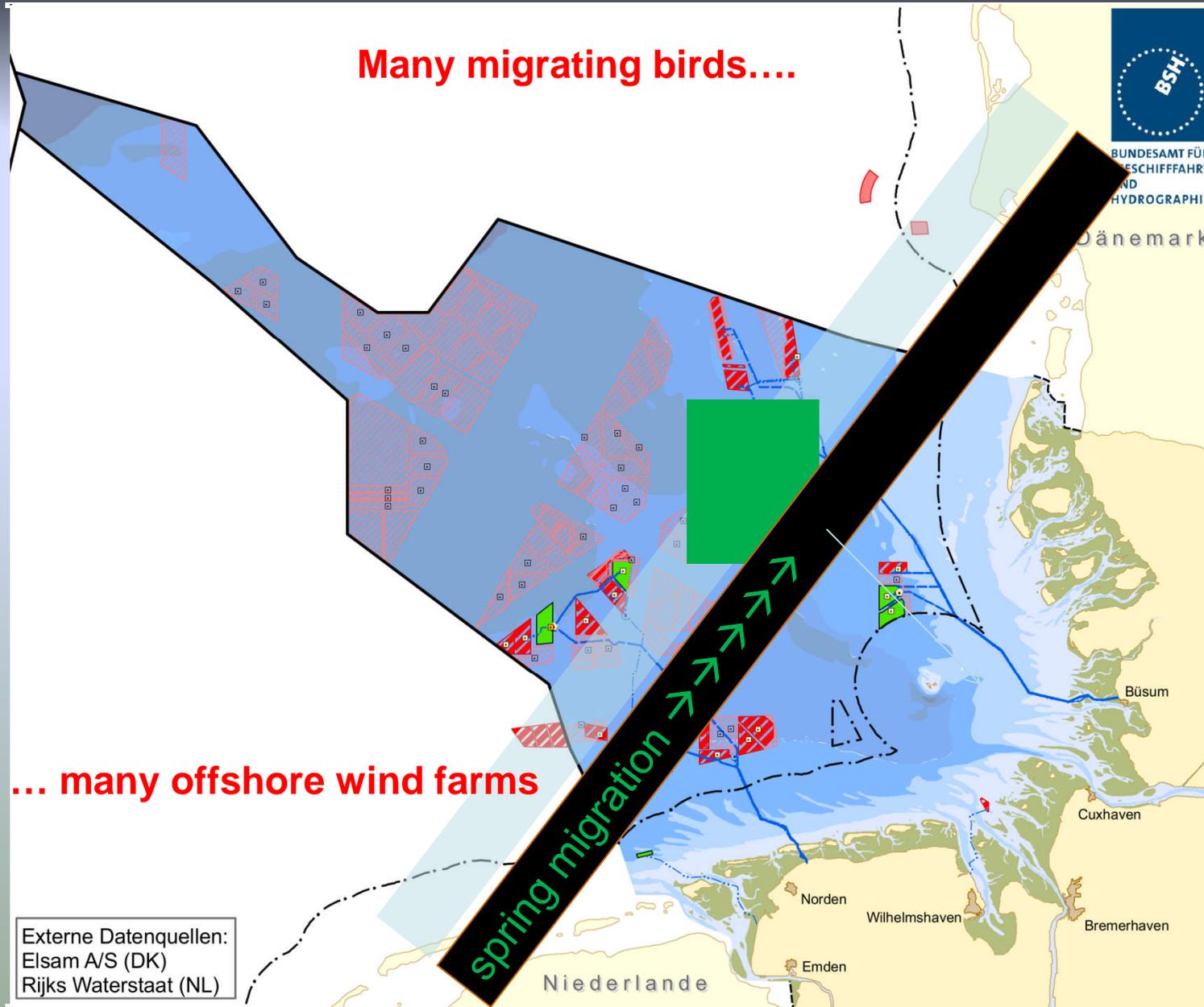
## Some facts

### Proposed offshore wind farm areas in Europe ([www.4coffshore.com](http://www.4coffshore.com))



**German EEZ: 26 permitted and 62 proposed  
each with 40- 100 wind turbines (Status 2012)**

# Some facts

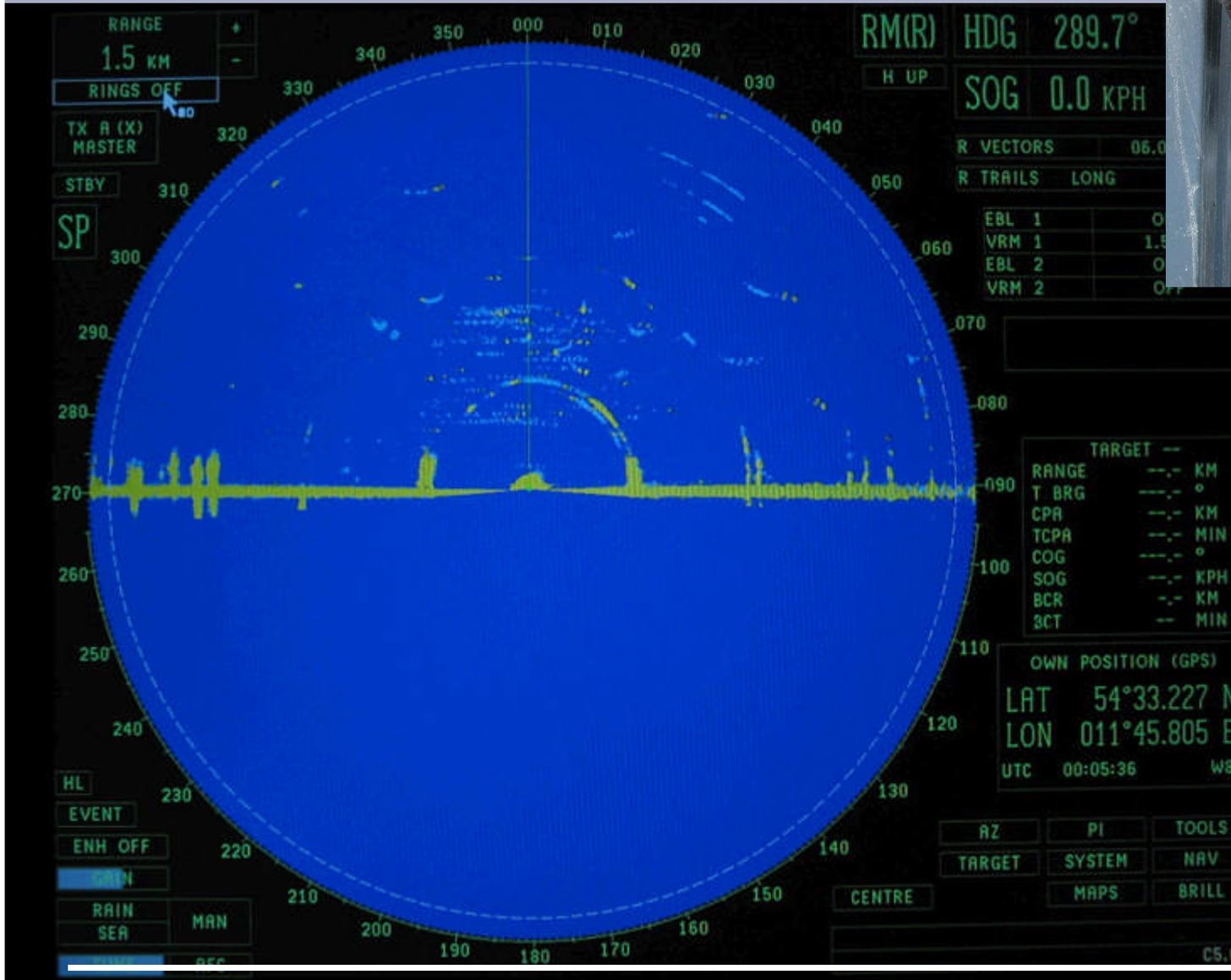


Many migrating birds....

... many offshore wind farms

# Some facts

Birds fly at night, many, all altitudes.



# Some facts



Do birds collide?

**They do - offshore!**

**Fino 1 (AUMÜLLER et al., 2011)**



## Some facts

---

### **Birds and lights at night - what do we know?**

- birds are attracted by lights – and collide;
- „trapping effects“ – increase the collision risk;
- flashing light is less harmful, light colour is being tested;

### **How many fly there at night?**

- e.g. breeding populations Sweden and Finland (incl. both partners plus 2 young per pair) –  
→ ~ 400 Mio, mostly songbirds; that is **MANY!**

### **How many may collide?**

- onshore: 2 to 60 per turbine and year (estimates from Germany and USA)
- offshore: nocturnal migrating songbirds: 100 to 1,000 per turbine and year (calculated, BELLEBAUM et al., 2010)

# What are we talking about?

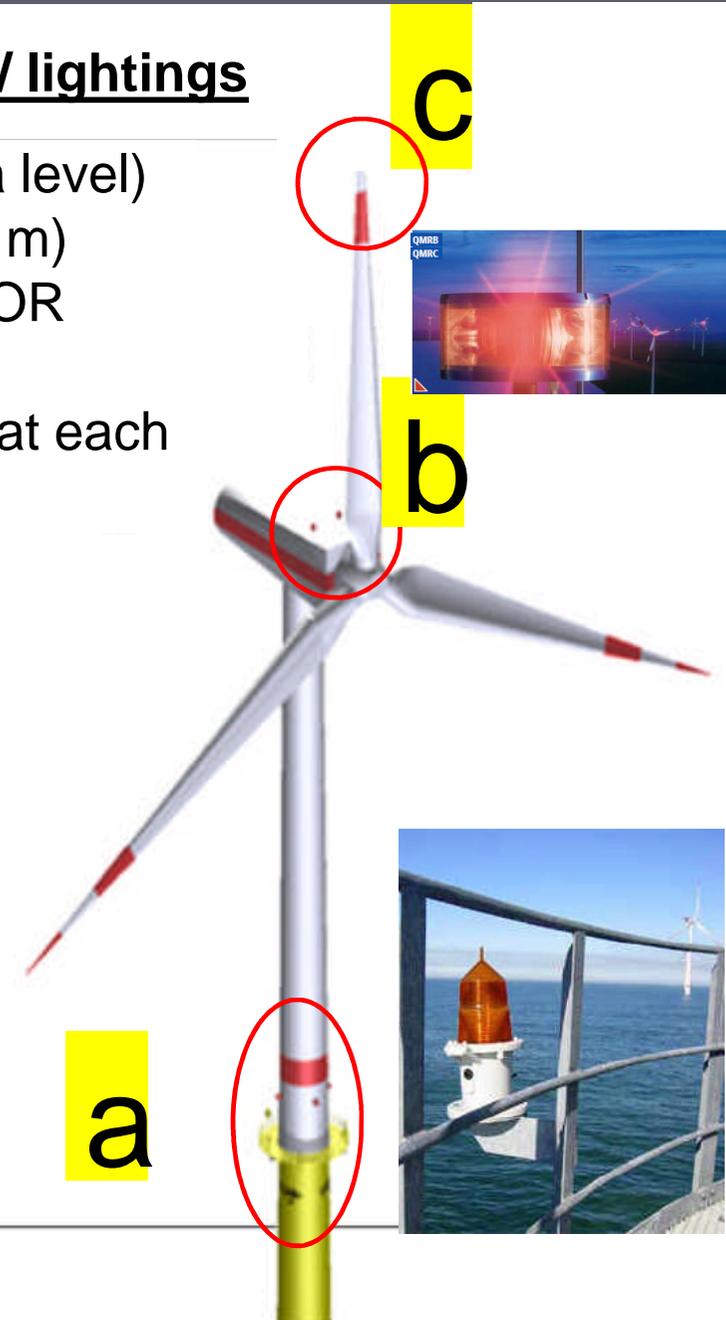
---

# What are we talking about?

## Offshore wind mill with potential markings / lightings

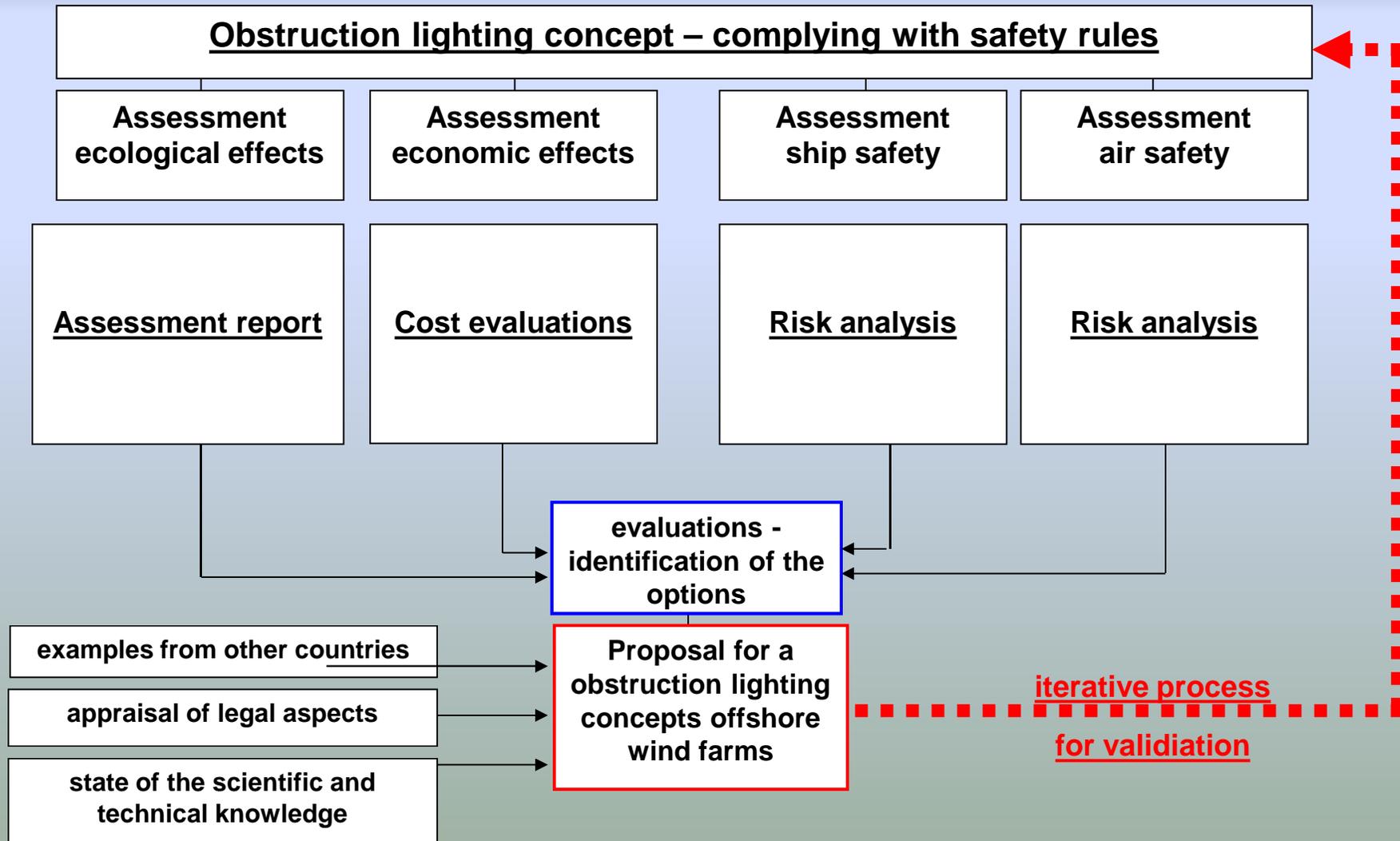
- Ship safety (a):
- yellow shaft (15 m above sea level)
  - 3 x ID markings (letter size 1 m)
  - illumination of ID markings OR illuminated ID
  - 5 nm lights (yellow, blinking) at each peripheral wind mill

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



# What are we talking about?

## Development of concepts for the marking of offshore wind farms (SSC – WIND)



# Mitigation

---

**The less light – the better!!**



A good example: The less light ...



RWE Mittelplate, Photo RWE, H. MATTFELD

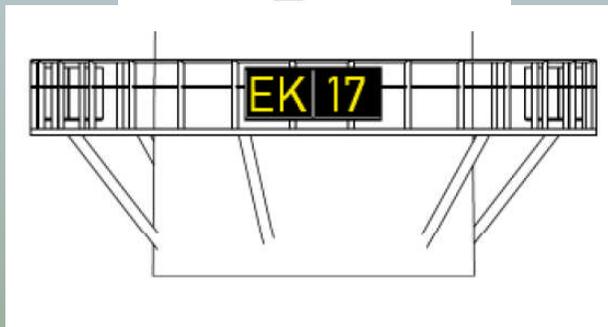
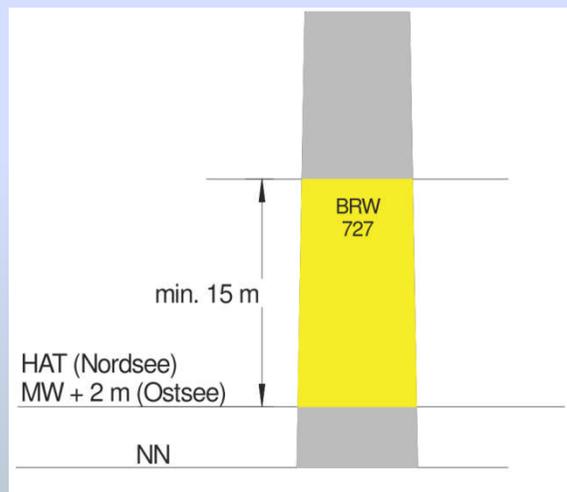
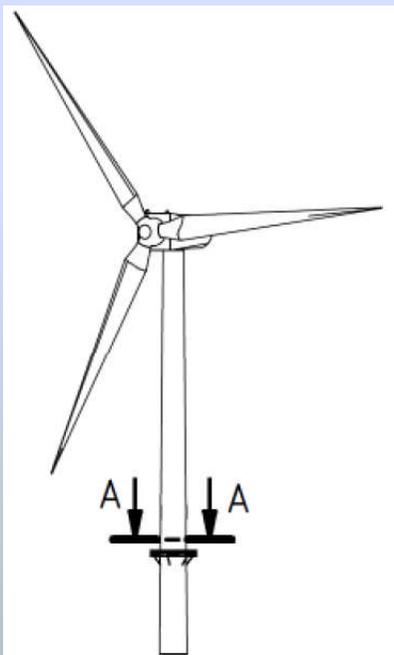
... the better! Not compromising on safety!



Mittelplate, Photo RWE Dea, H. MATTFELD

# Mitigation – the less light, the better

- Do not illuminate areas!
- Use inverse LED plates / letters / numbers;
- Use self-reflective material.

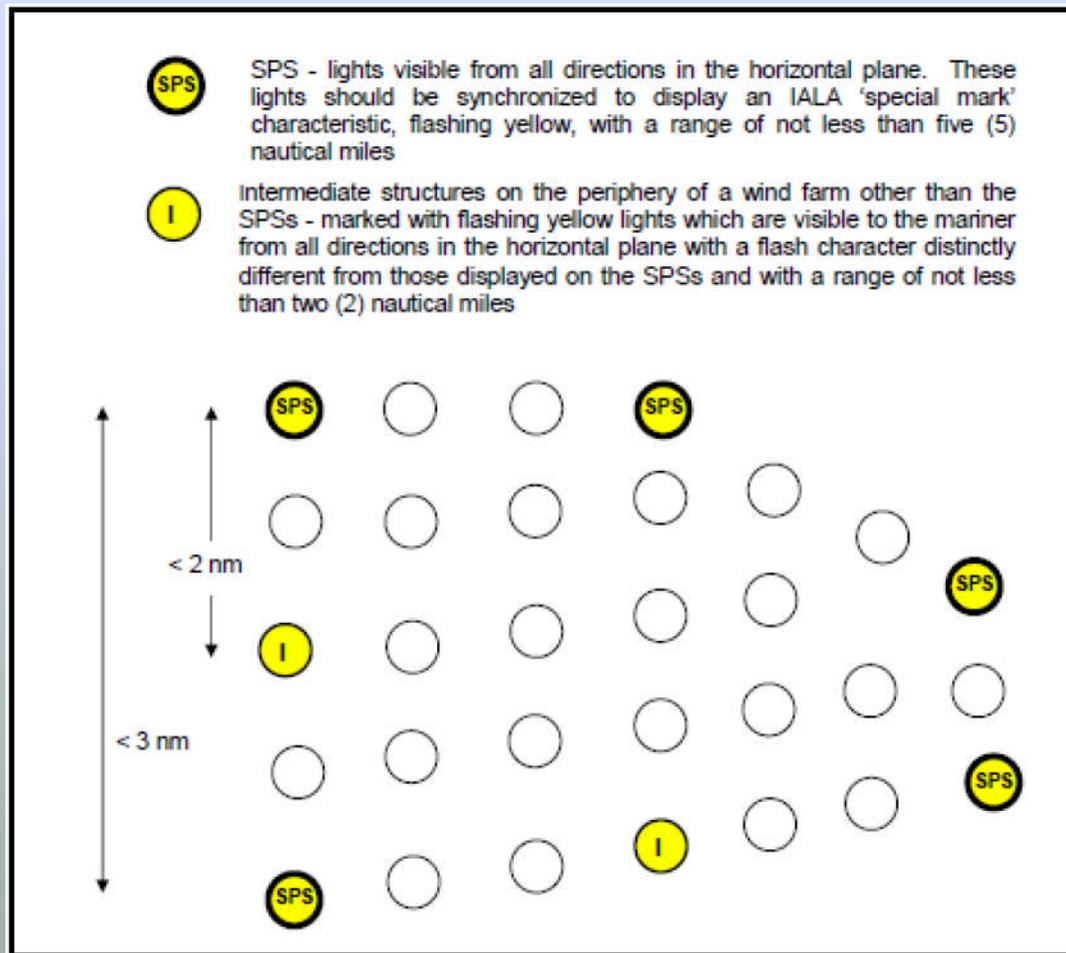


# Mitigation – the less light, the better



# Mitigation – the less light, the better

Only install lights for ship safety (5/2 nm safety lights) on corners and some peripheral wind mills per wind park.



# Mitigation – lights out, on on demand

Only use “light” on demand:

**Transponder (secondary radar):** airplanes to be equipped with transponder systems;

**FLARM** – Traffic and Collision Warning for General Aviation



**Passive Radar** – tested in North German onshore wind farms



# Mitigation – lights out, on on demand

**Primary radar;** 3 to 4 per wind park, 8 km by 600 m  
(Enertrag, e.g. North Germany)



**Technische Daten (SPEXER™ 500AC)**

- FMCW Primärradar mit digitalem Beamforming im X-Band (ca. 9,4 GHz)
- Kompaktes Design
- Elektronische Strahlschwenkung (keine beweglichen Teile)

Sendeleistung	ca. 4 W
Höhenabdeckung	bis ca. 600 m
Horizontale Abdeckung	120°
Reichweite	8 km

Der Radarsensor SPEXER™ 500AC ist ein Bestandteil des **airspex**®-Gesamtsystems



# What are we talking about?

---

## Ship safety

- yellow 5 nm lights; → but at each windmill of a park?
- other lit markings → can they be self-reflective?

## Air safety

- red blinking lights on generator house; > 150 m mid-level lights, blade tip lights;
  - do they (aircrafts) need to fly out there?
  - do the lights need to be on?

## What do we (ecologists) need to provide?

- quantitative data on avoidance behaviour, attraction effects
- true collision rates;
- altitude distributions / migration intensity depending on weather
- effects of light colours

## How frequently, where and when could mass collisions occur?

# What are we talking about?

---

Int. regulations are not binding, there is room for flexibility.

Offshore it is “only” a bird, onshore also an acceptance problem.

## **Less light, options to choose from:**

→ self-reflective ID markings instead of lit areas;

→ new challenges / new concepts for turbines larger than 150 m;

→ on-demand techniques (for turning lights on).

**Keep talking / working for as little light as necessary!**

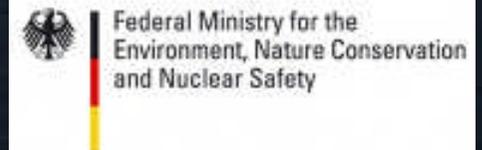
## Thanks to:

“Obstruction lighting ...” project,  
organized and steered by

**SSC-WIND, Germany**

Alpha-Ventus offshore wind farm and related  
research, initiated and financed by

**Federal Ministry for the Environment, Nature  
Conservation and Nuclear Safety, Germany,**





**Thank you!**