

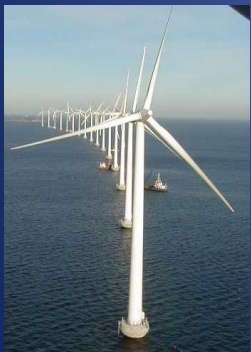
# Danish experience in connecting local communities and wind power.

## Middelgrunden offshore wind farm case study

by

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Board member Danish Turbine Owners Association  
CEO SPOK ApS



# Background H C Soerensen

DANMARKS  
VINDMØLLEFORENING



Business and university background

- PhD, 40 years with business development

Project management large projects

- Ocean wave energy (Wave Dragon), Tidal current (Tideng)

- Offshore wind (Middelgrunden 40 MW, Samsø 23 MW, Hvidovre 7.2 MW)

Committees

- Danish Wind Turbine Owners Association, board

- European Ocean Energy Association, vice president to 2011



# Background H C Soerensen



Hvidovre / Avedøre  
3 @ 3.6MW



# Data the Copenhagen coop projects

	Lynetten	Middelgrunden	Hvidovre
Year	1995/96	1996/2000	2007/2009/2011
Power	7 x 600kW	20 x 2MW	3 x 3.6MW
COOP/DONG	4/3	10/10	1/2
Shares/owners	3,600 shares/902	40,500/8,553	10,700/2,268
Price/share	604€	570€	670€
Upfront work	Coop/Utility	Coop & Utility	Coop & Utility
Upfront payment	Coop/Utility	Grant/Utility	Utility
Cost	4.1 mill€	49.5 mill€	22 mill€



# Danish Cooperative model

- Shared ownership, one person one vote independent of shares
- Typically no loans – up front payment of total cost \*
- One share equal to a production of 1,000 kWh/y
- Historically: ownership equal to own consumption of electricity
- Typically 3-5 shares => 3,000 – 5,000 kWh/y up to 2008
  - \* Typically 350€ to 670€ a share
  - \* A few banks are giving loans for individuals with security in revenue only

## Simple tax rules possible – and needed:

- No tax when production revenue less than 940€/y
- Simple tax revenue form
- Only an advantage with less than about 10-20 shares\*\*

\*\* Else use standard for companies: profit less depreciation, but then remember auditor for the tax authorities

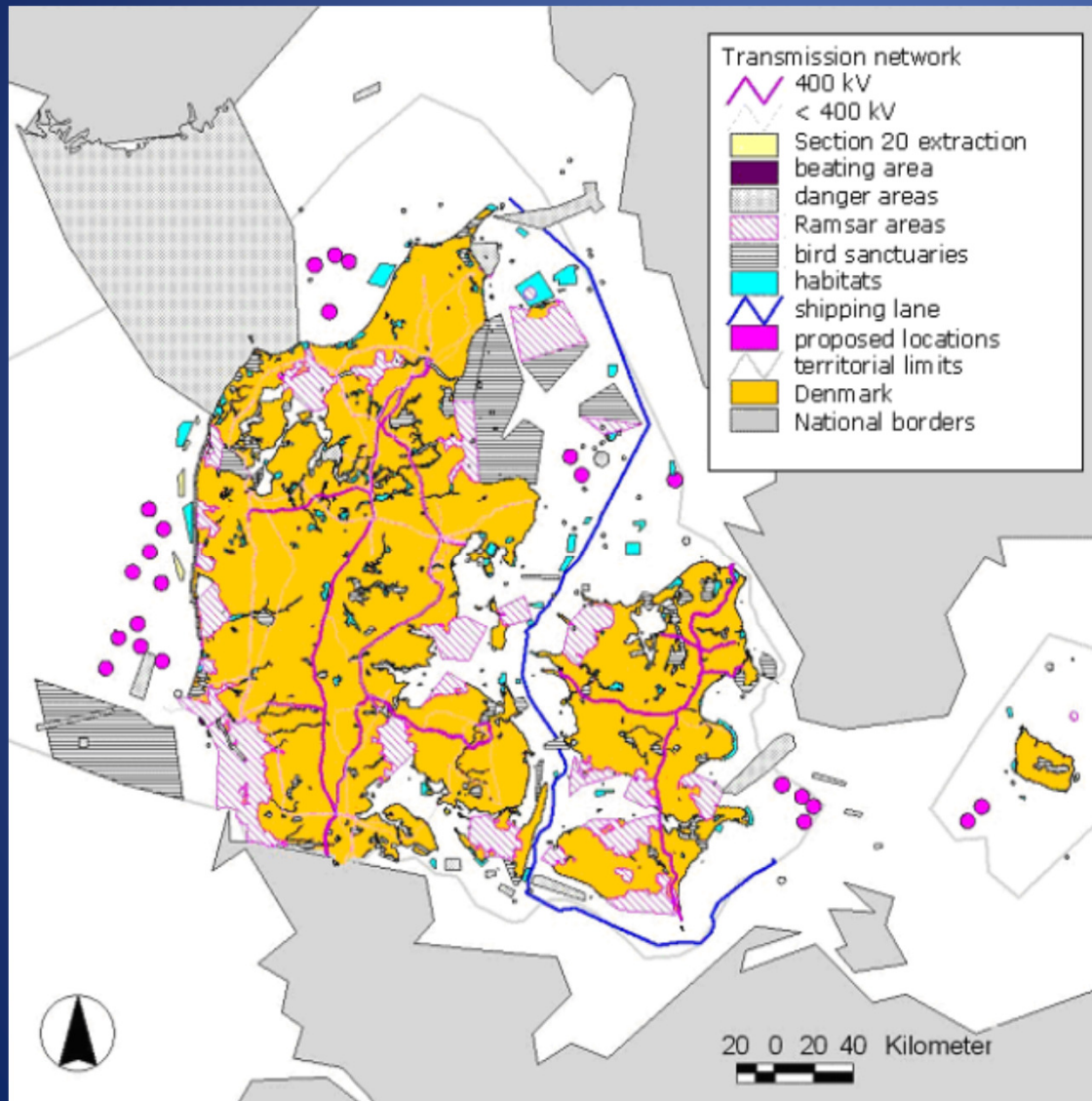
# The general conditions for wind farms

- 50% of electricity consumption by 2020 - today 34%
- Power produced to be bought by Transmission System Operator (TSO) - standard PPA
- Price - premium tariff on top of market price<sup>1</sup>:
  - First (22,000 hours x rated power): +33.6€/MWh
  - Wind producer to pay cost for balancing, but compensation paid with 3.1 €/MWh
- Offshore farms within Action Plan: tender procedure

<sup>1</sup> market price mean value 2009: 50€/MWh - 2011: 43€/MWh - 2012 32€/MWh  
but varies and can even be negative



# Offshore action plan



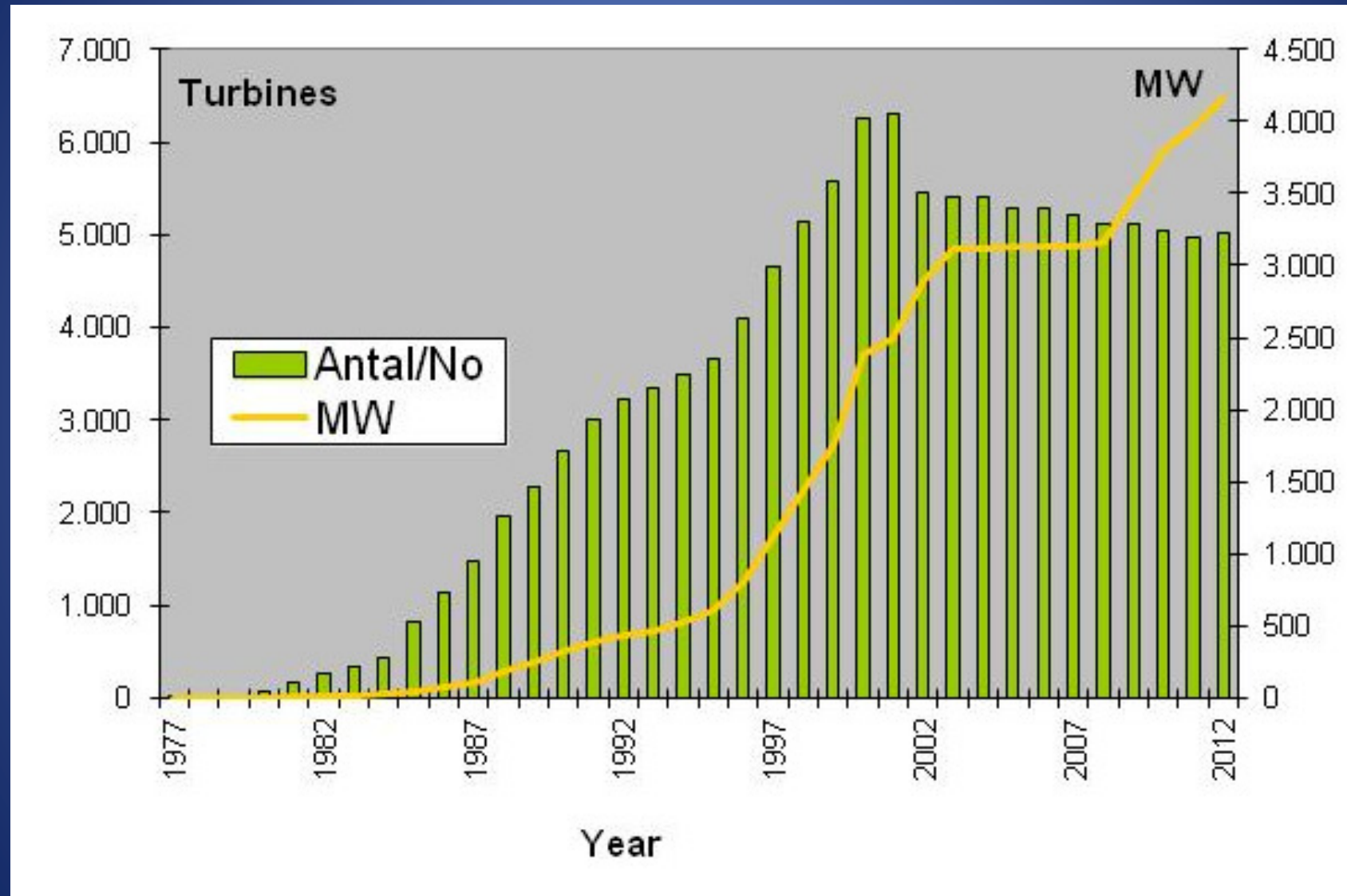
- Minimum 400MW
- Typically >20 km from shore
- Subjected to tender based on lowest price for first 50,000 full load hours
- Else market price
- Only coop involvement close to shore

# The organisation

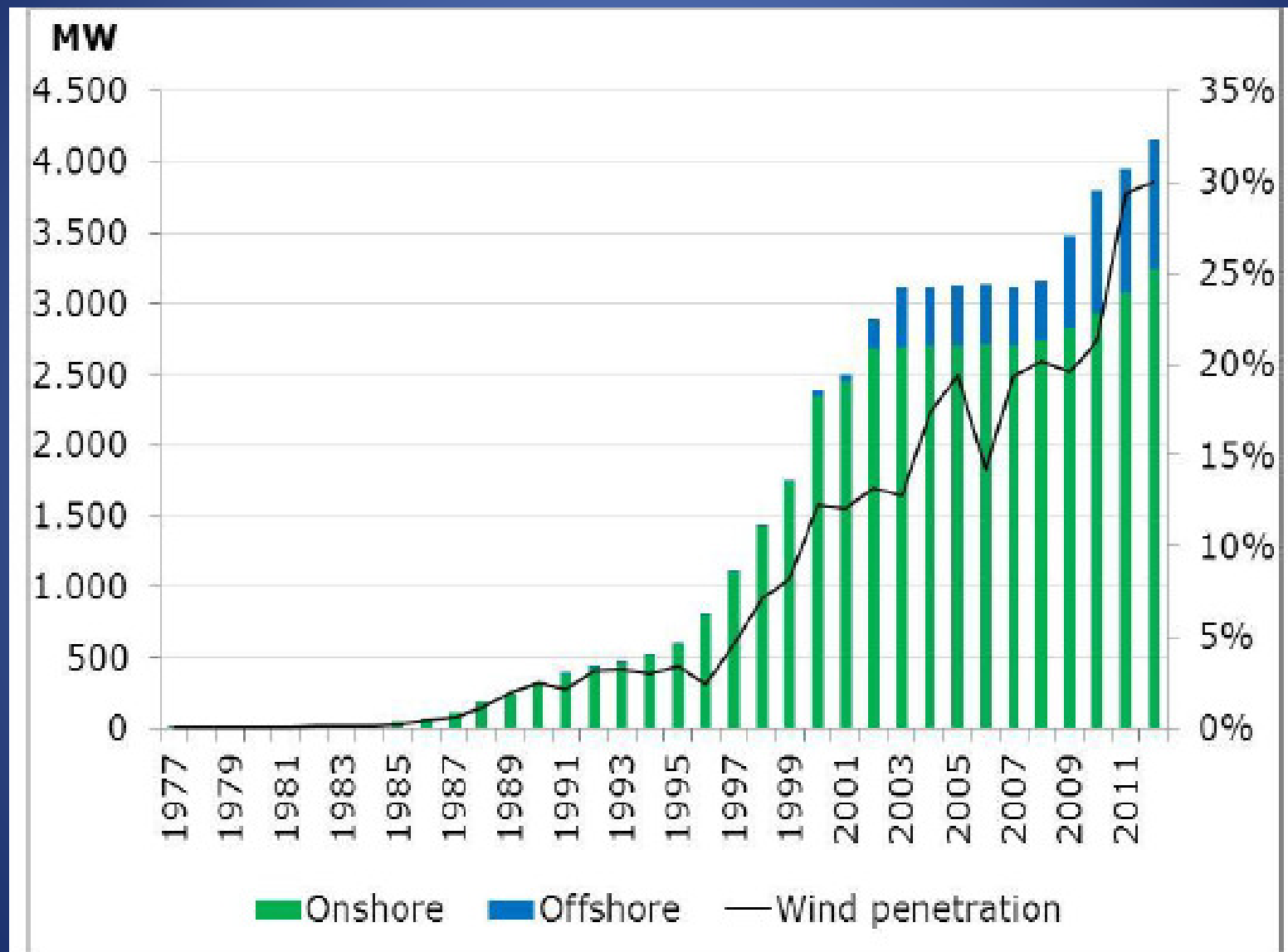
- Board of 5-7 people selected every 2 years
- No fee to board members
  - Administration office/book keeping /volunteers dependant of shares
  - One part time person paid to follow up on maintenance
  - Service company or manufacturer to do service
  - Audit company for account
- Home page for information; e-mail if possible
- Newsletter with call for General Assembly each year
- Open house for visiting if possible



# Growth in wind energy Denmark

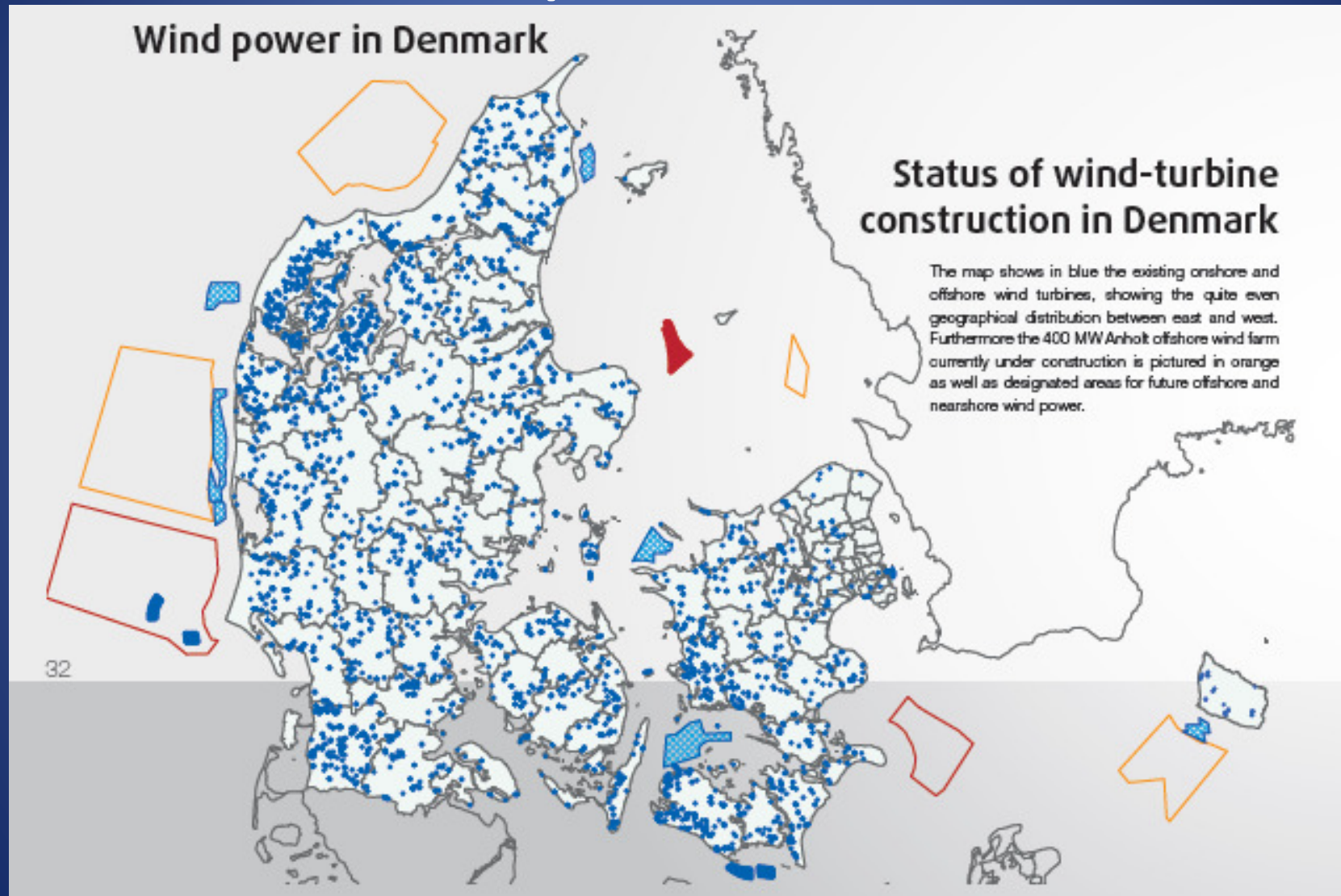


# Offshore - onshore

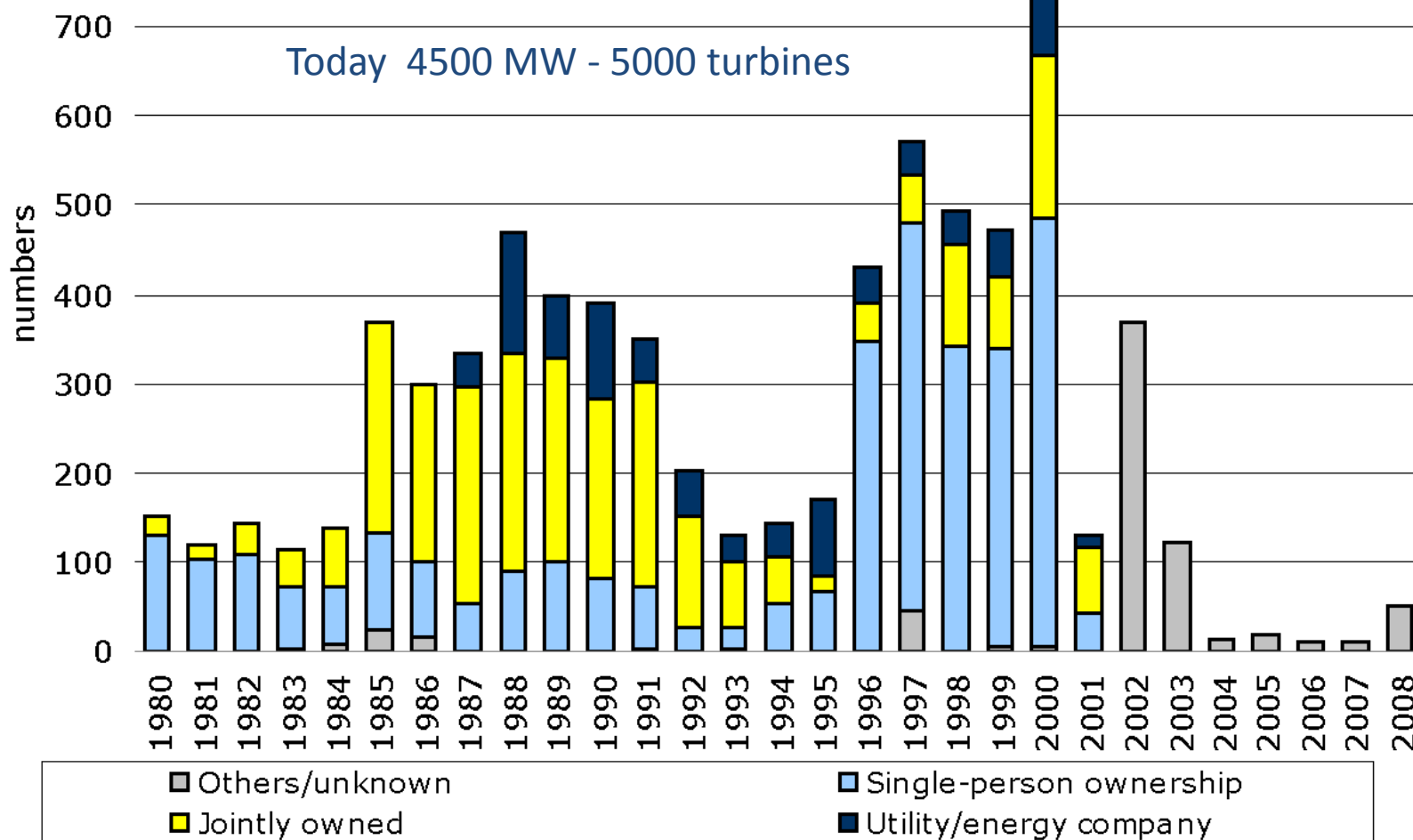




# Wind power 2013



# The development up to 2008





# The RE-law of 2008

- Minimum 20% local ownership to be offered within 4.5km, thereafter to local municipality; at cost price; if not sufficient buyers you can as developer keep it by yourselves.
- Loan guaranty after basic work have been done of up to 67,200€ for each project
- Social Green Fund to Municipality  
11,800€/MW
- Compensation for neighbours possible

Projects typically 3-6 turbines which is the most accepted pattern by people in the Danish landscape

# The cooperative approach – how to start?

## In old days:

- Village got together; meeting called for; landowner also partner; discussion site;
- Planning process started then automatically;

## Copenhagen (Middelgrunden):

- A small group from Lynetten wind farm started in 1996 called for interest to work and send application
- At the same time DONG Energy had started own search for setting up a wind farm at the reef
- We agreed to form a common group: *the NGO and DONG Energy to build and later split in two separate operational units each 20 MW and 10 turbines*

# The cooperative approach- Benefits

## Advantages

- Local involvement
- Earlier involvement
- Profit stays locally

## Disadvantages:

- Upfront payment even before consents
- Dependency of manufacturers when no grants

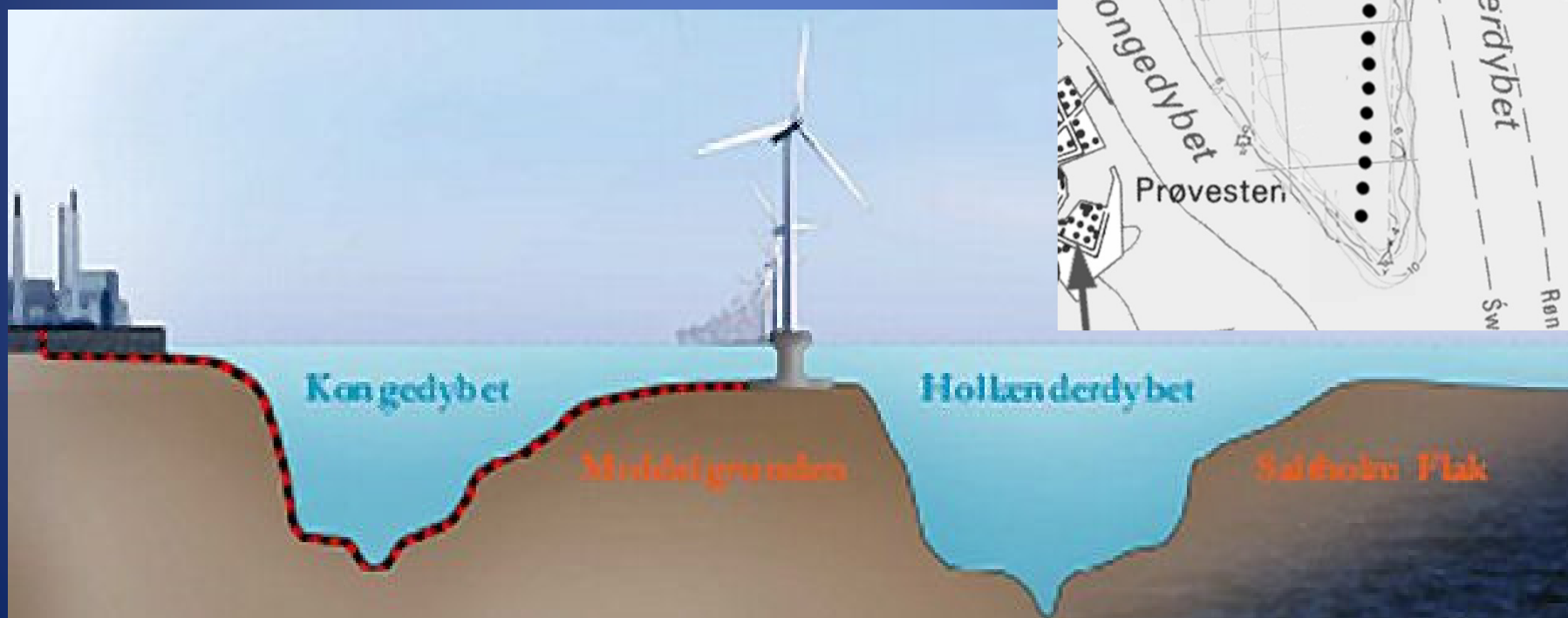
## Today (from 2009 onshore):

- Minimum 20% local ownership to be offered within 4.5km, thereafter to local county
- Offshore on close to shore farms: 16 km special incentives

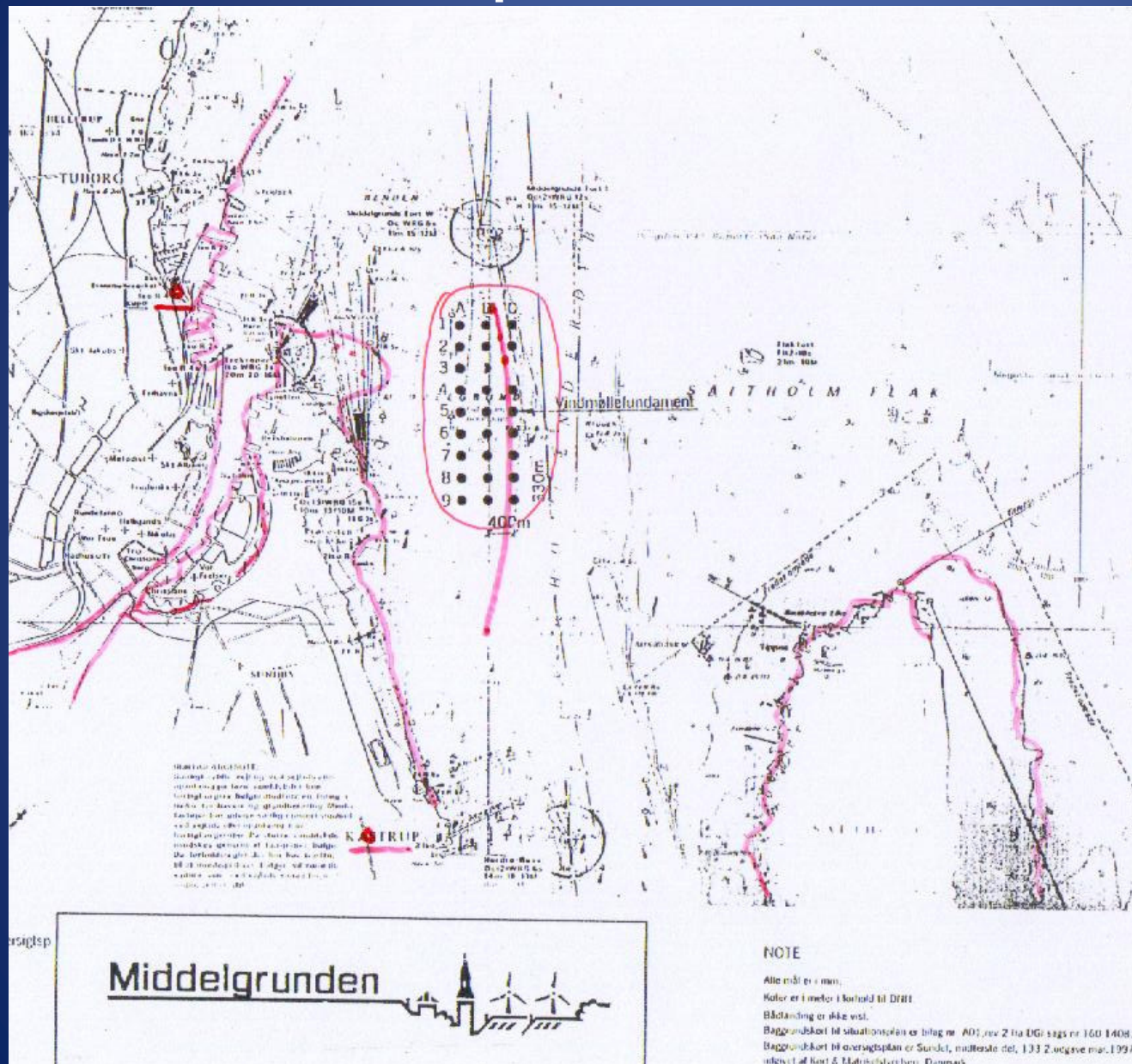


# Middelgrunden 40 MW Wind Farm

The farm is constructed on a reef called Middelgrunden with a water depth of 1-6 m deep



# Technical optimisation – visual impact



3 rows in  
the north  
part, 27  
turbines –

changed to  
one line over  
the whole  
length



# Visual Impact – two alternatives



27 turbines in 3 rows

A photograph showing 27 wind turbines arranged in three rows across a blue sea under a clear sky. A red railing is visible in the bottom right corner.

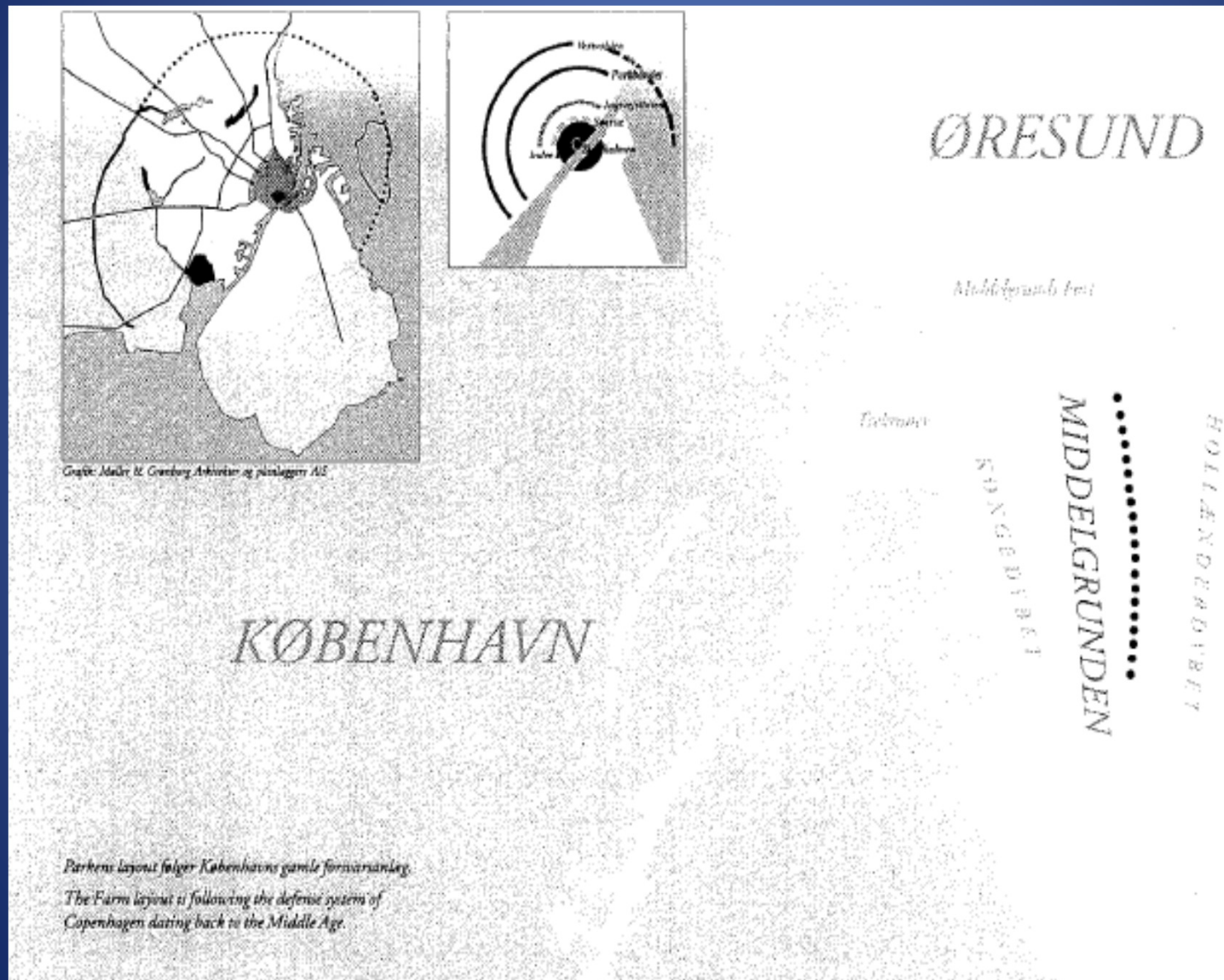


20 turbines in a curved line

A photograph showing 20 wind turbines arranged in a single curved line across a blue sea under a clear sky. A red railing is visible in the bottom right corner.



# Visual impact – the defence circles

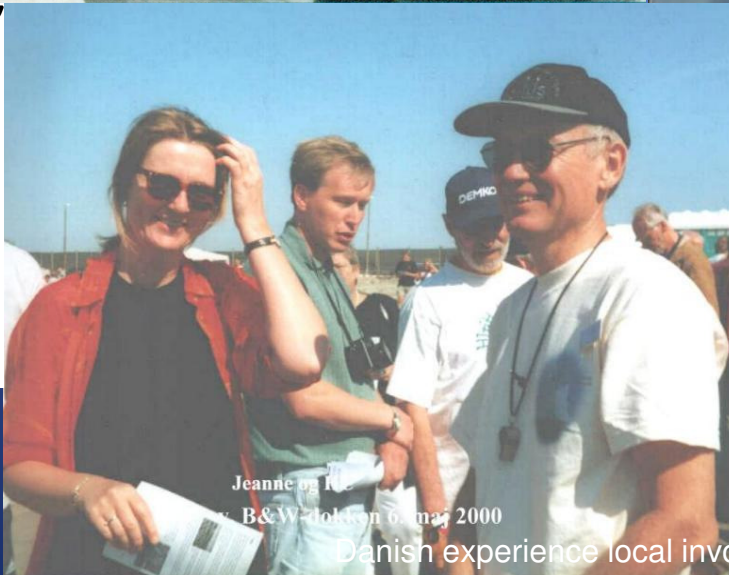
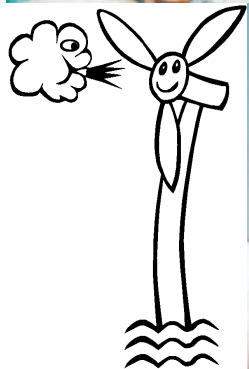


# Middelgrunden 40 MW Wind Farm



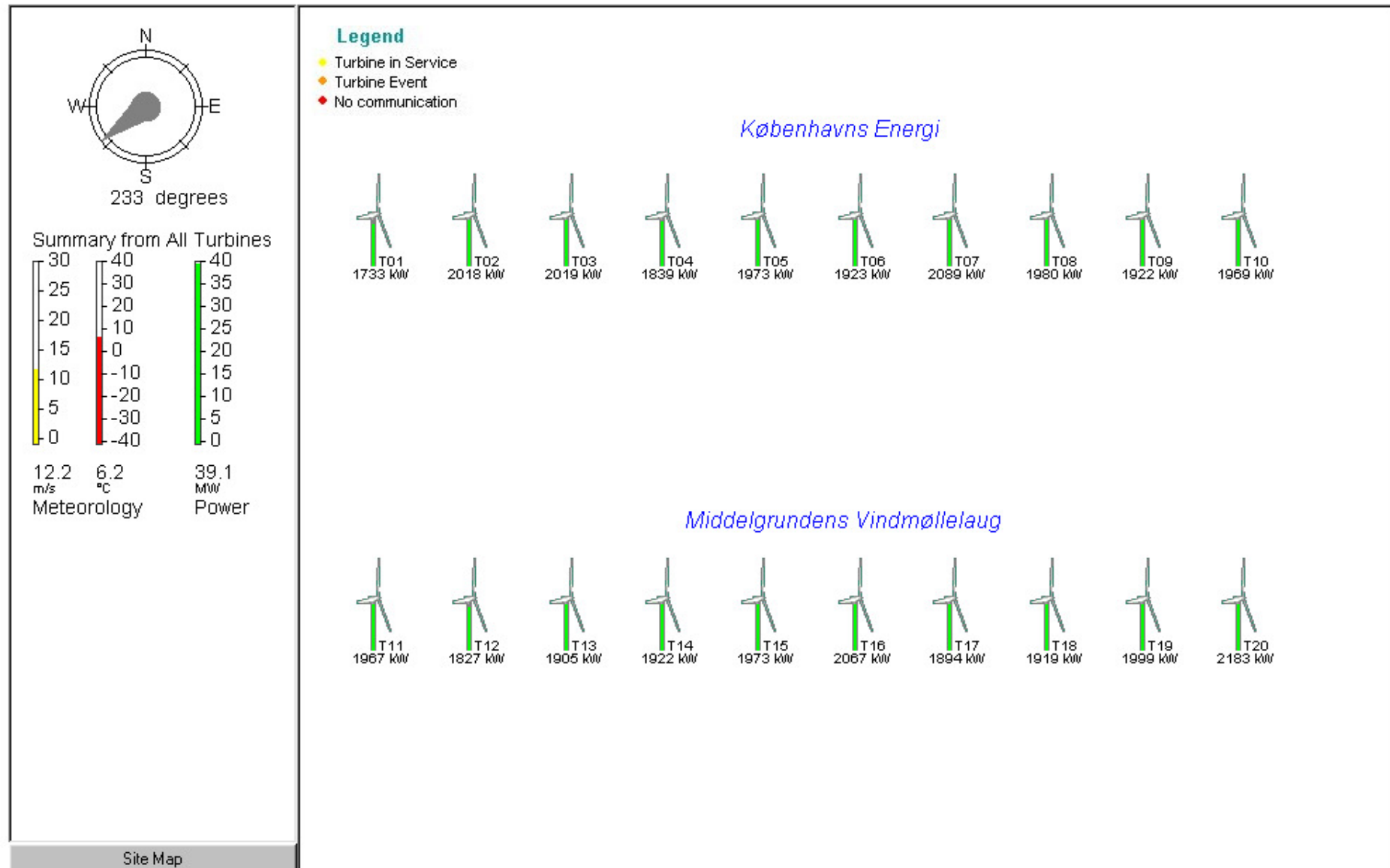


# Involvement of local people in the project

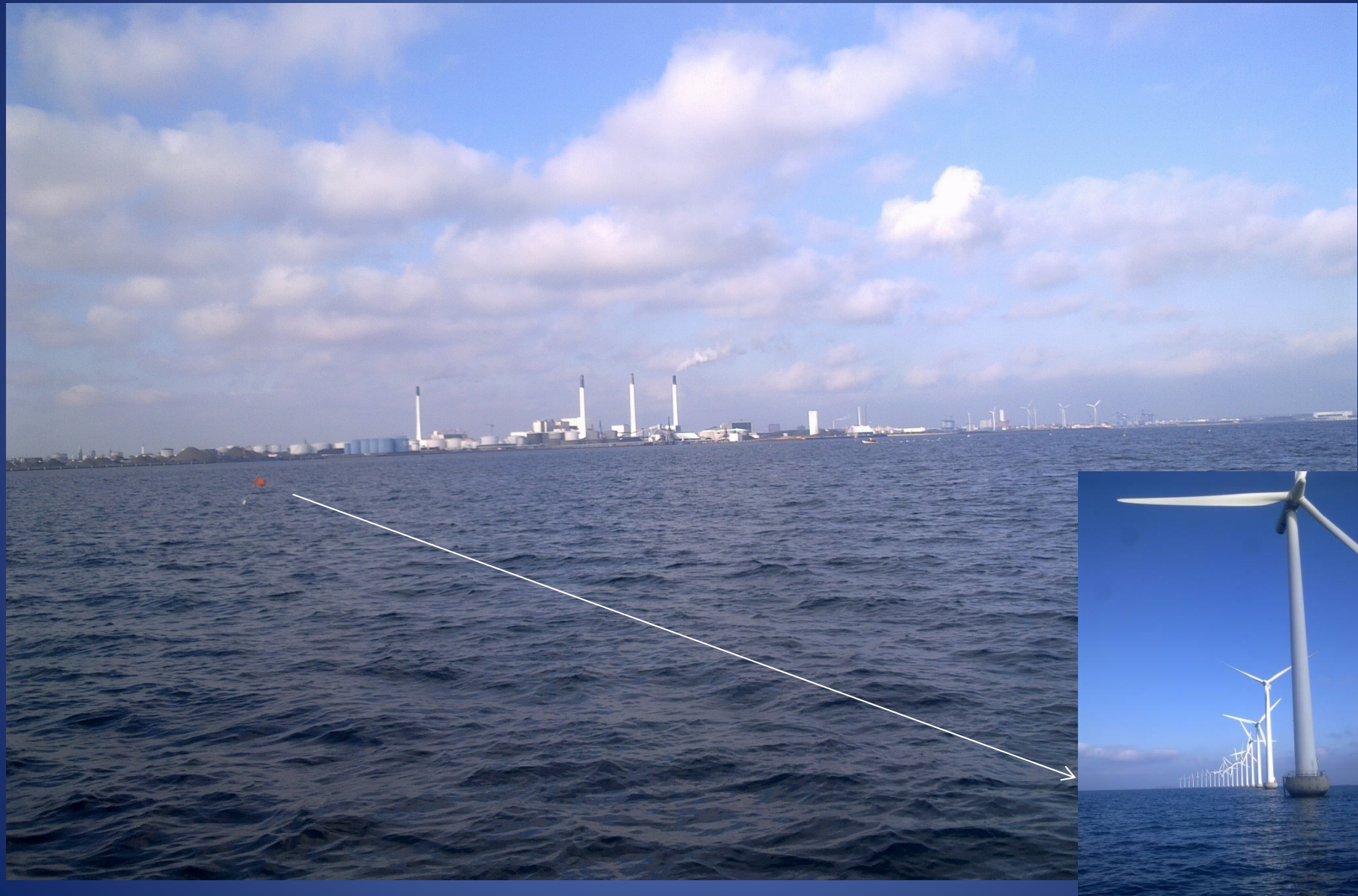




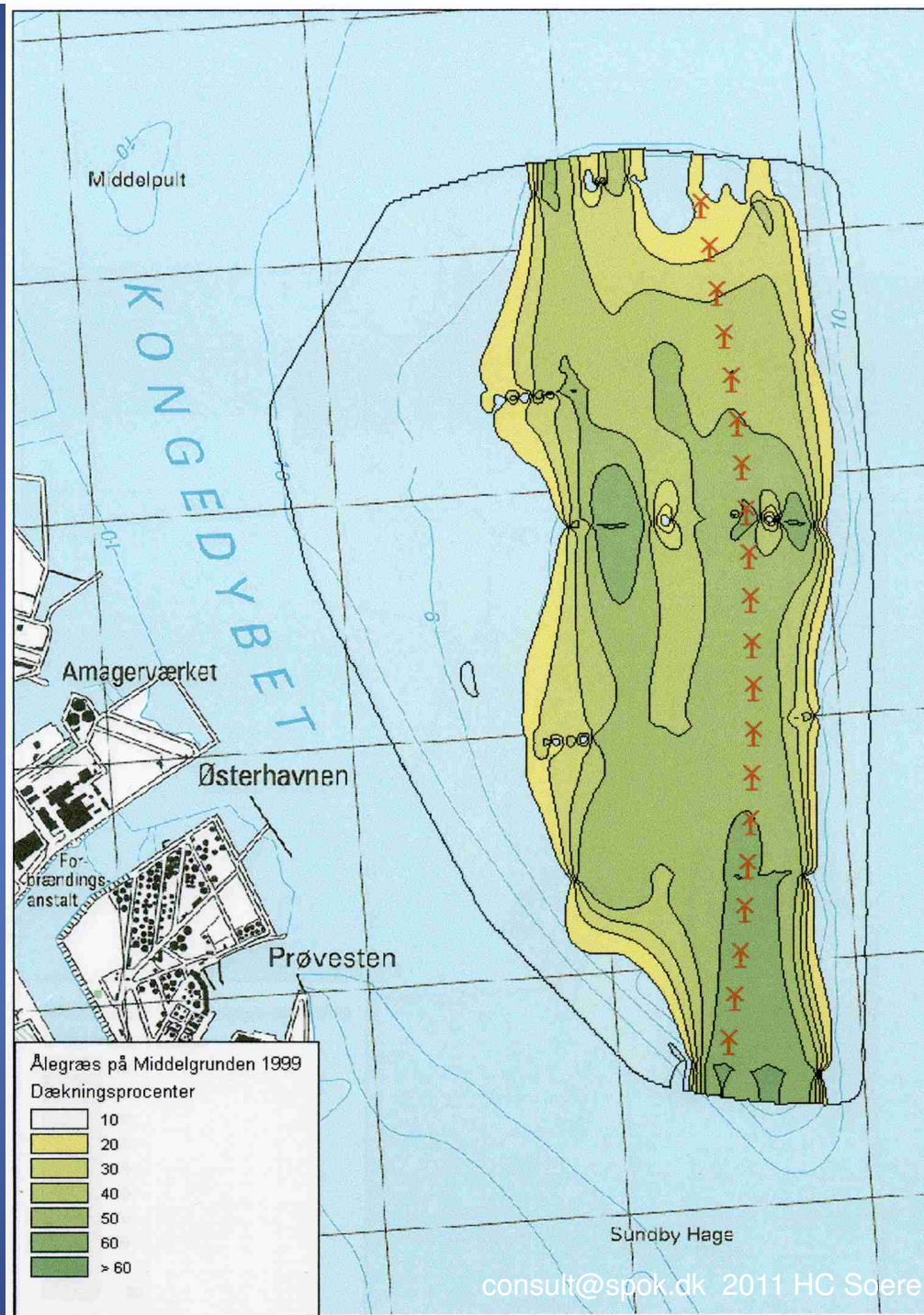
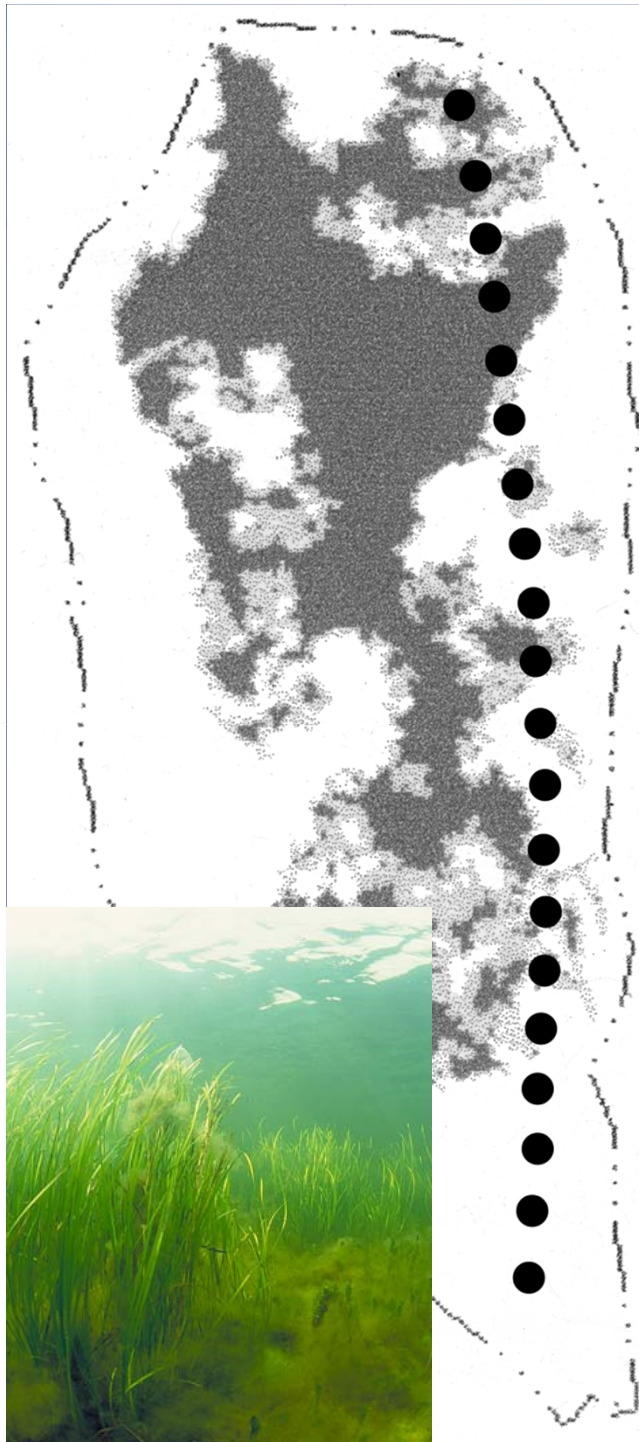
## ▶ Park view, Middelgrunden



# Middelgrunden and the fishermen

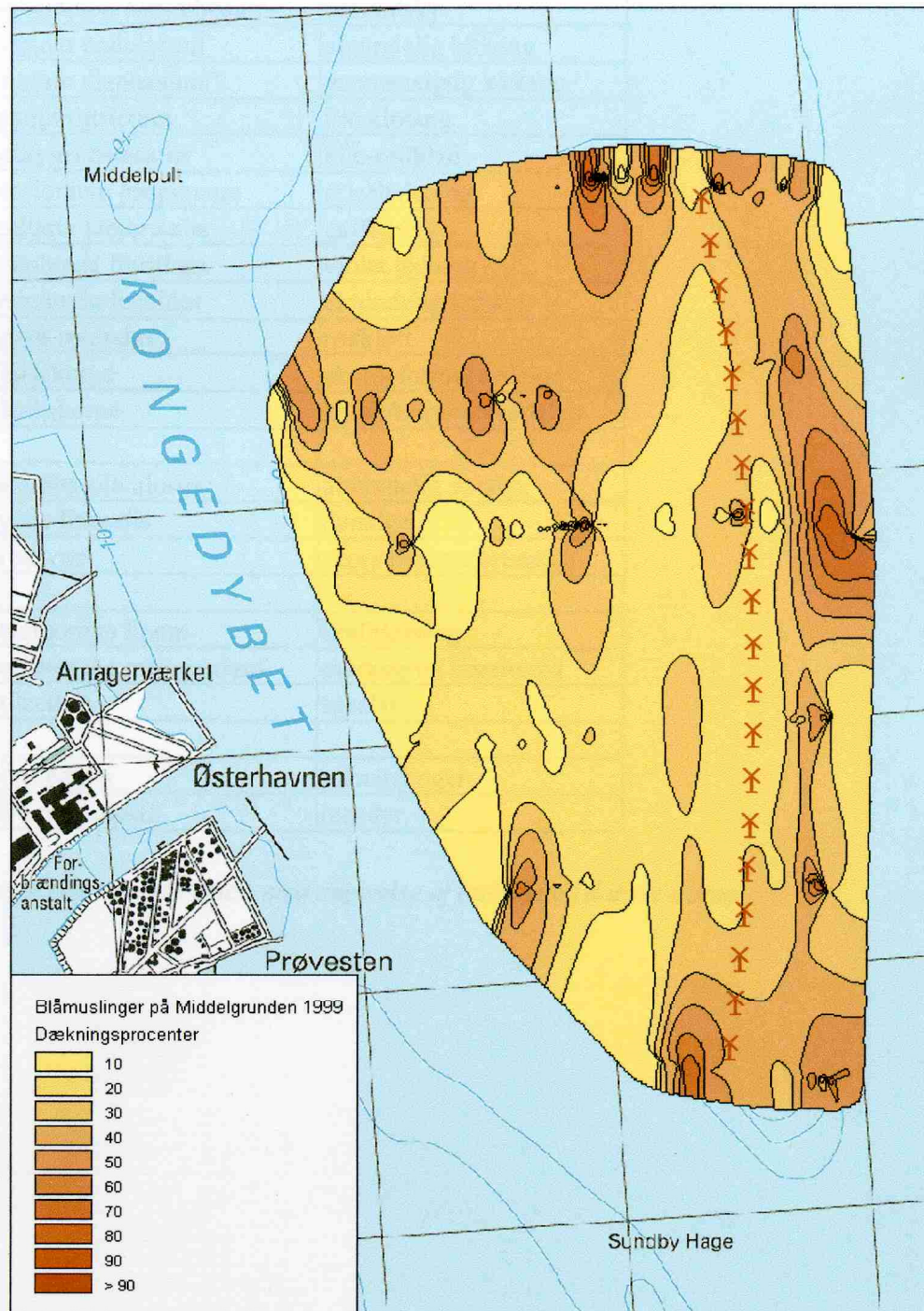






Eel grass  
before  
and after  
con-  
struc-  
tion





# Shellfish



# Casting concrete





# The dry dock



2000-09-30

consult@spok.dk 2011 HC Soerensen #27



# Deployment





Ready for lifting in place





# On the way up





# Cable deployment



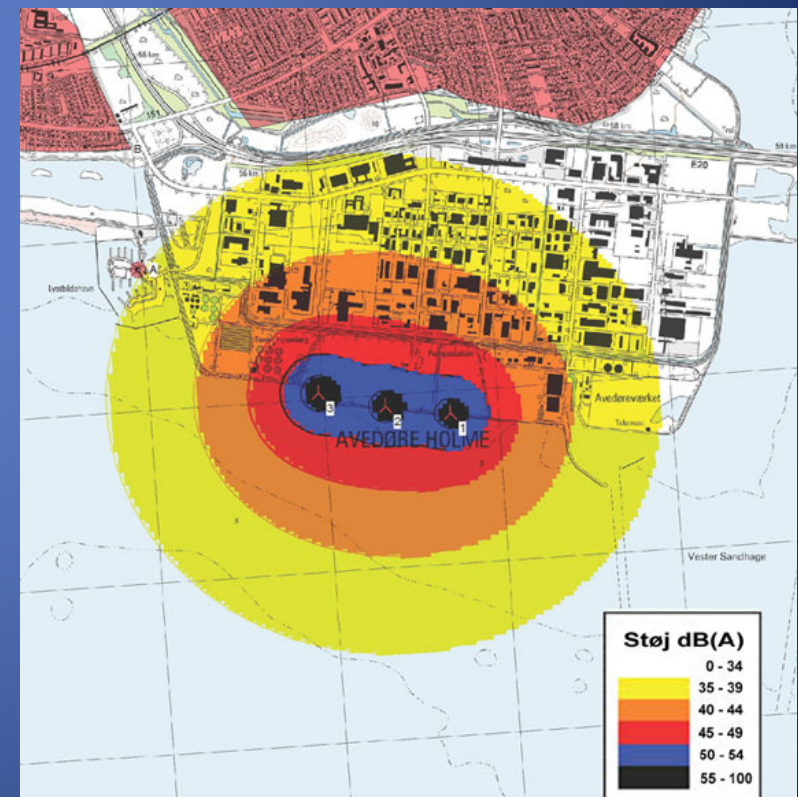
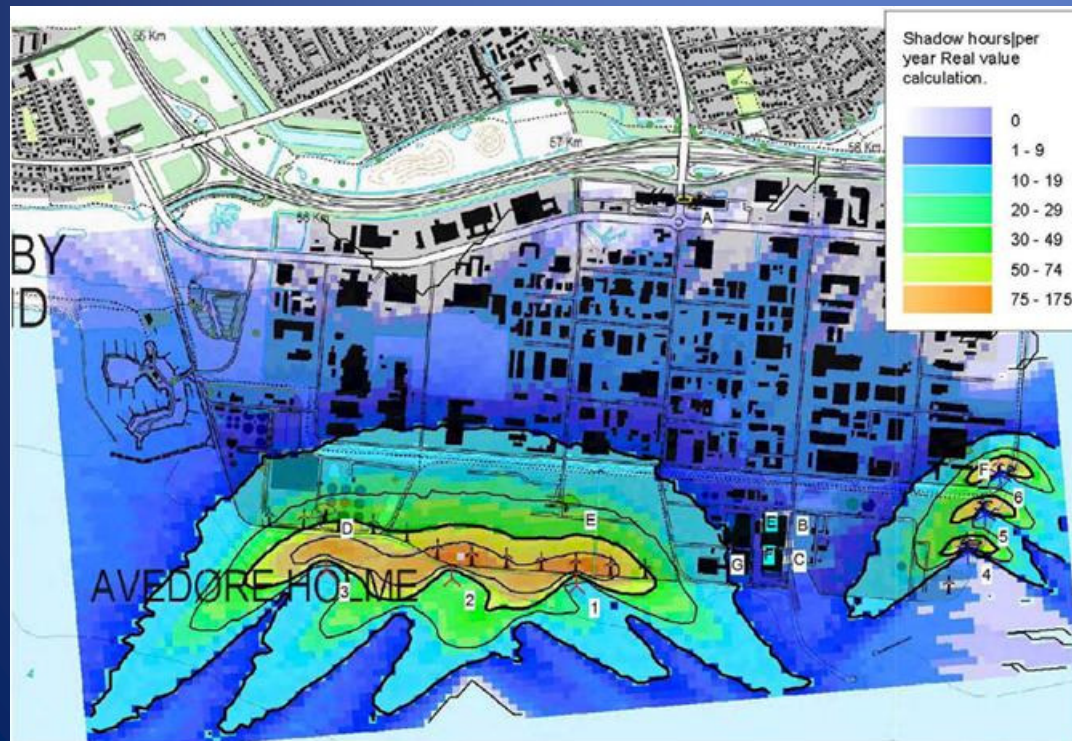


# Planning process Hvidovre



## Public acceptance

- Visual impact
- Noise
- Shadow



# References

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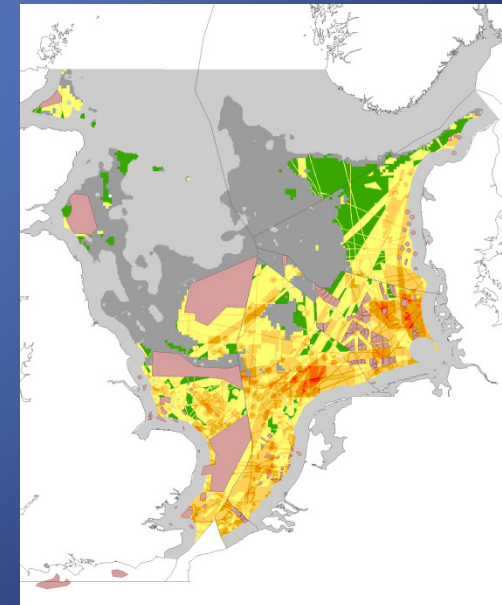
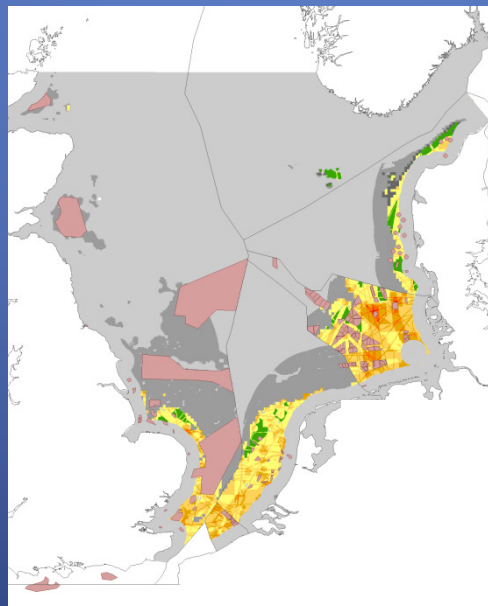
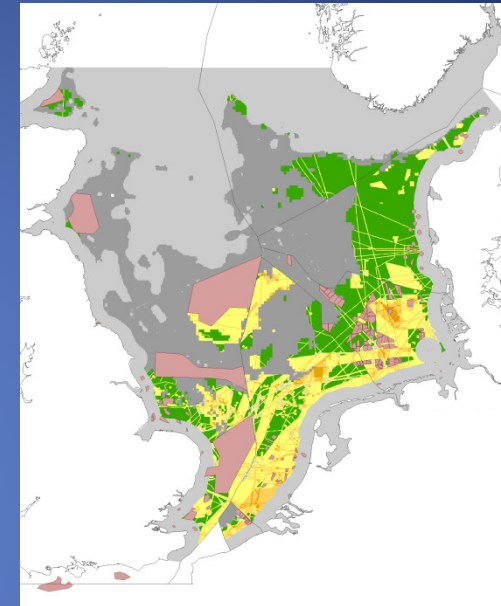
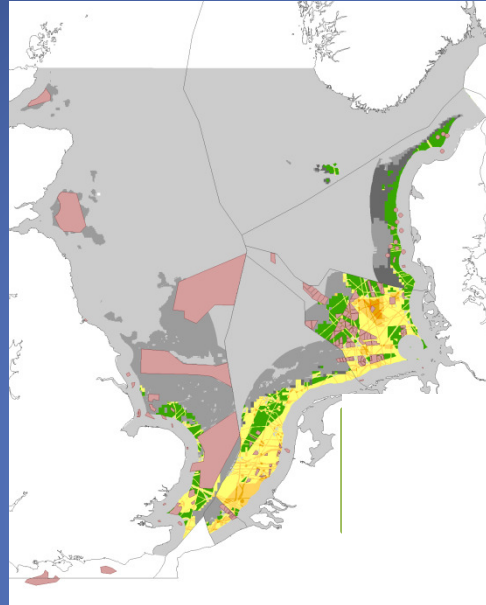


# Economic Potential North Sea trans-national



4 scenarios  
WindSpeed  
project

Map of economic potential  
in the WINDSPEED area for  
each scenario: Little Will  
Little Wind [bottom left],  
Going Solo [top left], In the  
Deep [bottom right] and  
Grand Design [top right]

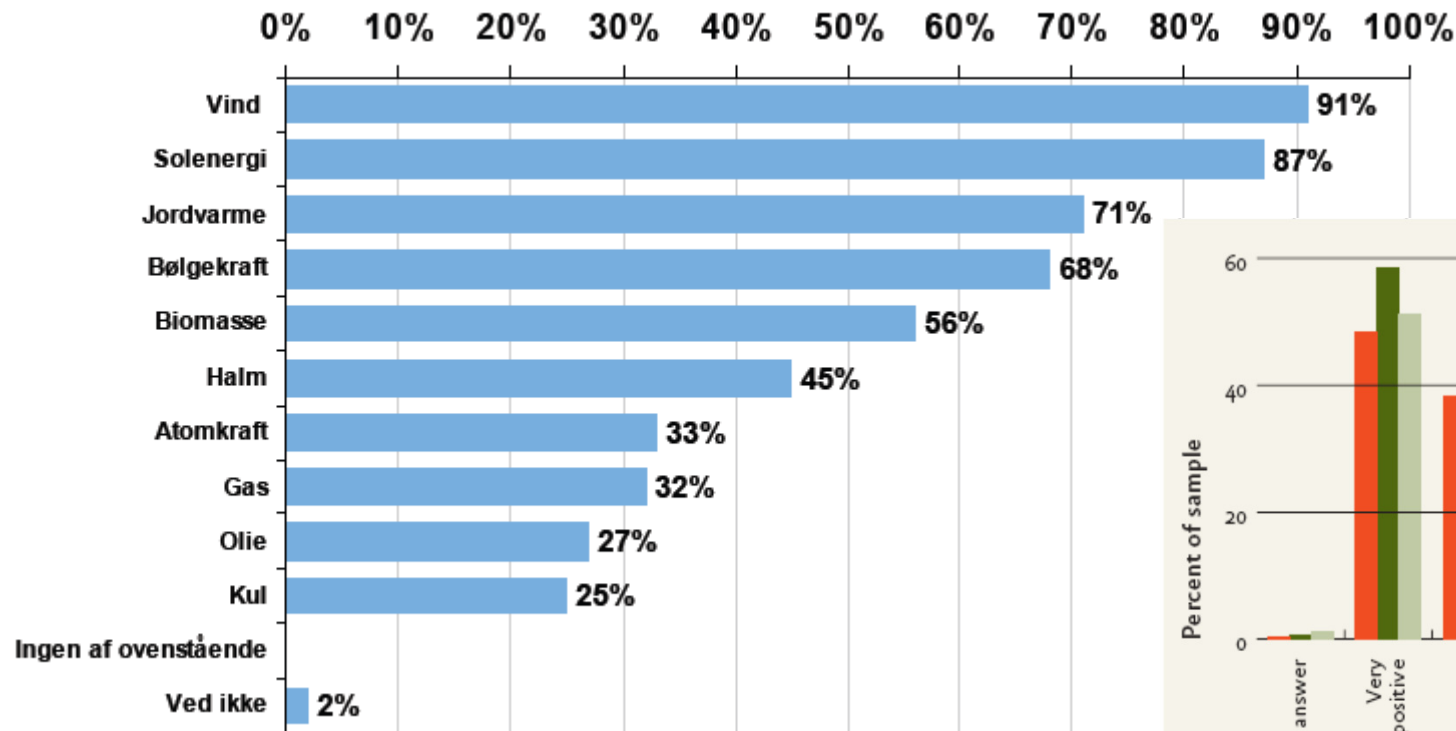


# Danish energy mix





# The Danish public acceptance of wind power



More than 90% support:  
more wind and has it as #1 source

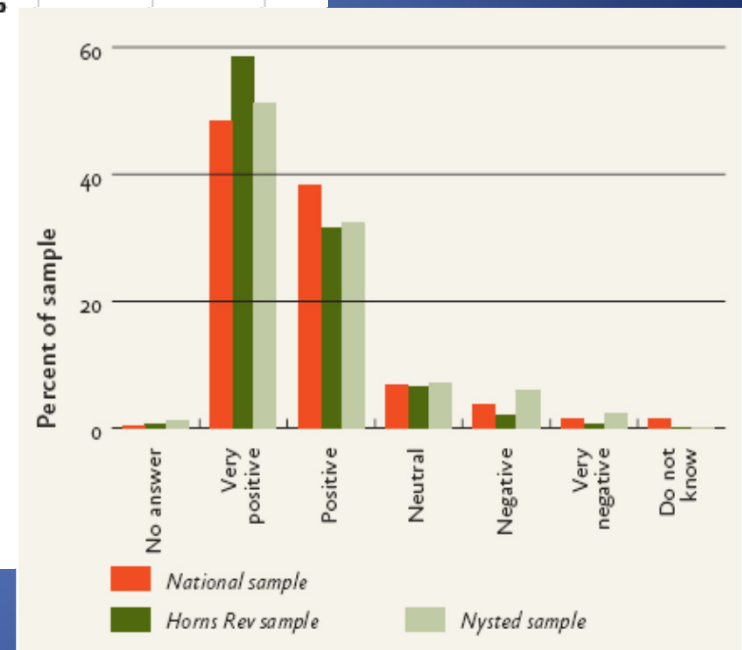


Figure 14: The attitude towards existing wind farms divided onto each of the three samples

# Lesson learned 20% ownership

- 8 projects: 100% of share offered sold
- 4 project 30 - 60%
- 3 projects 1-2%
- Some developers are not motivated
- Wind nomads -people occupying empty houses

## My recommendation:

- *Developers to start much earlier in activating the coop part of the project and then take advantage of the public support*





# What has been changed?



- System to avoid “Wind nomads” max 50 shares within 4½ km
- Control of public meetings to avoid developers “scaring histories”