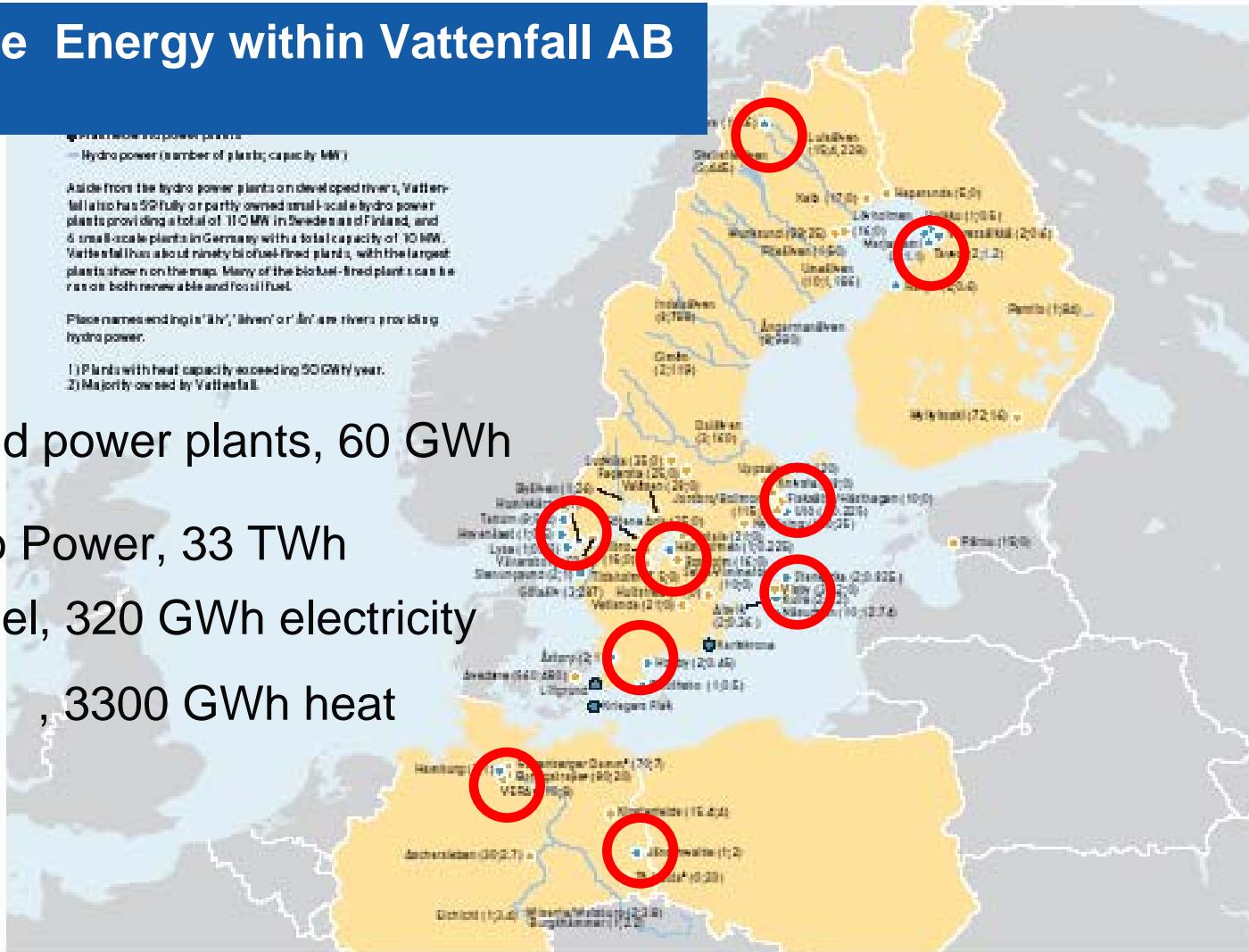


Latest Offshore Developments in Sweden

Conference
Copenhagen Offshore Wind,
Offshore Wind Markets – Myths and Realities
Bella Center, 27 October 2005

Kenneth Averstad, Vattenfall AB

Renewable Energy within Vattenfall AB 2005



Map from Vattenfall's Corporate Social Responsibility Report (vattenfall.com)

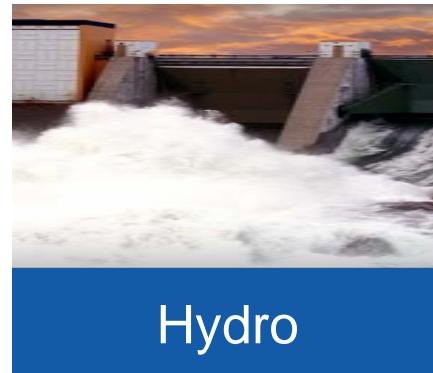
Intensive focus on renewable energy

Vattenfall is to take a leading role in the development of energy production from renewable energy sources

- New energy plants
- Existing energy plants



Wind

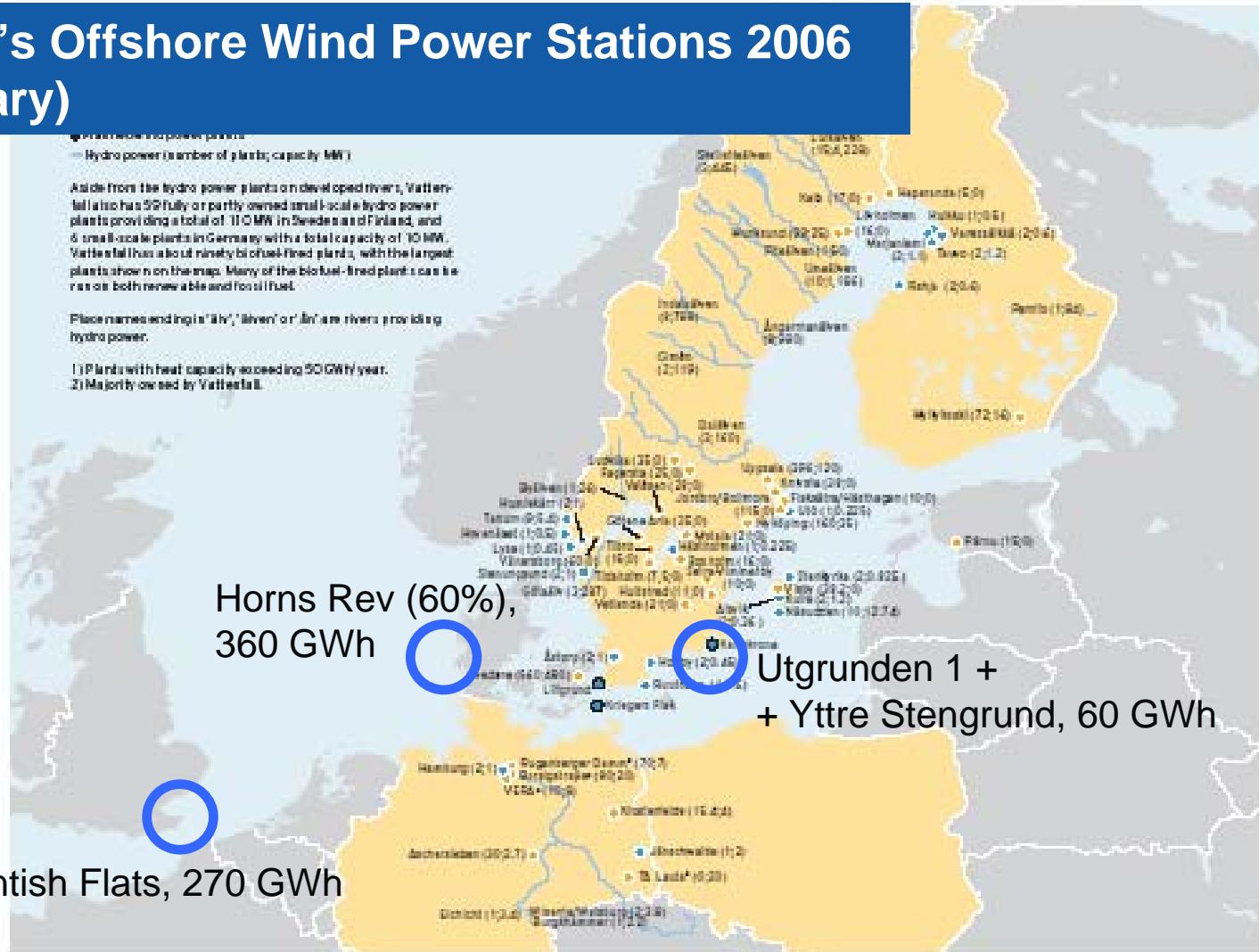


Hydro



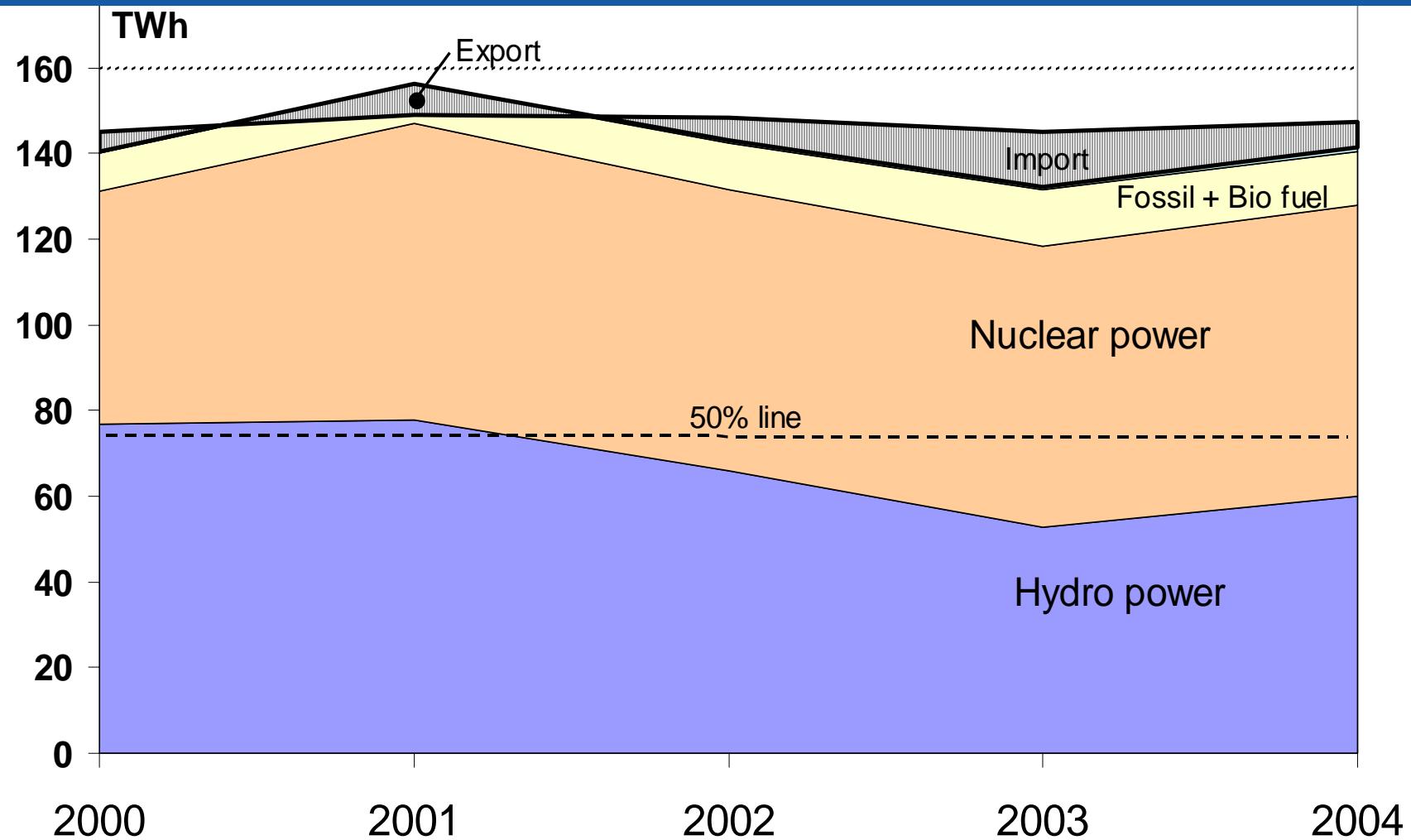
Biomass

Vattenfall's Offshore Wind Power Stations 2006 (preliminary)

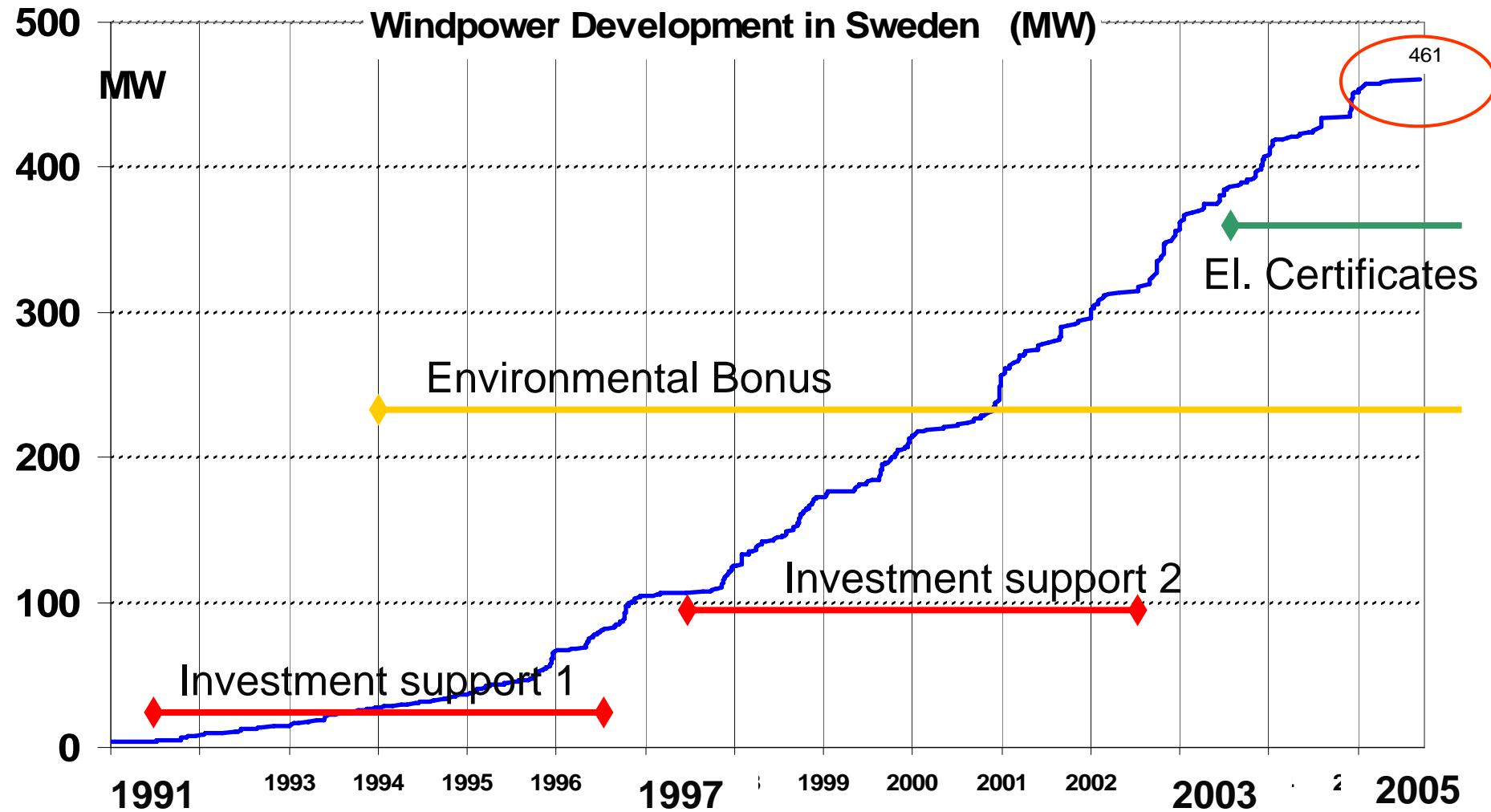


Map from Vattenfall's Corporate Social Responsibility Report (vattenfall.com)

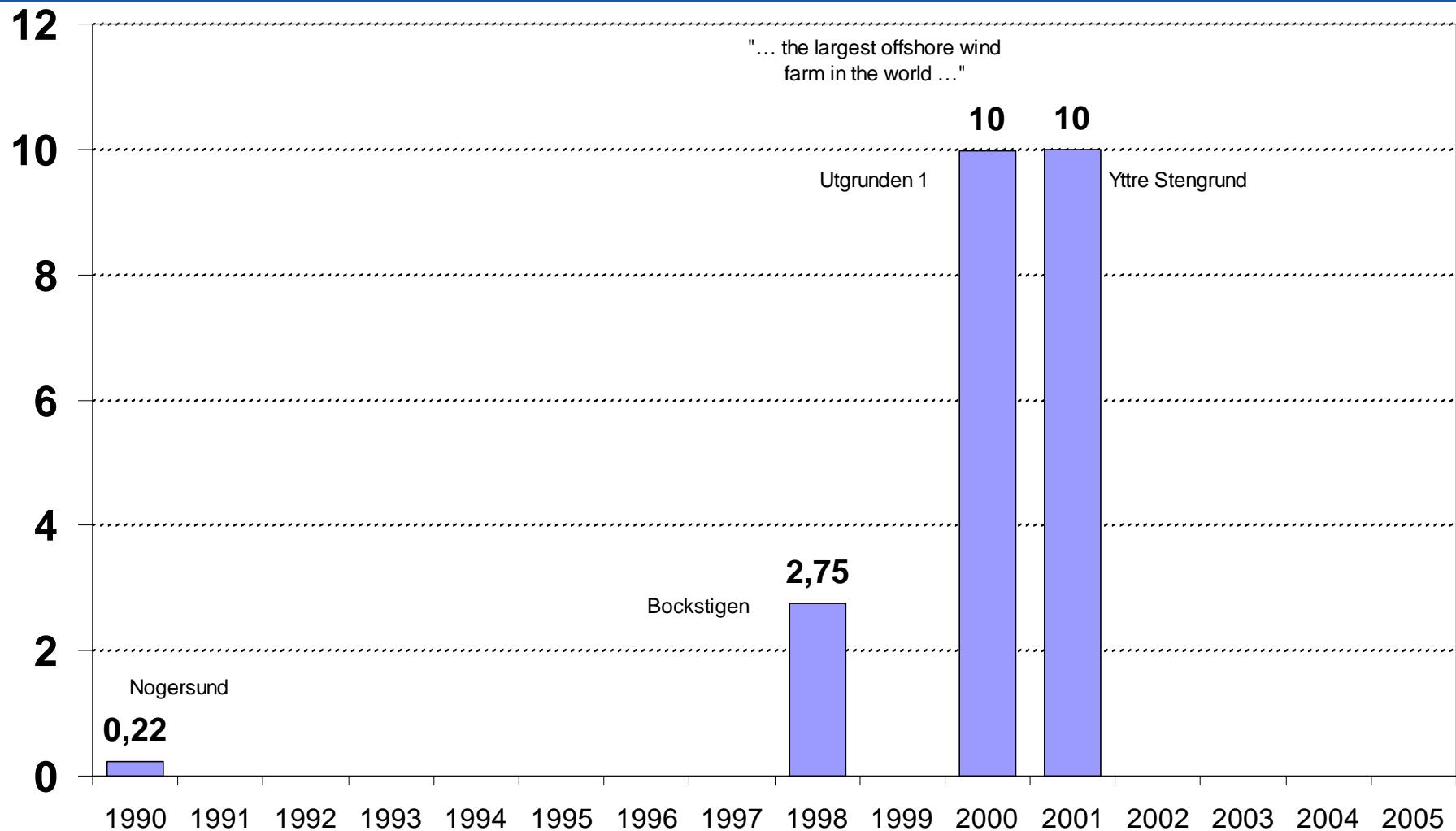
Sweden. Electricity generation (TWh / year)



Background. Windpower Development in Sweden.



Offshore Wind Power built in Sweden (MW / year)



Offshore projects in Sweden. In Operation.

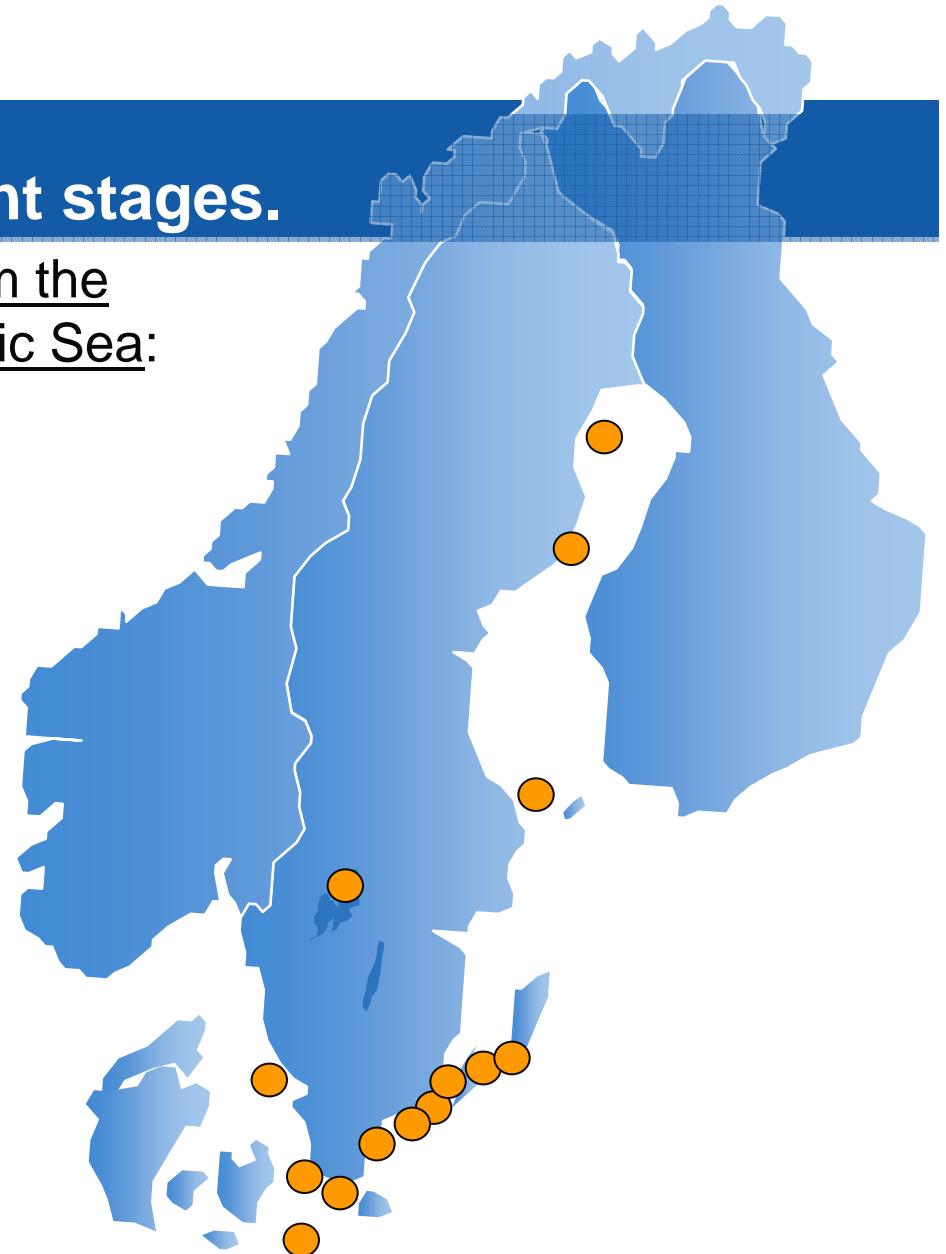
* Nogersund	1 x 220 kW	1990
* Bockstigen	5 x 550 kW	1998
* Utgrunden 1	7 x 1425 kW	2000
* Yttre Stengrund	5 x 2000 kW	2001



Offshore projects in Sweden. Many developers, different stages.

Some examples of offshore projects from the
West Coast to the north parts of the Baltic Sea:

- * Skottarevet ____ 28 wts
- * Vänern ____ 11 wts
- * Lillgrund ____ 48 wts
- * Kriegers Flak ____ 128 wts
- * Abbekås ____ 28 wts
- * Hanöbukten ____ 30 + 40 + 53 wts
- * Karlskrona ____ 22 wts
- * Trolleboda ____ 30 wts
- * Utgrunden 2 ____ 24 wts
- * Kårehamn ____ 21 wts
- * Klasården ____ 16 wts
- * Finngrundet ____ >100 wts
- * Väktaren ____ 30 wts
- * Marakallen ____ >100 wts



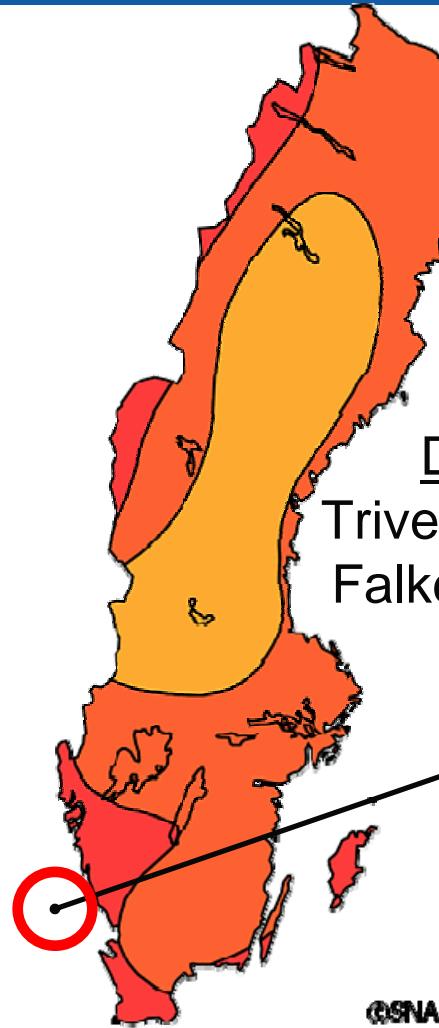
Vattenfall's Offshore projects in Sweden

Some examples of offshore projects from the West Coast to the north parts of the Baltic Sea:

- * Skottarevet ____ 28 wts
- * Vänern ____ 11 wts
- * **Lillgrund ____ 48 wts ; 330 GWh**
- * **Kriegers Flak ____ 128 wts ; 2000 GWh**
- * Abbekås ____ 28 wts
- * Hanöbukten ____ 30 + 40 + 53 wts
- * Karlskrona ____ 22 wts
- * **Trolleboda ____ 30 wts ; 400 GWh**
- * Utgrunden 2 ____ 24 wts
- * Kårehamn ____ 21 wts
- * Klasården ____ 16 wts
- * Finngrundet ____ >100 wts
- * Väktaren ____ 30 wts
- * Marakallen ____ >100 wts



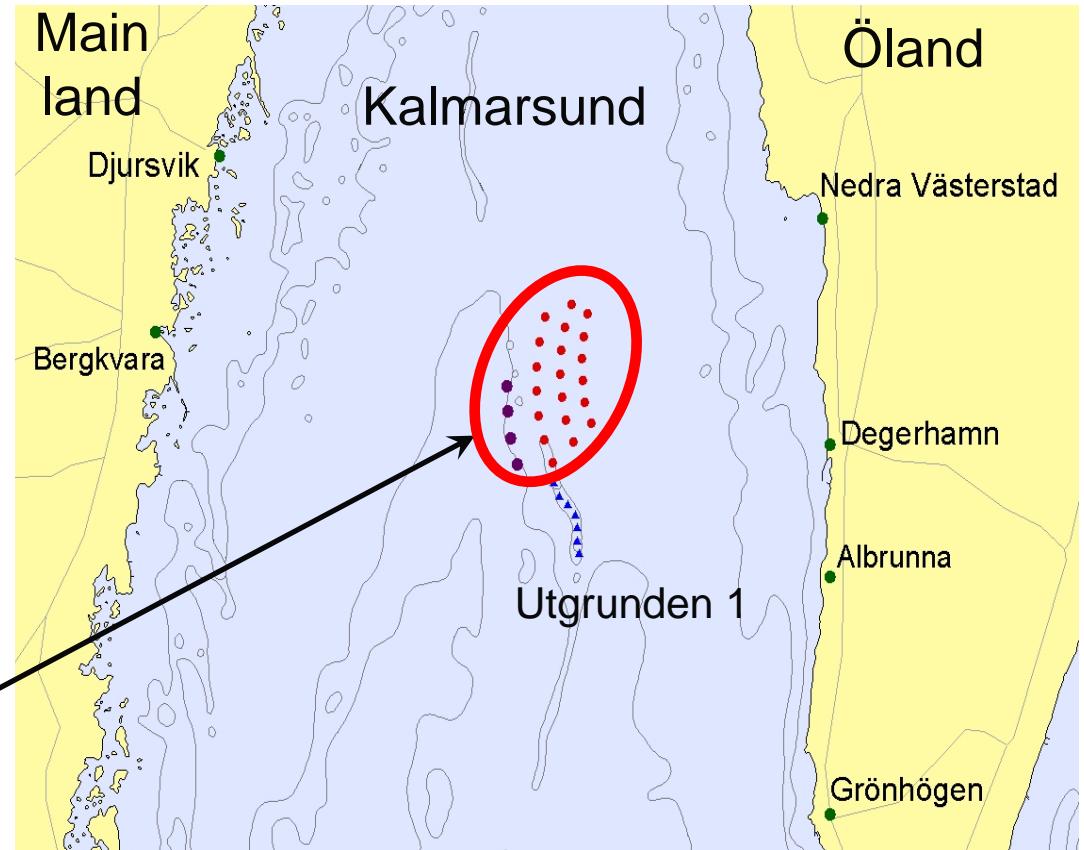
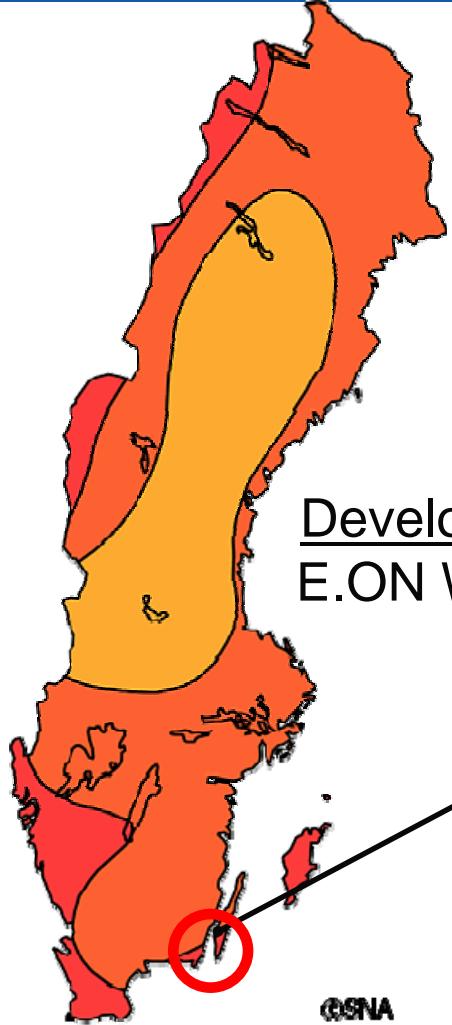
Skottarevet, 28 turbines, 250 - 300 GWh, 2008



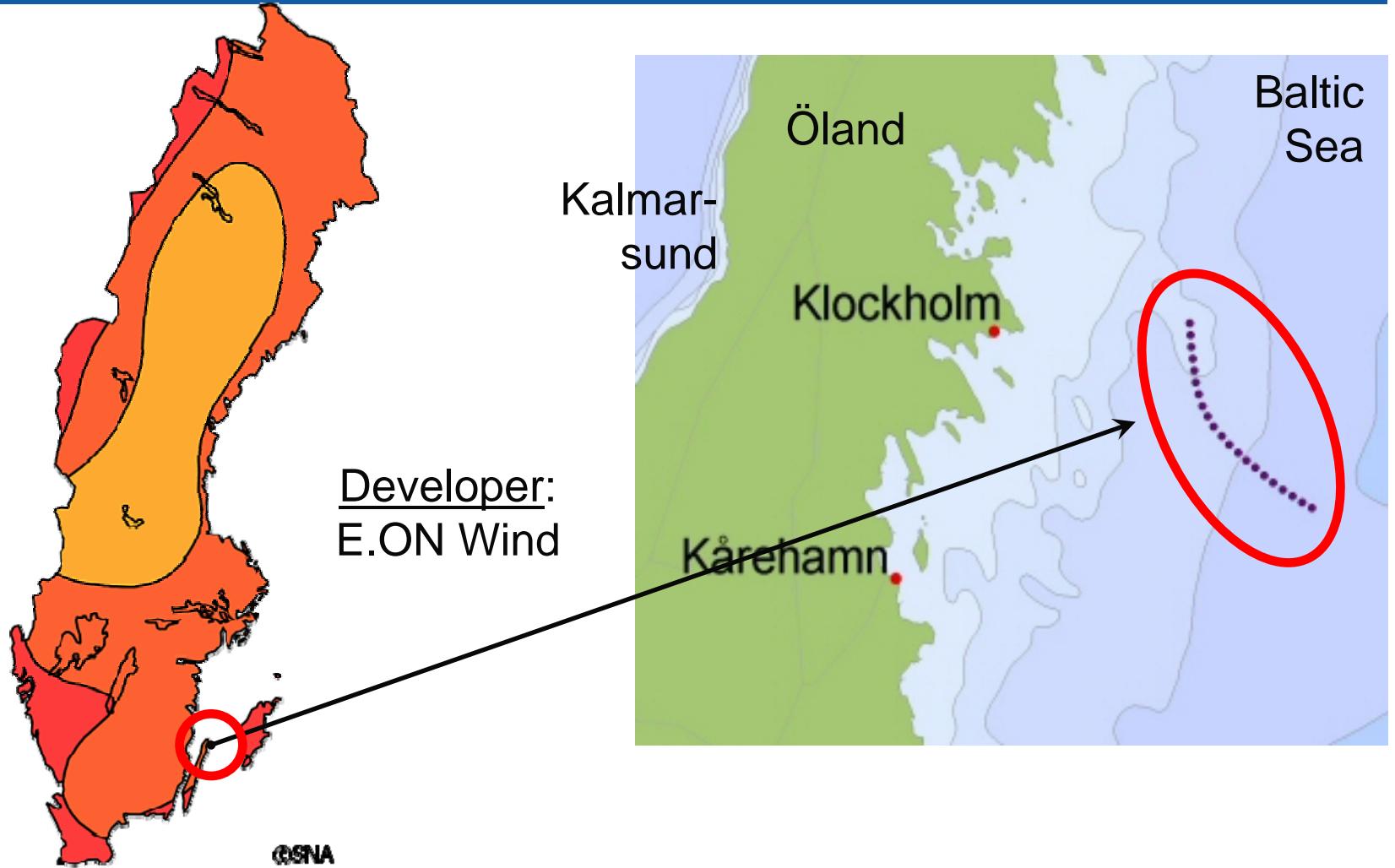
Developer:
Triventus, Agrivind,
Falkenberg Energi



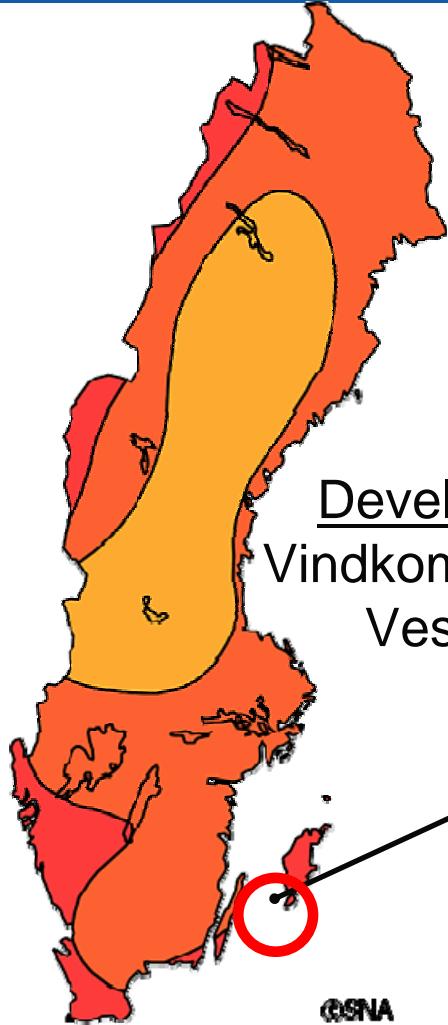
Utgrunden 2, 24 turbines, 275 GWh, 2008 Pilot Project



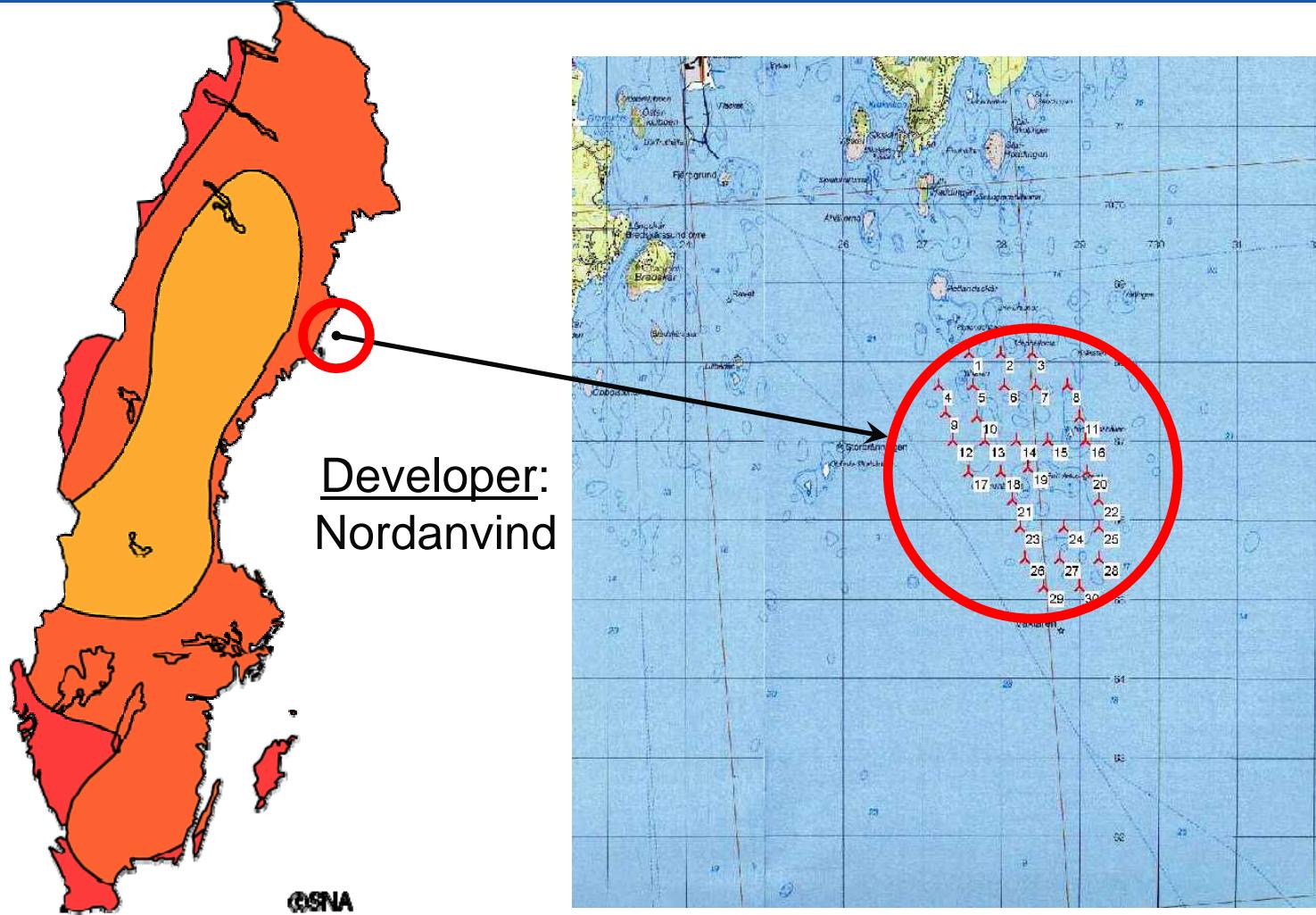
Kårehamn, 11 - 21 turbines, 165 GWh, 2008



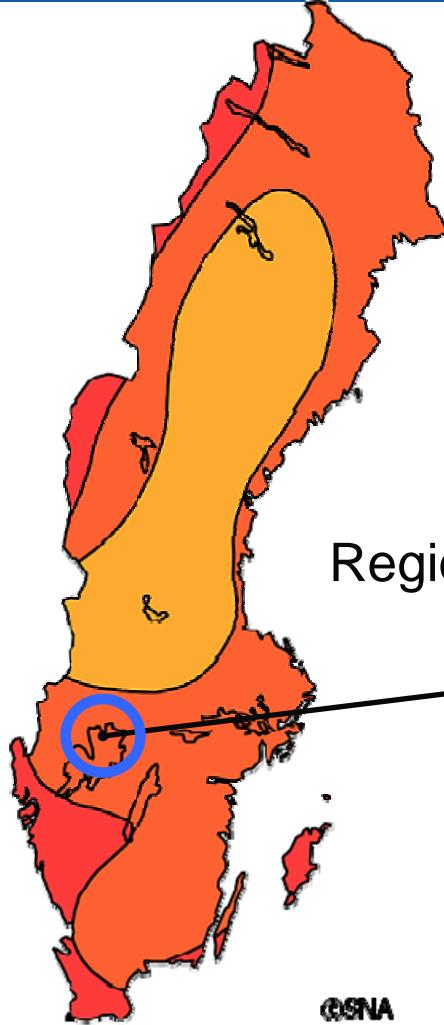
Klasårdens, 16 turbines, 140 GWh, 2006



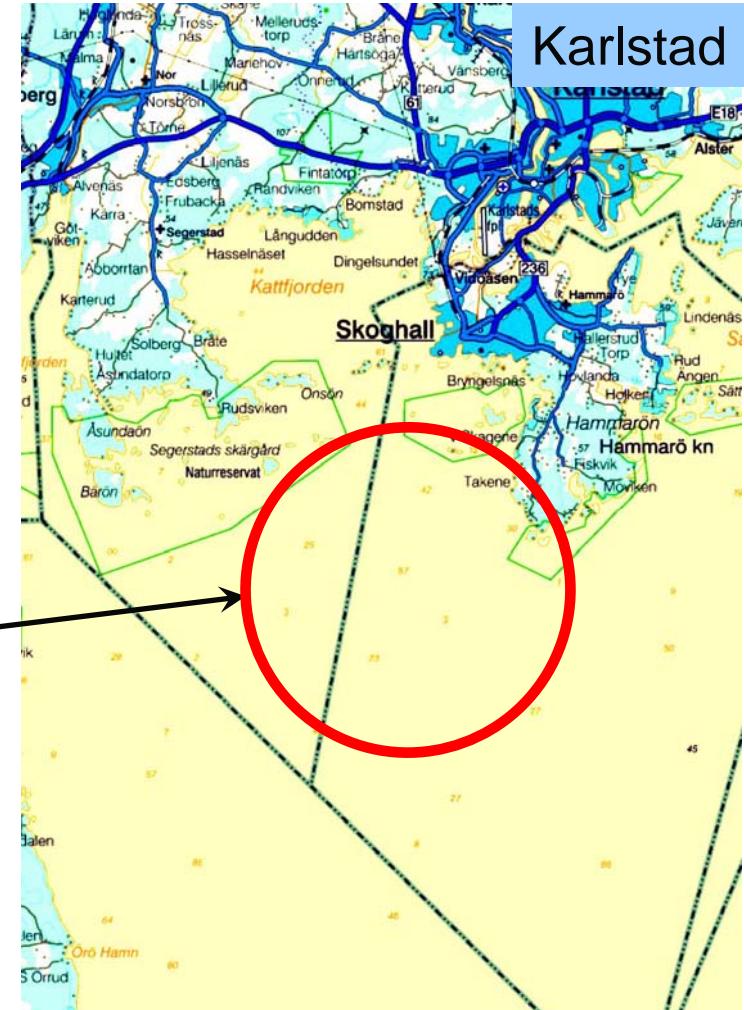
Väktaren, 20 - 30 turbines, 200 GWh, 2008



Wind park in lake Vänern, 10 - 11 turbines, 60 - 90 GWh

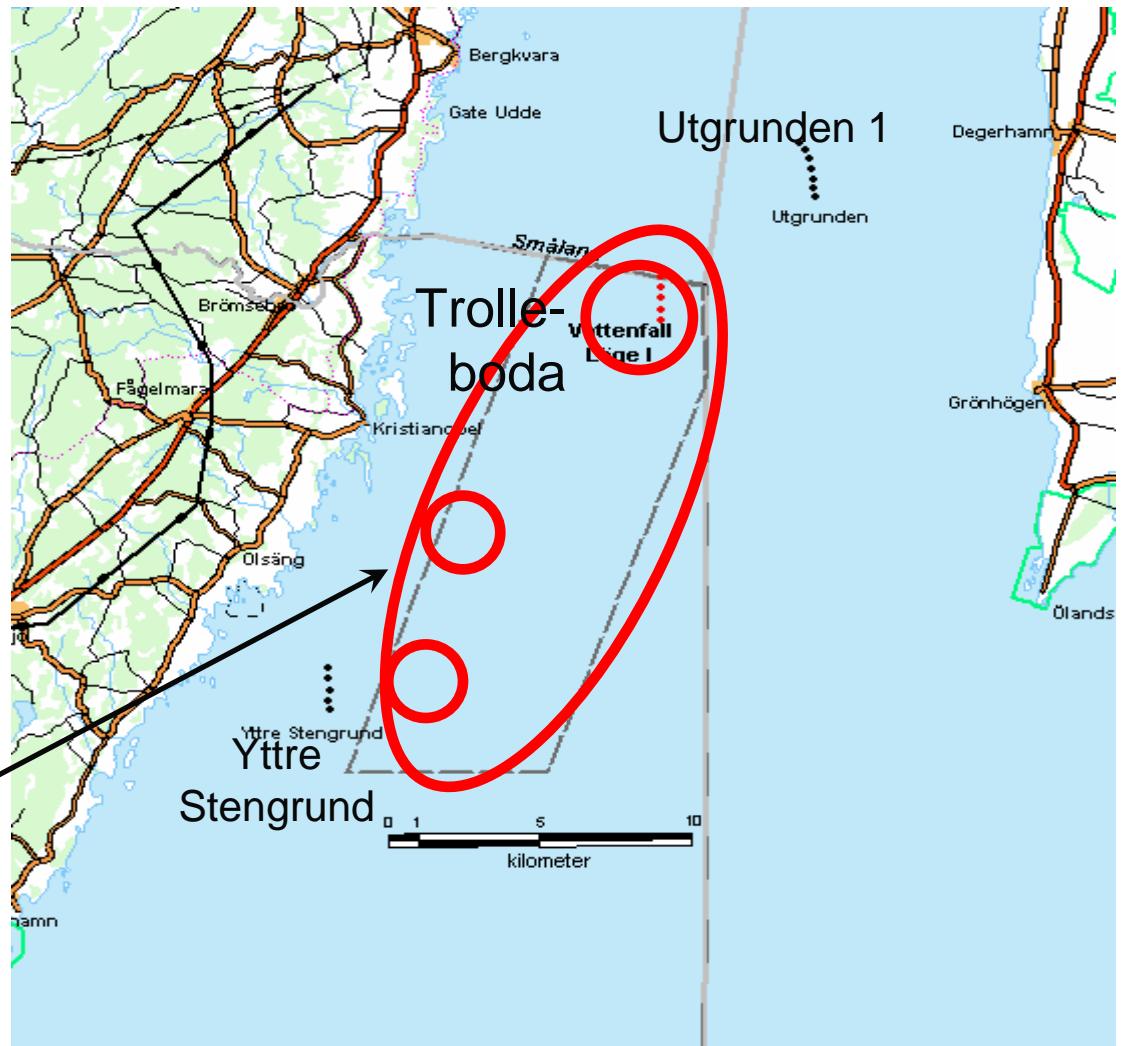
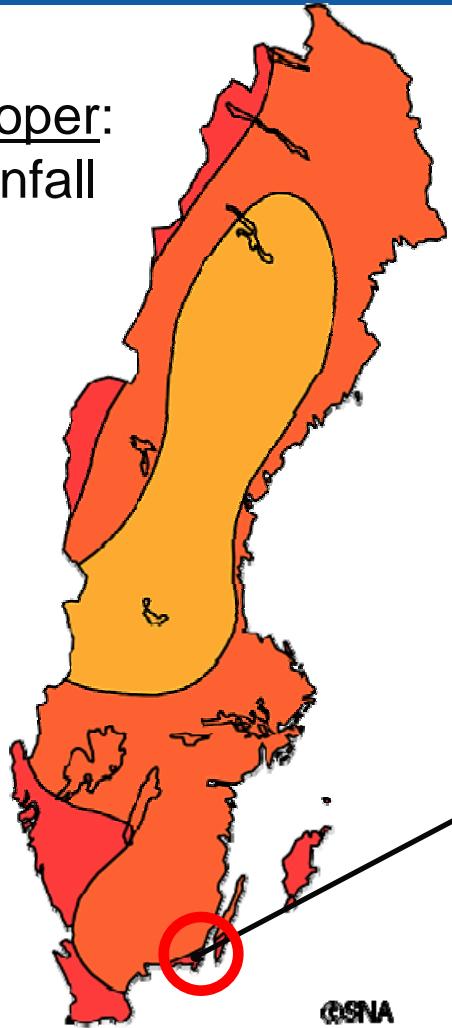


Developer:
Regional Consortium

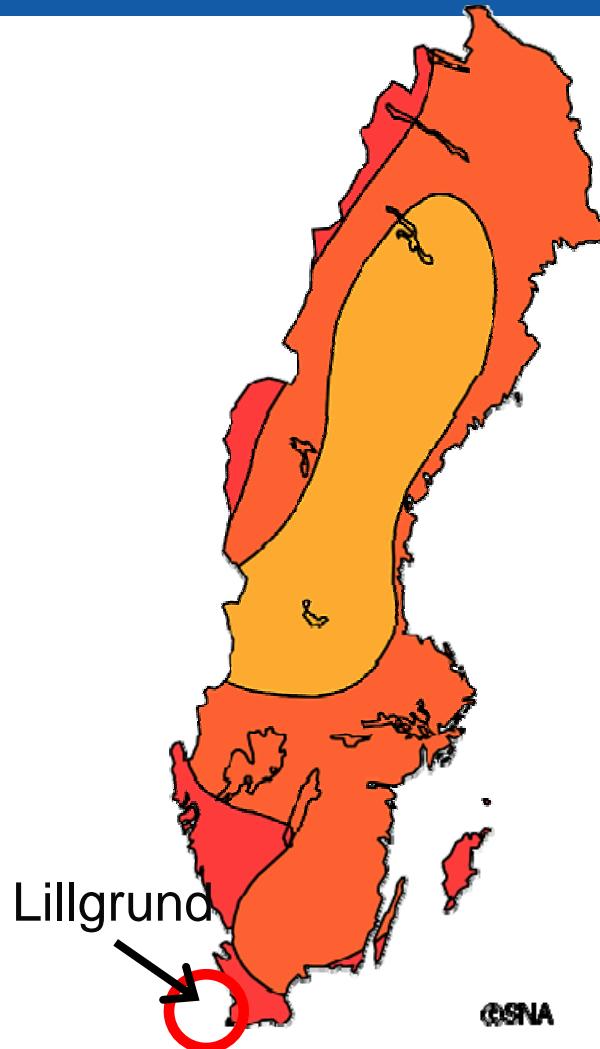


Karlskrona Windpower Offshore. 3 alternative sites.

Developer:
Vattenfall

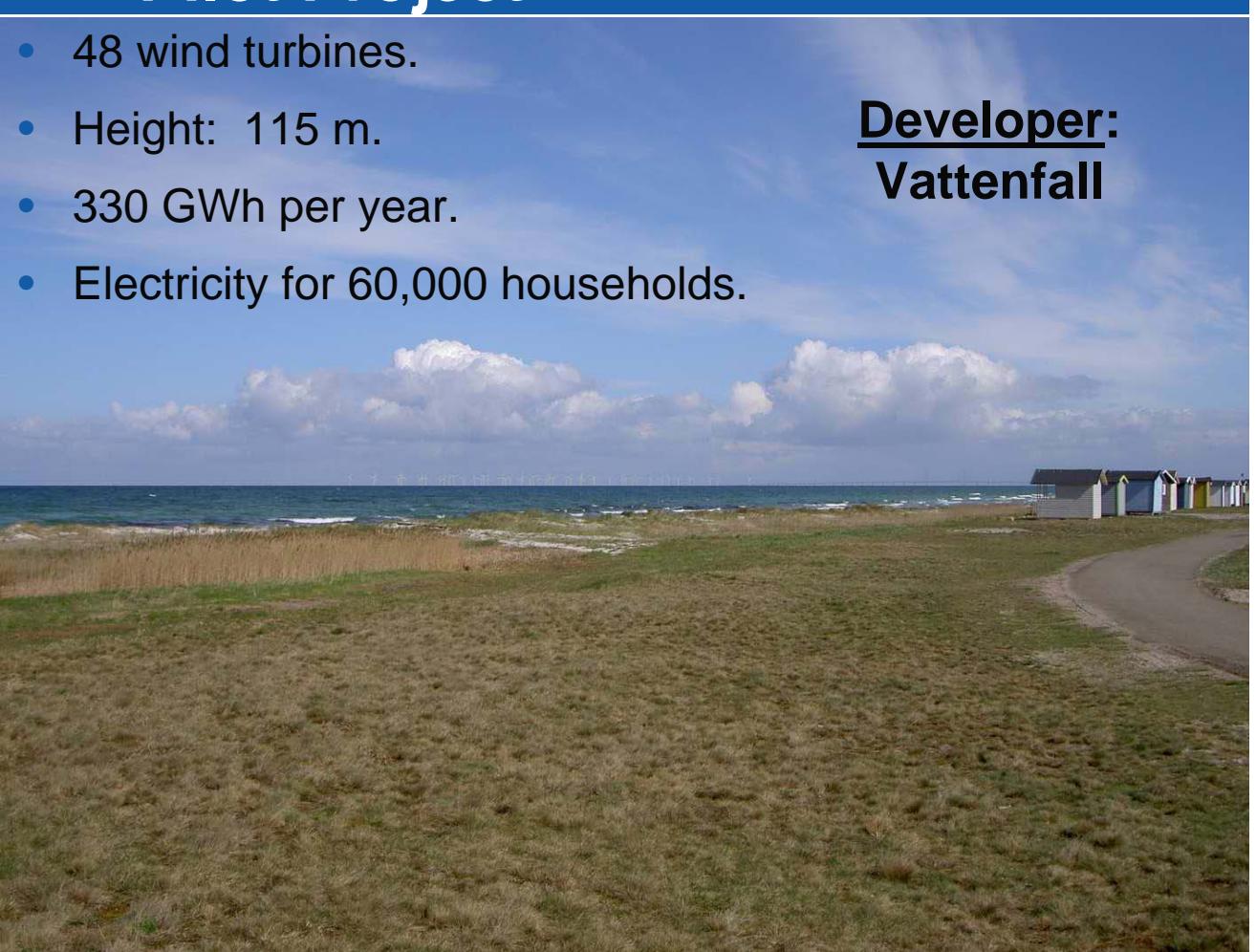


Lillgrund Wind Power Offshore Pilot Project

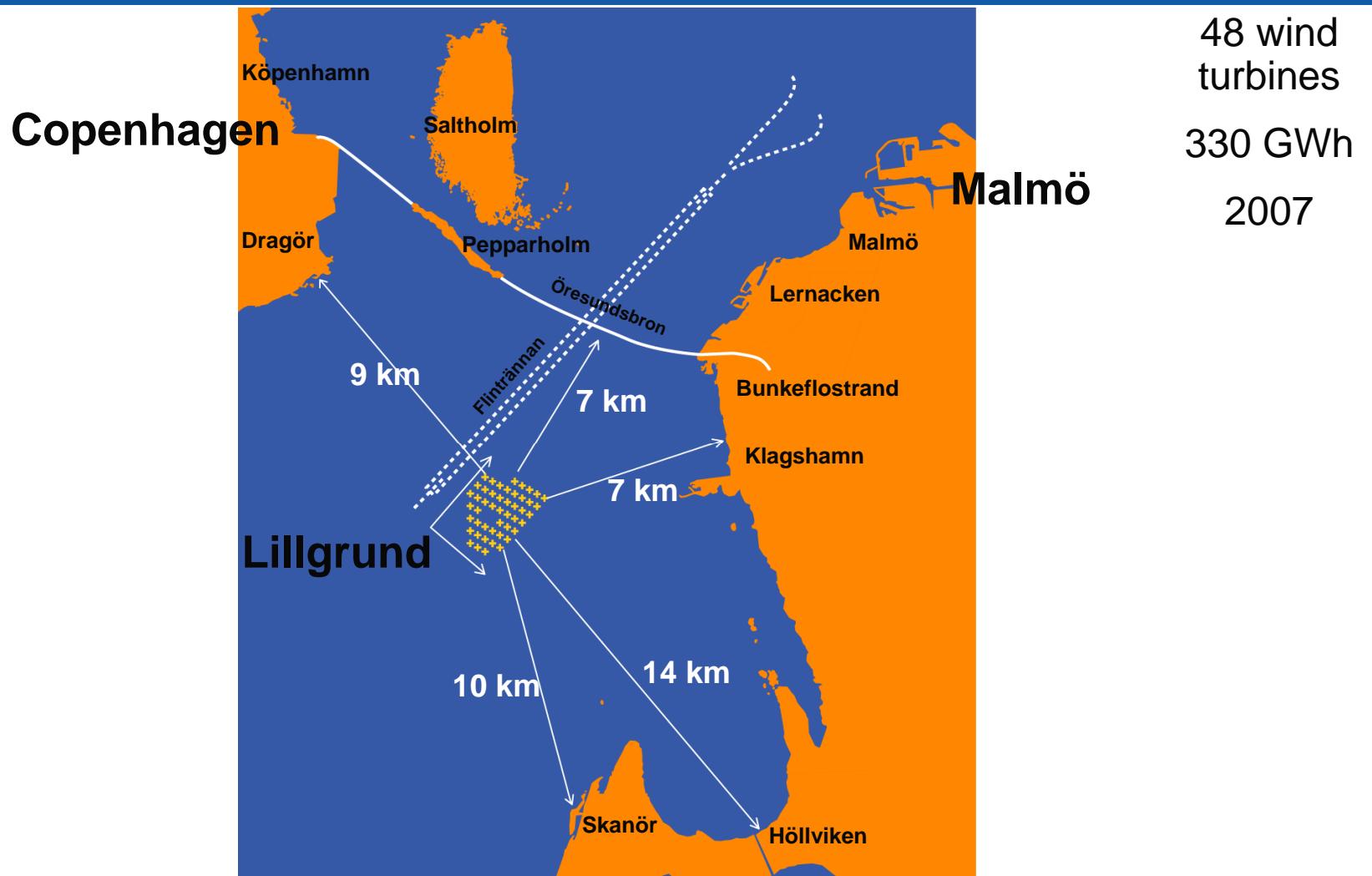


- 48 wind turbines.
- Height: 115 m.
- 330 GWh per year.
- Electricity for 60,000 households.

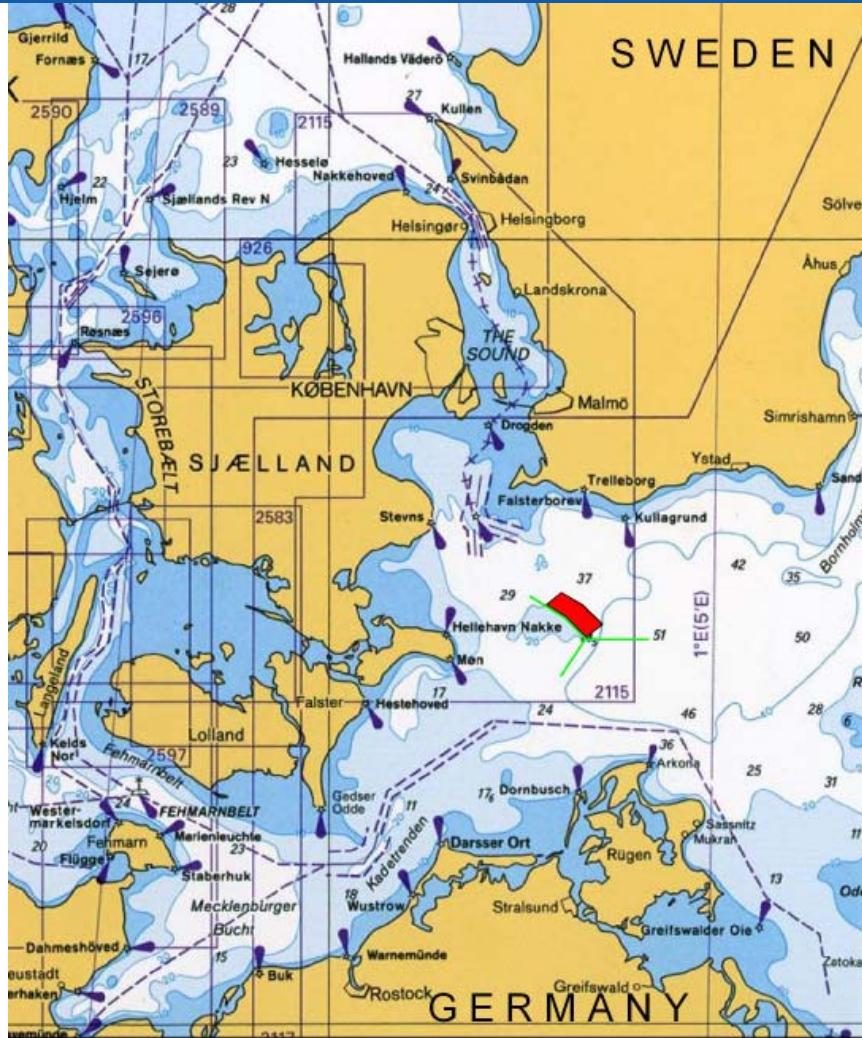
Developer:
Vattenfall



Map over Lillgrund Wind Power Offshore

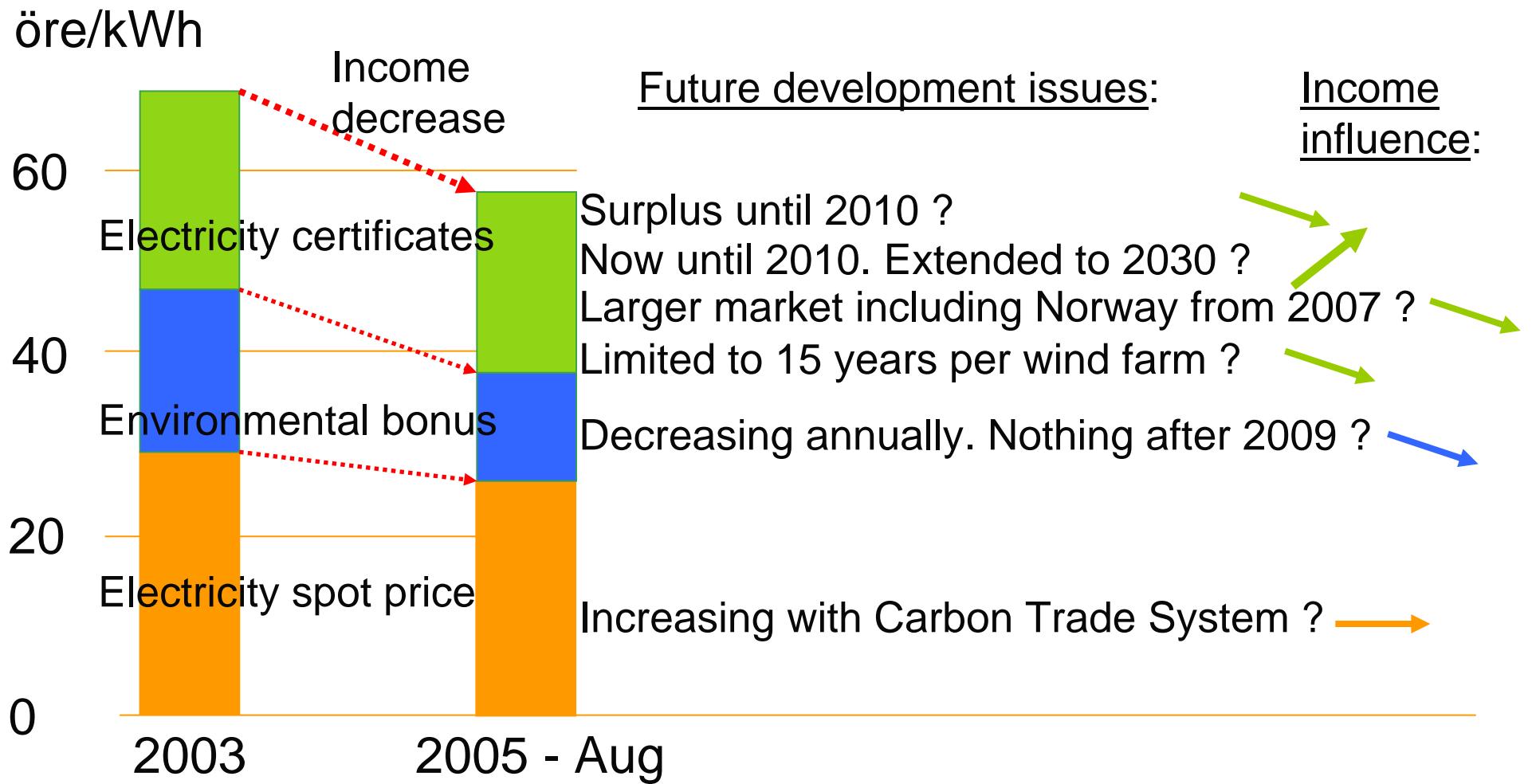


Kriegers Flak, 128 turbines, 2000 GWh, 2010



Developer:
Vattenfall

Income rules on the Market for Windpower in Sweden.



Future Development of Generation Cost ?

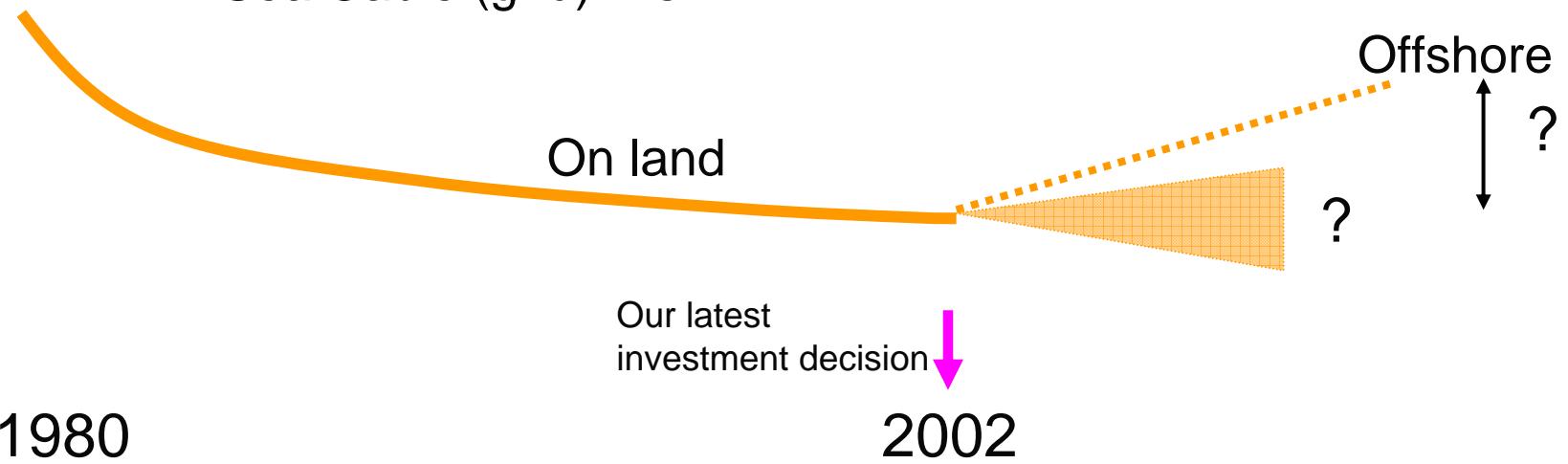
How will the cost curve develop

Cost drivers offshore --- water depth, distance from coast, ...

Technological Risk

Availability Risk

Sea Cable (grid) Risk



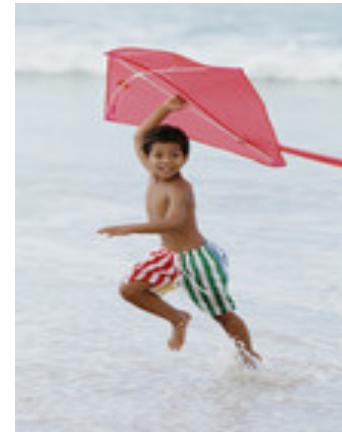
Wind Power Offshore. Pilot Projects.

Two of the Offshore projects was in Autumn 2004 appointed as Pilot Projects in the 1st governmental Pilot Program:

- * Lillgrund, 48 turbines, about 330 GWh, max 213 MSEK
- * Utgrunden 2, 24 turbines, about 275 GWh, max 70 MSEK

A 2nd Pilot Program was in September proposed by the Government:

- 350 MSEK in 5 years 2007- 2011



Difference in business culture



Utilities

Customers



Number of turbines
MW



ONE plant
GWh

Conclusions for a successful offshore expansion

- The time for Renewables is here. Is offshore wind competitive in the deregulated Nordic market?
- A long-term support system is needed for larger investments now
- Increased competition between suppliers
- The permission processes must be more effective



Thank You !



Lillgrund Offshore

Extra slides

New Government proposition, June 2005, about revision of the Certificate system.

- + Extension until 2030 (now limited until 2010)
- + A larger market area Sweden + Norway from 2007
- A new limitation in time per plant = 15 years

Parliament decisions planned in Sweden and Norway
in June 2006.

- + Positive for renewables, but can offshore compete ?