

Getting smart(er) in Offshore Wind O&M

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Inhoud

- Offshore windenergie: trends en cijfers
- Betrouwbaarheid van windturbines
- Access en beschikbaarheid
- Praktijkervaringen
- Verbeteringen => getting smart(er)

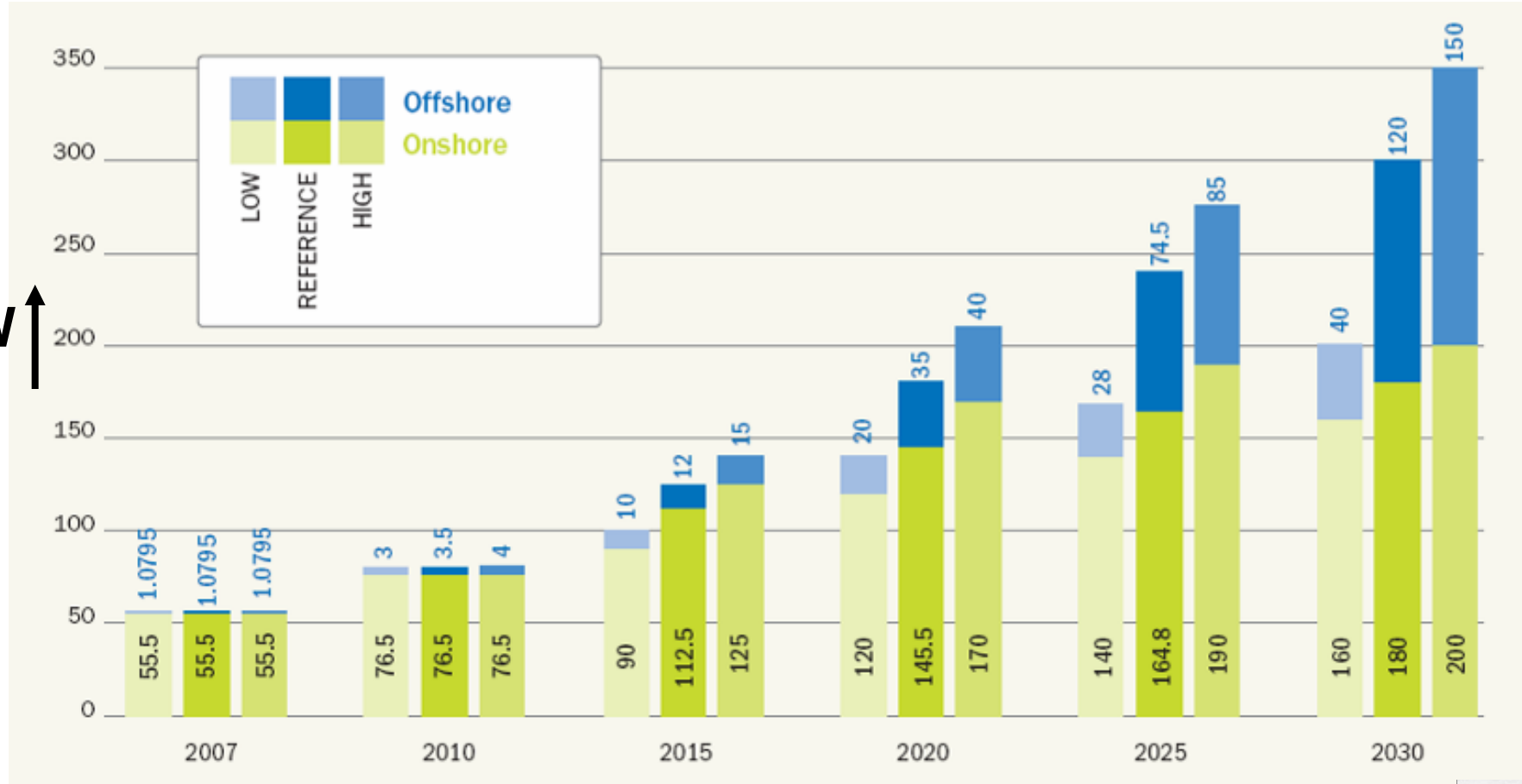
Plannen voor offshore wind in de Noordzee



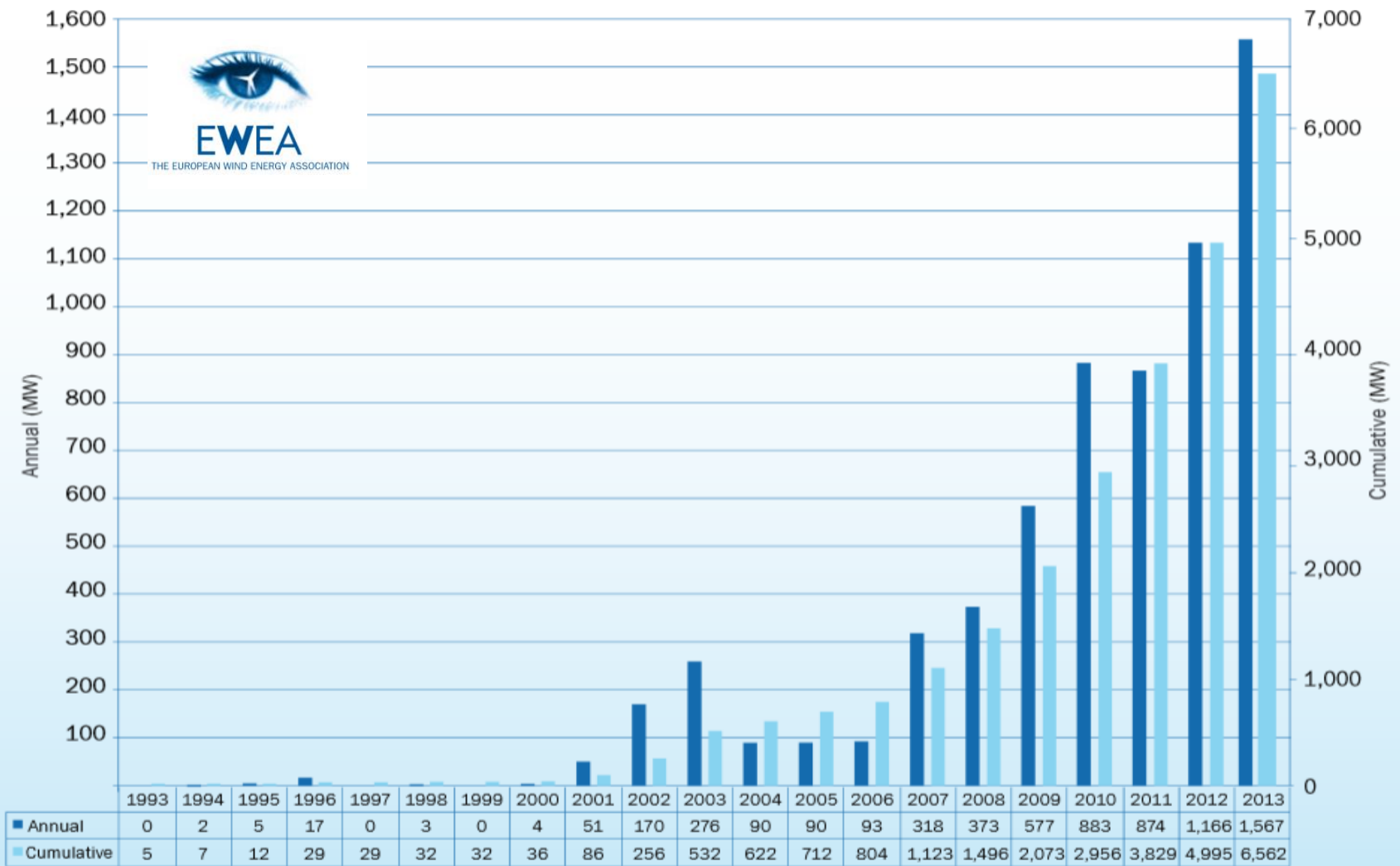
<http://www.4coffshore.com/offshorewind/>

De (verwachte) ontwikkeling van wind energie in de EU

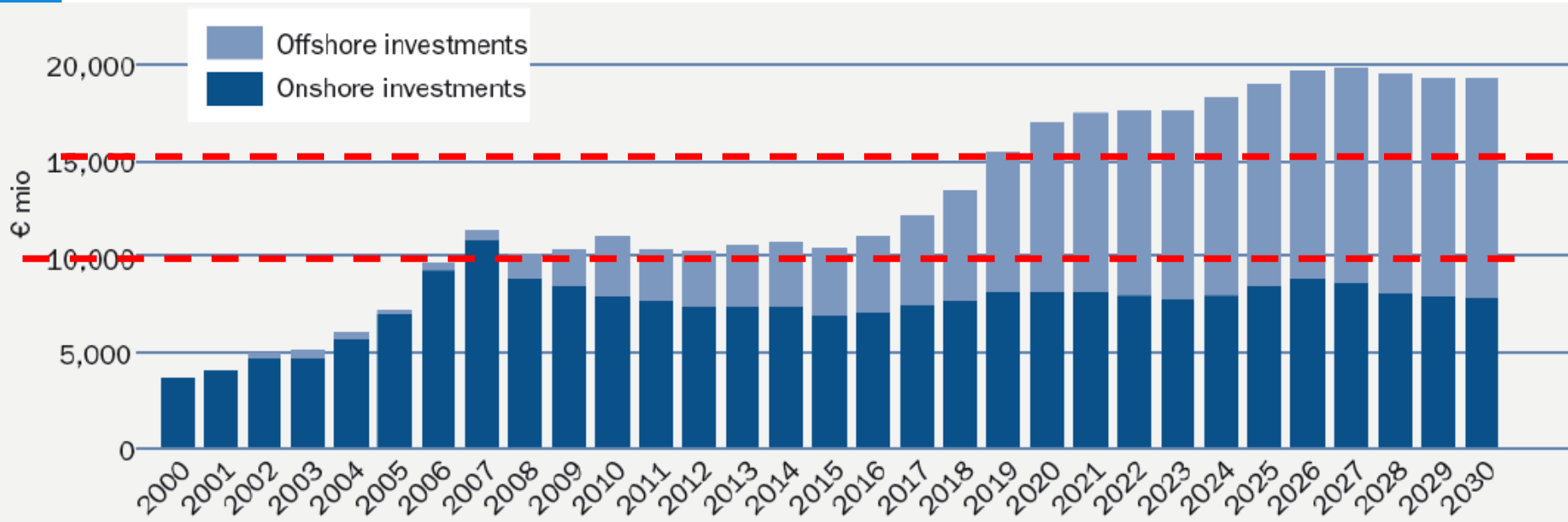
GW ↑



Geïnstalleerde offshore wind capaciteit t/m 2013



Investeringsen in windenergie per jaar in de EU



Bron:  EWEA 2010

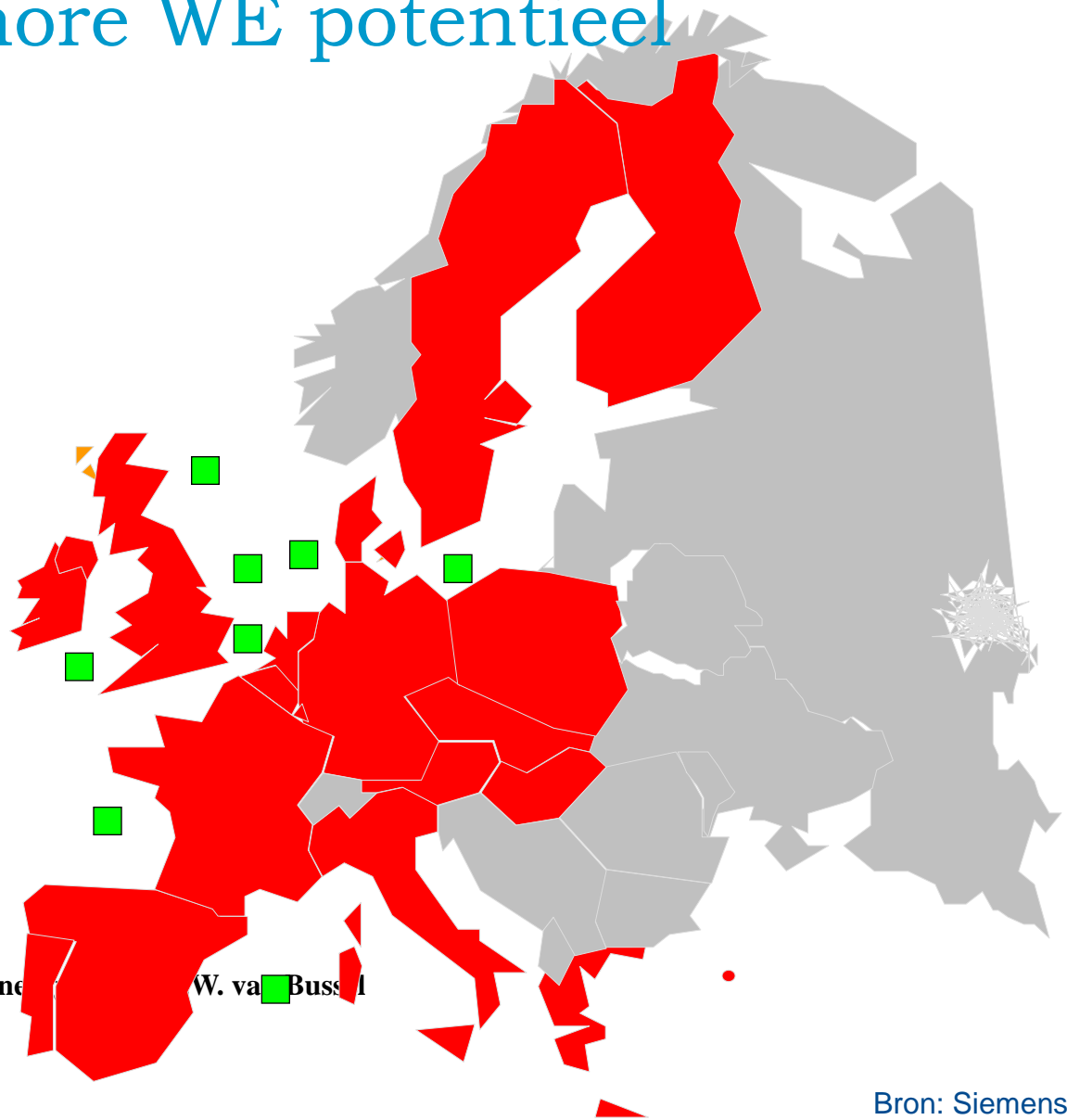
Nu zo'n 10 miljard Euro per jaar
Stijgt naar 15 miljard Euro per jaar in 2020

Europa's offshore WE potentieel

Eight 100x100 km offshore wind farms can produce 3,000 TWh.

≈ equal to electricity consumption in EU

Module Sources and Systems: Wind energy, W. van Bussel



Bron: Siemens

NL Offshore Windparken 1: Egmond aan Zee

108 MW (36 x 3 MW)
Opening: Sept 2006
Investment 230 M€



NL Offshore Windparken

2: Prinses Amalia Wind Farm (Q7)



120 MW (60 x 2 MW)

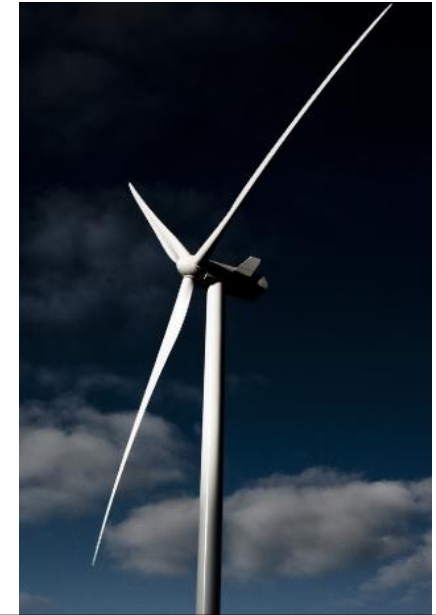
Opening: June 2008

Investment 360 M€



NL Offshore Windparken

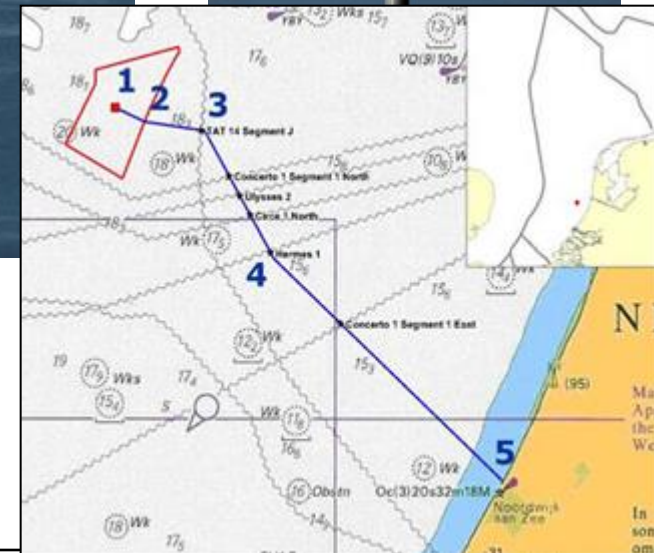
3: Luchterduinen (2015)



129 MW (43 x 3 MW)

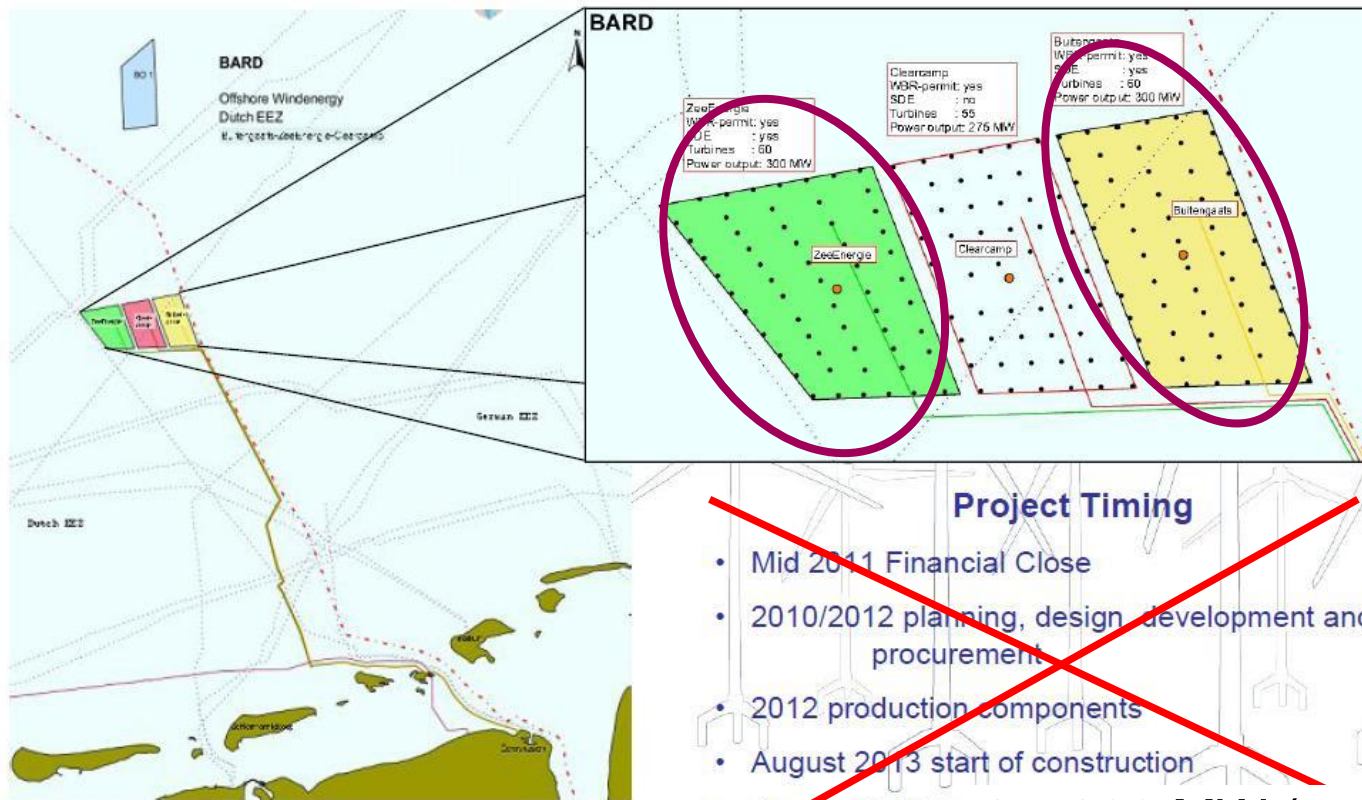
Opening: 2015

Investment 450 M€



NL Offshore Windparken

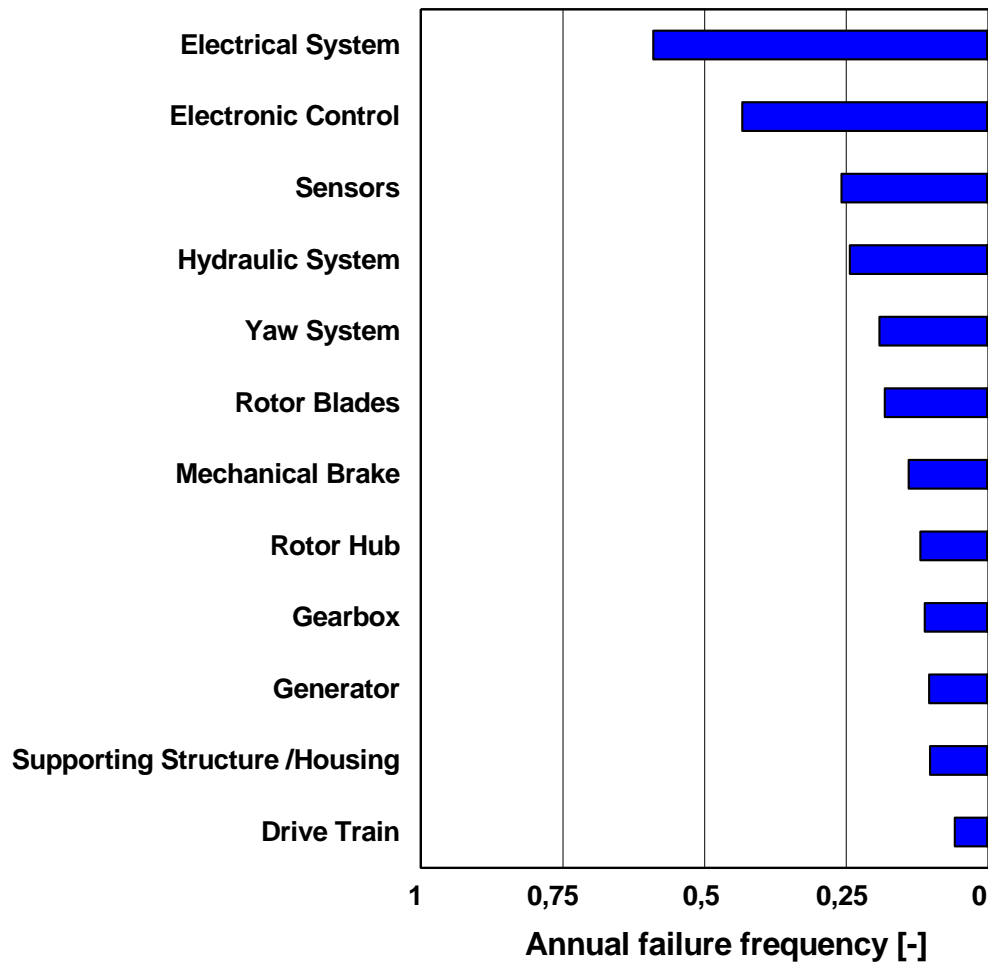
4: Bardin NL & 2 NW 2 Wind Farm (2011-2015)



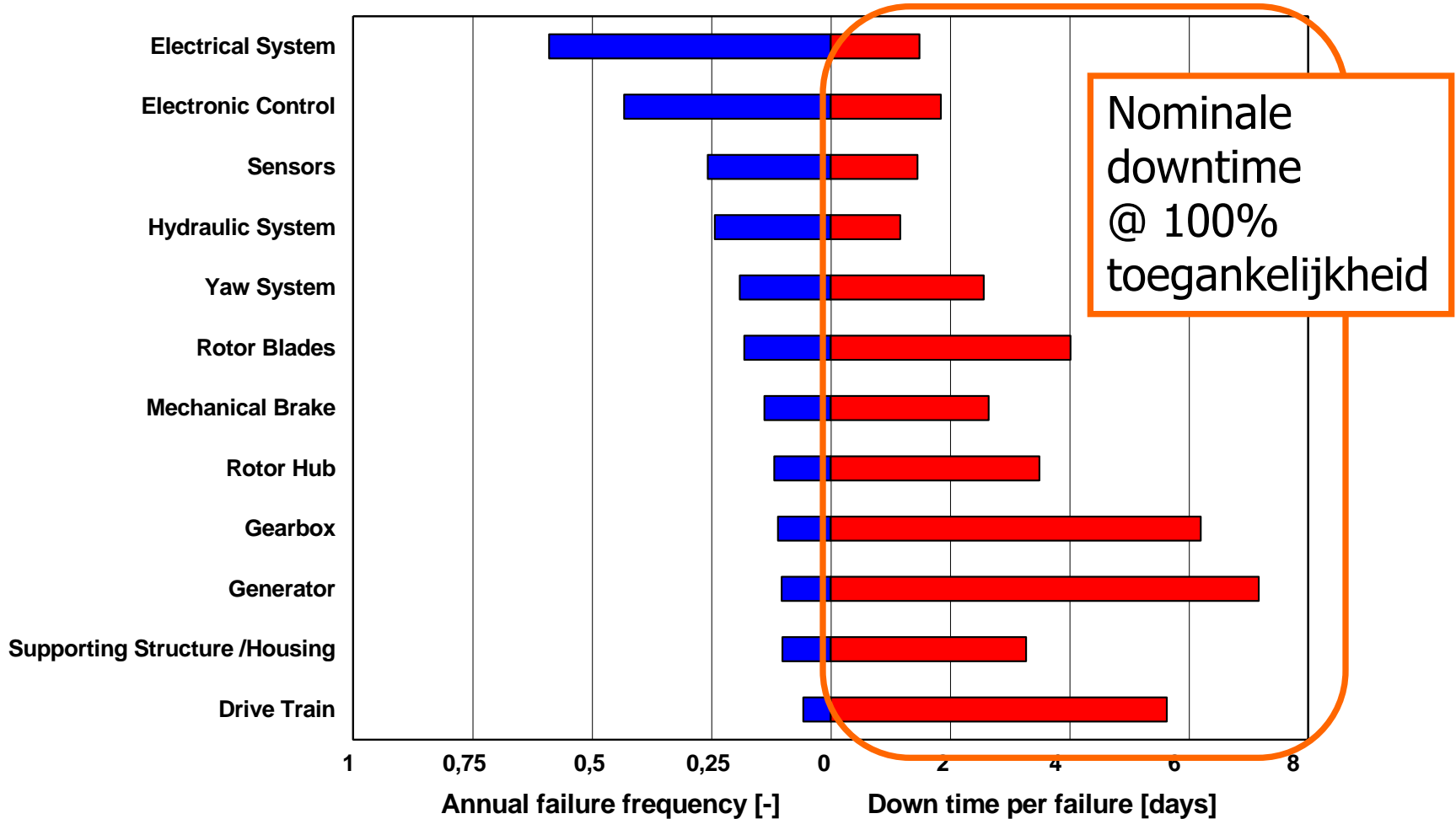
2 x 300 MW (75 x 4 MW)

Investment 2.800 M€

Faalfrequentie per windturbine subsysteem

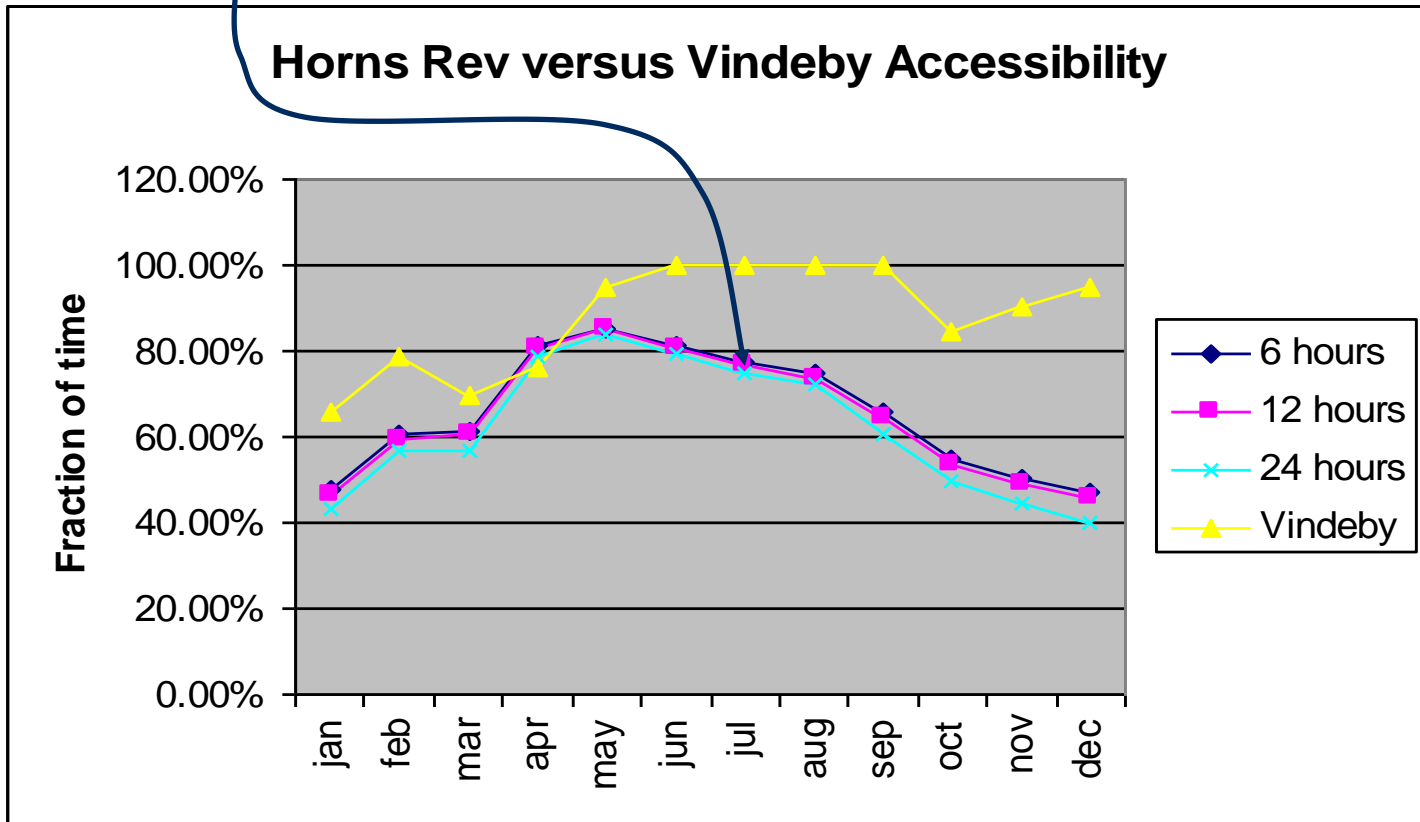


Faalfrequentie per windturbine subsysteem



Windturbine access per schip

Horns Rev
(near shore,
North Sea)



Real world experience

Maintaining Horns Rev (DK):

80 V80 wind turbines in operation since 2002



- **Access by boat:**
 - Winter 02/03: 5/7 days
 - Winter 03/04: 1/7 days
- **Helicopter:** 6/7 days
- **Vestas** responsible for crew (60 people)
- **Elsam** for transport (6 people)
- 75.000 transfers in 1.5 years (2 x /day/turbine)

Real world experience

Maintaining Horns Rev (DK):

Reasons:

- Design not (well) adapted for offshore
- O&M Strategy far from optimal
- Onshore crew in offshore environment
- Sophisticated monitoring => many alarms but what do they mean?



Real world experience

Scroby Sands (UK):

30 V80 wind turbines in operation since Jan. 2005

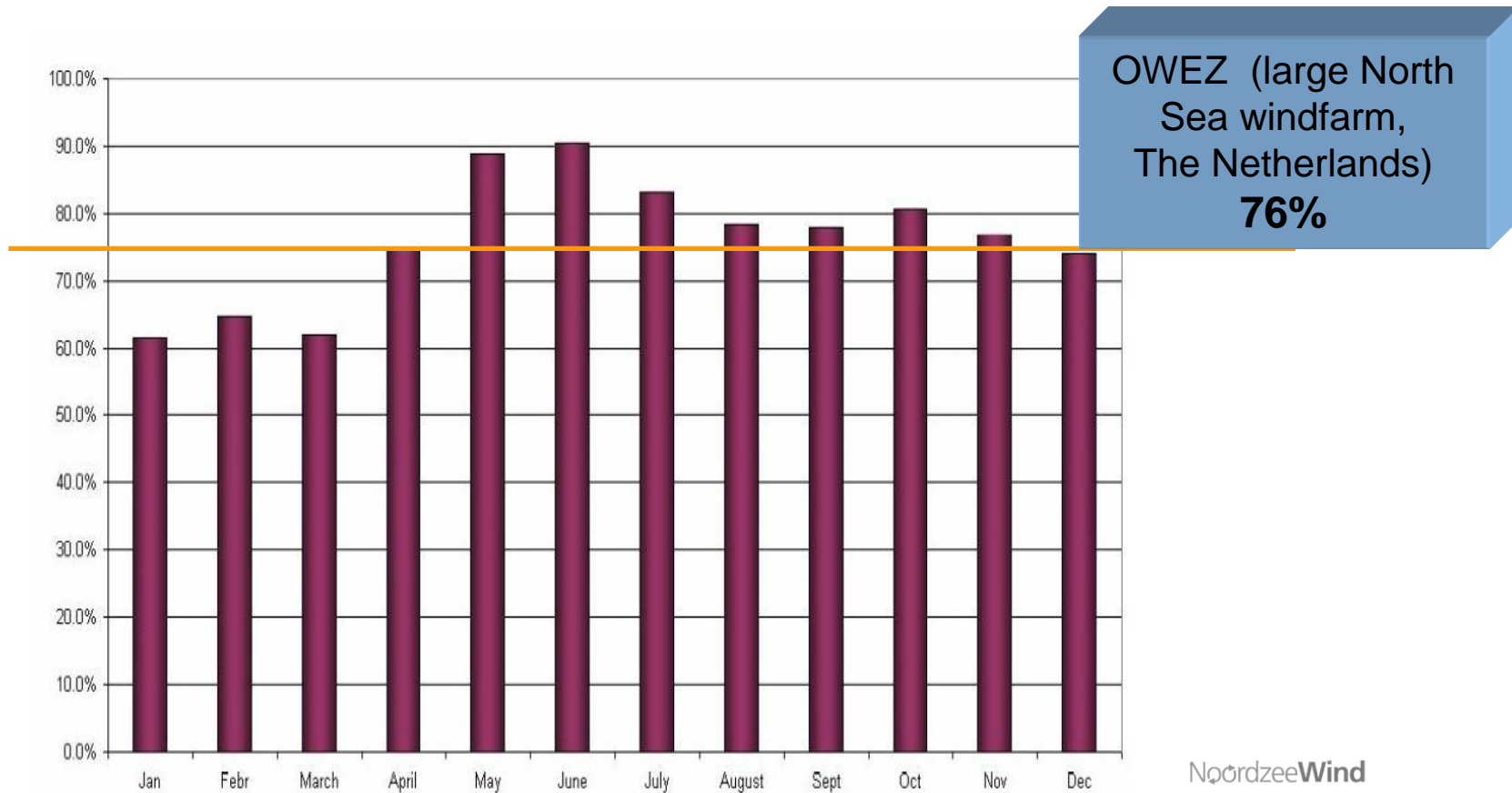
- Key figures:

	2005	2006
Accessibility	60 %	79 %
Availability	89.4 %	81.4 %
Capacity factor (projected 0.301)	0.284	0.246

- 1500 wind turbine visits per year
(8 wind turbines visited each working day)
- 4000 transfers of crew per year

Source: ODE

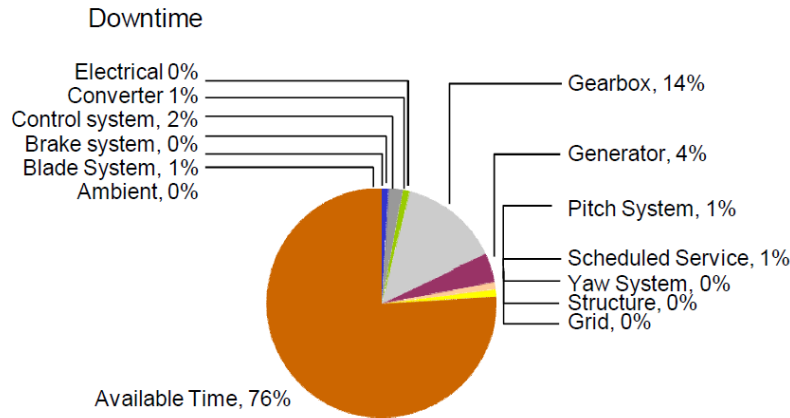
Beschikbaarheid in de praktijk (Noordzee)



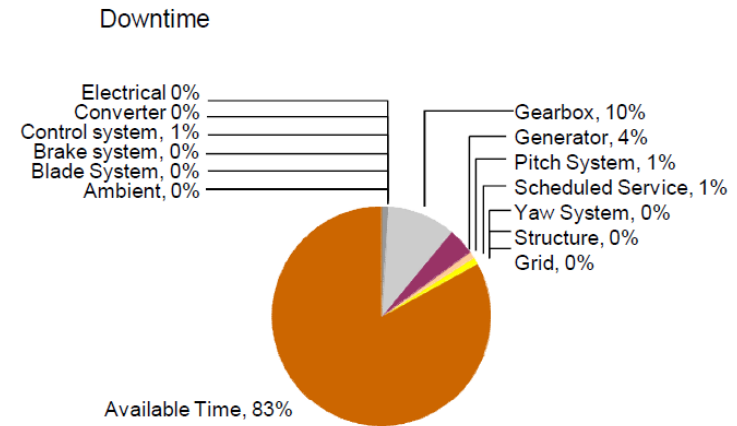
OWEZ availability over the year 2008 (12 gearboxes exchanged)

OWEZ Beschikbaarheid

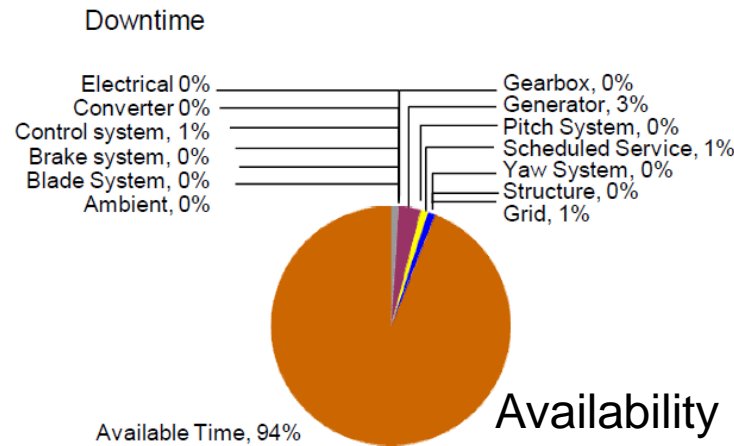
(large offshore Wind Farm in North Sea NL)



Availability in 2008: 76%



Availability in 2009: 83%



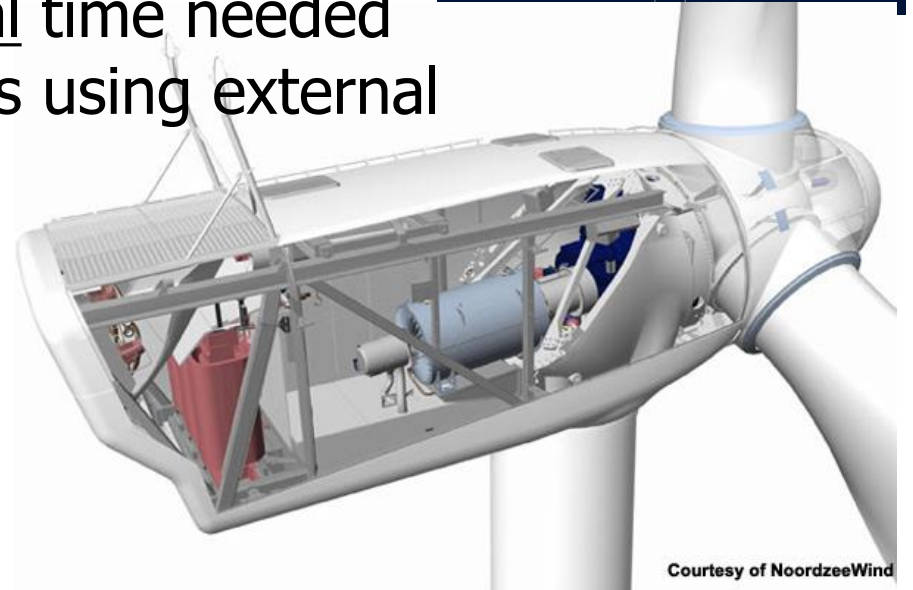
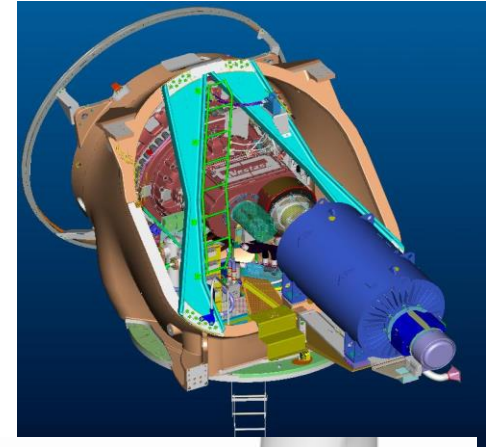
Availability in 2010: 94%

Uitwisselen van tandwielkast bij OWEZ



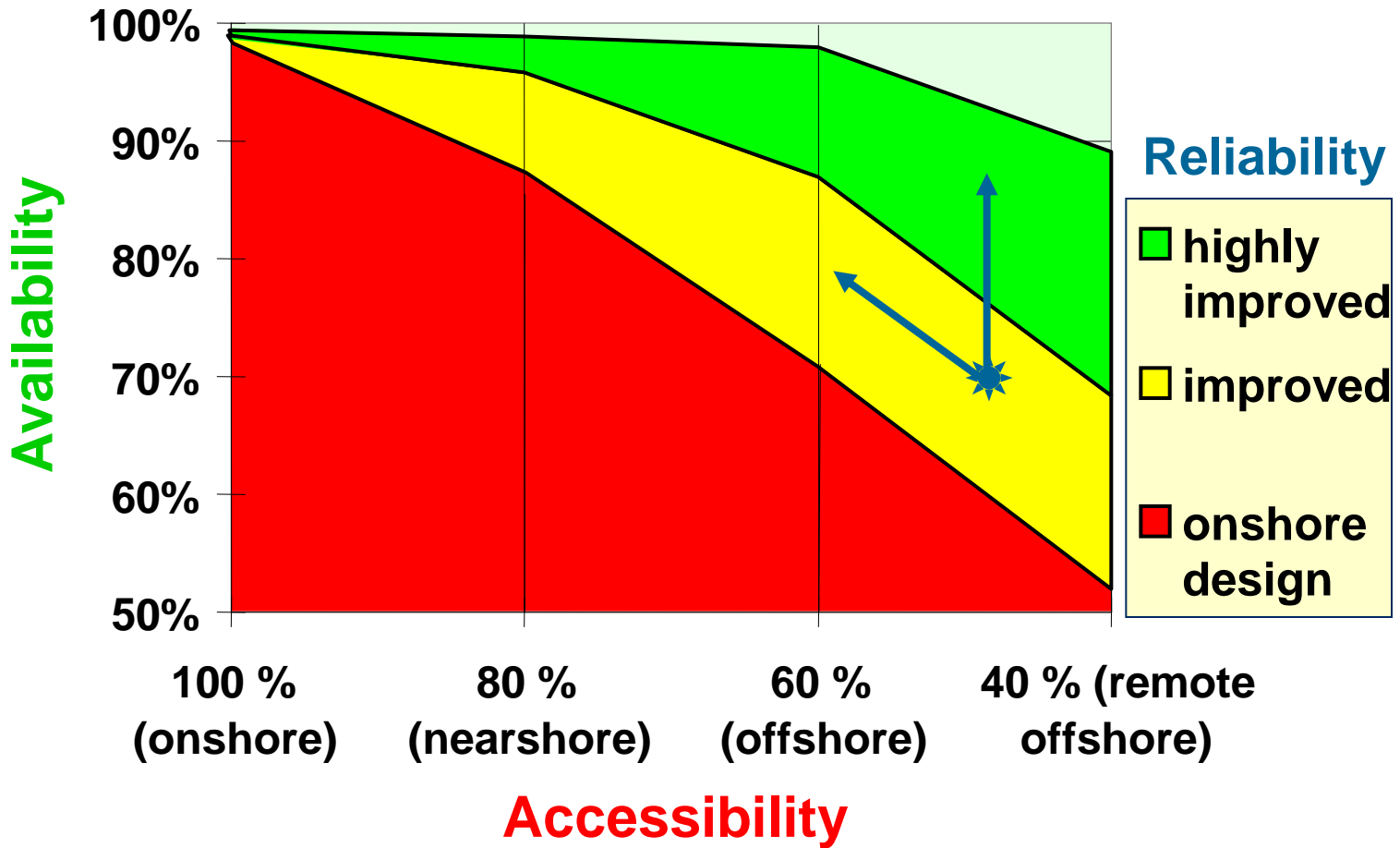
Integrated gearbox concept.

Consequence:
Nominal time needed
3 weeks using external
crane



Courtesy of NoordzeeWind

Belang van *Betrouwbaarheid* en *Accessibility*



Improving Accessibility



“WindCat” “SWATH”

Twin hull access boats



“Ampelmann”

Access platform with
wave compensation



Improving availability

By improving reliability?

- Improving component reliability
- Up scaling (less components per MW)
- Reducing nr. components (lean design)


expensive 



Improving availability

By reducing downtime??

- Optimise O&M operations

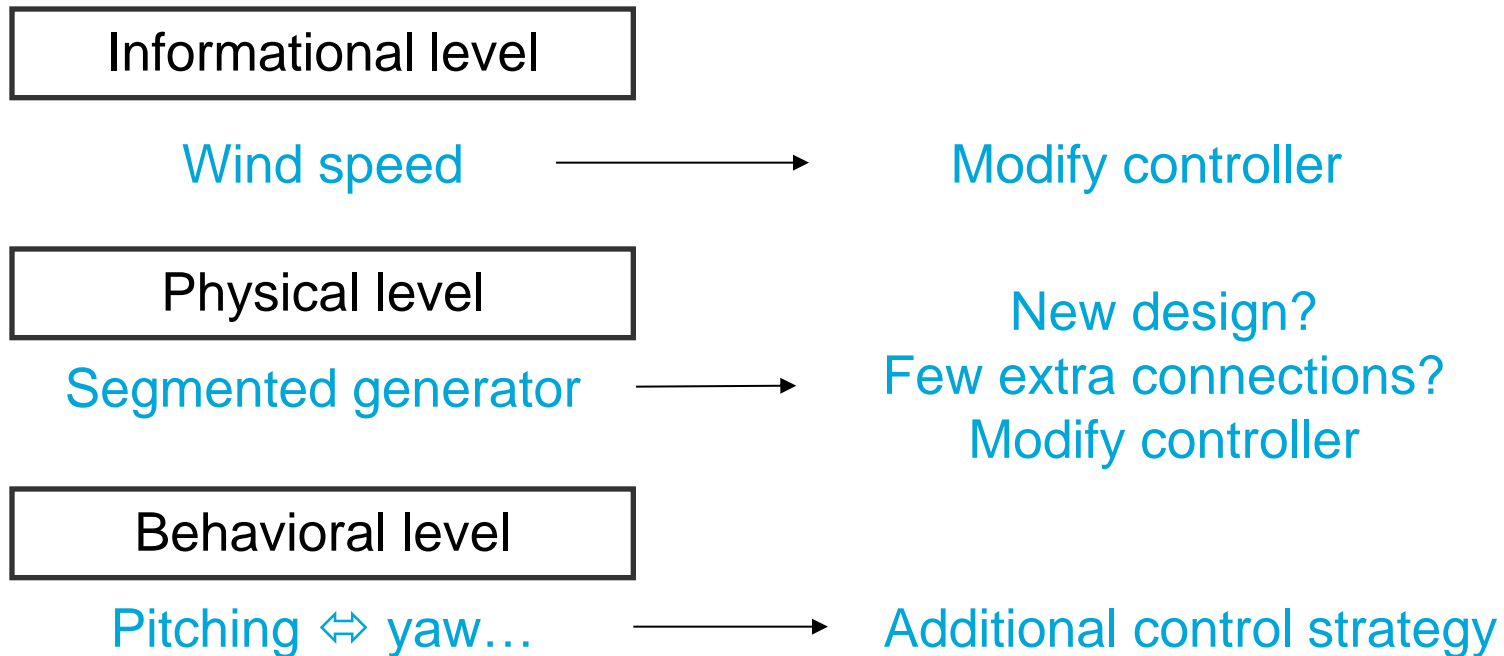
by experience & 
better access systems

- Develop (Smart) Prognostic Diagnosis systems using existing data 

- (Design for) re-configuration 

Reconfiguratie

Re-configure: It is to rearrange the components, settings, or connections of a system.



Conclusies

- Beschikbaarheid van Offshore windparken enorm verbeterd
- Veel betere, toegesneden, access systemen voor windturbines
- O&M operations kunnen nog (veel) optimaler worden
- Data niet (optimaal) gebruikt voor prognostics
- Reconfiguratie biedt nieuwe mogelijkheden