



# The Market for Installation Vessels



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# Agenda



- **A2SEA**
- **The Offshore Wind Farm**
- **Harbour**
- **The Products**
- **The Vessels**
- **The Market**



# A2SEA



SEA ENERGY  
2002



SEA POWER  
2002



WIND  
2011

- Started 1<sup>st</sup> July 2000
- 100% dedicated to offshore wind
- 4 (5) vessels, 300 employees, >100 mio Euro turnover
- Owned DONG Energy Power: 67.2%  
and Siemens Wind Power: 32.8%
- Siemens Wind Power 49% owner in 2011
- Installed >750 turbines, >300 foundations



SEA INSTALLER  
2012



SEA SERVER 2013



SEA JACK  
2007



SEA WORKER  
2008



Crew boats  
HRI/Walney 2010



# A2SEA, Scope of Work



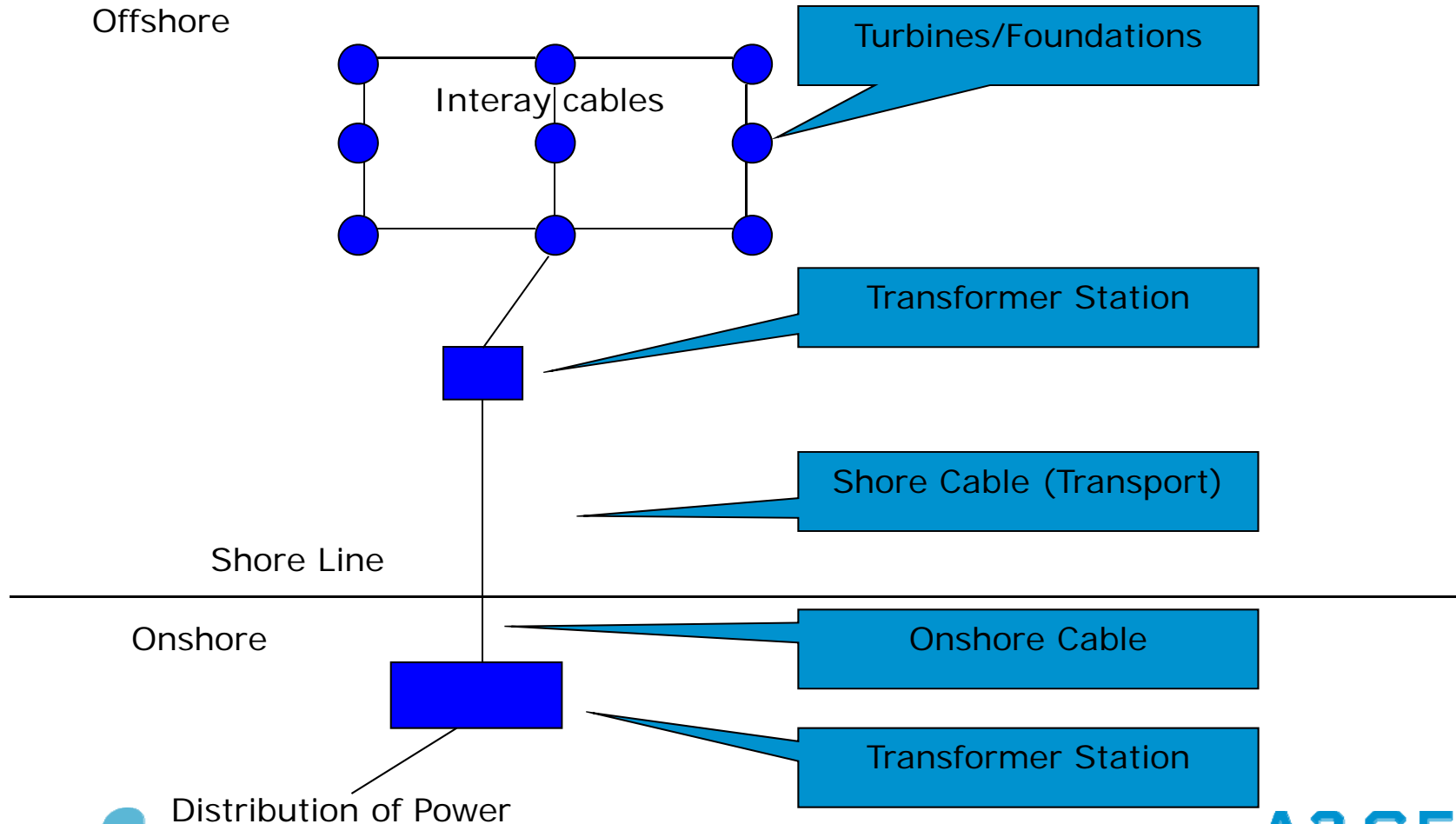
- Interface WTG
- Interface foundation
- MWS approval
- Customer approval
- Method statements
- Jacking strategy
- Positioning strategy
- Shore site base
- Vessel management involvement
- Sea fastening
- HSEQ evaluation

- Modifying vessel for project
- MWS approval
- Customer approval
- Crew induction

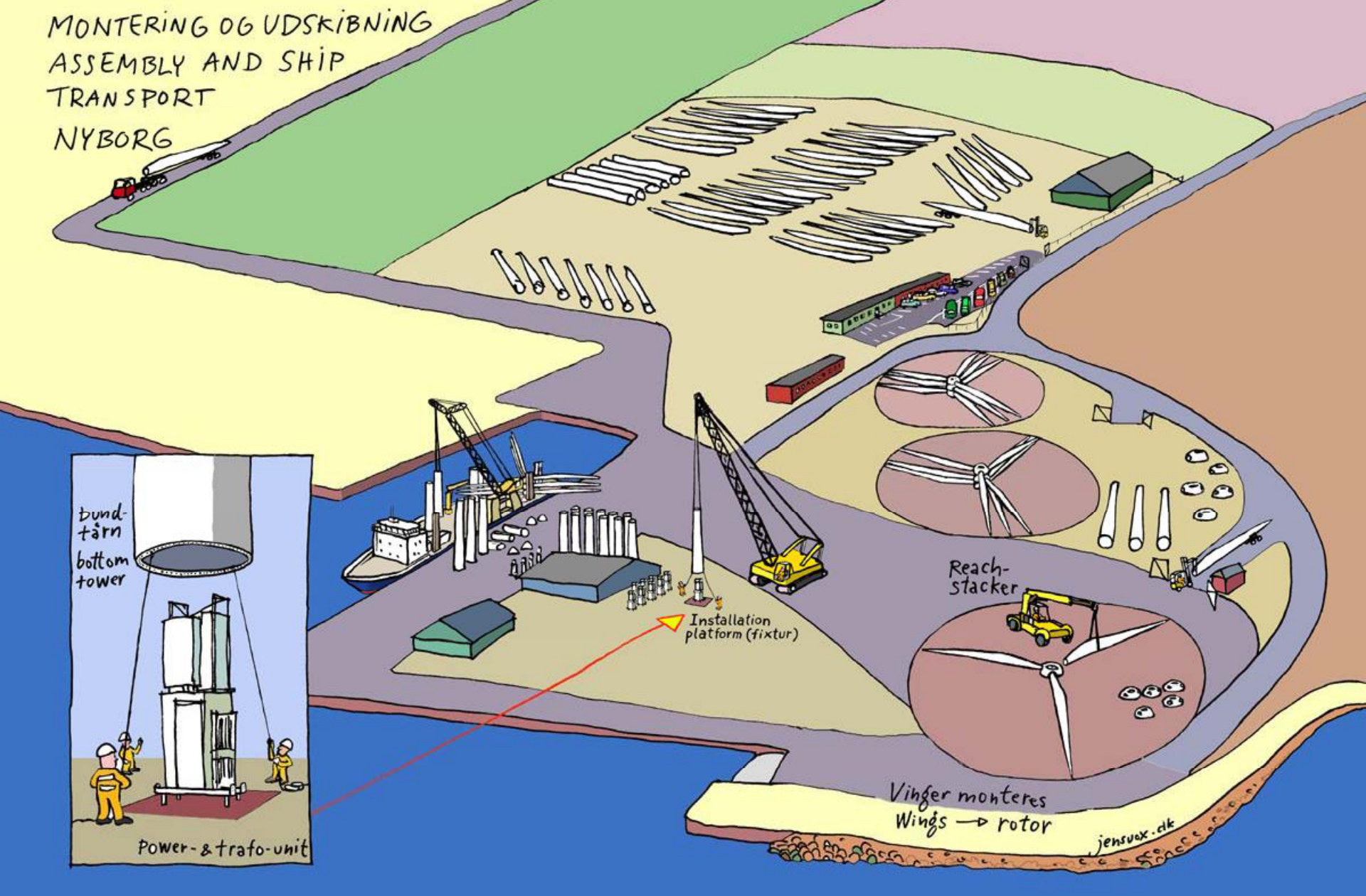
- Getting the job done safely
- Daily reporting
- HSEQ Management
- Updating documentation
- Corrective actions
- Liaise with on site management
- Interface management
- Liaison with authorities
- Planning monitoring and adjustments
- Weather planning
- Vessel management



# The Offshore Wind Farm



MONTERING OG UDSKIBNING  
ASSEMBLY AND SHIP  
TRANSPORT  
NYBORG



# Harbour

- Harbour key load limits per m<sup>2</sup>
- Labour unions
- Tug assistance
- Sea bed at harbour key for loading
- Harbour Prices
  - Tonnage tax
  - Harbour tax
  - Agents



# Harbour

- **Sail out limitations**
  - Tide
  - Speed
  - Restrictions
  - Priorities
  - Pilots
  - Ferries
  - Bridges



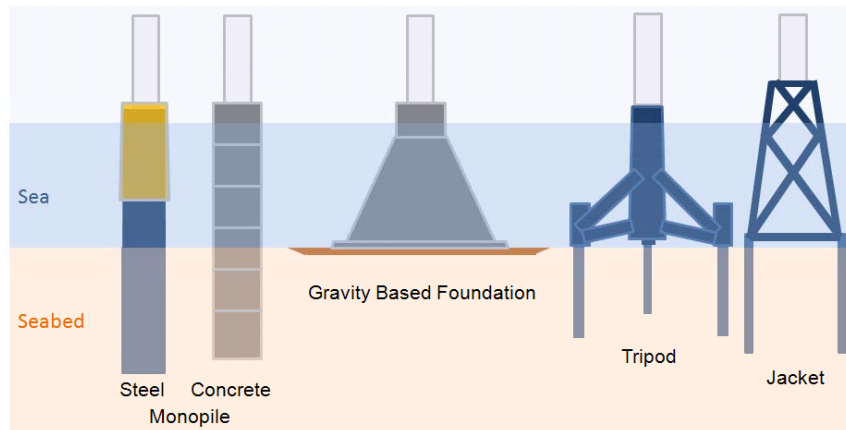




Photo: Aarsleff Bilfinger Berger



# The Products, Foundations



- Maximum weight 5.000t
- Maximum footprint of 35m x 35m
- Maximum monopile length 90m
- Maximum foundation height 60m

Additional know-how needed

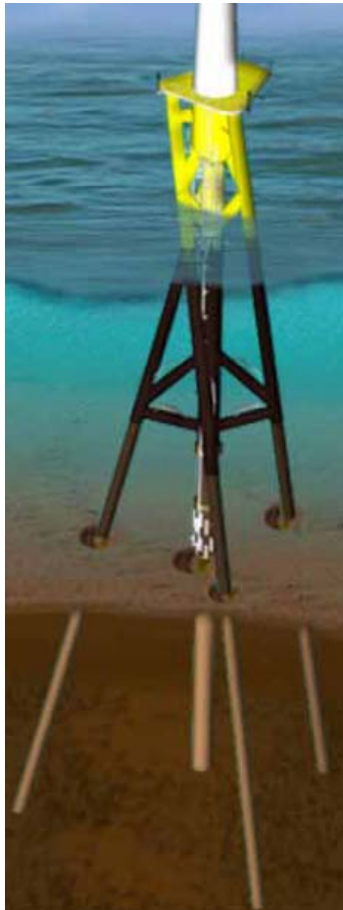
- Challenge for us
- Invitation for the Shipbuilding Industry



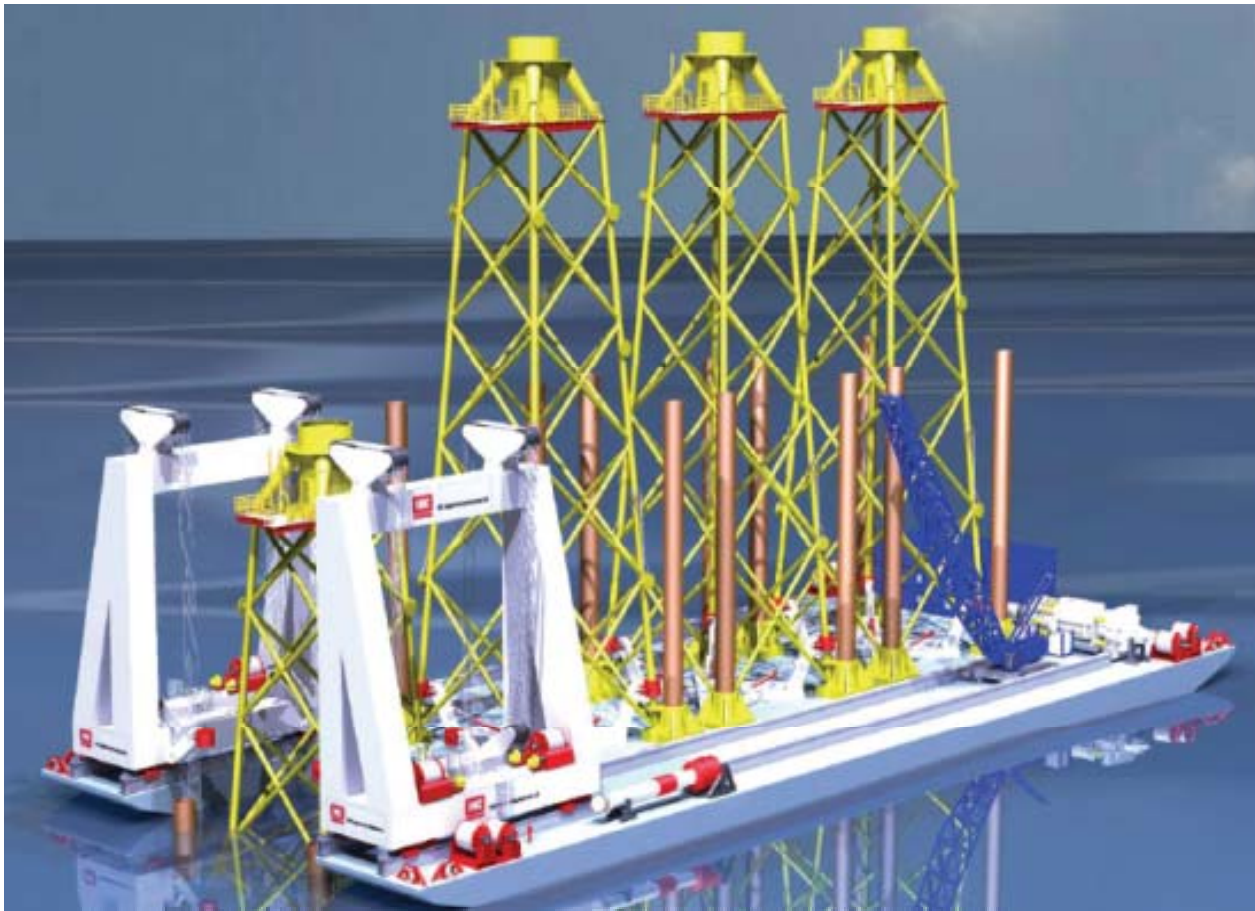
# The Products, Foundations



# The Challenge, New Concepts



# The Challenge, New Concepts



# The Products, Turbines

Vestas  
2.0MW/3.0MW



Siemens  
2.3MW



# Feeding Offshore

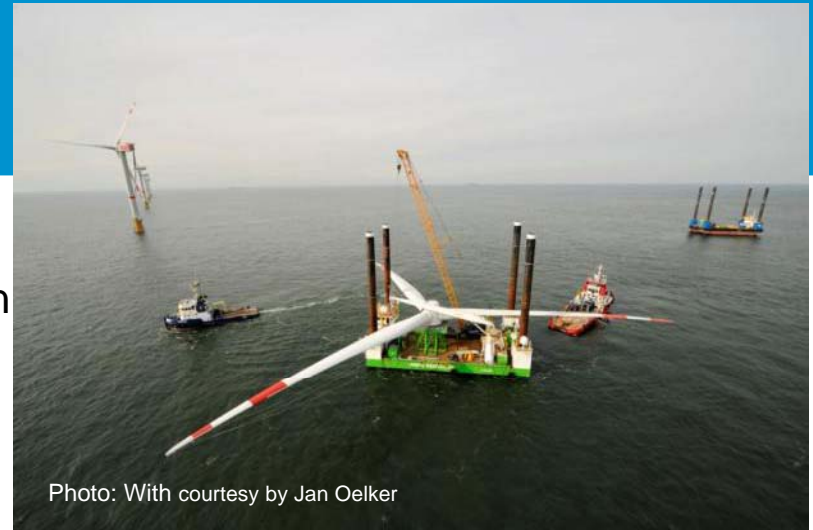


# The Products, Turbines

Repower 5.0 MW



Repower 5.0 MW  
Full Rotor Installation

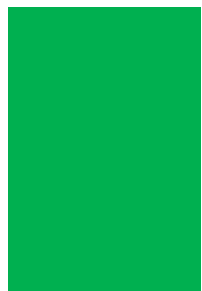


Siemens 3.6 MW Single Blade Installation





# The Challenge – Rotor Diameters



Wembley Stadium  
Football Pitch

??? m

135 – 165 m

120 m

90 m

80 m

50 m

25 m

1990

1995

2000

2005

2010

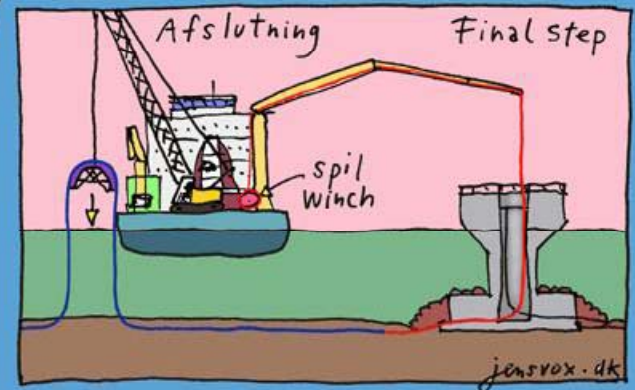
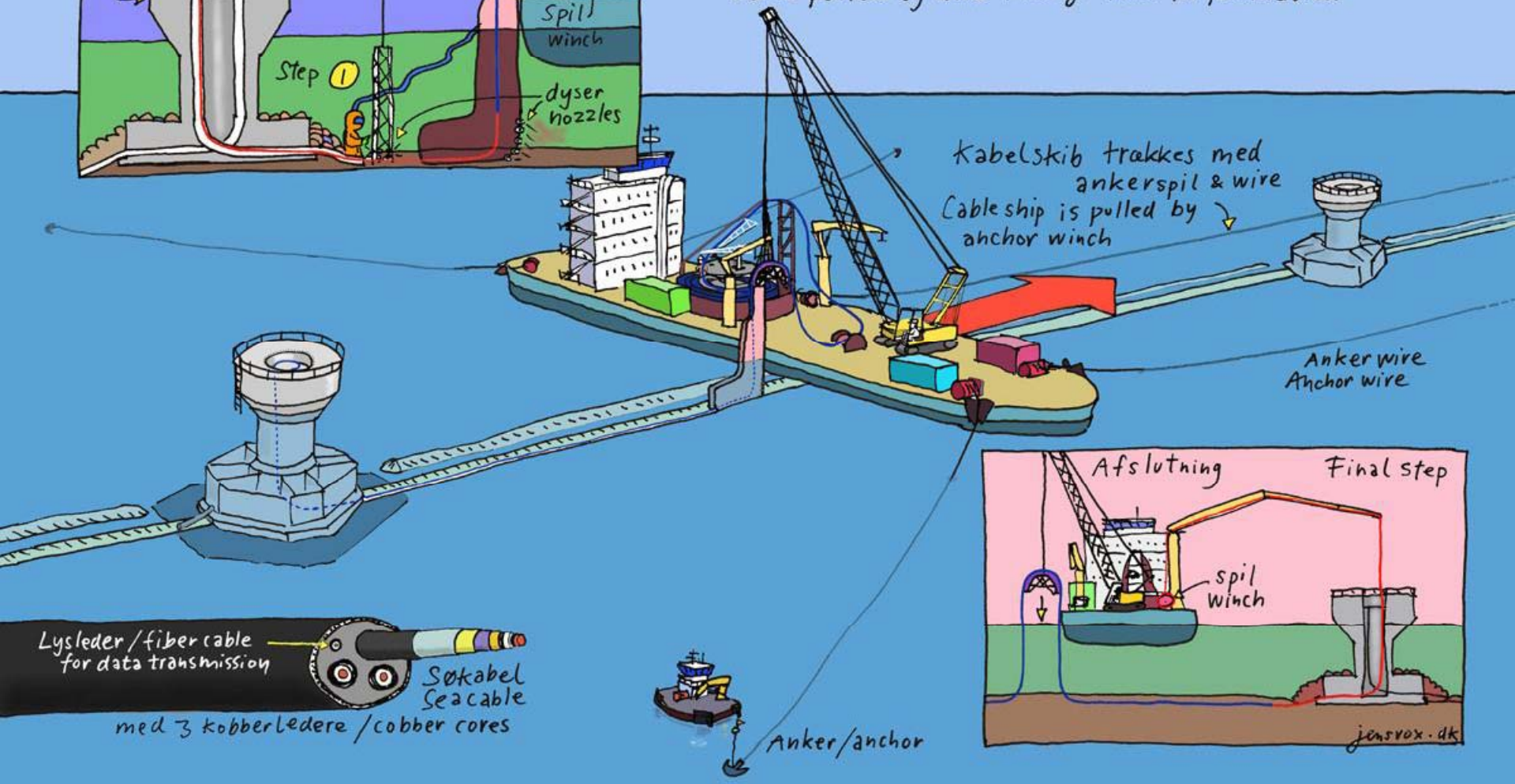
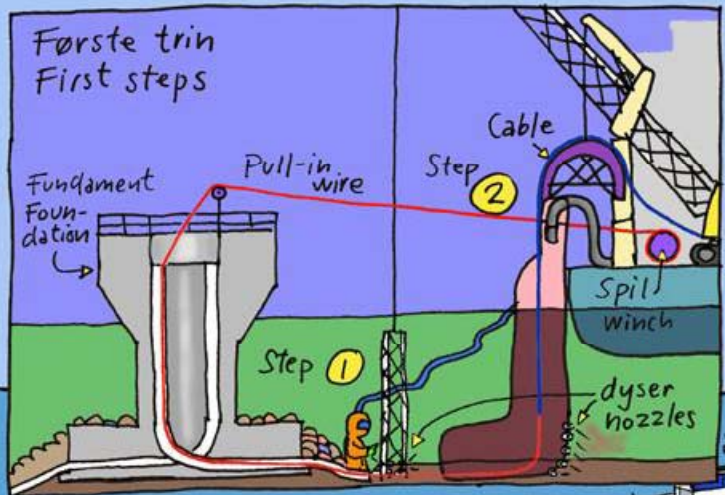
2015

2020



# KABEL-SKIB / CABLE SHIP

- ← ① Gravet rende renses med spule/suger, overvåget af dykker  
Cleaning trench with air lift, diver supervision
- ← ② Kabel trækkes gennem føringsrør i fundament  
Cable pulled by wire through tube in foundation



Lysleder / fiber cable for data transmission  
 Søkabel / Seacable med 3 kobberledere / copper cores



# The Vessels, Foundations



- DP vessels from O&G sector for piling operations
- Floating heavy lift cranes & shear leg cranes



# The Vessels, Turbines



RWE Seabreeze



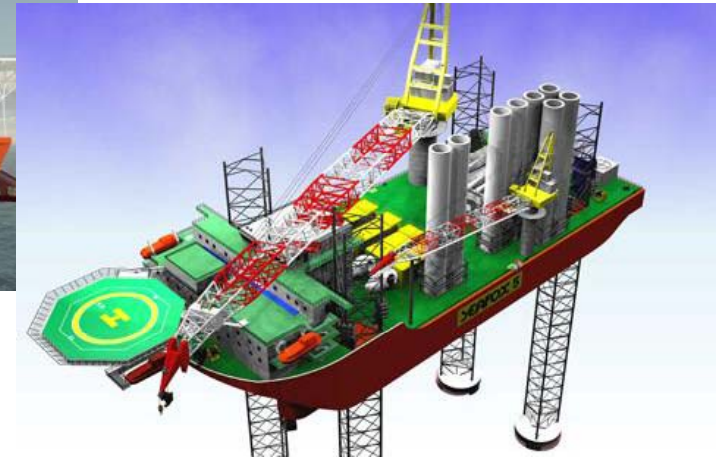
Fred Olsen Windcarrier



MPI Adventurer



A2SEA SEA INSTALLER



Seafox 5



# The Vessels, Turbines



# The Vessels, Turbines



# The Vessels, Cable Laying



# Other vessels will be required as well...

- Service vessels
- Personnel transfer vessels
- Tugs
- Hotel ships

Totally 52 different vessels involved in Horns Rev II.

Totally up to 30 different vessels on the site at a time.





# Installation Market

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Installed capacity, MW*	1,399	1,700	2,200	2,800	3,000	3,600	3,900	4,600	5,200	6,200	6,800
Estimated average capacity of one WTG, MW**	N/A	3.3	3.6	3.9	4.2	4.5	4.8	5.1	5.4	5.7	6.0
Number of WTG's (to be) installed (based on the above)	455	515	611	718	714	800	813	902	963	1.088	1.133

\* From 2011 and further on the installed capacity is based on EWEA's "Oceans of Opportunity"

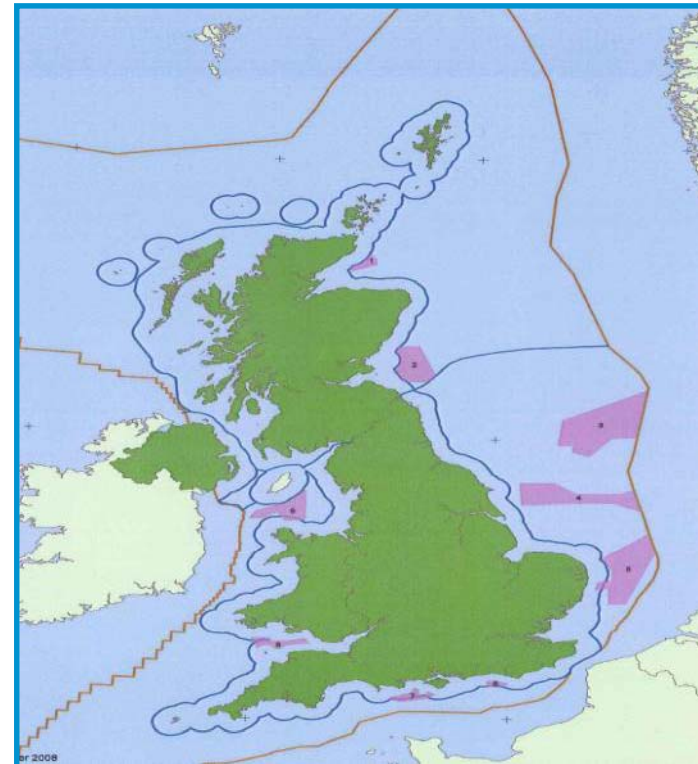
\*\* This figure is used for estimation of number of turbines for future projects



# Where is the market?



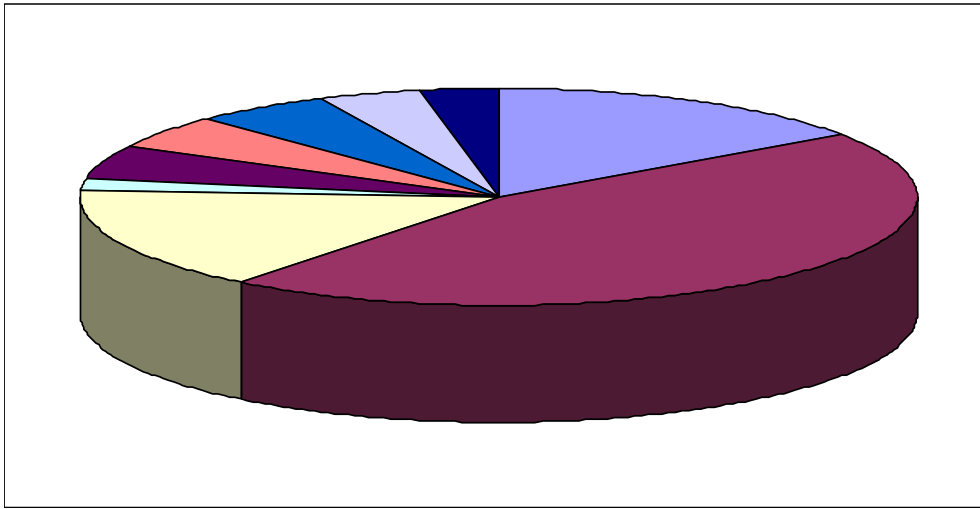
**German & Dutch Developments**



**UK Round II, II½, and III**



# Typical Offshore Installation



Hardware:		Software:	
Foundations	15%	Installation Foundations	5%
Turbines	45%	Installation Turbines	5%
Cables	15%	Installation Cables	4%
Transformer Station	2%	Traffic Control/HSE/Project Management	4%
Scour protection etc.	5%		

3.5 Mil. Euro/MW



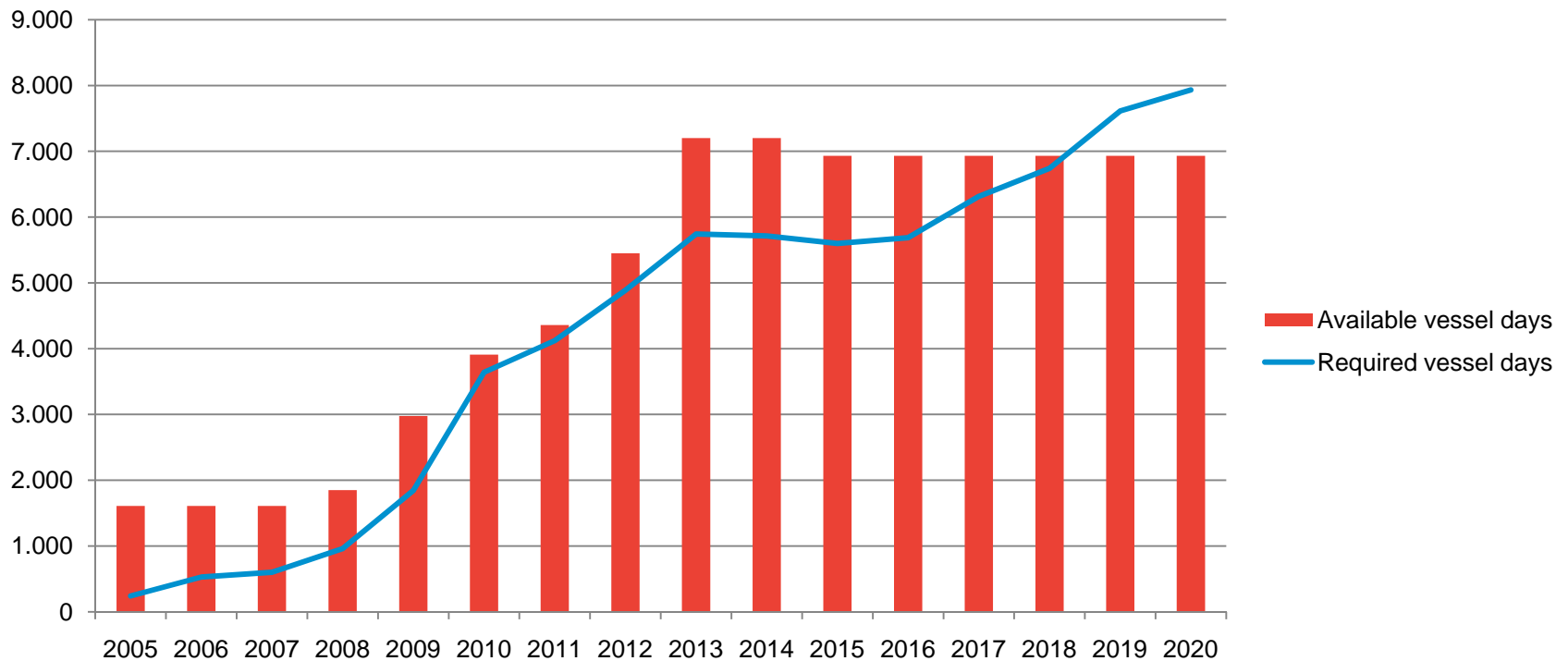
# Available Vessels and Vessels to come

Adventurer (MPI)  
Beluga Hochtief Offshore  
Blue Ocean Wind 1 (Swire Blue Ocean)  
Discovery (MPI)  
Dubai Drydocks (speculatively building)  
JB117 (Jackup Barge)  
RWE Seabreeze I  
RWE Seabreeze II  
Seafox 5  
Windcarrier I  
Windcarrier II  
Windlift II (BARD Offshore)  
Zaratan (Seajacks)  
Buzzard (GeoSea)  
Excalibur (Fugro Seacore)  
Goliath (GeoSea)  
Haven (Master Marine)

JB114 (Jackup Barge)  
JB115 (Jackup Barge)  
Jumbo Javelin (Jumbo Offshore)  
Kraken (Seajacks)  
Leviathan (Seajacks)  
LISA  
Odin (Hochtief)  
Resolution (MPI)  
Stanislav Yudin (Seaway Heavy Lifting)  
Svanen (Ballast Nedam)  
Thor (Hochtief)  
Vagant (GeoSea)  
Windlift I (Bard Offshore)  
SEA INSTALLER  
SEA JACK  
SEA POWER  
SEA ENERGY  
SEA WORKER



# Vessels contra Market





**Any questions?**

**Thank you for listening**

