

The Jumbo Solution for Optimizing Offshore Wind Turbine Foundation Installation

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Deloitte Oil & Gas Conference – 25th June 2013



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Industry Outlook for Offshore Wind Energy

16% of the **total world energy** comes from renewable sources, clean and with low environmental impact.

By 2050 this is expected to grow to 30%.

(SER growth ambition **for the Netherlands** is 16% by 2020)

Wind power is the most dynamically growing sector (+30% a year) – global investments of €130 bln by 2020.

Trends:

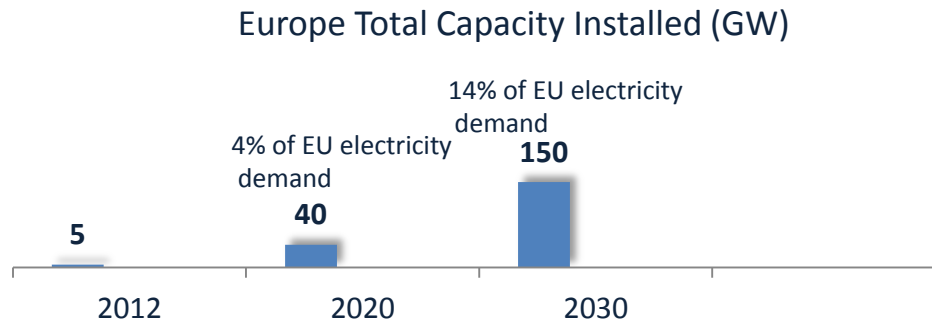
- windfarms located farther from shore to benefit from high speed winds & ensure power output increase
- larger turbines with large rotor diameter to provide greater efficiency and economy of scale.



Industry Outlook for Offshore Wind Energy

The offshore wind sector brings considerable economic opportunities and contributes to Europe's:

- Competitiveness and leadership in wind energy
- Provides employment in the EU
- Reduces Europe's import dependence
- Reinforces security of supply

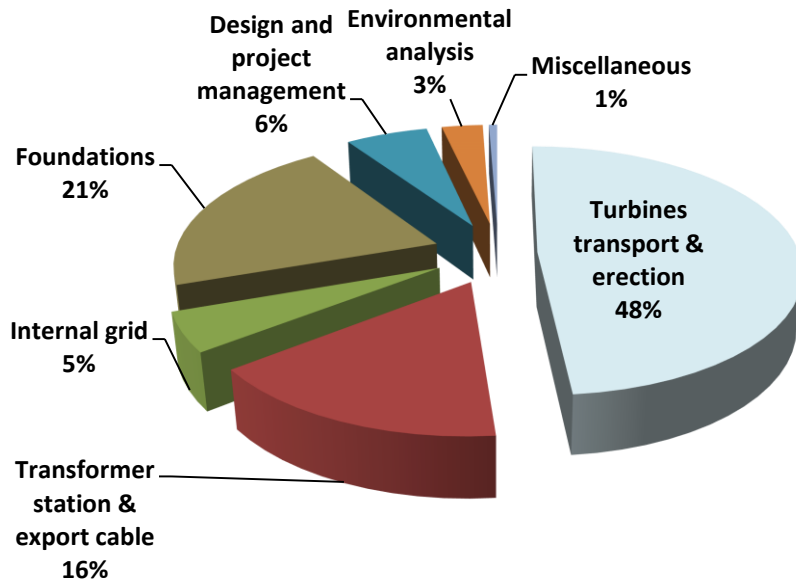


- Around €3.4bn to €4.6bn annual investment (2012)
- 35,000 FTE (2012)
- 170,000 FTE in 2020 and 300,000 FTE in 2030 (60% of wind employment)

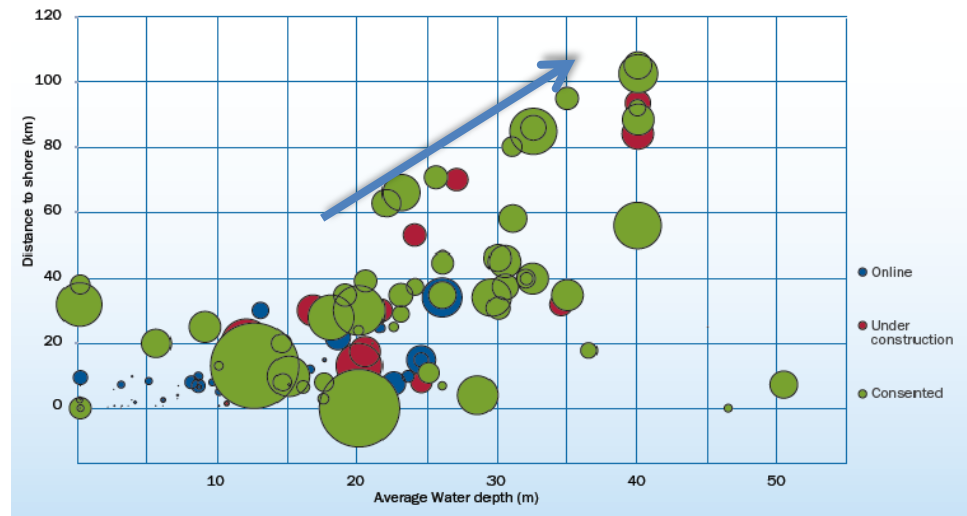


Industry Outlook for Offshore Wind Energy

Windfarm Installation Capital Costs Breakdown

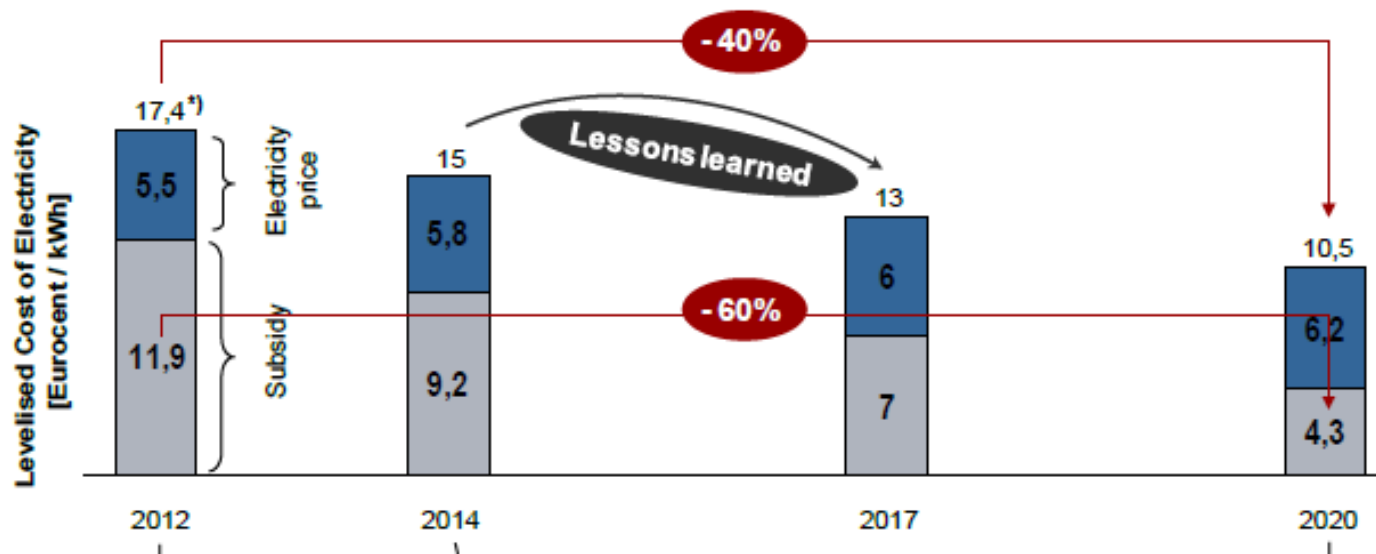


Average Water Depth and Distance from Shore



Industry Outlook for Offshore Wind Energy

Offshore wind energy production costs remain high: €150 MGW/h.



Cost reduction is priority number one for companies working in the offshore wind space – an ambitious goal is €100 MGW/h by 2020



Offshore Wind Energy – Industry Challenges

Example Projects - Lessons to learn

Reference Project 1:

- 80 turbines x 5MW
- 80 Tripile foundations (240 piles)
- 90 km distance from shore
- 40 m water depth

Construction started in Q1 2010.

Multiple charters provided transport and installation equipment.

By Q1 March 2013 72 foundations were installed. In average 1 foundation was completed in 15 days

By the time, when the project is expected to be completed there will be 3 years delay and costs will have risen by more than 50%

Reference Project 2:

- 40 turbines x 5MW
- 40 Four leg foundations (160 piles)
- 65 km distance from shore
- 30 m water depth

Construction started in the end of Q3 2011.

Foundation installation, done by **contractors**, was finished in the beginning of Q2 2013.

Turbine installation is in progress.

The site is expected to be operational by Q4 2013.

If financing is secured stage 2 will follow shortly after.



Offshore Wind Energy – Industry Challenges

Cost reduction is key. T&I part of CapEx needs to be considerably lowered through standardisation and industrialisation. Economy of scales and more focus on costs per foundation instead of charter rates.

Technical challenges

- Maturity: Offshore industry is still at lower end of technical learning curve.
- Only small exchange of experience between developers. Offshore development can not be copy-pasted from onshore
- Proper cost-efficient equipment is not available
- Lack of standardisation and industrialisation

Contractual challenges

- Currently there is a conflict of interests between the field development parties and equipment owners (charterers).

Financial challenges

- Some banks open for offshore wind but risk-averse (equity >50%, no construction risks, no industry specific equipment)
- The number of external investors looking to enter the market stays low, urging the industry to demonstrate better results towards sustainability.



Floating solutions for bringing the installation costs down

Business Case: Jumbo Total Cost of Pre-piled – Jackets Transportation & Installation

Transportation & Installation of Pre-piled Jackets	Cost € '000 per foundation (Jumbo Solution incl. WoW)	Foundation installation (Jumbo Solution) Duration (days incl. WoW)	Foundation Installation (Classic methods) Duration (days incl. WoW)
40 locations @ 100 nm from port	2.000	90	150
80 locations @ 100 nm from port	1.500	170	270
160 locations @ 100 nm from port	1.000	310	510
320 locations @ 100 nm from port	750	590	990

Achievable by combining J-1800 class for pre-pile installation and XL-1800 for jacket installation

Jumbo solution for lowering the installation costs is:

- Industrialisation
- Standardisation
- Single Contracting Philosophy: Lump-sum for the T&I part

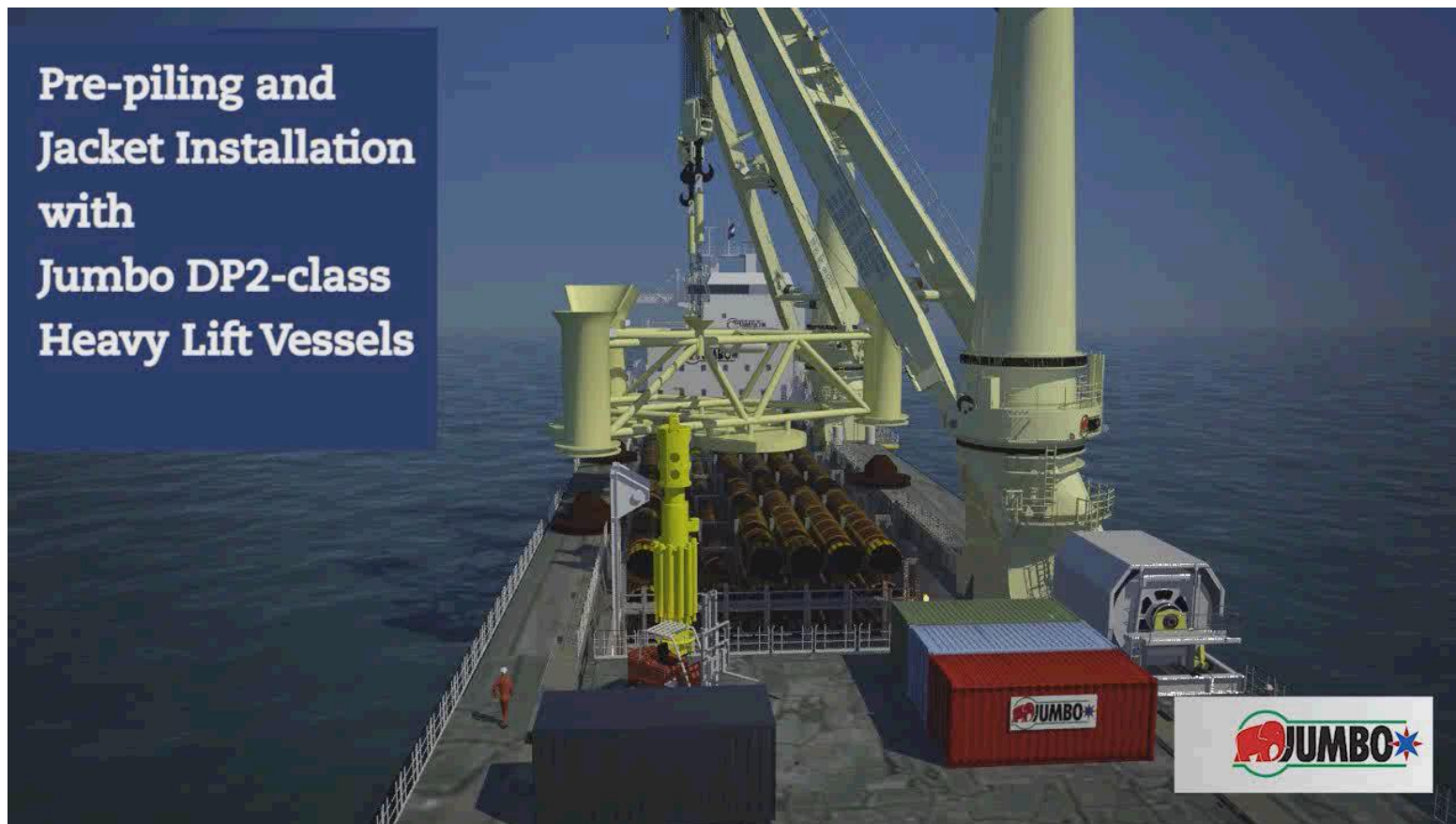
Similar developments & innovations could be made in the rest of the value chain



Video



**Pre-piling and
Jacket Installation
with
Jumbo DP2-class
Heavy Lift Vessels**



Closing remarks -Summary

- Offshore wind energy market has a huge potential for growth
- To realize the targeted volumes cost of energy production (foremost CapEx) needs to be considerably lowered
- Jumbo offers a cost-efficient solution for turbine foundations installation



Thank you for your attention

