

Harland and Wolff Heavy Industries Limited

Offshore Renewables Investment and Innovation

15th November 2011

OFFSHORE WINDFARM LOGISTICS

- Barrow (2006), Robin Rigg (2009) and Ormonde (2011)
- Monopiles, TPs, Towers, Hubs, Nacelles, Blades, Grout, Cables etc.
- Receipt, storage, protection, mechanical assembly, painting & cleaning, loading onto installation vessel





MARINE CURRENT TURBINES' SEAGEN
Assembly, storage and offloading of full
scale tidal energy generator and
foundation

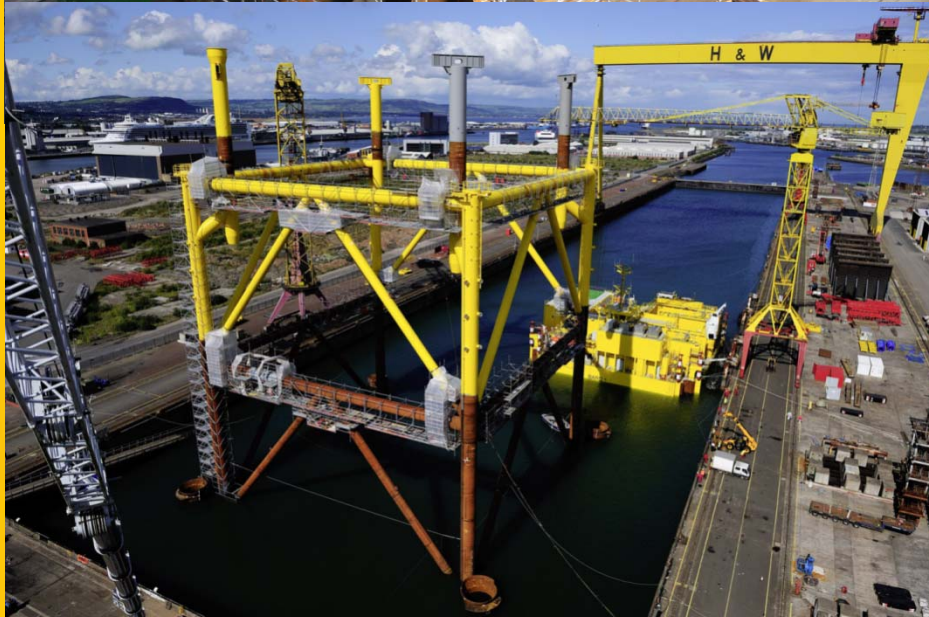
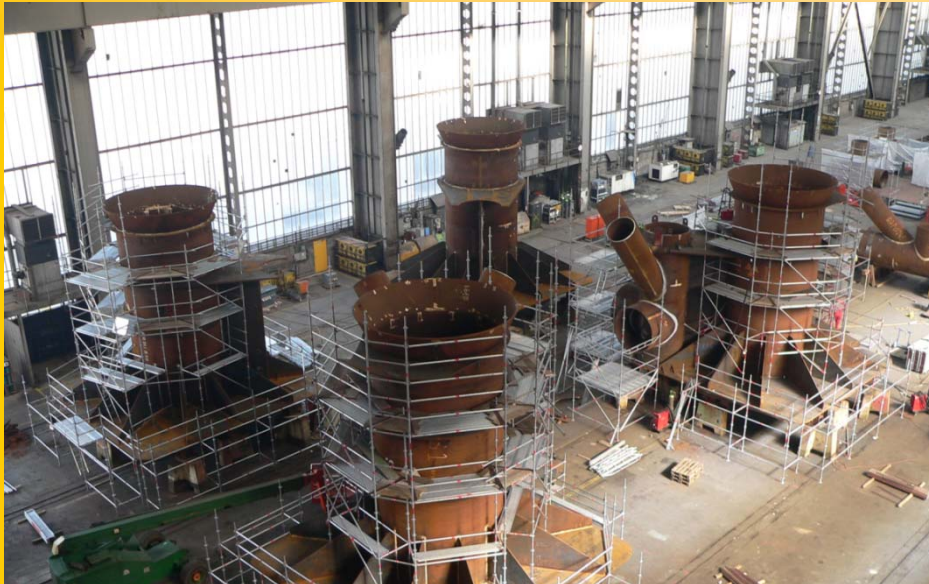
CLEARPOWER'S WAVEBOB
Wave Energy Device



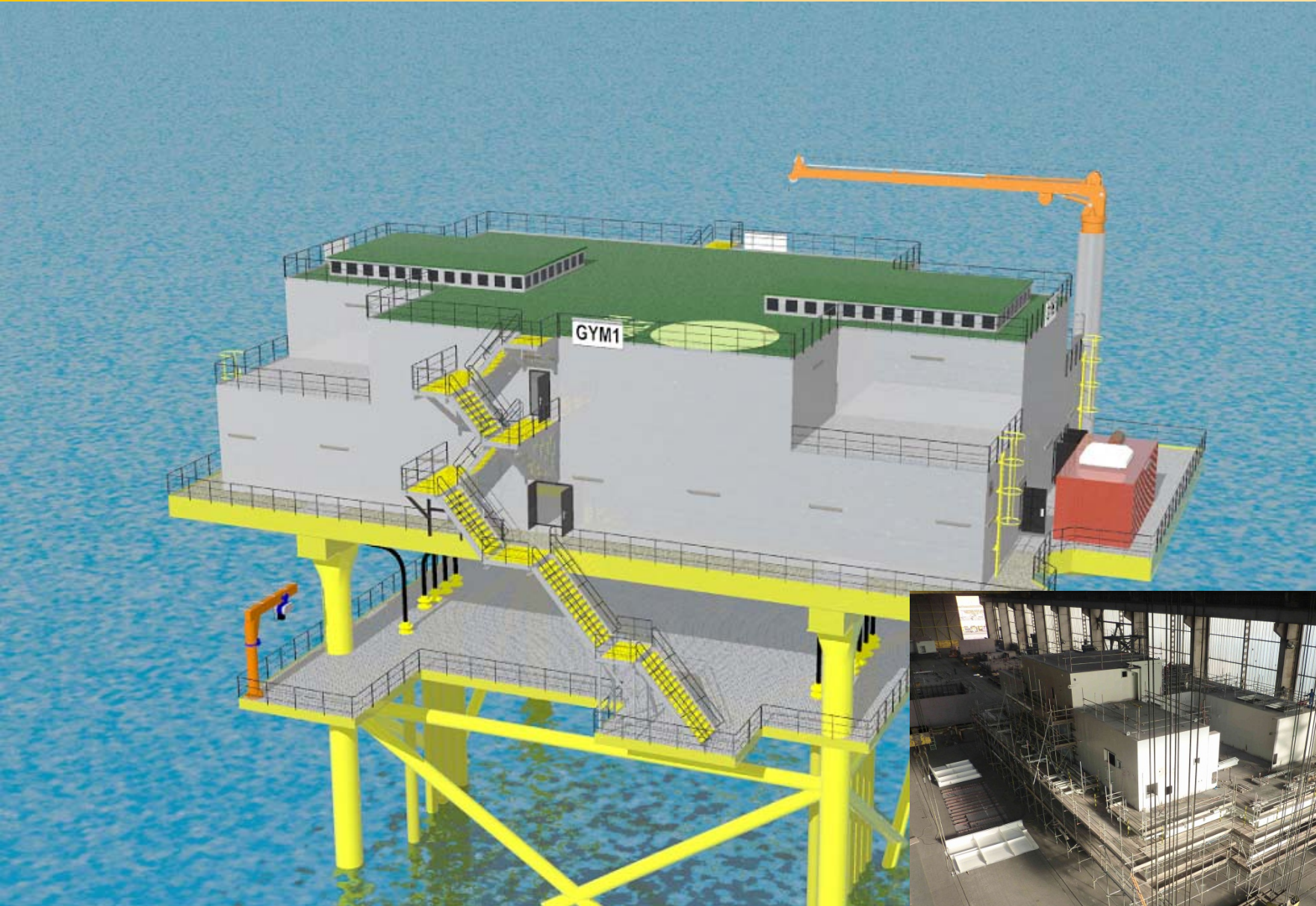
SCOT RENEWABLES SRTT250
Construction of a large scale
prototype tidal turbine

BARD / WESERWIND - BARD1 Jacket & Transformer Platform

3,000 tonne self-installing jacket structure assembled to accept a 3,500 tonne transformer platform



SIEMENS' SUBSTATION TRANSFORMER PLATFORMS FOR GWYNT Y MOR OFFSHORE WIND FARM June 2010 to July 2012



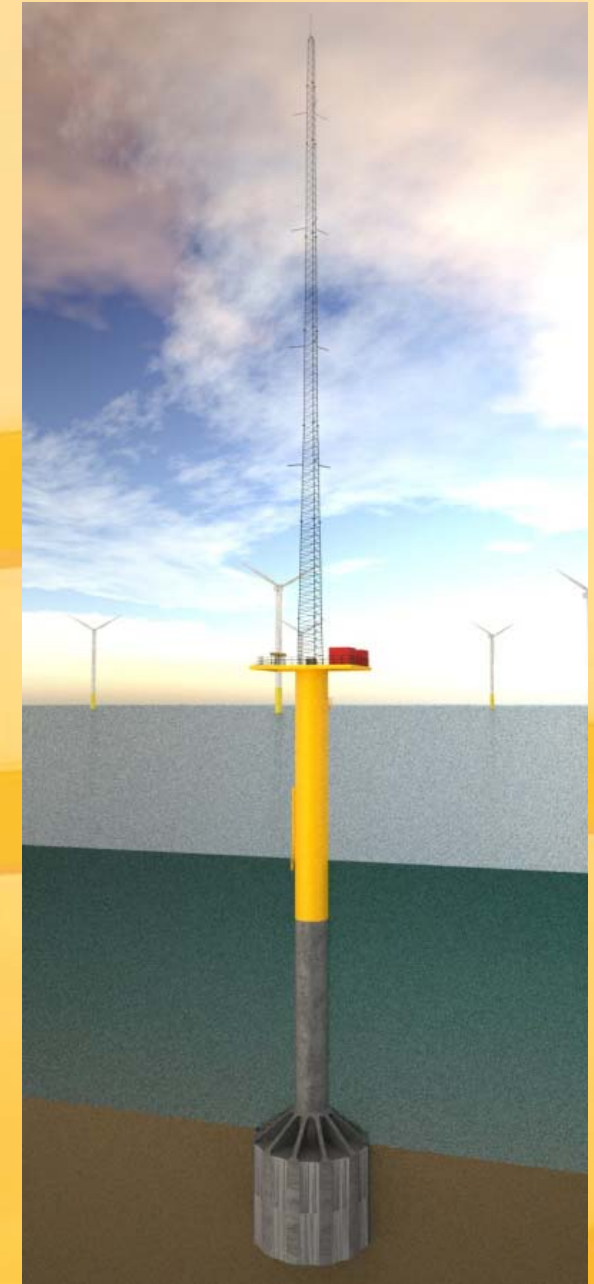
FOUNDATIONS





Advantages

- Foundation is a little more expensive to manufacture than a monopile (but not by much as it is lighter than a driven pile) but can be installed without large and expensive installation vessels. Result – lower cost.
- Verticality ensured by innovative patented installation system which controls the vertical alignment of the total foundation as it sucks itself into the seabed, reducing total installation time significantly and eliminating the need for a transition piece. This reduces cost and current concerns of grouted connections on transition pieces.
- No pile driving – environmental concerns eliminated.
- No diver intervention required for installation of foundation or for fitting of anodes.
- A wider selection of installation vessel options.
- Reverse suction / jetting process for easier decommissioning or relocation reuse (especially useful for met masts).



Fred. Olsen United AS can now offer a full, packaged solution for offshore wind farms foundations - from feasibility study / design through to finished installation of an integrated system of foundation and turbine.



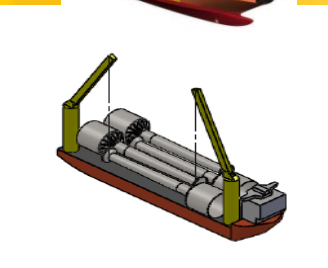
Fred. Olsen United AS



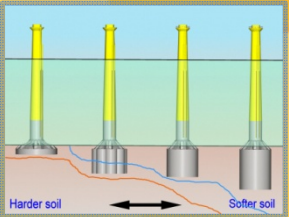
Fred. Olsen Windcarrier



Fred. Olsen Windcarrier



Universal Foundation A/S



harland and wolff heavy industries limited



SeaRoc

natural power

- Fred. Olsen & Co /**
- Support by way of
 - Legal
 - Accounting
 - HR
 - Finance

SUMMARY OF H&W RENEWABLES ACTIVITIES

DESIGN AND MANUFACTURE OF OFFSHORE WIND FARM FOUNDATIONS:
UNIVERSAL FOUNDATION SUCTION BUCKET
PILES, MONOPILES, JACKETS, TRIPODS/QUADRAPODS, GRAVITY BASES
etc.

DESIGN AND MANUFACTURE OF OFFSHORE MODULES:
TRANSFORMER PLATFORMS, OPERATIONS/ACCOMMODATION
PLATFORMS, MINIMUM FACILITY PLATFORMS etc.

MET STATIONS – OCEANPOD

WAVE AND TIDAL ENERGY DEVICES, PROTOTYPE AND MASS PRODUCTION

IRISH SEA LOGISTICS BASE