GL Noble Denton

Windfarm developments –challenges facing the insurance industry

Installed and in process.

- Round One 1GW
- Round Two 7GW
- In the order of 1.5 GW actually installed.
- Approximately 600 offshore WTGs
- We can expect in the order of 2GW per year to be installed over the next 5 years.

Components overview, monopile, TP, WTG tower.

Round Three Developments

- In the order of 26 GW of generating capacity (iro 5200 wtgs)
- Moray Firth 500MW
- Firth of Forth 500MW
- Dogger Bank 8 x 1240MW (9.9GW)
- Hornsea 2 x 1240MW (2.5GW)
- Norfolk 5 GW
- Hastings 500 MW
- IOW 500MW
- Bristol Channel 1.50GW
- Irish Sea 5GW

Lessons learned so far, WTGs only.

Construction methodology similar.
Sites ‘close’ to support bases.
Water depths < 30 metres
Construction can be delayed/impaired by fast currents and poor visibility (subsea).
Some incidents including fatalities.
AFAIK no catastrophic failures/incidents during installation of foundations, TPs or towers c/w nacelles and blades (WTG).

Substations

Not always used in small ‘close’ sites.

‘Generic’ construction, eg piled jacket, topsides welded to jacket. Similar to ‘oil and gas’

AC technology

Robust transformers and switchgear.

Standard, no frills or frights installation methodology.

Substation components

Marine Spread

- Equipment used so far comprised of jackups, monohulls, semis-subs and converted barges.
- Some purpose built cable installation vessels and construction vessels
- Much tonnage has crossed over from other offshore disciplines rather than windfarm specifics.

SEAJACK LOADED WITH 2 PILES IN RAMSGATE

Jack up barge preparing for hammer operations at monopile

River transport, Hoboken to Vlissingen

RESOLUTION SET UP AT PILE

TP being guided over monopile

Levelling and Grouting Operation

Nacelles on quay awaiting loadout.

Blades on deck of installation vessel, stowed in ‘cassettes’.

Grillage/tower bolts on installation vessel.

WTG MOBILISATION

Cable works, so far

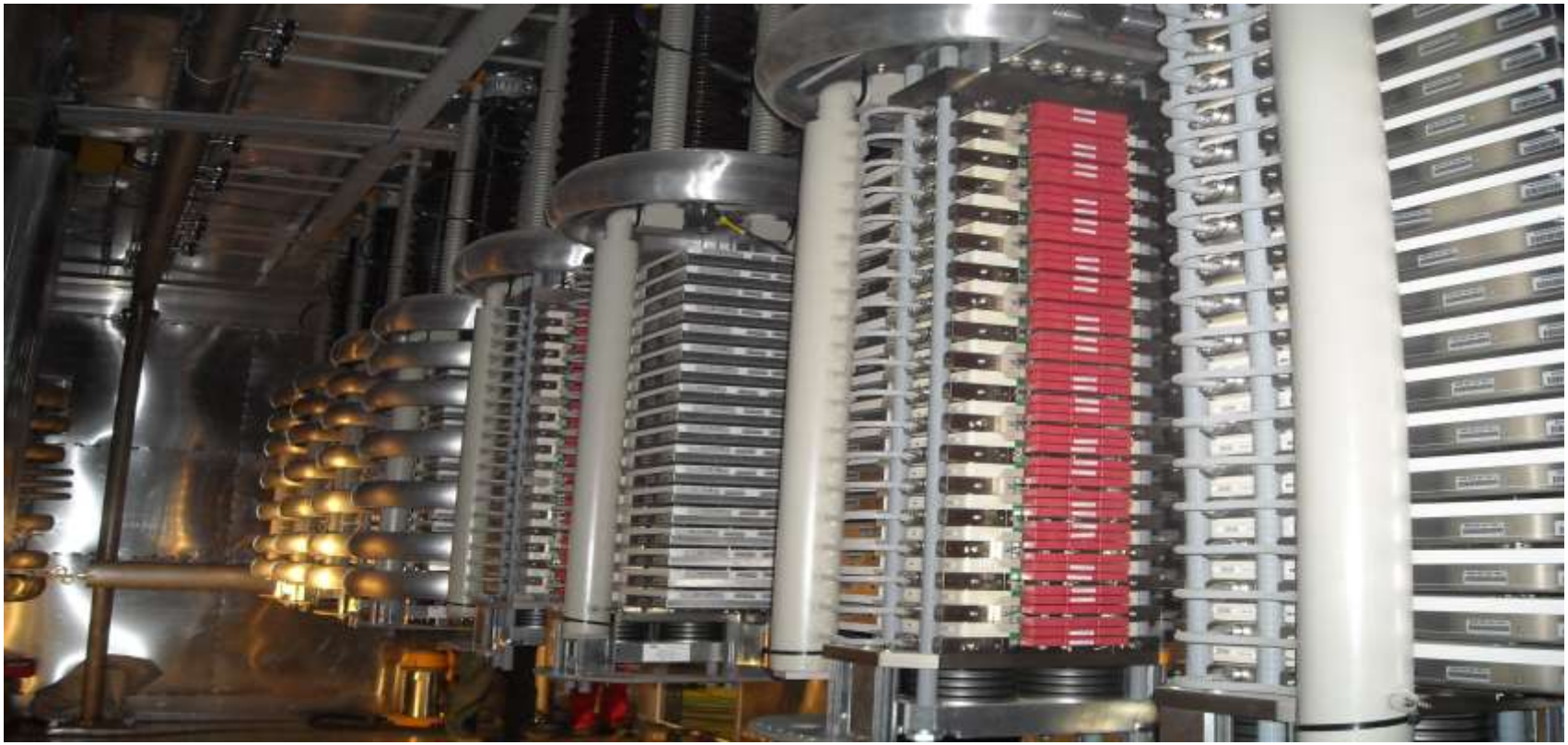
- Cable damage main source of claims to insurers and head-aches to warranty surveyors.
- Long ‘exposures’
- Possible inappropriate methodology (eg ploughing)
- Close and intricate in field work.
- Export cables long lengths, small capacity of installation vessels, thus requiring joints.
- Crossing existing cables (mattressing)
- Shallow depths approaching foreshore.
- Free-span and scour
- Cable entry to TPs and substations

The future, Round 3(& 2), what's new?

- Some 1300 WTGs (R2) and 5200 WTGs (R3) to construct, transport and install.
- Similar design, installation methodology, similar water depths.
- Possibly slower currents and better visibility in some locations.
- Possibly larger sea heights due to fetch.
- Longer logistic lines and transit times.
- Next generation jack-up and DP installation vessels in use, no 'performance history', possible 'expertise' drought. Mother ships?
- Possible pressure to tranship major components at sea.
- Increasing offshore 'clutter' and traffic possible conflict with other shipping.

The future…Substations.

- HVDC technology used for efficient distance transmission.
- In field Conversion substations- complex-fragile-expensive.



The future- lots of cables.

- Inter-array cables, balance of R2 and all of R3, in the order of 4500 kilometres to install and 13000 terminations to make.
- Export cables, becoming longer, >300km is some cases.
- At 2008 prices export cable/grid connection costs in the order of £10.5 Billion.

Shore end, export cable operation

Mooring anchor + cable barge in distance

Shore end equipment + rollers

Array cable installation by plough

Cable torsion damage

Challenges

- Assessing the ‘suitability’ of the new generation of vessels and their operators.
- Minimise the requirement to transfer components at sea.
- Encourage robust cable design
- Minimise frequency of cable jointing, transfer, handling.
- Share information wrt cable laying and trenching methodologies.
- Incorporate the dynamics of sea transportation and installation into HVDC converter station design.
- Improvement to cable terminations in field at TPs and SS.
- Encourage MWS involvement from earliest stages.

Thank you for your attention!

For further information visit www.gl-nobledenton.com

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