

(a) Case 32/2014

Issue: Monopile Foundation Design and Testing Proposal

Recommendation: Design

- (1) To accept the use of monopile foundation with diameter varying from 5 to 7m for an offshore wind turbine with 25 year design life.
- (2) To accept the design engineering approaches/principles for the determination of allowable pile capacities under working loads in accordance with the recommendations given in GEO Publication No. 1/2006 and American Petroleum Institute (API) – Recommendation Practice for Planning, Designing and Constructing Fixed Offshore Platforms
- (3) To accept the use of a cold-formed steel tubular section with thickness up to 90mm for the monopile in accordance with the recommendation given in DET NORSKE VERITAS – Design of Office Wind Turbine Structures (DNV) Standard DNV-OS-J101 and complying to BS EN 19902.

Verification of Design Assumptions

- (4) To accept the use of centrifuge model tests as a mean to verify the design assumptions for the design of the monopile foundation with 3 times the allowable working pile capacities.

Proof Test

- (5) To accept the use of Pile Driving Analysis (PDA) with CAPWAP analysis as verification test for the vertical pile capacity of the monopile foundation with a factor of safety equal to 3 together with performance review reports submitted upon completion of the foundation works and the superstructure works.

Decision: Noting the design principle, the construction methodology, the quality assurance proposal, the site constraints and the practical difficulties in association with the carrying out of static loading test on site, members endorsed the recommendations on a case-by-case basis. They also directed that the comments below should be duly addressed when processing the submission.

- a. The shaft friction resistance of the monopile in unplugged condition should be further assessed, taking into account any loosening effect on the sub-soil caused by disturbance during installation and cyclic loads.
- b. In view of the unusual thickness of the steel plates, random

samples should be cut from the plates for testing after delivery to the prefabrication yard and before the cold forming process to verify their mechanical properties and chemical properties for better quality assurance.

- c. Long-term monitoring to gauge the performance of the turbine structure would be necessary. The submission of performance review reports should be extended far beyond the proposed 2 years period after issuance of OP.