PO214.pdf 1 24/10/2015 05:29:12

PO.214

New Guidelines for Managing the Metocean Component of Offshore Wind Projects

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Abstract

Metocean is a technical engineering discipline that addresses meteorological and physical oceanographic conditions. In the context of an Offshore Renewables project, it is the characterisation of the hydrodynamic environment for which the project is designed, and in which it is constructed, operated and decommissioned. The Institute of Marine Engineering, Science and Technology (IMarEST)'s Offshore Renewables Special Interest Group (ORSIG), with support from the Operational Oceanography Special Interest Group (OOSIG), has produced a Metocean Procedure Guide (MPG) tailored to the Offshore Renewables industry.

The MPG outlines the metocean activities required to support all phases of an offshore renewable energy project. It concentrates on the key information that project managers and specialists need to consider in order to better understand the impact of the metocean conditions on the project and to develop a strategy for managing that risk. The MPG describes the requirements for the characterisation of metocean data during the whole project lifecycle, from the site selection and feasibility through to decommissioning. It then reviews what data must be obtained, how to obtain it, and how to manage it, in order to meet industry standards used as the basis for certification.

Metocean considerations

One of the key barriers to growth within the OR market is the requirement to reduce the cost of energy. There is considerable scope within the metocean component to drive significant cost savings throughout the project lifecycle. In particular, investment in metocean at an early stage of the project will result in significant cost savings in later phases. Significant variations in metocean criteria during the project lifecycle can introduce large engineering variations and result in programme and capital and operational expenditure (CAPEX/OPEX) increases. Therefore early engagement of metocean expertise is one of the key steps in reducing overall project risk and mitigating future cost variation within the project budget. The inclusion of a specific role of Metocean Technical Authority should be seriously considered.

Metocean strategy

A metocean strategy is recommended for offshore renewables projects. Three main deliverables are expected from the metocean package during the development and engineering phase, in which metocean activities are the most intensive:

- A metocean briefing note gives an overview of the metocean conditions and identifies those that may prevent the technical feasibility and economic viability of a potential project. This is used at an early stage of the project.

- Preliminary engineering data and analyses typically meet the requirements for conceptual definition of the project and consent application. The milestone defined by the project, and the level of engineering on which the data and analysis are to be based for a given milestone, will dictate how accurate and comprehensive the data should be.

- Full engineering data and analyses will comprise a high quality, accurate account of metocean conditions, typically based on detailed modelling validated against in-situ measurements, and taking account of spatial variability. It will be required as soon as is practicably possible within the design phase and will form the basis of engineering design and decisions throughout the engineering phase.

Metocean through the project lifecycle

SITE SELECTION AND FEASIBILITY → DEVELOPMENT AND CONSENTS → DESIGN → INSTALLATION → O+M → DECOMMISSIONING

Site selection and feasibility: Within this phase, it is necessary to understand the general metocean conditions across the geographical region of interest, and to identify any conditions or processes that may pose a significant risk to the project

Development and consents: The majority of metocean activities are usually undertaken within the development and consenting phase. Early in this stage, definition of the preliminary metocean dataset is required, fulfilling the requirements of the project for the purposes of consenting and concept design. It is within this phase that an appropriate in-situ measurement campaign should be initiated, Towards the end of the development and consents phase, execution of well-validated, detailed metocean should be underway,

Design: By the time of transition of the project into the design phase, a suitably reliable metocean dataset, representing all key processes, should be finalised, based upon the combined outcomes of detailed numerical modelling and site specific data acquisition.

Installation, O&M and decommissioning: For the phase involving offshore operations, it is necessary to procure weather forecasting services for the duration of the offshore installation activities. This should be undertaken in conjunction with real-time monitoring, which may be an extension of the previous metocean measurement campaign.

DELIVERABLE	ACTIVITIES	SITE SELECTION AND FEASIBILITY	DEVELOPMENT AND CONSENTS	DESIGN	INSTALLATION	O&M	DECOMMISSIONING
Metocean briefing note	Literature review[D]	■					
	Data collation from free sources and gap analysis[D]	■					
Preliminary engineering dataset and analyses	Purchase of data[D]		■				
	Uncalibrated modelling[M]		■				
	Data analysis[D]		■	■			
	Impact analysis [DMS]		■				
Full engineering dataset and analyses	*In-situ* measurement[S]		■	■			
	Fully calibrated modelling[M]			■			
	Data analysis[D]			■	■	■	■
Other	Weather forecast modelling[M]				■	■	■
	Real-time *in-situ* measurement[S]				■	■	■
	Power performance, strategy optimisation and condition monitoring[DMS]					■	

[D] Data analysis and desktop studies, including satellite observations
[M] Numerical hindcast and forecast modelling
[S] *In-situ* measurement

Conclusions

The MPG makes key recommendations:

- The metocean conditions should be considered at the feasibility/selection stage of the project, because they have a significant impact on its risks and costs, at all stages.

- A Metocean Technical Authority should be established within Offshore Wind Project teams in order to ensure that the metocean inputs are consistently managed, and integrated to the development process.

EWEA 2015 PARIS
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EWEA 2015 – Paris – 17-20 November 2015