FOWT Integrated Load Analyses – Impact on Innovation Process, Financing Costs and O&M strategy

B. Chassé(benoit.chasse@principia.fr)
PRINCIPIA

Abstract

The floating offshore wind technology has been developing for the past 10 years through offshore prototypes and pilot farms deployment across Europe and Asia. This development has been possible through various public funding schemes that were necessary to support innovations and to demonstrate the technical feasibility of such technology to investors. Floating offshore wind commercial farms are now under development with power production of several hundreds of MW. This paper demonstrates how Integrated Load Analyses participate to the reduction of the floating offshore wind Levelized Cost Of Energy, mandatory step toward extensive deployment of this technology worldwide. This paper will be illustrated by main floating offshore wind projects on which PRINCIPIA have been involved (Hywind Scotland, Groix & Belle-Ile, Dounreay Tri, Provence Grand Large, Umaine Aquaventus, TetraSpar…).

The first part of this presentation will show how Integrated Load Analyses have evolved for the last few years following a step by step consolidation of the numerical approaches coupling the hydrodynamic, aerodynamic and mechanical responses of floating offshore wind turbines. Without going into a detailed description of modeling assumptions, this presentation will rather provide current basis and requirements for integrated load analyses of FOWT and will show how those numerical models have now reached an acceptable level of accuracy, benefiting from technical feedback from prototypes and pilot farms deployments along with extensive basin test campaigns.

The second part of this presentation will focus on how these advanced numerical models will play a major role in CAPEX and OPEX reductions of future commercial floating offshore wind farms by impacting both technical and financing sides of this next generation floating offshore wind technology. The first impact will be related to an acceleration of innovation development for the mooring system, floating platform, subsea dynamic cable and turbine, as now relying mainly on numerical approaches instead of model tests or in-situ demonstrators. Then the link between project financial costs, reliability of floating offshore wind turbine designs and predictability of produced power will be discussed and impact on potential reduction of LCOE will be presented. The use of innovative integrated load models for the development of predictive condition monitoring system dedicated to the floating offshore wind technology will be finally presented. Consequences on the reduction of operation and maintenance costs, through predicting in-situ maintenance operations for instance, will be discussed to conclude on the impact of advanced numerical models on OPEX reduction of future commercial floating offshore wind farms.

Keywords: *Floating Offshore Wind Turbine*

Biography

15 years' experience in numerical modelling for fixed and floating offshore structures, riser & cable system, in the oil & gas and marine renewable energy sectors. Benoit Chassé joined PRINCIPIA in 2010 as Engineering Project Manager on offshore projects and is leading since 2017 the development of the offshore wind activities in PRINCIPIA, including engineering and design projects related to floating & fixed offshore wind turbines and subsea power cable system.