

THE ROLE OF INTERNATIONAL STANDARDS AND CERTIFICATION IN THE DEVELOPMENT, VALIDATION, AND IMPLEMENTATION OF NUMERICAL MODELS FOR FLOATING OFFSHORE WIND TURBINES (FOWTS)

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ABSTRACT

For FOWTs, complex models are used that integrate the loading from the wind, waves and current in combination with the structural dynamics and controls of the system. These models build off competency in other fields such as land-based wind and the offshore oil and gas industry but are unique in their application and requirements. The complexity and uniqueness of these models elevates the need for ensuring their validity in supporting the design and optimization of FOWTs. Relevant developments and ongoing efforts to support the numerical modelling of FOWTs within IEC TC 88 [1], *Wind energy generation systems*, and the IECRE System [2] will be provided with an industry case study focused on the application of OpenFAST and the critical role that standards and certification plays in the development, validation, and implementation of such models.

IEC TC 88 has developed IEC TS 61400-3-2:2019 - *Design requirements for floating offshore wind turbines*. This standard specifies essential design requirements to ensure the engineering integrity of FOWTs. Its purpose is to provide an appropriate level of protection against damage from all anticipated hazards during the planned lifetime. It also requires the use of a structural dynamics model, a numerical tool used to compute the physics-based response of the FOWT structure, including the environmental excitation, control actions and full-system structural response, to predict design load effects and to determine the load effects for all relevant combinations of external conditions and design situations (i.e., load cases).

The *IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications*, or IECRE System, is a global conformity assessment system that includes wind energy generation systems. The Joint Working Forum (JWF) on Model Validation is a collaboration between the IECRE and TC 88. The scope of the work is to develop a generic framework for model validation that can be used within the wind energy sector and provides further details on specific topics such as loads model validation (extreme and fatigue loads) and power performance model validation. A validated model is a requirement within the IEC standards for offshore wind design, but no specific procedure is defined for ensuring validity.

REFERENCES (Not mandatory, maximum 2 references)

- [1] <https://iec.ch/tc88>, Accessed 9/6/2022
- [2] <https://www.iecre.org/about/what-it-is.htm>, Accessed 9/6/2022