Development and qualification of a dynamic cable for the Provence Grand Large project

Emmanuel **SIRET**, Elisabeth **DURANTEAU;** EDF Renouvelables, (France), emmanuel.siret@edf-re.fr, elisabeth.duranteau@edf-re.fr

Maud **FRANCHET**; EDF Research and Development, (France), maud.franchet@edf.fr

Nicolas **BOUVIER,** Marzia **MANGONI**, Alessandro **PISTONESI**; Prymian Powerlink S.r.l, (Italy), nicolas.bouvier@prysmiangroup.com, marzia.mangoni@prysmiangroup.com, alessandro.pistonesi@prysmiangroup.com

ABSTRACT

The Provence Grand Large project relies on 66 kV dynamic cables, which is a first-of-a-kind for floating offshore wind. The design of dynamic cable requires a fine combination of modelling, including a cross-section local analysis, a global dynamic analysis and thermal analysis – and testing, including fatigue testing and type tests. This article reports these different steps of the design, showing how the successful and certified results obtained on the project will provide valuable return of experience for setting new standards in the floating wind industry.

KEYWORDS

Floating wind; Dynamic Cables; Global Analysis, Local Analysis; Full-scale Fatigue test; Type Tests

INTRODUCTION

The Provence-Grand-Large (PGL) project is an innovative pre-commercial floating offshore wind farm that will be commisionned in 2023 in the South of France (cf. Figure 1). This project won the call for projects issued in 2017 by l'Agence de l'Environnement et de la Maîtrise de l'Energie for the development of floating wind. The farm comprises three floating wind turbines composed of 8 MW wind turbines installed on a Tension Leg Platform (TLP). Dynamic Inter-array Cables (IAC) will link all the floating wind turbines before being connected to an export cable to carry the energy produced to the land substation at a voltage level of 66 kV. The farm is located at 17 km from the shore. The distance between each turbine is around 1 km and the water depth is around 100 m. The PGL synoptic is described in Figure 2.

Deploying 66 kV dynamic cables for floating offshore wind is a first-of-a-kind. In addition, only a few dynamic cables for floating wind have been installed for now and the return of experience on their ageing behavior and risk of failures is limited. In service, these cable systems are exposed to mechanical, electrical, thermal and environmental stresses. Consequently, they have to be designed and tested with care.

The design phase, certified, included local and global modelling of the cable, notably considering its interaction with the floater. In addition, as part of the inter-array cable qualification, a full-scale fatigue test was conducted in a specialized laboratory in Brazil to verify that the cable can endure the expected accumulated operational fatigue damage and validate modelling assumptions. Finally, type tests as defined in IEC 60840 [1], CIGRE TB 490 [2] and CIGRE TB 623 [3] were carried out.

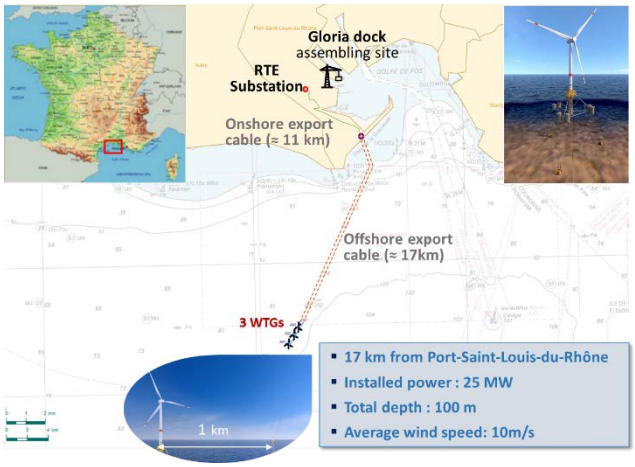

Figure 1 – PGL location