

## Dynamic Cable Installation for Fukushima Floating Offshore Wind Farm Demonstration Project

Kiyotomo **YAGHASHI**, Yuji **TATENO**; VISCAS Corporation, Tokyo, Japan, [k-yagihashi@viscas.com](mailto:k-yagihashi@viscas.com), [yu-tateno@viscas.com](mailto:yu-tateno@viscas.com),

Hiroyuki **SAKAKIBARA**, Hiroki **MANABE**; Furukawa Electric Co., Ltd., Tokyo, Japan, [mr960211@mr.furukawa.co.jp](mailto:mr960211@mr.furukawa.co.jp), [manabe.hiroki@furukawa.co.jp](mailto:manabe.hiroki@furukawa.co.jp)

### ABSTRACT

Furukawa Electric Company (FEC) and VISCAS Corporation have proceeded with a Fukushima FORWARD Project (FF project) as one of the commissioning manufacturers of the Ministry of Economy, Trade and Industry. This paper reports the development condition of the power transmission system, mainly the development of a high voltage dynamic cable, which is considered as an essential technology. A behavior of dynamic cables subjected to under-water rolling caused by the steadily wave movement is different from that of the static submarine cables. Therefore, a development point is the improvement of a fatigue withstands property.

### KEYWORDS

Renewable Energy, Floating Wind Turbine, Power Transmission, Dynamic Cable, High Voltage

### INTRODUCTION

An offshore floating wind turbine is a promising power generation method in Japan, because Japan has the 6th largest exclusive economic zone (EEZ) in the world and has few suitable shallow shores for the implantation of the offshore type wind power generations. Offshore floating wind power generations are very few in the world. The construction of a wind farm possessing complex floating windmills with an offshore floating substation will be a first in the world.

As the installation of dynamic cables, which is an essential technology for the offshore floating system, have been successfully completed, this paper reports the development condition of the project dynamic cable system and installation method.

### OVERVIEW OF THE FUKUSHIMA FORWARD PROJECT

#### Project Overview

The Fukushima Forward project (FF Project) consists of a 1st stage (2011-2013) and a 2nd stage (2014-2015). In the 1st stage, a 2MW down-wind type offshore floating wind turbine generator and a 25MVA offshore floating substation, for the first time in the world, have been constructed.

In the 2nd stage, it is planned to construct each one of 7MW and 5MW new floating wind turbine generation facility and to install the riser cables for connection with the offshore substation.

Fig.1 shows the project overview<sup>[1]</sup>.

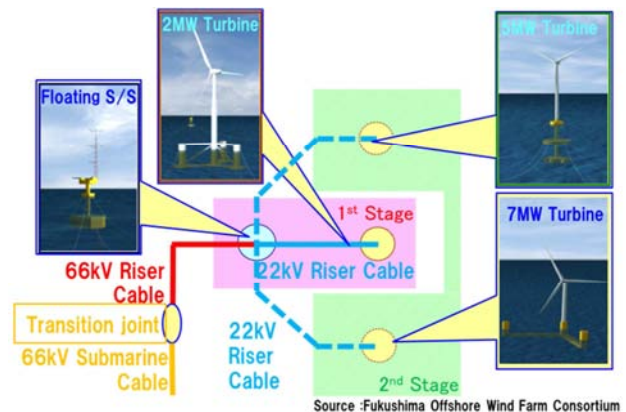


Fig. 1: Project overview

### Transmission and Substation System

The wind power generation capacities are 2MW, 5MW and 7MW respectively.

A 22kV cable (inter-array cable) is selected for the transmission line towards the offshore substation. The route distance from the propose shore position to a windmill installing potential position is approx. 25km long with a submarine cable.

In the FF project an offshore substation has been constructed to raise the cable (export cable) voltage up to 66kV for power transmission to the shore port because a 22kV cable has higher transmission loss.

The export cable on shore has been connected with an already installed nearby 66kV overhead transmission line which is operated by a power utility, a transformer station installed on the way, and so a systematic grid link has been completed.

Fig.2 illustrates the transmission and substation system<sup>[1]</sup>.

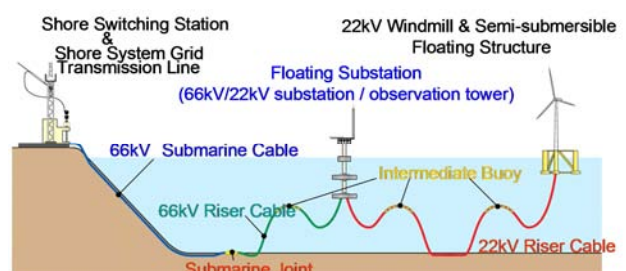


Fig. 2: Transmission and substation system