Korea Project for Developing Basic Technologies of a 10 MW Floating Wind Power Generator with HTS Magnet and Test Facility

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***Abstract*— The Republic of Korea's new government announced a major shift toward renewables, including offshore wind, and a phasing out of nuclear- and coal- generated power in 2017. The announcement was that the Republic of Korea will have a 20% renewable energy target by 2030 that means approximately 65 GW from renewable energy systems will be generated considering operation rates of the systems. Therefore, large-scale wind farms should be established in Korea to achieve the renewable energy target. A floating offshore wind turbine with a superconducting wind power generator is possible to constitute the large-scale and high-capacity wind farm. This paper introduces a new wind project for developing basic technologies of a 10 MW class high-temperature superconducting (HTS) generator with magnet and test facility which is a performance evaluation system sponsored by Korea Electric Power Corporation. A first step is the design of a 10 MW floating offshore wind power system with a superconducting generator. The design process of the 10 MW superconducting generator is developed, and the modeling method for the large-scale wind farm is suggested using real time simulator. The second step is the detail design of the 10 MW floating platform in which the floating system of the wind power system is designed considering the superconducting generator. And the performance evaluation system is suggested for testing the HTS magnet, which is one pole in the generator, in load and no-load condition of the generator. The system is modeled using FEM programs and the force values of the HTS magnet such as radial and tangential forces are compared with simulation and calculation results. The last step is the fabrication of the HTS magnet and its testing by using the performance evaluation system. The mechanical stress and electric characteristics by Lorenz force are analyzed, and the performance of the suggested cooling system is confirmed. As a result, we will discuss the possibility of a large-scale floating offshore wind power system, and a Korean type large-scale floating offshore wind power system platform with the HTS wind power generator will be proposed.**

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***Keywords (Index Terms)* — Offshore wind power system, superconducting generator, HTS magnet, Lorenz force.**

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