Abstract (English)

The selection of the bulk power transmission technology in offshore wind farms is strongly related to the wind farm size and its distance to shore. Several alternatives can be evaluated depending on the rated power of the offshore wind farm, the transmission losses and the investment cost for constructing the transmission system. However, when is necessary to connect larger and more distant offshore wind farms; the best technological solution tends to the transmission system based on high-voltage and direct-current with line commutated converters (LCC-HVdc). This dissertation proposes the use of diode-based rectifers as a technical alternative to replace the thyristor-based rectifers in an LCC-HVdc link with unidirectional power flow. This alternative shows advantages with regard to lower conduction losses, lower installation costs and higher reliability. Nonetheless, as a counterpart the offshore ac-grid control performed by the thyristor-based HVdc rectifer is no longer available. This lack of control is compensated by using new control strategies over an offshore wind farm composed by wind turbines with permanent-magnet generators and fully-rated converters. The control strategies have been based mainly on the ability of the wind turbine grid-side converter to perform the control of the offshore ac-grid voltage and frequency. The performance has been evaluated by using PSCAD. Wherein, the most common grid disturbances have been used to demonstrate the fault-ride-through capability as well as the adequate steady state and transient response.

Keywords: *HVdc links, Offshore wind farms, Wind power generation, Power transmission.*