Wind power permanent magnet direct drive generator set

Direct-drive permanent magnet generators are becoming an attractive option for highly efficient small-scale wind turbines due to their high-power density and size reduction capabilities. In this study, the optimal shape design of a direct-drive permanent magnet generator for 1 kW-class wind turbines was conducted while considering power generation and weight. ...

Optimisation tools for large permanent magnet generators for direct drive wind turbines Aristeidis Zavvos1, Alasdair McDonald2, ... Both tools seek to minimise the mass of three different permanent magnet direct drive (PMDD) generators with 5 MW nominal power output while keeping a set of deflection criteria under limitations. The results indicate

This paper presents analysis, design, and optimization of a high-power permanent-magnet synchronous generator (PMSG). This generator is introduced in a large-scale wind turbine which can be used ...

Direct-drive generators have low operational rotation speeds of around 10 rpm and high torques are developed through the generator structure (Wilson, 2010; Carroll et al., 2015; Márquez et al., 2018). Fig. 1 depicts a typical wind turbine direct driven powertrain configuration with a permanent magnet electrical generator, "PM". In order to ...

This article is based on a 12 MW high-power offshore semi direct drive permanent magnet synchronous wind generator as the research object. A cooling system with external casing water cooling and internal ventilation cooling of the rotor is designed, and 3D finite element calculation method is used to analyze and calculate the flow field and temperature ...

A new practical way of modelling direct-driven permanent magnet synchronous generator (PMSG) wind turbines is proposed. The model emphasizes on the wind-rotor-to-PMSG-to-converter-to-grid system, which is the main energy flow system of ...

High power generating efficiency. Permanent magnet direct-drive (PMDD) turbine generators avoid rotor winding losses and mechanical energy losses associated with gearboxes and couplings. The full power converter provides the flexibility ...

A directly-coupled generator requires a very low-speed operation to match wind turbine speed and also to produce electricity with a normal frequency range (10-60 ...

In direct-drive wind turbine concepts, a back-to-back PWM full power converter can be used as the interface between the stator of PM generator and grids in order to ensure that the generator currents and the grid

currents are sinusoidal [5], [17]. Fig. 3 shows a main circuit topology of a back-to-back PWM power converter, which is composed of a generator side ...

This paper proposes a set of simplified models of the direct-drive permanent magnet synchronous wind power generation system (D-PMSG) and classifies them according to the timescale of the dynamics and the use cases, i.e., faults (transient stability analysis), system contingencies (voltage and frequency stability analysis) and wind speed variations (energy ...

direct drive train for wind turbine and its characteristics. In mechanical point of view, the solution for reducing the mechanical structure, DDPM for large wind turbines is to do without a shaft ...

The direct-drive radial flux synchronous generator is considered as the modern wind turbine drive train. Both the electri-cally (e.g., Enercon) and permanent magnet (PM; e.g., Siemens) excited direct-drive generators are gaining popularity on the market today.

1 INTRODUCTION. Nowadays, direct-drive permanent magnet synchronous generators (DDPMSGs) are gaining more and more attention in the field of wind power, owing to the merits of simple structure, high efficiency and high reliability [1-3].However, low-speed generators directly coupled to wind turbines have sufficiently high number of poles on the ...

In current wind power systems, the prevalent types of generators are doubly-fed induction generators (DFIG) and permanent magnet direct-drive synchronous generators (D-PMSG). The D-PMSG, in comparison to the DFIG, eliminates the need for a gearbox, allowing the wind turbine to directly drive the generator [3].

Offshore wind turbines demand higher reliability, encouraging wind turbine manufacturers to integrate into their new designs inherently more reliable direct-drive permanent magnet synchronous generators. However, today"s high-power direct-drive generators are massive units that will need to become smaller to minimise costs.

The particulars regarding the electro-magnetic and mechanical designs of this direct-drive permanent-magnet wind turbine generator have been published in [4, 13-16]. This paper provides basic design equations to implement DLC using stator copper windings fashioned from copper conductors with internal coaxial cooling conduits.

The rotor of a wind turbine rotates at speed of around 20-200 rpm. In conventional wind power plants a generator is coupled to a turbine with a gear so that it rotates at a speed of 1000 to 1500 rpm. Gears can be eliminated in a wind power plant by a low-speed generator with the rotor rotating at the same speed as the turbine rotor.

Direct-drive generators are an attractive candidate for wind power application since they do not need a

gearbox, thus increasing operational reliability and reducing power losses. However, this is achieved at the cost of an increased generator size, larger inverter and decreased thermal performance. The associated cooling system is therefore crucial to keep ...

2 Generally, direct-drive generators are mostly custom built with the rest of the wind turbine and generator design standards such as the IEC 61400-1 or national derivations thereof are applied. Typical megawatt direct-drive permanent magnet (PM) generators have mean air-gap diameters (D airgap) between 4-6 m.

Wind turbines are getting larger. Their rated power capacities are moving from the 3 MW range to 6 MW and beyond. As a result, their size and mass, which grow rapidly with power capacity, is becoming a problem in terms of capital cost, logistics and assembly. Moreover, there is a move to offshore installations. Offshore wind turbines demand higher reliability, ...

Keywords: Cost of energy, permanent magnet (PM), ferrite magnet, optimisation, objective functions, direct-drive, wind turbine. Abstract In the past few years interest in the use of low speed permanent magnet generators for direct-drive wind turbine generator applications has increased significantly. The significant

With about 15% being the cost of the drive train it is reasonable to set an upper limit of 1.5 M Euro for the superconducting direct drive generator. ... generators will cause a 400 times smaller and more flexible usage of Rare Earth elements compared to the Nd 2 Fe 14 B based permanent magnet direct drive generators, ... 10 MW wind turbine ...

The Lagerwey direct drive permanent magnet generator outlines a new era for wind turbine integration. The torque density of our latest generator is very high (compared to conventional direct drive generators) because the magnetic ...

In this paper, the analytical thermal model of a radial flux permanent magnet synchronous generator (RF-PMSG) is developed for applications in variable speed direct-drive low-power wind turbines.

Wind power generation is an effective measure for addressing both the energy crisis and environmental pollution. Field-modulated permanent-magnet motors (FMPMMs), with their high torque density and efficiency, eliminate the drawbacks of gearboxes and are very suitable for direct-drive wind power generation. This paper proposes a new field-modulated permanent ...

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