

Is double fed induction generator suitable for grid-connected wind energy conversion system?

This paper presents the control strategies and performance analysis of doubly fed induction generator (DFIG) for grid-connected wind energy conversion system (WECS). The wind power produces environmentally sustainable electricity and helps to meet national energy demand as the amounts of non-renewable resources are declining.

Can a doubly fed induction generator be built economically?

The doubly fed induction generator system presented in this article offers many advantages to reduce cost and has the potential to be built economically at power levels above 1.5 MW, e.g., for off-shore applications. A dynamic model of the DFIG was derived to develop a vector controller to decouple dynamically active and reactive power control.

What is a DFIG wind turbine?

The construction of a DFIG is similar to a wound rotor induction machine (IM) and comprises a three-phase stator winding and a three-phase rotor winding. The latter is fed via slip rings. The voltage and torque equations of the DFIG in a stationary reference frame are: Doubly fed induction generator wind turbine system. speed ratio n/n_0 (right).

Will the power rating of wind turbines increase?

IT IS ANTICIPATED THAT THE POWER RATING OF WIND TURBINES WILL INCREASE. power flow in the DFIG for over-synchronous and under-synchronous operation. Above synchronous speed, the four-quadrant converter operates as a generator of active power delivering power to the grid parallel to the DFIG.

What are doubly-fed induction generators (DFIGs)?

Among the VSGs, the doubly-fed induction generators (DFIGs) have been widely applied for wind farms (WFs) applications because of their advantages such as variable speed constant frequency operating capability and active/reactive power controllability.

Why do wind turbines need adjustable speed generators?

Hence, the speed of the turbine blades is allowed to increase storing energy into the turbine's inertia. During this transient, output power remains practically constant, avoiding power surges into the power grid. This article shows that adjustable speed generators for wind turbines are necessary when output power becomes higher than 1 MW.

There is always, a strong expectation from wind generation system to harness maximum power as well as to have good interaction with the grid. To satisfy the increasing need of power, use of a wind generation system

with enhanced control is a nifty result. The wind power generation system needs a more sophisticated, novel and robust control methodology to cater ...

So far, much attention has been not received by the influence of the control modes on the wind turbine efficiency in maximum wind energy extraction, which is investigated based on variable speed wind turbines with doubly fed induction generator (DFIG) under vector control in stator flux orientation (SFO) in the paper. Prior art has tended to have an importance on investigating the ...

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The doubly-fed converter ($1/3 P_n$) is smaller compared to a full converter, however even with this smaller converter the generator speed, power and power factor can be controlled to reach power yield with low LCoE. The doubly-fed concept has ability to feed reactive power to support the grid and satisfy basic grid code requirements.

The doubly fed induction generator (DFIG) is a portion of wound rotor and an adjustable speed IG widely used in wind power industry. DFIG provides high energy yields, reduction of mechanical loads, simpler pitch control, less fluctuations in output power, an extensive controllability of both active and reactive powers [73] .

Abstract: In this paper, an improved efficiency control strategy for a Wind Energy Conversion System (WECS) with Doubly Fed Induction Generator (DFIG) is presented. The developed ...

efficiency, and improved power quality [1-2]. Generally, there are two types of induction generators widely used in wind power systems - Squirrel-Cage Induction Generator (SCIG) and Doubly-Fed Induction Generator (DFIG). The straightforward power conversion technique using SCIG is widely accepted in fixed-speed applica-

The brushless doubly fed generators (BDFGs) have been considered as a reliable, cost-effective candidate for wind turbines [1-10], which have traditionally been served by a wound rotor induction machine either with a controllable external resistance in the rotor circuit or operated in a doubly fed slip power recovery mode (DFIG) [] these applications, where only ...

power of the generator. Dynamic Model of a Doubly Fed Induction Generator To develop decoupled control of active and reactive power, a DFIG dynamic model is needed. The ...

1 Introduction. Wind energy, as a promising renewable energy resource, has attracted much attention. The Global Wind Energy Council (GWEC) Moderate Scenario foresees that the global wind installed capacity reaches ...

Wind energy is an increasingly important renewable resource in today's global energy landscape. However, it faces challenges due to the unpredictable nature of wind speeds, resulting in intermittent power generation. This intermittency can disrupt power grid stability when integrating doubly fed induction generators (DFIGs). To address this challenge, we propose ...

In order to cope with stability and efficiency, the wind power system requires advanced and robust control methodologies. This article presents a comparative study of DFIG control methods for wind energy systems using three of the most popular and efficient control methods namely, field-oriented control, direct torque control and direct power ...

The objective of this paper is to compare five different generator systems for wind turbines, namely the doubly-fed induction generator with three-stage gearbox (DFIG3G), the direct-drive ...

Many large wind farms employ doubly fed induction generator (DFIG) variable speed wind turbines because of their compatibility with the power system networks and their abilities to reduce the mechanical loads [1-3]. The main interest in DFIG-based wind turbines is due to their efficiency, power quality, and controllability [4, 5].

One of the most important advances in WECS technology was the use of variable-speed wind turbines. It is well established that for each wind speed, there is a rotor speed that maximizes power production, as a function of power coefficient [3]. Once wind speed has several variations along the day, this improvement allows a better power extraction, increasing WECS ...

The performance of the induction generator is presented on both sides of the power and the values of this generator such as speed, torque, voltage, current and maximum power at the time of...

Evaluation of the possibility of chaos for doubly-fed induction generator in wind power generation system December 2023 International Journal of Power Electronics and Drive Systems (IJPEDS) 14(4):1965

This article shows that adjustable speed generators for wind turbines are necessary when output power becomes higher than 1 MW. The doubly fed induction generator (DFIG) system presented in this ...

Optimization of doubly-fed induction generator (DFIG) based wind turbine to achieve maximum power generation with imperialist competitive algorithm (ICA) July 2022 Science Progress 105(3 ...

Due to its many advantages such as the improved power quality, high energy efficiency and controllability, etc. the variable speed wind turbine using a doubly fed induction generator (DFIG) is ...

The doubly-fed induction wind turbine has gradually become the mainstream model of wind power

generation. Power control is one of the advantages of doubly-fed induction wind generators and has been widely studied. However, existing power control strategies for these turbines have issues with low efficiency. An adaptive control method is ...

Fed Induction Generator (DFIG). Double-powered induction generators allow the operation of wind turbines in a variety of speed ranges. Therefore, pitch control is easier, mechanical stress ...

The main goal of this paper is to show the control capabilities of artificial organic networks when they are applied to variable speed wind generators. Since doubly fed induction generator (DFIG) is one of the most important variable wind generators, it requires to include advanced controllers which allow to improve its performance during operation. On the other ...

Doubly-fed induction generator based wind turbines: A comprehensive review of fault ride-through strategies ... Also, an efficient FRT scheme should limit the dc-link voltage within its limits i.e., $V_{dc-max} \leq 135\%$ of its rated value ... Effect of rotor excitation voltage on steady-state stability and maximum output power of a doubly fed ...

Various wind turbine concepts with different generator topologies have been developed to convert this abundant energy into electric power. The doubly-fed induction generator (DFIG) is currently ...

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