Methods to reduce the wind temperature of the generator

How to improve wind power generation reliability and reduce maintenance?
The wind power generation industry often prefers less performant conservative solutions against more performant but riskier ones. The steps that can be taken to increase reliability and reduce maintenance are as follows: Adopt a safe cooling fluidinside the generator like air or an inert gas.

How can wind turbines be cooled?
For example,the industry standard for cooling offshore large wind turbines adopted by many OEMs is forced air coolingin a closed loop configuration. This solution is bulky and furthermore increases in size and weight with the wind turbine output power.

Which generator is best for a wind turbine?
Small wind turbine applications are therefore better using a gearbox or an oversized direct-drive generatorthat can be naturally cooled. The direct-drive generator is therefore more suitable for medium to large wind turbines.

Why do wind generators need to be serviced?
This method is usually adopted in larger generators (hundreds of MVA), which are usually onshore and easily accessible for maintenance. For wind power generation, which has an important offshore trend, the maintenance can be a drawback as two separate cooling systems need to be serviced.

Should a generator be connected to a wind turbine?
One major design decision is whether to directly connect the generator's shaft to the wind turbine or to use a gearbox[10,11,12,13,14,15,16]. Both designs have pros and cons. The gearbox option allows the generator to operate at a higher speed than the one provided by the wind turbine blades.

What are the performance and maintenance requirements for a wind turbine?
The performance and maintenance requirements are unavoidable compromises that need to be investigated together, especially for large generators. The location of the wind turbine is also important and dictates critical issues such as accessibility and maximum size.

Torque per generator active material cost, (c) the difference between generator active material costs and the wind turbine revenue for 5, 10 and 15 years period of operation and (d) the wind turbine cost of energy. Most of the generator models in [4-11] focus on the active material and losses but do not consider the generator structure in detail.

A solution is proposed to substantially reduce generator winding and bearing temperature (Singh et al., 2018). In this paper Issue of bearing temperature difference at drive end (DE) and non-drive end (NDE) in IC6A1A6

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Mobile-friendly text version of the "How A Wind Turbine Works" animation. ... The rotor connects to the generator, either directly (if it"s a direct drive turbine) or through a shaft and a series of gears (a gearbox) that speed up the rotation and allow for a physically smaller generator. ... transformers reduce the voltage to make it safe and ...

The model for predicting generator temperature is built using five variables (out of 47 SCADA signals): power, ambient temperature, nacelle temperature, generator cooling air and stator winding temperature. The residuals obtained are analyzed using a moving average window.

Condition monitoring and early fault diagnosis for wind turbines have become essential industry practice as they help improve wind farm reliability, overall performance and productivity. If not detected and rectified at early stages, some faults can be catastrophic with significant loss or revenue along with interruption to the business relying mainly on wind ...

The most typical method to generate electrical power from wind turbine"s rotation in the wind industry is to couple the mechanical gearbox with a doubly-fed induction generator (DFIG) as shown in ...

In a world where environmental sustainability is paramount, the need for energy-efficient solutions such as fuel efficiency and natural gas generators has never been more crucial. Whether it"s an inverter or a standby ...

5. Selective Catalytic Reduction: The SCR is the most efficient method to reduce NOx emissions from ships (up to 90-95% of reduction). In this method, low sulphur fuel oil is used and exhaust temperature is maintained above 300 deg C. The exhaust gas is mixed by water solution of urea and then it is passed through catalytic reactor.

To address the source-demand uncertainty in a power system, the scenario generation method, which is a type of uncertainty modeling method used to generate wind-solar-demand power profiles by using historical wind-solar-load data and referring to various related factors, such as weather and data, has gained substantial attention .

To get optimal bearing life and generator reliability, either allowed bearing operating temperature range should be reduced significantly, by developing a new cooling ...

Condition Monitoring and fault-prognosis approaches are typical methods to reduce the energy production cost and Wind Turbine downtime. In this paper, a new CM combinatory system and fault prognosis are proposed based on an adaptive threshold, feature-level fusion, and new degradation indicator and the CM operation is based on a new index ...

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The key novelty in this paper is the assessment of the cooling methods based on generator size, reliability and maintenance requirements. Direct-drive generators are an attractive candidate for wind power application ...

Introduction. Wind power has gained remarkable attention in the past decade because wind energy is one of the rapidly clean energy sources and has received worldwide support for renewable energy development () recent years, in ...

Generator cooling is a well-known challenge for decades. For better performance, one option is either to make the system capable enough to handle extreme temperatures or reduce the ...

Among these methods, generator (Hossain et al., 2015; Yang et al., 2017) and gearbox faults (Wang et al., 2016b;Igba et al., 2016;Teng et al., 2016;Wang et al., 2019) are mostly studied. Fault ...

control. In this design, the turbine"s generator is directly coupled to the power grid, causing the generator speed to lock to the power line frequency and fix the rotation-al speed. These turbines are regulated using passive stall methods at high wind speeds. The gearbox ratio selection becomes important for this passive control because it en-

With the development of wind energy, the condition monitoring (CM) methods of wind turbines (WTs) based on supervisory control and data acquisition (SCADA) data have ...

Yet, they are installed in locations subject to every form of weather conditions - from the extreme lows of the artic to excessive heat of the desert. ... As stated prior, due to the wind turbine locations they are subjected to extreme temperatures swings, typically from -30ºC (-22ºF) to 55ºC (131ºF). All of the electronic equipment and ...

1 INTRODUCTION. Wind power is gradually moving towards long-distance offshore and high-altitude areas, with increasingly harsh environments and extreme weather [], leading to an increase in frequency of wind turbine faults and the difficulty of operation and maintenance (O& M).NREL statistics show that wind turbine gearbox faults cause the longest ...

By using the presented method, wind turbine power, gen-erated power, copper loss, iron loss, stray load loss, mechanical losses, converter loss, and energy efficiency can be calculated quickly. First, a calculation method of the efficiency for constant speed WGs using Squirrel-Cage Induction Generator (IG) is presented, in which, using the wind

In this paper, a new condition-monitoring method based on the nonlinear state estimate technique for a wind turbine generator is proposed. The technique is used to construct the normal behavior ...

Daily and sub-daily weather data are often required for hydrological and environmental modeling. Various

weather generator programs have been used to generate synthetic climate data where observed climate data are limited. In this study, a weather data generator, ClimGen, was evaluated for generating information on daily precipitation, ...

Traditionally, condition monitoring systems for wind turbines have focused on the detection of failures in the main bearing, generator and gearbox, some of the highest cost components on a wind turbine (Crabtree 2010; Sheng et al. 2009; Wiggelinkhuizen et al. 2008).

AB - Condition monitoring can greatly reduce the maintenance cost for a wind turbine. In this paper, a new condition-monitoring method based on the nonlinear state estimate technique for a wind turbine generator is proposed. The technique is used to construct the normal behavior model of the electrical generator temperature.

This paper investigates and compares bearing current problems in three kinds of wind turbine generators, namely doubly-fed induction generator (DFIG), direct-drive ...