

# Introduction to the wind measurement system of generator sets

How does a wind generator convert mechanical energy to electrical energy?

The shaft drives the generator to convert the mechanical energy to electrical energy. According to Newton's law, the kinetic energy for the wind with particular wind speed  $V_w$  is described as: where  $\rho$  and  $A$  are the air density and turbine rotor swept area, respectively. The extracted mechanical power can thus be expressed as:

What is the control objective of a wind generator?

The control objective is to regulate the motor speed rapidly and steadily, so as to keep the optimal tip-speed ratio and realize maximum energy conversion. The generator achieves its rated rotation but the power is still below the rated power. During this period, with the increase of wind speed, it reaches its rated value.

What are the components of a modern induction generator wind power system?

1. Introduction The core component of a modern induction generator wind power system is the turbine nacelle, which generally accommodates the mechanisms, generator, power electronics, and control cabinet.

How do wind turbines convert kinetic energy to electrical energy?

Model of wind power and wind turbine As a typical kinetic energy, wind energy is extracted through wind turbine blades and then transferred by the gearbox and rotor hub to mechanical energy in shaft. The shaft drives the generator to convert the mechanical energy to electrical energy.

Which generator is used to convert wind energy?

Among various generators used to convert wind energy, the induction generator has attracted more attention due to its lower cost, lower requirement of maintenance, variable speed, higher energy capture efficiency, and improved power quality [1-2].

What is the principle of wind energy conversion?

increase onto a maximum value, namely  $\lambda_{opt}$ , and then decrease gradually. This is the basic principle for wind energy conversion. In actual wind turbine systems, some other factors relating to the dynamic characters and control objectives should be considered together to achieve the optimal power efficiency.

Wind turbines have a variety of data requirements, such as wind speed, wind direction, generator voltage and current, power production, blade pitch, and maintenance issues such as the number of hours the blades have been rotating. The anemometer is an instrument that measures wind speed; it is mounted on the top of the nacelle, usually near the back.

systems in recent years, phase measurement units (PMUs) and wide-area measurement systems (WAMS) based modeling approaches have been widely used on various occasions to effectively reflect the devices' real dynamic characteristics, such as modeling of generator, excitation system and dynamic load [17-19]. PMUs

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are capable of

guide to data measurement activities, therefore currently the following standards are being reviewed and this list may grow: IEC 61400-12-2:2013 Power performance of electricity-producing wind turbines based on nacelle anemometry IEC 61400-21:2008 Measurement and assessment of power quality characteristics of grid connected wind turbines

linearly proportional to the wind velocity, as proven in the theory above. This means that it is more profitable to place a wind turbine in a location with occasional high winds, than in a location where there is a constant low wind speed. Measurement at different places shows that the distribution of wind velocity over the year could be ...

wind farm development. ON-SITE MEASUREMENT The best, most accurate indication of the wind resource at a site is through on-site measurement, using an anemometer and wind vane (described in detail later in this chapter). This is, however, a fairly costly and time-consuming process. I.2 WIND RESOURCE ESTIMATION 1565\_Part I dd 32 2/17/2009 7:02: ...

The shaft system has been presented as six, three, two and lumped-mass models in other research, among which the lumped and two-mass shaft models are often used to study the electric behaviours of the DFIG. It is ...

Finally, we have gathered information regarding the quantities the users both measure and log. A set of quantities that can be considered basic for the system according to the results are: the DC voltage/current and the Wind speed. Additionally, wind direction, DC power, RPM/Frequency are the second most

calculating the electric power and energy generated in small wind turbine-generator sets in a very short-term horizon, will be provided. 1 Introduction The issue of very short-term forecasting of ...

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Generator sets or Genset, widely used as primary or backup source electric power generators. When the generator set is used as the main power to support field operations, it must be ensured that ...

generator systems (WTGSs) are being ... usually located upon the cover of the nacelle to measure the wind speed [6, 7]. ... which sets individual targets for each member state. In 1999, the United ...

The electrical wiring diagram of the wind-integrated power system is shown in Figure 9, and the detailed

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parameters are shown in . Generator G3 is set as the reference generator, and 3%, 4%, and 5% random ...

30. KV If the average wind speed  $\bar{u}$ , is known for a given site, then it can be assumed that the wind obeys a Rayleigh distribution, i.e. the probability,  $p(u)$ , of the wind having a velocity,  $u$ , is  $p(u) = \frac{1}{2\bar{u}^2} u e^{-\frac{1}{2} \frac{u^2}{\bar{u}^2}}$ .  $\bar{u}$  is the mode of the distribution, i.e. the value at which the probability distribution function (pdf) peaks ...

Measurement behaviour beyond that has to be extrapolated. 4 Using this concept, the PTB has developed a 5-MN m reference torque transducer (also known as "torque transfer standard"). 5, 6 It is intended to be a movable reference torque measurement, which can be used to calibrate other torque-measuring devices, for example on a wind turbine test bench.

**RECOMMENDED PRACTICES FOR WIND SPEED MEASUREMENT AND USE OF CUP ANEMOMETRY IN WIND TURBINE TESTING** 1. THE USE OF ANEMOMETRY IN TESTING WIND TURBINES When evaluating the power performance, mechanical loading, power quality or acoustic emission of a wind turbine, wind speed is an important, usually dominant, ...

The six-phase generator is driven by a wind turbine with three blades of radius  $R$  and are controlled by a wedge angle orientation system  $\psi$  to protect the system in the case of high wind speeds ...

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