

Review of Future on Power electronics for Wind Turbine Systems

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Abstract: The electrical energy consumption continues to grow and more applications will be based on electricity in the next decades. We can expect that more 60% of all energy consumption will be converted and used as electricity. It is a demand that production, distribution and use of electrical energy are done as efficient as possible. Further, emerging climate changes argues to find future solutions which also are sustainable. Two major technologies will play important roles to solve parts of those future problems. One is the change the electrical power production from conventional, fossil (and short term) based energy sources to renewable energy sources. Another is to use high efficient power electronics in power generation, power transmission/distribution and end-user application. This research discuss trends of the most emerging renewable energy sources, wind energy, which by means of power electronics is changing the future electrical infrastructure but also contributes steadily more to non-carbon based electricity production. Most focus is on the power electronics technologies used in wind turbine systems.

Keywords: Wind Turbine, Power Electronics



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[I] INTRODUCTION

A **wind turbine** is a popular name for a device that converts kinetic energy from the wind into electrical power. Technically, there is no turbine used in the design, but the term appears to have migrated from parallel hydroelectric technology (rotary propeller). The correct description for this type of machine would be **aerofoil-powered generator**. The result of over a millennium of windmill development and modern engineering, today's wind turbines are manufactured in a wide range of vertical and horizontal axis types. The smallest turbines are used for applications such as battery charging for auxiliary power for boats or caravans or to power traffic warning signs. Slightly larger turbines can be used for making contributions to a domestic power supply while selling unused power back to the utility supplier via the electrical grid. Arrays of large turbines, known as wind farms, are becoming an increasingly important source of renewable energy and are used by many countries as part of a strategy to reduce their reliance on fossil fuels.

1.2 Resources

A quantitative measure of the wind energy available at any location is called the Wind Power Density (WPD). It is a calculation of the mean annual power available per square meter of swept area of a turbine, and is tabulated for different heights above ground.

Calculation of wind power density includes the effect of wind velocity and air density. Color-coded maps are prepared for a particular area described, for example, as "Mean Annual Power Density at 50 Metres". In the United States, the results of the above calculation are included in an index developed by the National Renewable Energy Laboratory and referred to as

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