BRIEF INFORMATION ABOUT ENERGY DEVICES BASED ON TYPES OF RENEWABLE ENERGIES

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Annotation: This thesis provides detailed information about renewable energy sources. Also, this thesis contains information about some electronic devices that work on electricity obtained from renewable energy sources, and the mechanism of operation of these devices.

Key words: Renewable energy, solar, wind and hydropower, power electronic circuits, wind turbine, gearbox, water turbine, dam or barrier, wind generator.

Renewable energy is energy collected from renewable sources that replenish naturally over time. It includes sources such as sunlight, wind, water movement and geothermal heat.[1] Solar, wind and hydropower are some of the most commonly used sources of renewable energy, and they offer a clean, sustainable and cost-effective alternative to traditional sources of energy like coal and natural gas. A new analysis reveals that there is an abundance of aluminum, steel and rare Earth metals available.

Power electronic circuits play a crucial enabling role in variable speed based wind energy conversion systems. Fixed speed wind turbines are simple to operate, reliable and robust. However the speed of the rotor is fixed by the grid frequency. As result, they cannot follow the optimal aerodynamic efficiency point.

The fusion of the Sun is the source of most renewable energy, with the exception of geothermal and flow energy. Astronomers estimate that the Sun's remaining lifespan is about five billion years, so on a human scale, renewable energy from the Sun is not threatened with depletion.

Sunlight is one of the richest and most readily available energy resources on our planet. The amount of solar energy that reaches the Earth's surface in one hour exceeds the planet's total energy needs in a year. While this sounds like an ideal renewable energy source, the amount of solar power we can use varies depending on the time of day and season of the year, as well as geographic location. In the UK, solar energy is becoming an increasingly popular way to supplement energy consumption PV cells, or solar cells, are semiconductor devices that convert solar energy directly into DC electric energy. In the 1950s, PV cells were initially used for space applications to power satellites, but in the1970s, they began also to be used for terrestrial applications. [2]

[1] Ellabban, Omar; Abu-Rub, Haitham; Blaabjerg, Frede (2014). “Renewable energy resources: Current status, future prospects and their enabling technology”. Renewable and Sustainable Energy Reviews. 39-volume. 748–764 [749]-page.

[2] Li, Z., Yuan, Y., Li, F., Evaluating the reliability of islanded micro gridin an emergency mode, 45th International Universities Power Engineering Conference (UPEC) 2010, pp. 1-5, Cardiff, U.K., August 2010.

A whole lot of power electronics applications that we use in our daily life, such as a fan regulator, air-conditioning, induction cooking, light dimmer, emergency lights, vacuum cleaners, personal computers, UPS, battery charges, etc., are the major applications of power electronics.[3]

Wind is an abundant source of clean energy. In order to select an electrical generator for small wind energy power application, it is necessary to study and define a wide set of variables such as voltage, frequency, speed, output power, slip factor (for induction machines), required source of reactive power, and field excitation along with other to harness electricity from wind power, turbines are used to power generators, which then supply electricity to the national grid. Despite the fact that there are residential or "off-grid" power generation systems, not all facilities are suitable for the installation of a domestic wind turbine. Find out more about wind energy on our wind energy page. In order to understand the characteristics of wind energy conversion and how a turbine works, it is possible to make a simplified assumption that the wind approaches the turbine with constant velocity, with homogeneous properties (such as temperature, density), and without turbulence. A gearbox is used to match the rotational speed of the turbine to the generator. Although the rotational speed of a small wind turbine can be very high, a larger turbine is usually designed to have a slow rotational speed. A wind turbine operates with much higher wind speeds. The normal cut-in wind speed is 4.5 m/s and the cutout wind speed is approximately 30 m/s. A water turbine operates at a much lower water speed; thus, the rotational speed of a water turbine is much lower than the rotational speed of a wind turbine.

With a gearbox, it is possible to use a high-speed generator to match the rotational speed of the blades, so a much smaller size of the generator (often off the shelf) can be used. Unfortunately, a gearbox requires regular maintenance, so it is often the cause of generators downtime and consequently the loss of productive hours.[4]

As a renewable energy source, hydropower is one of the most commercially developed. Areas where the wind is stronger and more constant, such as the sea and high mountains, wind farms are the most suitable places for this type of energy production.

By building a dam or barrier, a large reservoir can be used to create a controlled flow of water that will drive a turbine that generates electricity. This energy source can often be more reliable than solar or wind power (especially if it is tidal rather than riverine) and also allows electricity to be stored for use when demand peaks. Like wind power, hydropower may be more viable as a commercial energy source in certain situations (depending on the type and compared to other energy sources), but to a very large extent depending on the type of property it can be used for residential, autonomous' generation. WEC devices extract energy contained within ocean surface waves and convert it into useful electrical power. To date, there are more than 100 proto types of various WEC systems.

Areas where the wind is stronger and more constant, such as the sea and high mountains, wind farms are the most suitable places for this type of energy production. Wind generated electricity met nearly 4 percent of global electricity demand in 2015. Wind power is the leading source of new power in Europe, the United States, and Canada. It ranks second in China. In

[3] Mirzaliyev Zohidjon Rayimalievich,a senior lecturer at the Military Training Center of the National University of Uzbekistan. ENERGY DEVICES BASED ON RENEWABLE ENERGY TYPES. GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)ISSN (E): 2347-6915Vol. 9, Issue 5, May (2021).

[4] Mirzaliyev Zohidjon Rayimalievich,a senior lecturer at the Military Training Center of the National University of Uzbekistan. ENERGY DEVICES BASED ON RENEWABLE ENERGY TYPES. GALAXY INTERNATIONAL INTERDISCIPLINARY RESEARCH JOURNAL (GIIRJ)ISSN (E): 2347-6915Vol. 9, Issue 5, May (2021).

Denmark, wind power meets more than 40% of electricity demand, while Ireland, Portugal and Spain meet almost 20%.[5] This is a branch of energy specializing in converting the kinetic energy of air masses in the atmosphere into electrical, thermal and any other form of energy for use in the national economy.

The transformation takes place with the help of a wind generator (for generating electricity), windmills (for generating mechanical energy) and many other types of units. Wind energy is a consequence of the activity of the sun, therefore it is classified as a renewable energy. The power of the wind generator depends on the area swept out by the blades of the generator. For example, turbines with a capacity of 3 MW (V90) manufactured by the Danish company Vestas have a total height of 115 meters, a tower height of 70 meters and a blade diameter of 90 meters.

Renewable energy is energy that comes from a source that won't run out. They are natural and self-replenishing, and usually have a low- or zero-carbon footprint.

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5. Zhou, J., Li, H., Zhou, Z., Xu, D., Control strategy of Li-ion battery module in super UPS, IEEE PEAC 2014, pp. 1236–1241, Shanghai, China, November 5-8, 2014.

[5] “Electricity – from other renewable sources - The World Factbook”