

DESIGN OF A HYBRID ENERGY POWER SYSTEM USING SOLAR AND WIND POWER

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Keywords: Solar energy, wind energy, renewable energy sources, utility interactive inverter

ABSTRACT

There is increasing demand for the use of alternative renewable energy sources to achieve clean and low-cost electric energy for loads. Wind and solar energies are some of the renewable energy sources which are mostly available in the world. In this study, a hybrid power station has been designed using solar and wind energies.

I. INTRODUCTION

The amount of energy sources such as gas, water, coal and petrol are being reduced day by day since they are used in industry intensively. On the other hand, the need of electrical energy is increasing in parallel with developing technology. Electrical energy can be produced using energies of water, coal, petrol and gas. But, the price of the electrical energy is increasing due to lack of energy sources mentioned above. In addition, coal, gas and petrol can cause air pollutions when they are burned to produce energy.

There are other energy sources that can be used for production of electrical energy. Wind and solar (W&S) energies are some of them. These are renewable energy sources as well as environment friendly, cheap and mostly available in the world.

The use of wind energy for production of electrical energy was started in 19th century in the world. Studies about the production of electrical energy from solar energy were started in 1954. These studies were increased after the petrol crises in 1974.

Studies about the systems use renewable energy sources such as solar, wind, geothermal, biomass (Wood and

Charcoal), and water are being continued. A hybrid wind/photovoltaic system has been developed recently and studies about it are still being carried on. Wind and solar are very important renewable energy sources for these kinds of applications [1-3]. Double-input single-output converters as parts of hybrid system were also discussed in these papers. Steady-state performance of a grid-connected roof-top hybrid wind/photovoltaic power system with battery storage was studied in reference [4]. Developments in micro controller and semi-conductor technologies have increased the studies about the hybrid systems running in parallel with the grid [1-4]. Residential photo-voltaic grid-connected inverters are modular distributed power generation devices that convert the direct current (DC) power from the roof-top solar panels to high-quality alternating current (AC) power at the utility grid interface [5].

In this study, a hybrid power station has been designed using W&S energy. The obtained energy from W&S is given to the loads first, and then stored in the batteries. When the batteries are fully charged, it is directly transferred to the power grid. This will enable the power to flow in both directions between the power station and the power grid. If there is no energy produced by the system or stored in the batteries, the load of the system is fed from the power grid. Proposed hybrid system produces cheap, clean and environmental friendly electric energy and therefore is very important for countries which are very rich in S&W energy sources.

II. THE CONFIGURATION W&S SYSTEM

Hybrid power station has been designed using W&S energy. The W&S system configured in Fig. 1 is composed of following;