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Result on Integration of Solar and Hydro Power Plant Connected on Grid

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ABSTRACT: Renewable energy systems (RES) are an attractive option for electrifying the community as they are environmentally friendly, free and pervasive. The efficiency of these energy systems can be improved by their very low, parallel integration. In this article, water and solar energy systems are considered RES and are connected to the utility grid. Due to the intermittent nature of both water and photovoltaic energy sources, the utility network is connected to a system that provides a continuous flow of energy. The hydropower system uses a self-exciting induction generator and converters. The DC / AC converter serves as an interface for connecting the hydro turbine and the utility network to match the generated voltage to the utility network voltage.

The solar system is a combination of a PV array, a boost converter and a solar inverter. Both hydropower and solar power plants are controlled by a permanent current regulator. The analysis is designed to confirm the existence of the proposed system.

KEYWORDS: Renewable energy, solar and hydro, converter, AC & DC

I.INTRODUCTION

Recently, researchers are investigating solar- and water-based hybrid energy systems. This hybrid energy system can be implemented in areas where solar and water resources are moderate in nature. The problem with this hybrid system is that hydro and solar systems cannot produce electricity at the same time on summer / rainy days because it cannot produce electricity. To meet the energy demand, it is necessary to integrate the electrical network or the diesel generator. In rural areas to supply power with this hybrid system. A system is proposed in which a hybrid energy production system based on water and solar energy is connected to the utility network.

There is plenty of solar energy available during the summer peak, but it is difficult to generate electricity from solar energy on rainy days. Similarly, hydropower production results in better efficiency during rainy seasons. Thus, a parallel combination of these two power systems has been used and is also connected to the DC grid. In summer, the grid-connected solar system will supply the load and the water system will be disconnected. On rainy days, the grid is connected to the grid and the solar system shuts down. In other seasons, grid-connected solar and water systems are able to supply electricity to the consumer. Therefore, it is a good opportunity to adopt the proposed system of continuous supply of electricity to the consumer.

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II.LITERATURE REVIEW

1) Integration of PV floating with hydroelectric power plants by RanieroCazzaniga, Marco rosa Clot In this paper a detailed analysis is given of the advantages of coupling FPV plants with HPP.

2) Performance Analysis of Grid Integrated Hydro and Solar Based Hybrid Systems by SweekaMeshram and Ganga Agnihotri

3) Integration of Renewable Energy Systems for Optimal Energy Needs by*R. Naveen, P. P. Revankar, S. Rajanna*

4) Erinofiardi, P. Gokhale, A. Date et al., "A review on micro hydropower in Indonesia," Energy Procedia, vol. 110, pp. 316–321, 2017.

A micro hydropower plant can use a reaction or impulse turbine depending on the available resource

5) Planning of Hybrid Micro-Hydro and Solar Photovoltaic Systems for Rural Areas of Central Java, Indonesia by Ramadoni Syahputra and Indah Soesant

III. SYSTEM DEVELOPMENT

A. Hydro power system:

Hydropower is energy produced from water sources such as the ocean, waterfalls and rivers. Because water is constantly moving in a global cycle, its movement can be used to generate electricity or drive machinery. Because water is an infinite resource, its cycle provides an infinite recharging system, making it a renewable energy source. There are several types of hydropower facilities, all of which are driven by the movement of flowing water. Turbines and generators are used to convert the kinetic energy of water into electrical energy, which is then fed into the electrical grid to supply homes, businesses and industries. Hydropower works by utilizing the energy from the flow of water through a turbine connected to a generator, thus converting it into electricity. Most hydropower plants store water in a dam that is controlled by a gate valve or valve to measure the amount of water flowing out. The higher the height of the dam, the more energy can be produced

B. Solar power plant:

A photovoltaic cell, commonly referred to as a solar cell or PV, is a technology used to convert solar energy into direct electrical current. The photovoltaic cell is usually made of silicon alloys. Particles of solar energy, called photons, condense on the surface of a photovoltaic cell between two semiconductors. These semiconductors exhibit a property known as the photoelectric effect, which causes them to absorb photons and release electrons. Electrons are recorded in the form of electric current, in other words electricity. A solar power plant produces heat and electricity by concentrating solar energy. This, in turn, produces steam that helps feed the turbine and generator to generate electricity.

C. Integration of solar and hydro power plant:

Sometimes two is better than one. Such is the case with the combination of solar energy and storage technologies. The reason: Solar energy is not always produced when it is most needed. Peak performance often occurs on summer afternoons and evenings when solar power production declines. The temperatures can be highest and people working during the day will return home and use electricity to cool, cook and operate their homes.
Storage helps the solar panel contribute to power even when the sun is not shining. It can also help smooth out changes in the flow of solar energy across the grid. These differences can be attributed to changes in the amount of sunlight emitted on photovoltaic (PV) panels or concentrated solar power (CSP) systems. Solar energy production can be affected by the season, time of day, clouds, dust, mist, or obstacles such as shadows, rain, snow, and dirt. Sometimes energy storage is placed with or next to a solar system, and sometimes the storage system is stand-alone, but in any configuration can help integrate solar energy more effectively into the energy environment.

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Components used in this project:

1. Metallic assembly
2. turbine
3. DC dynamo generator:
4. Solar plate
5. Battery
6. Inverter
7. IC CD 4047
8. Resistors
9. Inductor
10. Capacitor
11. Snabber circuit
12. Microcontroller (AT mega 328)
13. LCD display
14. Transformer

1) Metallic assembly: metals such as iron and steel are used to build the project

2) Turbine: Hydropower plants capture the energy of falling water to produce electricity. The turbine converts the kinetic energy of the falling water into mechanical energy. A generator then converts the mechanical energy from the turbine into electrical energy.

3) DC Dynamic Generator: The operating principle of a DC generator is based on the Faraday laws of electromagnetic induction. When a conductor is in an unstable magnetic field, an electromotive force is induced in the conductor. The magnitude of the induced e.m.f can be measured from the equation of the electromotive force of the generator

4) Solar plate: Solar panels are made from photovoltaic cells that convert solar energy into electricity. Photovoltaic cells are placed between layers of semiconductor materials such as silicon. Each layer has different electronic properties that receive energy when exposed to photons in sunlight.

5) Battery: A lead-acid battery consists of a negative electrode made of spongy or porous lead. Lead is porous to facilitate the formation and dissolution of lead. The positive electrode consists of lead oxide. Both electrodes are immersed in an electrolytic solution of sulfuric acid and water

6) Inverter: The inverter converts direct current from sources such as batteries or fuel cells to alternating current. The electric current can be at any required voltage; in particular, it is capable of operating AC equipment designed or rectified for mains operation to produce direct current of any voltage.

7) CD 4047: The CD4047 is a low power IC that can operate in stable or monostable mode. It is connected in stable mode here. It works by charging a capacitor (C2) through a resistor (RV1) as in any stable multivibrator. Variable resistance (RV1) to set the output frequency to exactly 50 Hz

8) Resistor: A resistor is a passive, bipolar electrical component that implements an electrical resistor as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, distribute voltages, bias active elements, and terminate transmission lines, among other things.

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9) Inductor: An inductor, also called a coil, choke, or reactor, is a passive, bipolar electrical component that stores energy in a magnetic field as electric current flows through it. The inductor typically consists of an insulated wire wound into a coil.

10) Capacitor: A capacitor is a device that stores electrical energy in an electric field. It is a passive electronic component with two terminals. The effect of the capacitor is called capacitance. The primary purpose of capacitors is to store electrostatic energy in an electric field and, where possible, to supply the circuit.

11) Snabber circuit: Snubber circuits are essential for the diodes used in switching circuits. You can save the diode from overvoltage peaks that may occur during the reverse recovery process. A very common damping circuit for power diodes consists of a capacitor and a resistor connected in parallel with the diode

.

12) Microcontroller (AT mega328): The ATmega-328 has 32 KB of internal flash memory. The ATmega328 has 1 KB of electrically erasable programmable read only memory (EEPROM). This feature shows that if the power supply to the microcontroller is removed, it will be able to store data and give results even after the power supply.

13) LCD display: The 16x2 LCD means you can display 16 characters per line, and there are 2 such lines. On this LCD, each character is displayed in a 5x7 pixel matrix. The 16 x 2 intelligent alphanumeric dot matrix display can display 224 different characters and symbols. This LCD has two registers, namely the command and the data

14) Transformer: The easiest way to describe a transformer is to increase or decrease the voltage. The output voltage increases at the boost transformer and the output voltage decreases at the downlink transformer. The incremental transformer reduces the output current and the lower transformer increases the output current so that the input and output power of the system is equal

IV. RESULT

1) When we give 300 liter water and rotation at 1000 RPM then it will generate 12 v DC.
2) When we provide 300 liter water and rotation of 800 RPM then it will generate 10v DC.
3) When we give 700 liter water and rotation of 700 RPM then it will generate 9v DC.

Figure 1

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Figure 2

V.CONCLUSION

In a hybrid power plant, we generate electricity from two different sources and connect that electricity to the grid.

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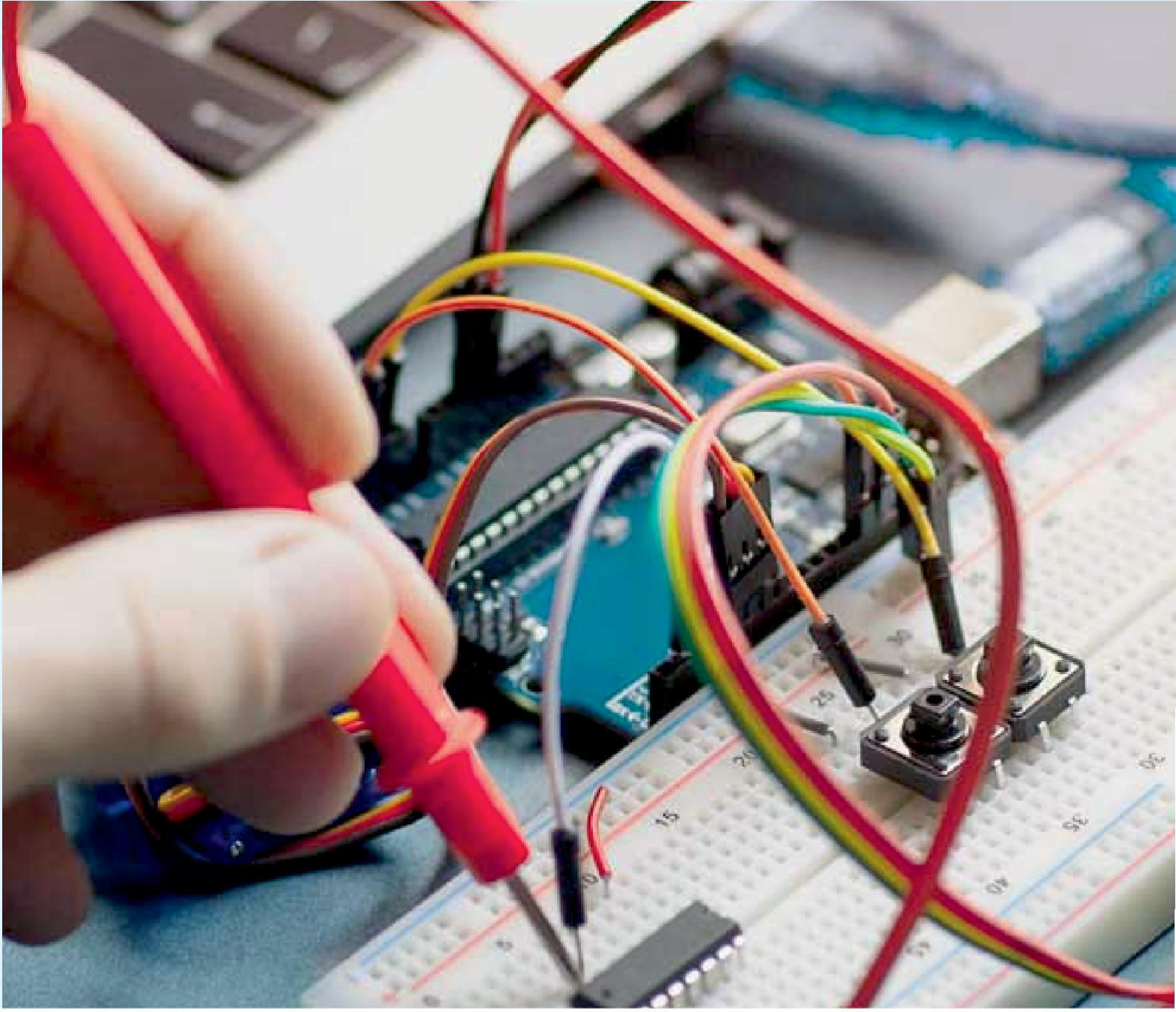

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