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Fabrication of Hybrid Power Generation

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ABSTRACT: There are many power generating methods available in our nation to meet the power needs. But the resources used to generate are almost fossil fuels and non-renewable energy resources. Some other power generating methods utilizes the renewable sources to produce electric power. Tidal energy is a form of energy that can be utilized to produce electric power but there is no equipment or machine to utilize the tidal energy and to convert into a useful form of energy our ultimate aim is to design a machine that utilize the tidal energy to produce electric energy. Some of the renewable energy resources are not available at all time, solar energy is also a renewable energy but it is not available at all times during nights and windy, rainy seasons the availability of sunlight is very less. But tidal energy is constant at all times so the usage of tidal energy can pave way for constant energy generation. Our machine is designed to utilize the tidal energy and also the solar energy to produce electric power. If anyone input energy source is very low then the power generation also gets reduced in its rate but it never stops completely. Our machine is designed such that it can be engaged and disengaged the transfer of machine from one place to another is easy that means the machine is portable. Number of fans used to produce power is more than two to ensure the complete utilization of the tidal energy resource. Tidal energy, wind energy, solar panel, air velocity, rotary motion. Vertical wind turbine utilized to convert wind energy into electricity. Solar panel is utilized to transform solar radiation into electricity. Hydro generator is used to convert hydro energy into electricity. This electrical power can be deploying for residential, or commercial purposes. In this paper, we are showing that how we have combined three renewable energy sources to generate electricity continuously without harming the nature, less maintenance and at a lower cost.

KEYWORDS: Monitoring display, solar panels, rack and pinion, torque motor, battery.

I. INTRODUCTION

When renewable sources are used as source for power generation, the method is permanent and it is preferable than the power producing by non-renewable sources. Tidal energy and solar energy are some of the renewable energy sources which can be utilized for power generation. Solar energy is almost utilized by the usage of solar panels and some other applications that produces the necessary from sunlight. Sometimes the level of sunlight may vary during bad weather conditions such as rainy, cloudy and much more seasons, but tidal energy is constant without any variation. Tides are formed near the seashores which moves towards the land at a considerable velocity. During this travel of water from ocean to the land a layer of air that is present between the land and the sea, also moves with a velocity that is proportional with the velocity of the tides. This velocity of air and tides can be utilized to drive the power generating source. Wind mills are placed at locations where the velocity of air is maximum, so the placing of wind mills near seashores can produce a large amount of electric current. Our design ultimately aims to utilize the velocity of air that is present in the seashores. As to meet the power requirement our design will be very helpful. A combination of windmill and a solar panel is our design. The designation of our project is to produce electric power from the renewable energy sources. There are many power generating methods which produces electricity from renewable energy sources, but the tidal energy is almost not utilized properly, our design will be helpful to utilize the tidal energy to produce the required current or electricity. The movement of water from sea to the land occurs frequently and this process never stops. The rate of movement that means the velocity of waves formed may vary with respect to the time and the season, but the formation of waves never stops. The tidal energy is considered to be a renewable energy source as the formation of waves never stops. Power generating methods used in our country are almost efficient but the absence of any equipment or method to use the tidal energy as a source for power production keeps the power generated less than the power required by the people. Power requirement can be decreased but the power generated can be increased by increasing the efficiency of the power generating methods and also by increasing the available power generating methods. Therefore, new inventions should be made in power generating methods and equipment used to produce power.

While we look at solar and wind power as two of the main sources of renewable power, we are ignoring another huge source of renewable energy on planet earth.

Well here we propose a dual power generator that utilizes solar as well as sea wave power to generate unlimited energy using sea waves. This system will allow us to utilize the third source of renewable power on planet earth using a specialized alternator-based generator arrangement.

The Solar plus sea wave generator provides following advantages including:

- No Dependency on Solar or Wind for Generation
- Efficient use of sea waves to generate tidal power
- Portable machine for ease of transport
- Dual power generation for guaranteed power generation in all climates
- Lightweight and anti-rust design for long term usage

The combination two or more energy sources which generates the electricity is known as hybrid power generation system. Here the system is fabricated or designed to obtain the power using three energy sources. This system has good reliability, efficiency, resources available freely, no emission, and economical. In this proposed system the use of solar, wind, and hydro for generating the power. There is no need to find special location for installing this system. We can set up hybrid energy system on to the residential apartments, or commercial place. solar energy the energy which get from the sun in the form of radiation. It is available freely and present continuously. Solar energy has high potential compare to other sources and shows greater efficiency. Solar won't be present during cloudy or night time. Wind energy the energy which can be utilized from the wind to generate power. It needs low cost for generation of electricity. Wind is present almost 24 hrs. on earth and can be utilized freely. It has lower emission. The speed of wind flowing depends the generation of electricity.

II. LITERATURE REVIEW

Pritesh. P Shirsath, Anant Pise, Ajit Shinde, "Solar-Wind Hybrid Energy Generation" International Journal of Engineering, Research and General Science Volume 4, issue 2 March-April, 2016 ISSN 2091-2730.

M.V.P. Geetha Udyakanthi "Design of a Wind Solar Hybrid Power Generation System in Sri Lanka. Anila Kumara Vadakkepurakkal, "Design of a Hybrid Power Generation System Using Solar-Wind Energy". Dekin University, November 2018.

India is a country which is surrounded by water on its three sides and land on one side. This explains that a large number of beaches available in India.

The utilization of tidal energy must be done to increase the rate of power production from renewable energy resources. As the number of available beaches is more than the tidal energy source is also more, therefore the proper utilization of available tidal energy will lead a way to meet the power requirement.

III. OBJECTIVES

1. Optimize Energy Output:
Maximize the overall energy output by efficiently combining tidal, solar, and wind energy sources.
2. Reliability and Redundancy:
Ensure the reliability of the hybrid system by incorporating redundancy mechanisms to mitigate the impact of fluctuations in one energy source.
3. Energy Storage Integration:
Investigate and implement effective energy storage solutions to store excess energy generated during peak production for use during low production periods.
4. Environmental Impact Assessment:
Conduct a comprehensive environmental impact assessment to understand the ecological consequences of the hybrid power generation system.
5. Technological Integration and Compatibility:
Ensure seamless integration of tidal, solar, and wind energy technologies to create a cohesive and efficient hybrid system.

IV. REQUIREMENT OF COMPONENTS

A. Battery: -

1. The battery is a crucial component for storing excess electrical energy generated by the system. It typically consists of one or more rechargeable cells and serves as a buffer to balance supply and demand. Batteries ensure a continuous power supply during periods of low wind or solar activity and can also provide backup power during grid outages.



Fig 4.1 Rechargeable acid battery

B. Solar Panel: -

1. Solar panels consist of photovoltaic (PV) cells that convert sunlight directly into electricity through the photovoltaic effect. They are typically made of silicon-based semiconductors and are mounted on a frame to form a solar array. Solar panels complement wind energy generation by providing power during daylight hours and in sunny conditions.



Fig 4.2 solar panel

C. DC Generator: -

The DC generator is a device that converts mechanical energy into electrical energy in the form of direct current (DC). In a wind turbine system, it is driven by the rotational motion of the wind blades. It consists of coils of wire rotating within a magnetic field to produce electricity.



Fig 4.3 DC Generator

D. Ball Bearing: -

Bearings are mechanical components that reduce friction and facilitate smooth rotation of moving parts within the system. They support rotating shafts and ensure efficient operation of components such as the wind turbine rotor, generator, and other rotating machinery.



Fig 4.4 Ball Bearing

E. Rack and Pinion: -

The rack and pinion mechanism is a type of gear system used to convert rotational motion into linear motion. In the context of a renewable energy system, it may be used to adjust the angle of the solar panels to maximize sunlight capture throughout the day. The rack is a linear gear, and the pinion is a small gear that meshes with it to produce linear motion.



Fig 4.5 Rack and Pinion

F. Microcontroller: -

The PIC microcontroller is a small, programmable computer chip that serves as the control center of the renewable energy system. It is programmed to monitor and control various functions such as system performance, power output optimization, safety features, and communication with external devices or the grid. The microcontroller may regulate voltage, control the operation of the inverter, manage battery charging and discharging, and implement other control strategies to maximize the efficiency and reliability of the system.



Fig 4.6 Microcontroller

G. Chain and Sprocket: -

Chains and sprockets are mechanical components used to transmit rotational motion from one shaft to another with minimal energy loss. In a renewable energy system, they may be employed to transfer rotational energy from the wind turbine rotor to the generator or between other components.

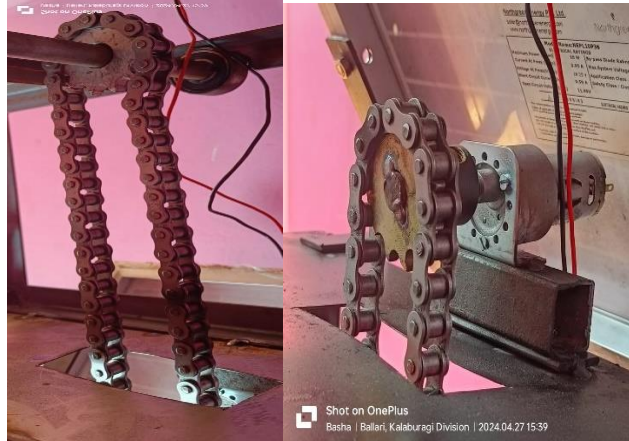


Fig 4.7 Chain and Socket

V. ASSEMBLE MODEL





Solar Energy Calculation: -

Solar = 29.9
Wind = 4.4
Maximum Power (Pmax) = 10W
Current at Pmax (Imax) = 0.55A
Voltage at Pmax (Vmax) = 18.25V
Short-Circuit Current (Isc) = 0.59A
Open Circuit- Voltage (Voc) = 21.96
Diode rating = 6A
Max system Voltage = 600vDC

Consider,

Max power efficiency and duration of sunlight
Max power output of solar panel,
= max voltage * max current
= 18.25v*0.55A
= 10.0375W

Max power output of solar panel is = 10.0375W
Approximately = 10W

Calculation for electrical energy converted: -

The electrical energy = max power output *efficiency*duration
Then 10w* (0.8) *1hour
Electrical energy = 8KW

Wind Energy Calculation: -

Solar = 29.9
Wind = 4.4
Ratio = solar energy (s) / wind energy (w)
= 29.9/4.4
= 6.79
Ratio = 6.80 approximately

V. CONCLUSION

In conclusion, hybrid power generation systems utilizing solar, wind, and wave energy, along with monitoring systems, represent a promising solution for meeting energy needs sustainably, reliably, and efficiently. These systems offer a range of benefits, including diversification of energy sources, increased energy capture, optimized system performance, enhanced energy security, and environmental sustainability. By combining multiple renewable energy sources and leveraging monitoring capabilities, hybrid systems can overcome the limitations of individual energy sources and address challenges such as intermittency, variability, and energy storage.

However, it's important to acknowledge the complexities and challenges associated with hybrid power generation systems. These include higher upfront costs, technical complexity, intermittency, variability in renewable resource availability, site-specific considerations, and regulatory constraints. Successfully implementing and operating hybrid systems requires careful planning, design, integration, and ongoing monitoring and maintenance.

Despite these challenges, hybrid power generation systems have a wide range of applications, from off-grid and remote areas to island and marine installations, microgrids, distributed energy systems, emergency and disaster relief operations, and industrial and commercial facilities. They offer flexible and scalable solutions for meeting diverse energy needs while reducing reliance on fossil fuels, lowering greenhouse gas emissions, and contributing to a more sustainable energy future.

In summary, hybrid power generation systems utilizing solar, wind, and wave energy, integrated with monitoring systems, hold great promise for advancing renewable energy deployment, enhancing energy resilience, and addressing global energy and environmental challenges. Continued research, innovation, and investment in hybrid renewable energy technologies are essential to unlock their full potential and accelerate the transition to a cleaner, more sustainable energy landscape.

REFERENCES

1. Pritesh. P Shirsath, Anant Pise, Ajit Shinde, “Solar-Wind Hybrid Energy Generation” International Journal of Engineering. Research and General Science | Volume 4 | Issue2 | Mar 2016.
2. M.V.P. Geetha Udyakanthi “Design of a Wind Solar Hybrid Power Generation System in Sri Lanka. Dec 2015.
3. Anil Kumara Vadakkepurakkal “Design of a Hybrid Power Generation System Using Solar-Wind Energy.” November 2018.
4. G Halasa and J Asumadu, “Design of wind solar hybrid electrical power production” Volume 1 NO 2,2009.
5. Peter Jenkins “Hybrid power generation using solar and wind energy” April 2019.



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