



HYBRID ENERGY GENERATION SYSTEM

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Abstract: Renewable energy integration has attracted widespread attention due to its fuel cost, cleanliness, availability, and ease of installation. Among various renewable energy sources, photovoltaic (PV) and wind turbines (WT) have become very attractive due to the abundant local availability in nature, technological progress, and economic benefits. The hybrid combination of both distributed energy resources eliminates mutual intermittences due to their adverse nature, therefore the reliability of the system will be improved. The basic key objective of this project is to generate electrical energy by using renewable and clean energy with minimum pollution. We use a hybrid system to overcome the drawbacks of renewable free-standing generation system. The working model of the solar-wind hybrid energy generation system successfully operated. By considering the cost and effectiveness of the system it is suggested for all the rural community members to use the solar-wind hybrid system for the generation of electricity.

Keywords: Renewable Energy, wind turbines, Hybrid Energy, Solar-wind hybrid system

I.INTRODUCTION

The combination of renewable energy sources, wind & solar are used for generating power called as wind solar hybrid system. This system is designed using the solar panels and small wind turbines generators for generating electricity. A solar-wind hybrid energy generation system is a renewable energy system that combines the use of solar and wind power to generate electricity. This type of system aims to maximize energy production and provide a more consistent and reliable power supply, especially in areas where the availability of one renewable energy source may be limited due to seasonal or weather-related changes. In a solar-wind hybrid system, both solar panels and wind turbines are used to capture energy from the sun and wind. The solar panels convert sunlight into electricity, while the wind turbines capture the kinetic energy of the wind and convert it into electricity. The electricity generated from both sources is then combined and stored in a battery or fed into the power grid. One of the advantages of a solar-wind hybrid system is that it can produce



energy throughout the day and night, as well as during different seasons, which helps to balance out the variability of each individual renewable energy source. This can also result in a more stable and consistent energy supply, which can be particularly useful in remote areas or for off-grid applications. Overall, a solar-wind hybrid energy generation system provides a sustainable and reliable solution to meet the energy needs of a community or facility while minimizing the impact on the environment, manufactured by hundreds of manufacturers worldwide and there are several different technologies available. There are three main type of commercially available PV cells.

II.LITERATURE SURVEY

A Review on Hybrid Energy Systems by K Shiva Ramakrishna,2015 cited by 326,the world is witnessing a change-over from its present centralized generation to a future with greater share of distributed generation. Hybrid energy systems are inter-connected with wind power, photovoltaic power, fuel cell and micro-turbine generator to generate power to local load and connecting to grid/micro-grids that decrease the dependence on fossil fuels. The hybrid system is a better option for construction of modern electrical grids that includes economic, environmental and social benefits. An overview of different distributed generation technologies has been presented. This paper puts forward a comprehensive review of optimal sizing, energy management, operating and control strategies and integration of different renewable energy sources to constitute a hybrid system. The feasibility of the different controllers such as microcontroller, proportional integral controller, hysteresis controller and fuzzy controller are presented. The controller is a closed loop feedback mechanism used for power regulation which achieves zero steady state error and the output signal generated from the controller produces desired output response.

III. PROBLEM STATEMENT

The objective of a solar-wind hybrid energy generation system is to leverage the complementary nature of solar and wind power to create a more reliable and efficient renewable energy source. By combining the two sources, the system can provide a more consistent output of power since wind power tends to be more prevalent at night and solar power is more abundant during the day.

The hybrid system aims to reduce the intermittency and variability associated with individual solar and wind systems, which can help to stabilize the power output and improve overall energy efficiency. Additionally, by using both solar and wind power, the hybrid system can potentially

reduce the overall cost of energy production by taking advantage of economies of scale and shared infrastructure.

IV.METHODOLOGY

The basic working principle of a solar energy system involves using solar panels to convert sunlight into electricity. The solar panels contain photovoltaic cells that absorb sunlight and convert it into a direct current (DC) electricity. The DC electricity is then converted into alternating current (AC) electricity using an inverter, which can be used to power homes and



Fig: 1 Working Of Solar & Wind Energy (Hybrid Energy

businesses or fed back into the grid.

The basic working principle of a wind energy system involves using wind turbines to convert the kinetic energy of the wind into electricity. The wind turbines have blades that rotate when the wind blows, turning a rotor connected to a generator. The rotation of the rotor generates electricity, which is then sent to a transformer to increase the voltage level for use in homes and businesses or fed back into the grid.

In a hybrid energy system, solar and wind power are combined to create a more reliable source of electricity. The system can be designed to use solar power during the day when the sun is shining and wind power at night or during periods of low solar radiation. The system can also be designed to use both solar and wind power simultaneously, providing a more stable and consistent source of electricity.



MERITS OF HYBRID ENERGY: Hybrid energy systems that combine renewable energy sources such as solar and wind power offer several advantages over single-source systems. Here are some of the key merits of hybrid energy:

1. Increased reliability: Hybrid energy systems are more reliable than single-source systems because they are designed to use multiple sources of energy. If one source of energy is not available, the system can switch to another source, ensuring a constant supply of electricity.

2. Cost-effective: Hybrid energy systems can be more cost-effective than single-source systems because they use multiple sources of energy. This means that they can operate more efficiently, reducing energy costs over time. Additionally, hybrid energy systems can reduce or eliminate the need for expensive fuel deliveries and maintenance associated with single-source systems.

3. Reduced carbon footprint: Hybrid energy systems can help reduce greenhouse gas emissions and mitigate climate change. By using renewable energy sources such as solar and wind power, hybrid energy systems can help reduce dependence on fossil fuels and promote a more sustainable energy future.

4. Flexibility: Hybrid energy systems are flexible and can be customized to meet specific energy needs. They can be designed to work in a variety of settings, from remote locations to urban areas, and can be tailored to meet the energy needs of homes, businesses, and communities.

5. Energy independence: Hybrid energy systems can provide energy independence, particularly in remote areas where grid power is not available or is unreliable. By generating their own electricity, homeowners and businesses can reduce their dependence on external sources of energy and increase their self-sufficiency.

Overall, hybrid energy systems offer several merits and can be an excellent option for homeowners, businesses, and communities looking to reduce their carbon footprint, increase energy independence, and reduce energy costs over time

V. EXPERIMENT RESULTS

LOAD CALCULATIONS:

NAME OF THE LOAD	RATING	QUANTITY
FANS	60-80watts (+20%)	12



LIGHTS	20watts (+25%)	09
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1. The capacity to the load produced by the inverters is 1500w
2. The capacity of Solar Plant generated power is 1000w
3. The capacity of Wind Mill generated power is 500w
4. Each fan consumes 90watts and we are having 12fans then $90 \times 12 = 1080$ watts
5. Each light consumes 24watts and we are having a 8 lights then $24 \times 8 = 192$ watts
6. Total power consumed by the load = $1080w + 192w$ Total power = 1272 watts(at full load).

S.NO	LOAD	DURATION
1.	At 100% load	2hours
2.	At 75% load	3hours
3.	At 50% load	4hours

Conclusion: Solar-wind hybrid energy generation systems are a promising approach to renewable energy generation. By combining two different sources of clean energy, these systems can provide a more consistent and reliable supply of electricity than either solar or wind power alone. One of the advantages of a solar-wind hybrid system is that it can produce electricity even when one of the sources is not available. For example, wind turbines can generate electricity on cloudy days when solar panels are less effective, and solar panels can provide power during calm periods when wind turbines are not generating electricity. In conclusion, solar-wind hybrid energy generation systems have the potential to be a cost-effective and reliable source of clean energy, but careful planning and implementation are necessary to realize these benefits.

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