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Feasibility Analysis of Grid Connected Renewable (Hybrid- Solar and Wind) Energy Systems

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Abstract: Global energy consumption is rising exponentially, producing new concerns such as global warming. To mitigate theissues, major actions have been made, the other is to accomplish the objective of enhancing the usage of renewable energy sources. However, apart from hydropower renewable energy has been used insufficiently across the world. According to the greenhouse gas emission reduction report on renewable energy. Meanwhile wind and solar power have only responsible for 5% and 2.2% respectively.The feasibility of hybrid power systems integrating PV-Wind and solar energy generation in distant locations is proposed in this studywind and solar energy systems are being integrated. The economic and environmental parameters of hybrid energy systems are thencompared. A hybrid system comprised of PV and wind. Batteries are used to store the excess energy and as a backup source. This article also establishes analytical guidelines and criteria for three power supply modes based on a yearly load by using HOMER software.

Keywords: Hybrid (Solar (PV) and Wind), Batteries, HOMER, Mitigation of power.

1. INTRODUCTION

Wind, solar, hydro, biomass and geothermal are examples of renewable energy sources. Electricity supply can rangefrom very high to much below the reasonable level market demands, depending on the geographic region. Renewableenergy sources are a safe and environment friendly way to solving the electricity problem.

Wind, solar and geothermal energy are examples of renewable energy sources that can be used to replace the currentenergy mix. Photovoltaic power innovation has now gained the attention of manpower even when it is reduced exposure.This research investigates the creative, economic and technological factors of constructing a solar farm in some of the country's most challenging technologies. This is based on the fact that sustainable energy is critical and interconnectedwith many of the world's most significant opportunities and challenges. As a result, focusing on universal consciousnessaccess alternative energy. Clean energy and most relevantly greater complexity of renewable energy into the global energy mix will promote positive societies and mitigate current issues.

The main objective is by using HOMER software, integrate renewable energy i.e. hybrid (solar and wind) energy efficiently allocate energy infrastructure or meet local energy demand particularly in remote areas.

2. SYSTEM ANALYSIS

Existing System

It contains of turbine and diesel system. In planning any grid, the choices concerning the configuration of the systemmust be analyzed like parts and its specifications for the system style. Size of the parts the provision of energy resourcesand technological choices and therefore the price of energy offered technology.

Disadvantages

- By using wind and diesel, there is a lack of wind supply due to climatic changes.
- By using diesel, it increases cost.
- Also by using wind the accuracy is low.
- By using fossil fuels like Diesel, it causes the environmental pollution and so on.
- To overcome this drawbacks, we use renewable energy which is in eco-friendly manner.

Proposed System

- Each solar and wind (renewable) energy is included.
- Has a lower environmental impact and reduces the reliance on fossil fuel for household energy use.
- Renewable energies are theoretically evaluated in terms of satisfying the family's energy need in the sameway

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as temporary equilibrium is analyzed.

- Offers profitable economic boundary conditions and a lower cost of electricity supply than the national gridtariff.
- It is equipped with a battery facility and connects to the national grid, allowing the customer to choosebetween customer details electricity from the grid or using it at additional electricity hours. Due to environmental condition changes solar and wind generation is alternatively used.

Advantages

- Eco-friendly
- Fuel flexibility
- High efficiency
- Economically low cost compared to fossil fuels.

3. BLOCK DIAGRAM FOR PROPOSED SYSTEM

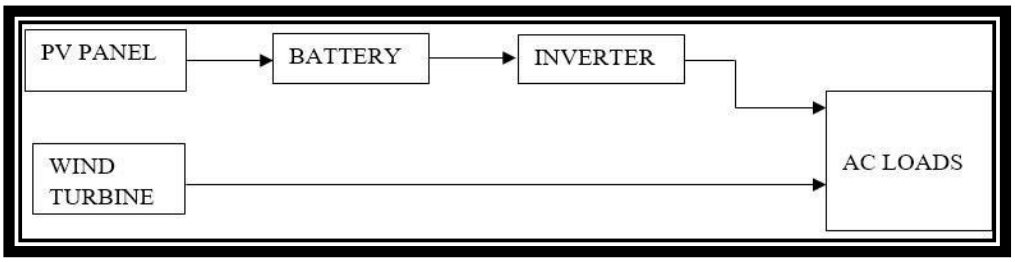

Fig 1: Block Diagram for Grid Connected Energy Systems

4. SYSTEM COMPONENTS

Solar Panel

Photovoltaic cells are made of single crystal silicon PN junctions with a wide light sensitive field, similar to photodiodes, except without the reverse bias. In the dark they have the same performance characteristics as a verylarge semiconductor. Solar energy is the energy that measures the amount of light. The PV panel is a system that incorporates solar energy into electricity.

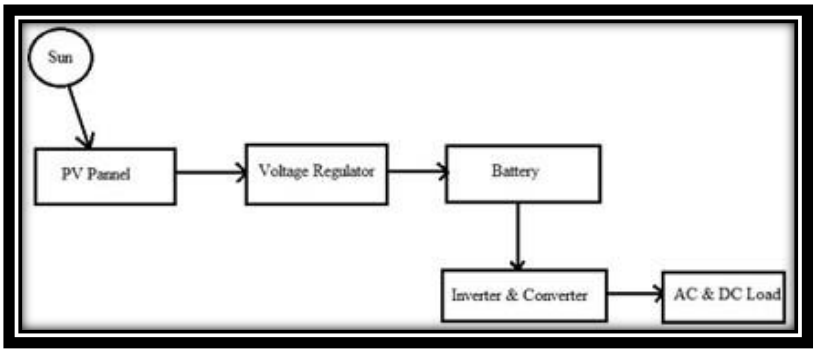

Fig. 2: Solar Design

Wind Turbine

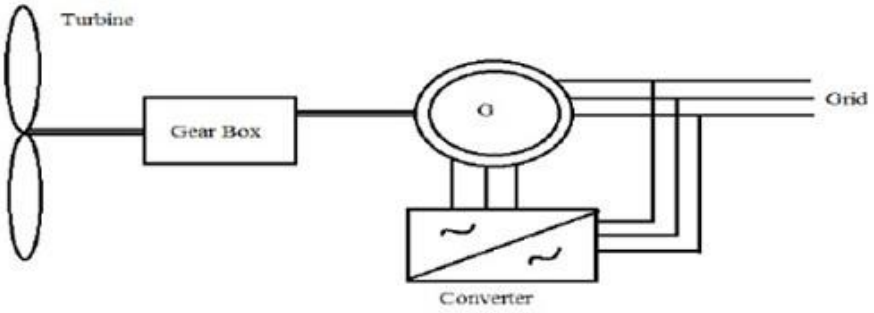

Fig. 3: Design of Wind Turbine

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Wind turbine, like many other distributed generators, provide electricity. Wind results from the air in motion. Wind caused by the uneven heating of the land and the water. The aero turbine is used to convert the wind energy intomechanical energy. The turbines are of horizontal and vertical axis turbine.

Wind speed ranges from 3 to 7 meters per second. At a depth of 182 meters, the average wind speed is 4.12m/s. This power output from a rated power wind turbine can produce 1130kwh of energy per year.

Battery

Batteries are used to set up a rechargeable battery. The efficiency of this battery is 12V and 1250Ah. This batteryhas a huge advantage over other metabolic pathways because the electrolyte participate in the start charging reaction.The open-circuit voltage of the rechargeable batteries can also be used to determine the distribution of charge.

5. SIMULATION SOFTWARE

RET screen, HOMER, i-HOGA and hybrid are standard techniques that can be used to evaluate the efficiency of production of electricity. The HOMER Renewable System Research Method was developed by the National Renewable Energy Lab (NREL) in the United States. HOMER will be able to validate the easiest possible device that could accommodate the pressure in most cost-effective fashion anywhere the program requires a PV, generator, turbine, diesel engine and an adapter of different sizes in this report. HOMER was not expected to assure the smallest possible device that could satisfy the demand in an even more cost-effective way everywhere the optimal resolution ofPV, battery, turbine, ICE and techniques of different length.

6. CIRCUIT DIAGRAM AND ANALYSIS

Circuit Diagram

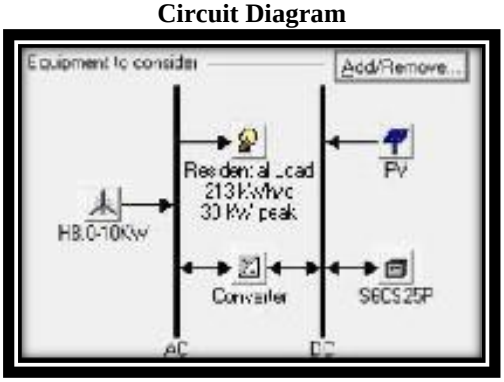

Fig. 4: Circuit Diagram

Analysis

Susceptibility method is typically conducted to measure the outcome of the systems threshold factors, such as radiation change, wind speed and load demand. Typical wind radiation and wind speed for the situation are termed during this study. This is therefore no need to be required to undergo this ionizing and speed analysis. The tolerance ofthe fuel value is not likewise achieved.

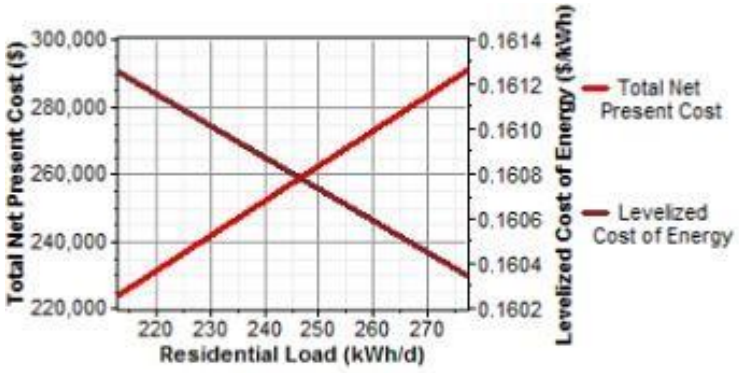

Fig. 5: Sensitivity Analysis for Increase in Load Demand

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7. SOLAR/WIND/TURBINE/ BATTERY SYSTEM

Configuration, everywhere PV, wind and battery systems are used as outlets. Since this approach does not use adiesel engine. In contrast to diesel generator schemes, battery banks have no operation and maintenance cost benefit.Results have been reported on electric power systems. Since the device's implementation is too big and there is adequate wind speed, a significantly bigger propeller is used, resulting in improved energy storage.

8. SYSTEM DESCRIPTION

Electrical Load Profile

The weather prediction research method have been used to arrive at a realistic computational load. The structuraleffect on the transmission system is thought to be totally different from the rated power in six different environmentsand the full load template created by HOMER in this regard.

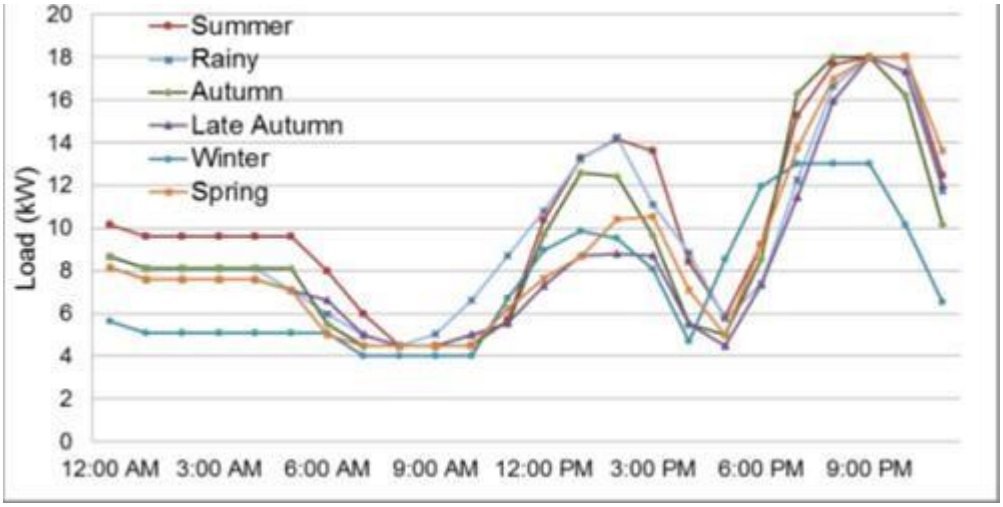

Fig.6: Hourly Average Load Variations in Different Seasons

Strategy of Operation

The strategy of operations are:

- Renewable energy sources such as PV, wind and battery can support the load in contemporaryinstallation.
- Once the production of PV and wind exceeds the energy demands, the battery is changed.
- If the battery is fully charged, the excess energy will be amused to dump the load.
- During the operation of the generator, the battery is not changed by the generator facility.
- The generator power is entirely presented for the load.
- In the event of no radiation or relative humidity, the generator provides the full load.

TECHNICAL SPECIFICATIONS

PV Panel

Specification	Value
Model	Astronergy 255 silver poly CHSM 6610p
Material	60 cell polycrystalline
Maximum Power	250W
Voltage at max. power point	30.70V
Open circuit voltage	38.39V
Short circuit current	8.70A
Current at max. power point	8.35A

Table 1: Specifications for Single PV Panel

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Wind Turbine

Specification	Value
Model	H8-10kw
Rotor blade diameter	8.5m
Number of blades	3 blades/horizontal axis
Cut in /cut off wind speed	3.5/25 m/s
Rated power	15 kw
Rated voltage	230V AC

Table 2: Specifications for Single Wind Turbine

9. RESULTS AND DISCUSSION

The impact assessment of the generator system for the following production loads to the 2 most democratic structures. The primary could be the PV/Wind/Battery system and therefore the ideal solution would be the PV/Windsystem.

Production (KWh/yr)			Consumption (KWh/yr)		
PV array	42,309	28%	AC primaryload	71,260	100%
Wind turbines	109,726	72%			
Total	152,035	100%			

Table 4: Annual Energy Production and Composition of the Hybrid System

Output for Daily Load Characteristics

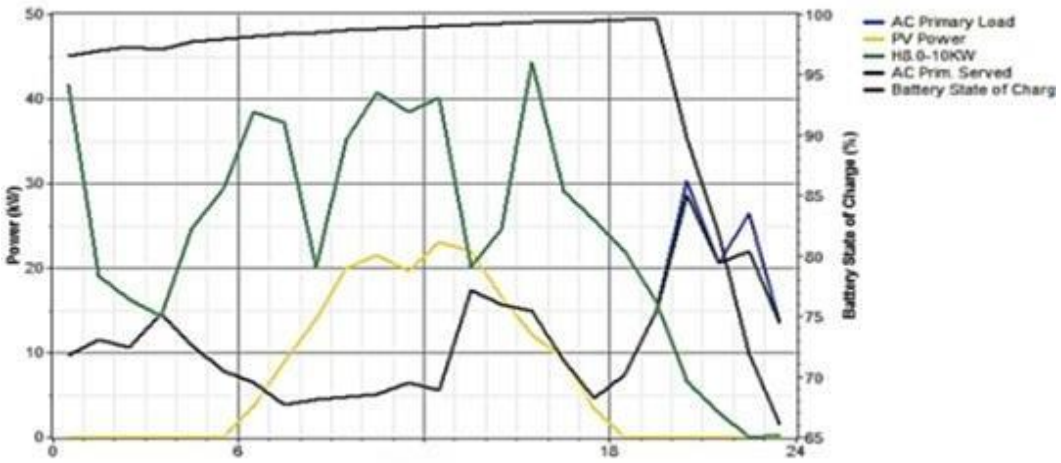

Fig. 7: Daily Load Characteristics

10. CONCLUSION

The usefulness of hybrid renewable energy is primarily based on systems where power production is just not areward. The optimum style consists of the PV system, the wind turbine and the battery system. The load is assumed to be supported by a regular rural route. Most parameters of the study square measure per unit energy price, the initial price, the biennial employee compensation and the total web gift price of the system. The HOMER optimization is capable of identifying the viability of the system as the system has competitive energy prices with alternative achievableconfigurations. The system may be a non-polluting, reliable energy supply with a total web reward price of $254,355, a capital cost of $126,657, a cost of $240,320, and a production and transportation price of $118,398. The annual operating expense is $4897. The price of energy is $0.251 per kWh, which is the lowest of all available configurations.Furthermore, this technique has no exhaust gas emission, whereas the closest competition hybrid system has 13,786 kg/year of waste product gas emission. Sensitivity analysis has shown that the system can also handle increasedloads in the near future

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