Combi Smart Energy Generator

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Abstract -*The main function of Hybrid solar energy is that it obtains energy from both sources- solar energy with the help of PV panels & wind energy from wind turbines. Solar panel absorbs the sunrays and convert-s it into DC current. In addition, a wind turbine move due to the force of wind & its rotor connects with a generator rotates and gives DC current. Now both the current works simultaneously. This hybrid energy system, which combines photovoltaic (PV) and wind power as an alternative source small-scale electric power, where the conventional production is not practical. The proposed system is attractive because of its simplicity, ease of control and low costs. Complete descriptions of the proposed hybrid system with the results of detailed simulations, which determine feasibility, are given to demonstrate the availability of the proposed system.*

Key Words: Renewable, Hybrid, Solar Energy, Wind Energy, Turbine

1. INTRODUCTION

Energy is an integral part of humans which keeps balance between economic development and world peace. Due to development in technology there is increase in demand and supply of energy and hence the annual consumption has increased. It was found out that fossil fuelslike oil, natural gas and coal were alone responsible for three quarters of the total. With the current demand and future development it was estimated that reserves of coal will last for about 200 years, natural gas for about 60 years and oil for 40 years which in turn depends upon the development of technology.Hybrid solar energy attains solar energy with help of PV panels which absorbs the sunrays and converts them into DC Current & wind energy from wind turbines which rotates due to the force of wind along with the generator connected to rotor which then produces AC current. Thus the AC current is converted into DC current with the help of AC-DC converter.

Thus we can say that energy generated from solar panels and wind turbines serves as economical type of energy. This type of Renewable energy is dependent on modern technology which is clean and simple.And since there is great demand of this Renewable energy and it is playing an
important part of human life and will also be of greater importance in future too.

Since there is huge demand of this Renewable energy without any stop in future to there is urgent need of development in production and conservation of this energy at larger scale. Small-scale stand-alone power generation systems are an important alternative source of electrical energy, finding applications in the places where the conventional production is not practical.

The certainty of load demands at any time is considerably increased by the hybrid production systems, which use more than one source of energy. It is possible the high outputs production factors combine wind turbines and photovoltaic arrays with storage technology to master the movements of the production facility. An effective energy storage is necessary to obtain a constant power, the power delivered by wind and solar should be easily converted into energy stored.

1.1 IMPORTANCE OF RENEWABLE ENERGY

As we have already discussed there is great demand and supply of electricity. This also depends on the development of technology. And this demand will be at higher rate in future. There is no alternative source for electricity except Generators which can be used at smaller scale and cannot be implemented in day to day life. Also fueling Generators is also another problem because of its cost and hence it will be difficult to use Generators as an alternative to Renewable energy produced from Solar PV Panels and Wind Turbines. Hence there is great importance of Renewable energy obtained from Solar PV Panels and Wind Turbines therefore there should be techniques developed for the preservation of this Renewable Energy.

1.2 HYBRID PORWER SYSTEMS

There are autonomous electricity generating systems, which obtains energy from various power sources combine them together in one system and provides electric power to the concerned area or location.Because of combination of different energy sources into one single system we get the best possible output results.

1.3 OBJECTIVES

Following are the objectives:

i. To implement Hybridization of energies such as wind & solar energy into a single system which will work simultaneously.
ii. Designing Wind Turbines on highways which will use wind drafted by vehicles passing on highway to generate electricity that can be used in cities.
iii. To reduce or keep the pollution in control generated by burning fossil fuels by implementing new source of clean energy.

2. SOLAR ENERGY

The energy generated from the Sun in the form of solar radiation is called Solar Energy. The Sun is continuously radiating energy continuously from many years and will do so which is one of the most important source of energy for life forms. This energy is used as a Renewable energy which is used to generate electricity with modern technology. Solar energy is one of the most important source of energy which is providing electricity.

Solar energy is the energy generated from the sun which is then harnessed and converted using technologies such as solar heating, solar photovoltaic and solar thermal electricity. Solar energy is a renewable source of energy that is sustainable and totally inexhaustible, unlike fossil fuels that are finite. It is considered to economic and environmentally friendly as it does not involve the burning of fossil fuels.

2.1 HARNESSING SOLAR ENERGY

The amount of solar energy accessible at any given location on the planet is determined by the day of the year, the time of day, and the latitude of the collecting site. The amount of energy gathered can be altered further based on the orientation and shape of the collecting item. The amount of solar energy that reaches the Earth's surface is measured by insolation.

Fig 2.1: Solar Photovoltaic

The amount of insolation received by a location is determined by the angle of the Sun, the amount of dust and water vapour in the air, and the quantity of cloud cover. Only about half of the energy emitted by the Sun reaches the Earth's surface. The remaining energy is either absorbed by the atmosphere or reflected back into space.

The solar constant, which has a mean value of 1.37 106ergs/sec/cm^2, or about 2 calories/minute/cm^2, is the strength of solar radiation at the outer edge of the earth's atmosphere when the earth is taken to beat its average distance from the Sun.

2.2 WIND ENERGY

Wind electricity or wind electricity is the usage of wind to offer mechanical electricity thru wind mills to show electric powered turbines for electric electricity. Wind electricity is a famous sustainable, renewable supply of electricity that has a miles smaller effect at the surroundings in comparison to burning fossil fuels.

Fig 2.2: Windmills

The wind is an intermittent electricity supply, which can't be dispatched on call for. Locally, it offers variable electricity, that's regular from 12 months to 12 months however varies significantly over shorter time scales. Therefore, it should be used collectively with different electricity re-assets to provide a

dependable supply. Power-control strategies inclusive of having dispatch able electricity re-assets (frequently fuel-fired electricity plant or hydroelectric electricity), extra potential, geographically disbursed mills, exporting and uploading electricity to neighboring regions, grid storage, lowering call for whilst wind manufacturing is low, and curbing occasional extra wind electricity, are used to triumph over those problems. As the share of wind electricity in a location will increase the grid can also additionally want to be upgraded. Weather forecasting lets in the electrical-electricity community to be readied for the predictable versions in manufacturing that occur.

3. METHODOLOGY

The methodology adopted for testing the Hybrid System has been divided into two segments namely Hybrid energy system that is combination of two or more energy sources into a single system. It can be defined as "The Energy system which is developed to extract power by more than one energy source called as the hybrid energy system." Hybrid energy system has good reliability, efficiency, less emission, and lower cost.

In this proposed system solar and wind power is used for generating power. Solar and wind has good advantages than other than any other non-conventional energy sources. Both the energy sources have greater availability in all areas. It needs lower cost. There is no need to find special location to install this system.

3.1 WORKING ANALYSIS FOR SOLAR UNIT

i. For assessing the cappotential to generate solar energy, the solar unit is located beneathneath solar in the course of the day.

ii. It is initiated beneath nil battery condition. For the primary hour (i.e., from 10 am-11am), it accepts solar power and generate energy.

iii. This energy is concurrently saved in the battery. The solar energy generated for the duration of this hour is stated down.

iv. In the following hour (i.e. from 11am-12pm), the battery is absolutely tired such that the fee will become nil once more.

v. This is completed with the intention to one by one decide energy generated in every respective hour. The time for entire battery discharge is about 50 minutes.

vi. In the following hour (12pm – 1pm), the sun panel is once more made to just accept power and generate energy. This energy is saved in the battery. The energy generated for this hour is stated down.

vii. The equal approach of alternately charging and discharging battery and noting down the energy generated at the same time as charging for every respective hour is followed.

viii. This checking out approach is taken into consideration pretty powerful because it enables to evaluate the energy technology for each hour with an awesome quantity of accuracy.

ix. Draining out of battery will increase the extent of accuracy withinside the evaluation of energy technology.

3.2 WORKING ANALYSIS FOR WIND POWER GENERATION UNIT

i. For reading the overall performance of the wind energy technology unit, the equal process done for assessing the solar unit is followed.

ii. In the primary hour, the turbine is made to rotate and generate energy and, in the subsequent hour, the battery is absolutely discharged.

iii. This process is repeated and the values of energy generated for every respective hour are stated down.

iv. In this manner, evaluation has been completed upon each structures and the effects had been mixed which will evaluate the provision and performance of every supply in that unique area.

3.3 WORKING OF WIND TURBINE

i. When the wind moves the rotor blades, blades begin rotating.

ii. The turbine rotor is attached to a excessive-velocity gearbox. Gearbox transforms the rotor rotation from low velocity to excessive velocity.

iii. The excessive-velocity shaft from the gearbox is coupled with the rotor of the generator and consequently the electric generator runs at a better velocity.

iv. An exciter is wanted to provide the specified excitation to the magnetic coil of the generator discipline device in order that it may generate the specified energy.

v. The generated voltage at output terminals of the alternator is proportional to each the rate and discipline flux of the alternator.

vi. The velocity is ruled through wind energy that is out of manage. Hence to preserve uniformity of the output energy from the alternator, excitation need to be managed in keeping with the provision of herbal wind energy.

vii. The exciter present day is managed through a turbine controller which senses the wind velocity.

viii. Then output voltage of electrical generator(alternator) is given to a rectifier in which the alternator output receives rectified to DC.

ix. Then this rectified DC output is given to line converter unit to transform it into stabilized AC output that is in the end fed to both electric transmission community or transmission grid with the assist of step up transformer.

x. An greater unit is used to provide the energy to inner auxiliaries of wind turbine (like motor, battery etc.),this is called Internal Supply Unit.

4. ADVANATGES AND DISADVANTAGES

Following are the advanatges:

i. Solar and Wind power generating systems can be installed at the same place.

ii. Since solar panels can be on towers of windmill, the space occupied is less.

iii. Alternating Current and Direct Current loads booth can be operated.

iv. Bot are very flexible to use.

v. It require low maintenance cost.

vi. This type of system is more economical compared to the usual solar or wind power project.

vii. Since the sources of energy used are renewable, it is environment friendly and economic. Thus it serves in protecting and retaining the environment.

Following are the disadvantages:

i. It requires higher installation cost.

ii. Since it's a hybrid structure it causes difficulty in arrangement process.

5. LIMITATIONS

i. Solar Designing process of Hybrid Structure is very complicated.

ii. It takes additional design effort as compared to conventional solar and wind projects.

iii. The operation of the system is complex.

iv. More complex control systems are required for handling: – power generation – storage – transmission – usage options higher costs.

6. CONCLUSION

i. By combining the two intermittent sources of Wind and Solar and by incorporating maximum power point tracking (MPPT) algorithms, the system's power transfer efficiency and reliability can be improved significantly.

ii. By implementing this Hybrid Structure System the villages which are far away from construction site of large power generating stations such as hydro and nuclear can be provided with electricity.

iii. It will satisfy the supply-demand of electricity with clean hybrid power station.

iv. Due to weather changes the conventional solar and wind powers will not be efficient as when compared to this Hybrid Structure system of Solar and wind.

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