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A Research Paper on Design – Development of Hybrid Charging Station for EV/Home Appliances

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ABSTRACT – Here we can see that the demand of electricity is increasing as the day passes. Conventional sources of energy are becoming rare. The use of fossils fuels for making electricity may cause air pollution which results into climate changes all over the world. This is also leading to the major health problems of Human Beings as well as Animal & Plant. In order to reduce the use of conventional sources, we will have to do production of electricity by our own by using renewable resources such Solar, Wind power, etc. The hybrid design of solar and wind power will have an impact in all seasons, i.e., When there is sunlight and flow of wind simultaneously, this design will help to extract electricity from both power sources. And when there is only sunlight and lack of wind flow, then solar power & when there is only wind power and no sunlight, then wind power can be used to produce electricity.

1. INTRODUCTION

In development of any sectors and at any corner of country, energy plays vital role in this case. In Mar 2014, India had to face major energy shortages in which Maharashtra, Madhya Pradesh, Uttar Pradesh, Punjab were the most affected states. The primary sources of energy such as coal, oil, natural gas making environment worst and harmful day by day which can overcome/stopped by increasing production of own power/renewable sources. Renewable sources are solar, wind power, etc. Currently, Solar power is being used for producing household electricity/heating water and wind turbines are being used for making commercial electricity.

Hybrid power sources can be best solution for cost effectiveness, reliability. The design of using renewable resources such solar & wind as hybrid solution can make required results happened. But we all know, there are slightly disadvantages of some kind, as initial installation cost of Solar Panels, Wind Turbines, Battery for storage electricity. But also as end result, it will always be reliable and cost effective for longer run.

2. PROBLEM STATEMENT

Energy as a key point in National Economic Development being most demandable day by day. In previous year (2022-23), energy requirement was 10,15,908 MU and now in current year (2023-24), it has been increased up to 8.9 % as compared to last year. In addition to this, after COVID-19 pandemic, most of the sectors has gone to WFH strategy. Also the increase in digitization, most of the work can be done from remote places. Thereby energy consumption also increased drastically.

In order to meet this energy demand, use of single renewable power source is not sufficient to cope up with requirement of energy.

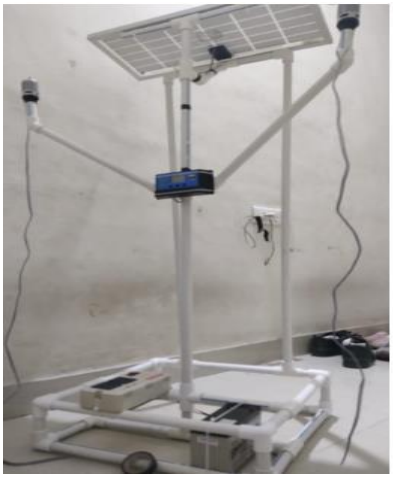
3. OBJECTIVE

1) To develop the hybrid combination of Solar & Wind power sources to generate electricity for charging Electric vehicles/Home Appliances.
2) To develop system to provide continuous flow of power irrespective of seasons/climate conditions.
3) To develop reliable system for generating electricity with cost effectiveness.

4. SCOPE

1) This Proto Setup can be installed in road side/on divider of road as large scale in order to run by carrying large flow of wind created by movement of vehicles and simultaneously sunlight is being extracted and generating electricity.
2) It can be installed in unused land for industrial/commercial usage.
3) As world is heading towards Electric vehicles, we can setup EV charging station at required locations wherever is needed to which electricity will be supplied.
4) It can be installed on home terrace and generated electricity can be used for charging/running home appliances.

5. COMPONENTS OF MODEL



(Complete Structure)

1) Solar Panel –
The Polycrystalline solar panel is used in this proto model as cost effective for extracting energy from sunlight and converting into electrical energy. It is of 15W.

2) PVC Pipes and Joints–
The PVC pipe of 1.5 inch and 25 is used to design structure as Wind Tree for this model, refer attached below snap. In addition to that, 3 way joints (08 nos), T joints (04 nos), 4 way joints (01 nos), Elbows (03 nos), Sue (04 nos).

3) Solar Charge Controller–
The Solar charge controller of 12V, 6 Amp is used for controlling the fluctuation of energy from solar panel and providing it to battery for further storage.

4) Wind Turbine (Designed)–
The Savinous turbine is one of the simplest form of wind turbine in S shape. PVC black water pipe of 4 inch is cut in way to make wind turbine by attaching 2 opposite sides as shown in below snap.

5) Dynamometer–
The dynamo uses commutators to produce direct current. In this case, rotary energy from turbine is converted to electrical energy.

6) Electric Cable–
The Electric cable is used for deriving electrical energy throughout this proto model (From Solar Panel & Wind Turbine to the appliance to be charged).

7) Wind Charge Controller -
The wind charge controller ensures to avoid transferring fluctuation of energy from wind power to battery. It is of 12V.

8) Battery -
The Lead Acid Battery of 12V is used for storing energy generated by the combination of wind and solar power sources.

9) Invertor -
The Device named as invertor is used for converting DC supply to AC getting from battery.

6. MERITS

1) It will reduce dependency on Fossil Fuels.
2) This proto design is simple/no complexity.
3) Less maintenance cost than conventional sources.
4) Safer than conventional sources.
5) Usage of this will reduce air pollution caused by fossil fuels.

7. LITERATURE REVIEW

1) Generation of Electricity by Wind Tree (Shekhanabi B Chalageri, Akash M Deshpande, Manjunath S Banad, Anoop S Pavate,Prof. Sujata Eresimi)

This author in the present paper, gives a brief description of the general features of hybrid energy. In this paper, wind and solar hybrid systems have been designed for travelers and remote areas where electricity is not easily available. Since, this charger is based on a non-conventional source of energy and hence, the running cost of this charger is very low.

2) Solar Power Operated Table For Charging Electronic Gadgets, Dinesh Keloth Kaithari,Amira Khamis Salim Al Ismaili,M. Achuthan

The solar table is taking advantage from the sunlight. Solar table will collect all the energy from the sunlight to help the people to charge the electronic gadgets. This will be an eco-friendly solar panel table.The solar table also features rec connectivity harging for many electronic gadgets such as laptops and smartphones. The solar panel needs to pull power from the battery which works like source power backup at night. There is USB port to charge the phone.

3) Design of Aeroleaf Wind Turbine, Abdulkareem Abdullah A Alshammari, Mubarak Jazzaa N Alharbi, Abdulrahman Hassan D Alkaabi, Abdullah Ahmed Z Alghoneman

From our research we were able to come up with many important conclusions and suggestions which will profit the future advancement of individual vertical pivot wind turbines. We could outline a VAWT framework that enhanced power yield when contrasted with the past projects. From our results we were able to recommend new design aspects to improve the system and efficiency.

8. CONCLUSION

In this, we have gone through objective, components used along with snaps, scope of model, its merits & literature review. At the end, it has been concluded that, renewable energy with hybrid solution can offer impactful results in case of producing electricity by our own at large scale with effective/cheaper cost.

9. REFERENCE

1) Generation of Electricity by Wind Tree (Shekhanabi B Chalageri, Akash M Deshpande, Manjunath S Banad, Anoop S Pavate,Prof. Sujata Eresimi)2) This proto design is simple/no complexity.
2) www.google.com
3) www.wikipedia.com