Review on Development of Solar-Wind Based Hybrid Power System Using Super Capacitor

Prof. Vedanti Hardas
Electrical Department
KDK Collage of Engneering ,
Nagpur, India

Anjali Parsawar
Electrical Department
KDK Collage of Engneering ,
Nagpur, India

Mansi Birkhede
Electrical Department
KDK Collage of Engneering ,
Nagpur, India

Trupti Bukne
Electrical Department
KDK Collage of Engneering ,
Nagpur, India

Prashant Gedam
Electrical Department
KDK Collage of Engneering ,
Nagpur, India

***Abstract*— In today's technology-driven world, electricity is one of the most important things in our daily lives. Because we all don't know that renewable energy sources run out immediately. So it is time for us to shift our focus from conventional energy sources to unconventional energy production. The hybrid system can be used both in industry and at home. In this project we will generate electricity from unconventional and conventional sources. All renewable energy sources, such as solar energy, wind energy, are used to produce electricity in industry. This paper deals with the use of a solar-electric-wind system in the design of a hybrid energy system. Use of super capacitor can reduce the need to maintain electrical cables and we can manage the load demand at very high times. The review shows that the renewable hybrid energy system. It creates a pollution-free environment.**

Keywords*— *Solar energy , wind energy , Hybrid power system , Super capacitor , power saving etc.

I. INTRODUCTION

Renewable energy sources provide clean energy that is sufficient on earth. These renewable sources are obtained from land, water, sun, plants, etc. These sources are widely used in the production of electricity. Solar and wind power generation are attractive sources because they are environmentally friendly. A hybrid system is a mixture of different renewable energy sources such as solar energy, biomass electricity, wind energy, etc. In hybrid energy production, the produced power is first stored in the battery and then used to meet the energy demand. Today, the wind and solar energy system is growing rapidly, and the traditional energy source is depleting every day and disappearing in the coming years. So we must look for a new source of energy that is non-polluting and easily accessible. On sunny days you get energy from the sun and on cloudy days from the wind system.

A growing global problem related to rapid economic development and a relative lack of energy, because we all do not know that renewable energy sources are quickly running out. So it is time for us to use both conventional and non-conventional sources of energy to generate electricity. Today,

Supercapacitors are widely used. These high pressure and efficient energy storage devices are also known as ultracapacitors or electrochemical double layer capacitors (EDLC). Their favorable properties make them ideal for use in energy storage systems, including the ability to charge and discharge quickly without losing efficiency in the long term. The supercapacitor package can be used in a HESS (battery-supercapacitor system), which integrates various energy storage technologies with a specific control strategy that maximizes the benefits of each energy source used for overall efficiency.

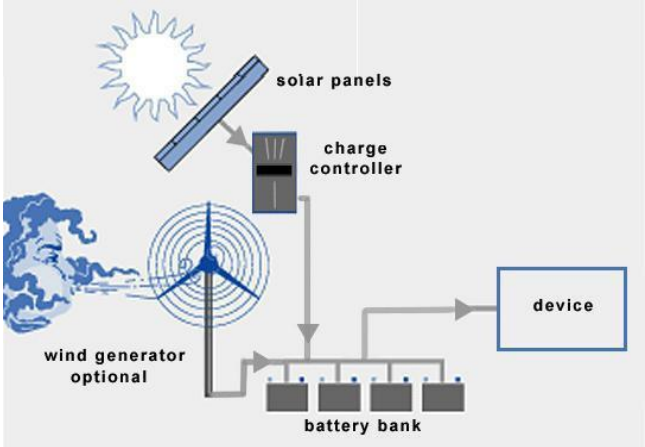

Fig. 1 Schematic of a conventional photovoltaic Hybrid System.

II. LITERATURE SURVEY

To ensure faster hybrid charging, outboard chargers that provide high direct current are used. It's worth noting that with external chargers, the entire AC/DC conversion is done by an independent inverter.

Therefore, it is important to increase the power of the transformers to ensure faster charging. The results of several published studies have been used in the design and development of faster, more efficient and reliable charging stations.

• Pritesh P. Shirsath and others. 2016 [1], In this paper wind and solar energy used for electricity production, availability and convertibility to electricity. This work involves the implementation of a hybrid energy system

suitable for several applications, which operates on a circuit designed to utilize solar and wind energy. This would increase the output of the wind turbine in the winter, while the solar panels would produce their peak power in the summer. Hybrid energy systems often produce greater economic and environmental performance than wind, solar, geothermal or trigeneration systems alone.

• Laukik Sanghavi et al. 2016 [2], In this paper authors try to harness vibration and solar energy and use them to generate electricity in the future. Since both sources have their own disadvantages, they combine the energies of both to remove limitations and increase efficiency. For maximum efficiency, such systems should be installed in high-traffic areas such as train stations, shopping malls, bus stops and high-traffic walkways.

• Yatin Sharma et al. 2017 [3], that research investigated and discovered the possibility of using piezoelectricity to convert the mechanical vibrations of the road into useful electricity production. They also investigated the feasibility of using solar concentrators to increase the power of a solar panel to significant levels.

• K. Aneelkumar et al. 2017 [4], The aim of this project is to generate electricity from continuously renewable energy sources. Renewable energy sources in this project are solar electricity and rainwater. This project is based on the principle of using a hybrid mechanism, in which solar energy technology is combined with piezoelectric technology.

• Bharat Raj Singh and others. 2018 [5], In this research, the development of hybrid systems is one of the most convenient and efficient solutions for electricity production compared to non-renewable energy sources. It is not only cheaper, but also does not harm the environment. Another thing is that it can generate electricity in a hilly area where it is quite difficult to transmit electricity by traditional methods. Depending on the requirement, its settings can be decided.

• Bhusari Priya Govind and others. 2015 [6], this article implements an efficient way to generate electricity using solar energy. A solar energy system is used to collect maximum energy from the sun. the proposal is to more effectively use the solar panels implemented in this project and apply a realistic experimental approach to increase the solar energy to a significant level and implement a piezoelectric harvesting circuit.

• Li Wang et al. 2018 [7], this paper proposes a highly efficient green energy-saving charging station designed for electric vehicles. This article asserts and proposes integrated electric vehicle charging stations that integrate solar energy generation, wind energy utilization, battery energy storage technology, efficient DC-DC conversion and other new energy applications that not only improve new energy sources , but also avoids the effect of new energy availability on the grid.

• Jagruti Gowardhan and others. 2022 [8], this paper explains the relative achievement of a hybrid Solar-Wind charging station using a Buck and Zeta converter for DC voltage balancing. Proposed system analysis in MATLAB Simulink environment. In the world of electric technology, electric vehicles play a key role in saving energy and reducing harmful greenhouse gases.

• Nilesh Dhongade and others. 2022 [9], This project describes a solar and wind-based charging mechanism (SWCM) that generates current to charge electric vehicle (EV) batteries. The renewable charging station consists of both a wind generator and PV (solar electric) modules. A settlement mechanism based on wind energy significantly reduces the need for fossil fuels in electricity production, which reduces CO2 and carbon dioxide emissions.

• Haiying Li et al. 2013 [10], In this work, a solar-wind hybrid charging station for electric vehicles was designed to generate electricity according to the wind and solar situation in Tangshan coastal areas. Important components such as wind turbines, solar modules, batteries, inverter and other control devices were studied. LPSP was used as a control condition to determine the power of the components to obtain configurations that realized the energy need and cost of each configuration when other control conditions were calculated to optimize the system.

So many researcher investigates the usage of EV is directly affected by the present charging technique. Recharging stations are necessary for longer drive vehicles and it is commonly used in few countries. The traveling distance depends on the capacity of energy storage present in the vehicle. The recharging stations are needed for long distance travel. In this paper, we have introduced a new hybrid renewable charging mechanism for EVs using supercapcitor.

III. CONCLUSION

This paper has reviewed the challenges and ways to find the reliable system using solar and wind energy with the use of supercapacitor. This paper gave an overview of different research work related to renewable energy and supercapacitor. This work will take place considering the hybrid electric system, which will be completed in the near future. The performance of the proposed centralized energy management strategy with interleaved conversion steps is investigated and validated under different real-time scenarios. These scenarios consist of different weather profiles covering a 24-h horizon and different alternating hybrid power load conditions. As we know, the hybrid system has a higher unit cost, but it makes efficient use of available resources. This hybrid system can also recover from accidental or unwanted situations. The hybrid system can also fill remote and rural areas with energy. So it is clear that a hybrid system is a better choice.

REFERENCES

[1]. Pritesh P. Shirsath “Solar-Wind Hybrid Energy Generation System”, B.E., Department of Electronics, NMIET, Savitribai Phule Pune University, Pune, India , International Journal of Engineering Research and General Science Volume 4, Issue 2, March-April, 2016.

[2]. Laukik Sanghavi , “Hybrid Vibration and Solar Power Generation System using Piezoelectric Sensors and Fuzzy Logic based Sun Tracking Solar Panels” ,Department of Instrumentation & Control Engineering Department of

Instrumentation & Control Engineering AISSMS's IOIT, Pune India , International Journal of Science Technology & Engineering | Volume 2 | Issue 10 | April 2016 .
[3]. Yatin Sharma, "Hybrid Power Generation Using Solar Panel And wind energy", B.tech in Electronics Engg. BVDUCOE, Pune, Maharashtra, India, International Research Journal of Engineering and Technology (IRJET) , May -2017.
[4]. K.Aneelkumar , Design Of Multi Electricity Generator Using Solar And Piezo Electric Transducer , Student Department of EEE, Pragati Engineering College, Surampalem, A.P , International Research Journal of Engineering and Technology (IRJET) , July -2017.
[5]. Bharat Raj Singh , "Solar-Wind Hybrid Power Generation System", B.tech Students, Department of Electrical and Electronics, KIET Group of Institutions, Ghaziabad-201206, Uttar Pradesh , International Research Journal of Engineering and Technology (IRJET) , Jan-2018.
[6]. Ms. Bhusari Priya Govind,"A Hybrid Piezoelectric-Solar Based Power Generation System ", Department of E&TC Engineering, Bharati Vidyapeeth's College Of Engineering For Women, Pune, India , International Journal of Advanced Research in Computer and Communication Engineering Vol. 4, Issue 3, March 2015.
[7]. Li Wang , "Design of Electric Vehicle Charging Station Based on Wind and Solar Complementary Power Supply", 6th International Conference on Computer-Aided Design, Manufacturing, Modeling and Simulation (CDMMS 2018).
[8]. Jagruti Gowardhan1, Souras Ghotekar2, Shibu Thomas3 Hybrid Solar-Wind Charging Station for Electric Vehicles and Its Simulation , International Journal for Research in Applied Science & Engineering Technology (IJRASET) , Volume 10 Issue VIII Aug 2022.
[9]. Nilesh Dhongade*1, Rakesh Dhopare*2, Arpita Malode*3, Hrushikesh Dandwate*4 , Hybrid Solar-Wind Powered Charging Station For Electric Vehicles , International Research Journal of Modernization in Engineering Technology and Science, Volume:04/Issue:05/May-2022.
[10]. Haiying Li, Hao Liu, Aimin Ji, Feng Li, Yongli Jia , Design of a hybrid solar-wind powered charging station for electric vehicles , National Technology Support Program of China , IEEE 2013.
[11]. A. Adejumobi,S.G. Oyagbinrin, F. G. Akinboro & M.B. Olajide, "Hybrid Solar and Wind Power: An Essential for Information Communication Technology Infrastructure and people in rural communities", IJRRAS, Volume 9, Issue1, October 2011, pp 130-138.
[12] Kavita Sharma, Prateek Haksar "Designing of Hybrid Power Generation System using Wind Energy- Photovoltaic Solar Energy- Solar Energy with Nanoantenna" Internationa Journal of Engineering Research And Applications (IJERA) Vol. 2, Issue 1,Jan-Feb 2012, pp.812-815 .
[13] Sandeep Kumar, Vijay Kumar Garg, "A Hybrid model of Solar-Wind Power Generation System", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE), Vol. 2, Issue 8, August 2013, pp. 4107-4016.
[14] International Journal of Electronic and Electrical Engineering. ISSN 0974-2174, Volume 7, Number 5 (2014), pp. 535542 © International Research Publication House http://www.irphouse.com Hybrid Renewable Energy System: A
[15] Arjun A. K., Athul S., Mohamed Ayub, Neethu Ramesh, and Anith Krishnan," Micro-Hybrid Power Systems – A Feasibility Study", Journal of Clean Energy Technologies, Vol. 1, No. 1, January 2013,pp27-32.