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EV Charging from Multiple Sources

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ABSTRACT—

Dependencies on fossil fuel for day to day activities must be reducing due to limited stock of fossil fuel resources, also to prevent earth atmosphere. Optionally it's necessary to increase the usage of natural resources as it is available in abundant . Energy crises led to fall of nation due to dependencies for fuel, gas coal petroleum on other countries which in turn leads to nation falls bankrupt just like srilinka. Also use of fossil fuel leads to pollutions which is destroying earth atmosphere , increasing growth in few diseases such as corona , money pox, etc destroying human health and reducing human life, that why becoming necessary to be independent as well as utilization of natural resources and pollution free clean energy for day to day needs of energy bin transportation, electricity generation. This paper suggest the basic development and design for cost effective energy generation and utilization from combination of renewable energy sources such as solar, wind hydro power generation. Design shows maximum utilization of natural resources for energy supplies to industries, homes as first preference and if natural resources not Available at time then Switching over to fossil fuels or grid supply. In turn reducing energy crises, reducing pollution preventing earth atmosphere, saving nation fund by becoming independent and self generation of power to cop up energy requirements saving from bankrupt, saving resources for future generation. Design shown in this thesis achieves development of low cost affordable AC/DC micro grid for residential energy management. Design achieves real time balancing between multiple renewable sources and available grid from mseb.

I. INTRODUCTION

In fewer than ten decades, according to the World Energy Forum, fossil fuels including coal, oil, and gas will run out. Combined with the urgent need to stop the harmful climate changes, this has compelled planners and policymakers to explore for alternative sources or maximum utilization of renewable energy sources. The most significant event in international climatic cooperation will be the 2015 United Nations Climate Conference in Paris. In order to achieve sustainable growth and prevent catastrophic climate change, it was reiterated that a swift and global shift to renewable energy technology was necessary. The first ever universal, binding global climate agreement was ratified by 195 nations. In fact, several nations throughout the world have already made major investments in renewable energy technology in order to meet their electrical needs and cut emissions. According to the World Energy Outlook published by the International EnergyAgency, the global supply of renewable energy will increase from 1,700 GWe in 2014 to 4,550 GWe in 2040. At the end of 2015, there were 1, 985 GW of renewable energy capacity worldwide. In 2015, 152 GW of additional renewable energy production capacity was added. In 2015, there was an 8.3 percent increase in renewable capacity. In 2015, Asia made up 58 percent of the increase in renewable capacity India is moving forward with determination to create renewable energy in order to stop climate change and in light of the depletion of conventional energy sources. India has a lot of potential for producing electricity using renewable energy sources. There is an estimated 896,602 MW of renewable energy (RE) potential in India, which is made up of 25,090 MW of bio-energy, 19,749 MW of small hydropower, 102,772 MW of wind power

Renewable energy resources and significant opportunities for energy efficiency exist over wide geographical areas, in contrast to other energy sources, which are concentrated in a limited number of countries. Rapid deployment of renewable energy and energy efficiency, and technological diversification of energy sources, would result in significant energy security and economic benefits. It would also reduce environmental pollution such as air pollution caused by burning of fossil fuels and improve public health, reduce premature mortalities due to pollution and save associated health and diseases. Renewable energy sources, that derive their energy from the sun, either directly or indirectly, such as hydro and wind, are expected to be capable of supplying humanity energy for almost another 1 billion years.

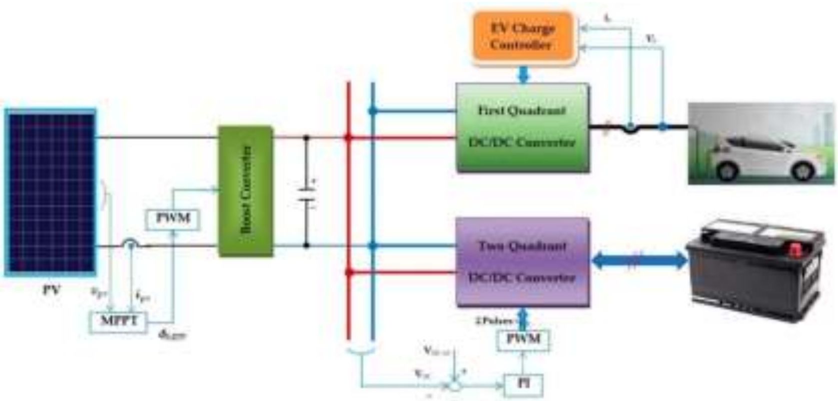
II. REVIEW OF LITERATURE

India is moving forward with determination to create renewable energy in order to stop climate change and in light of the depletion of conventional energy sources. India has a lot of potential for producing electricity using renewable energy sources. There is an estimated 896,602 MW of renewable energy (RE) potential in India, which is made up of 25,090 MW of bio-energy, 19,749 MW of small hydropower, 102,772 MW of wind power, and 748,990 MW of solar power.Through its policies and programmers, the Indian government has prioritized the growth of the RE sector in its pursuit of energy security and minimizing environmental effect. Emerging renewable energy sources include wind, solar, and small hydro.Greater energy security, better energy access, and more job possibilities will all be made possible by the substantial higher capacity objective of renewable. India would overcome several wealthy nations to become one of the world's top producers of green energy if these lofty goals are met.Figure 1 shows the year-by-year goals established by the Ministry of New and Renewable Energy (MNRE) to reach the scaled-up target of 1,75,000 MW of installed renewable capacity by 2022.

Fig-1: Year wise targets of renewable energy sources.

The capacity has been adjusted to arrive at total capacity from RES of 1, 75000 MW by 2021-22(Source-NRE). The task of transferring electricity from power generating to the final userefficiently and reliably falls on the electric power grid. Electricity generation, transmission, and distribution systems are the three main parts that make up the grid. In order to monitor and manage every aspect of the grid, a SCADA system is used. The 1950-based standards upon which the current electrical grid is founded make it an outdated, ineffective, and weakly constructed system. In the last 40 years, there have been five significant blackouts, which show the electricity grid's vulnerabilities. Smart grids and Smart micro grids were developed in order to address these problems, as well as the rising demand for quality and availability, the integration of renewable energy sources, and the growing threat of terrorist attacks. In essence, what makes the grid smart is the digital technology that enables two-way communication between the utility and its customers as well as the sensing along the transmission lines. The smart grid will be made up of equipment, computers, automation, and emerging technologies like the Internet of Things (IoT), but unlike the internet, it will cooperate with the electrical grid to a.dapt digitally to our rapidlyshifting demand for electricity. The Smart Grid gives a once-in-a-lifetime chance to usher the energy sector into anew era of dependability, availability, and efficiency that will improve our economy and the health of the environment.

III. PROPOSED SYSTEM/PROBLEM DEFINITION



MPPT

Maximum Power Point Tracking (MPPT) is a technologycommonly used in renewable energy systems, especially in solar photovoltaic (PV) systems. Its primary purpose is to optimize the power output

from a solar panel by adjusting the voltage and current to operatethe panel at its maximum power point, which varies with factors like sunlight and intensity of temperature.

PWM

PWM stands for Pulse-Width Modulation, a technique used in electronics and electrical engineering for various applications, including controlling the speed of motors, regulating the brightness of LEDs, and ore. Here's some key information about PWM

❖ Basic Principle:

PWM involves rapidly switching a digital signal on and off (high and low) at a specific frequency. The ratio of time the signal is in the high state to the total time of one cycle determines the "duty cycle."

❖ Du BOOST ty Cycle

The duty cycle is expressed as a percentage and represents the fraction of time the signal is in the high state during one cycle. It controls the average power delivered to a device or component. A higher duty cycle results in more power being delivered.

• Converter

Charging electric vehicles (EVs) from multiple sources can involve complex power management and conversion systems. A boost converter, also known as a step-up converter, is one component that can be used in such scenarios to efficiently increase the voltage

Boost Converter for EV Charging from Multiple Sources:

Basic Function:

A boost converter is a type of DC-DC converter that takes a lower voltage input and increases it to a higher voltage output. In the context of EV charging, it can be

used to boost the voltage supplied by multiple sources, such as different batteries or charging stations, to a level suitable for charging the EV's battery.

Power Management:

When you are charging an EV from multiple sources (e.g., solar panels, grid power, and a backup generator), a boost converter helps manage and combine the power from these sources efficiently. It can ensure a consistent and suitable voltage for the EV's battery

Project Scope

Infrastructure PlanningIdentifying locations for charging stations, considering factors like accessibility, power availability, and future demand projections.

Charging Station Design

Designing charging stations to accommodate different types of connectors and charging speeds, ensuring compatibility with various EV models.

Power Management

Implementing systems to manage power distribution efficiently, prioritizing renewable sources when available and optimizing charging schedules to minimize grid strain.

Billing and Payment Systems:

Developing mechanisms for users to pay for charging services, including subscription models, pay-per-use options, or integration with existing payment platforms. Scalability and Future Expansion

Designing the system to

IV.OBJECTIVE OF PROPOSED SYSTEM

The main objective of the thesis is to implement a power system that is a hybrid of both Photovoltaic and wind powers. The step by step objectives are

To study and model PV cell, PV array and PV panels

To study the characteristic curves and effect of variation of environmental conditions like temperature and irradiation on them

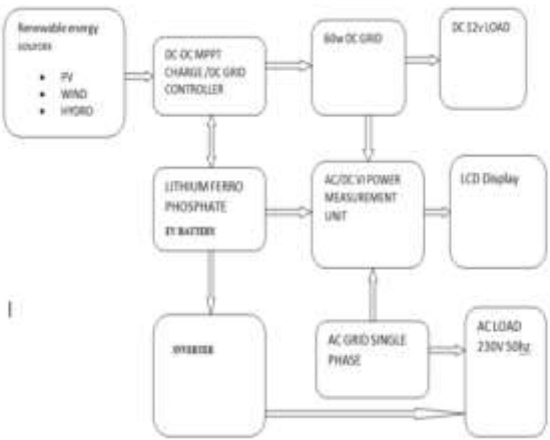
To study the PV modules behavior under partial shading condition

To trace the maximum power point of operation the PV panel irrespective of the changes in the environmental conditions

To study and simulate the wind power system and track its maximum power point

Implement hybrid system

XXIII: METHODOLOGY



Block diagram for tracker unit

1] MCU: The MPPT control circuit is implemented in a microcontroller, that has 8bits analog-to-digital (A/D) converters and two four PWM mode signals. The buck/boost converter is controlled by the microcontroller. It read the voltage and current of the solar panels through the A/D port of controller and calculates the output power. It also calculate power by reading the voltage and current of battery side in same way and send corresponding control signal to the boost converter and control the duty cycle of the converter by PWM signal through controller to accordingly increase, decrease or turn off the DC to DC converter. The avr is a perfect combination of performance, features, and low power consumption for this application. The control circuit compares the PV output power before and after a change in the duty ratio of the DC/DC converter control signal. It is expected that the MPP presents a constant oscillation inherent to the algorithm.

2] DC-DC convertor:-

There are several topologies available for DC-DC converter. Among them buck converter is in an increasingly popular topology, particularly in battery powered applications, as level of the output voltage can be changed with respect to input voltage. The commonly used a converter in PV systems is a zeta DC/DC power converter. It ensures, through a control action, the transfer of the maximum of electrical power to the load. The structure of the converter is determined according to the load tobe supplied. In this article we focus on the step-up DC/DC converter (Buck/Boost converter). MPPT uses the same converter for a different purpose, such as regulating the input voltage at the Maximum power point and providing load matching for the maximum power transfer.

3] Mppt:

A typical solar panel converts only 30 to 40 percent of the incident solar irradiation into electrical energy. Maximum power point tracking technique is used to improve the efficiency of the solar panel. According to Maximum Power Transfer technique, the output power of a circuit is maximum when the source impedance matches with the load impedance. In the source side a buck converter is connected to a solar panel in order to enhance the output voltage. By changing the duty cycle of the buck converter appropriately by PWM signal the source impedance is matched with that of the load impedance. There are various MPPT techniques are proposed. Among those methods, the perturb and observe (P&O) and incremental conductance (INC) methods are widely used although they have some problems such as the oscillation around MPP and confusion by rapidly changing atmospheric conditions. In this proposed system perturb and observe MPPT algorithm is used. In this method the controller adjusts the voltage by a small amount from the array and measures power, if the power increases, further adjustments in the direction are tried until power no longer increases. This is called P&O method. Due to ease of implementation and cost effectiveness, it is the most commonly used MPPT method. The voltage to a cell is increased initially, if the output power increase, the voltage is continually increased until the output power starts decreasing. Once the output power starts decreasing, the voltage to the cell decreased until maximum power is reached. This process is continued until the MPPT is obtained. This result is an oscillation of the output power around the MPP. PV module's output power curve as a function of voltage (P-V curve), at the constant irradiance and the constant module temperature, assuming the PV module is operating at a point which is away from the MPP. This P&O algorithm periodically increment or decrement the output terminal voltage of the PV cell and comparing the power obtained in the current cycle with the power of the previous one. If the power is increased, then it is supposed that it has moved the operating point closer to the MPP. Thus, further voltage perturbations in the same direction should move the operating point toward the MPP.

If the power decreases, the operating point has moved away from the MPP, and the direction of perturbation should be reversed to move back toward the MPP.

4] Storage: storage device is 12v lead acid/lithium ion dry battery.

IV. Conclusion

To conclude, managing electric vehicle (EV) charging for multiple sources is essential for efficient and equitable utilization of charging infrastructure. Implementing smart charging solutions, grid integration, and equitable pricing models can help balance the demand and supply of EV charging, ensuring a smoother transition to sustainable transportation. Collaborative efforts between governments, utilities, and EV charging providers are crucial in achieving seamless and reliable chargingecosy

V. Future scope

Today electric vehicle stockpiles around the world are growing rapidly How guarantee of sustainable rise of EV ownership and how to allow full play of scalable development are two potential orientations in WEVC under the trend of industrial prosperity. Furthermore, developing technologies, materials, and theories can help WEVC become even more competitive. Additionally, power electronics can gain by using modern materials. For one reason, switching loss is a significant cause of energy waste in a WEVC system, alongside flux leakage. Though static WEVC can free up operators' hands, it does little to improve charging station adaptability. Here, the benefits of dynamic WEVC become clear. Broadly speaking, trambased and on-road varieties of this technology exist

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