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Review on Hybrid DC Micro grid for Smart Energy Delivery

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Abstract: *The novel Hybrid system consist different sources such as PV system, t AC source, The battery are used as the main energy storage sources all together, form DC micro grid for smart energy delivery in off grid and on grid mode. Therefore, grid provide good quality of power to three different load namely 110V AC single-phase output and 48V DC output, The grid is at 230Vrms with 50Hz connected to a isolator in connection with the DC bus. The Three phase output of the grid is converted to rippled DC by the use of DBR (Diode bridge rectifier) The converted DC voltage is fed to ZETA converter which is a DC-DC converter, making the rippled DC to constant DC with the use of a buck inductor. Proposed system using Zeta converter to stabilize the DC voltage. Proposed system analyse in MATLAB Simulink environment.*

Keywords: DC Microgrid, Zeta Converter, PV System Ultracapacitor, EV

I. INTRODUCTION

Micro grids are to be one of the most important factors for future power systems. These various renewable energy sources are generally connected parallel in Micro grid system. In order to get better performance from Micro grid, the existing system has to be modified or rectified. Micro grid concept integrates large amounts of micro energy sources without disrupting the operation of main utility grid. Hybrid Micro grid consists of PV/AC source energy sources for DC and AC networks respectively. Total energy storage systems may be connected to either AC or DC Micro grids. • Renewable energy source is one of the most searched topics in the field of electrical and electronics engineering. When fossil fuels such as coal, oil and natural gas are burned, the emission gases such as carbon dioxide and methane are released in atmosphere. And this causes climate change. The fossil fuels cannot be found constantly, which leads us to the use of renewable energy sources. Due to reasons such as the availability of renewable energy source such as solar, wind, hydropower, hydrogen, biomass, geothermal energy, reliable and clean energy resources and high efficiency, it has been widely studied today. One of the advantages of renewable energy source is the coexistence of several renewable energy source. There are some advantages of these hybrid models where renewable energy source is used together. In this project, a new Hybrid charging Station system is proposed for the smart energy delivery. The proposed system is connected with the 230V AC power source, and integrates the renewable energy sources of photovoltaic (PV) power and the battery. Hence, the proposed DC micro-grid system can not only provide the high quality power for two types of DC and AC loads, but also achieve many special features and characteristics for smart energy delivery.

II. LITERATURE SURVEY

[1] Binayak Bhandari, Shiva Raj Poodle, Kyung-Tae Lee, Sung-Hoon Ahn "Mathematical Modeling of Hybrid Renewable Energy System: A Review on Small Hydro-Solar-Wind Power Generation," international journal of precision engineering and manufacturing-green technology Vol. 1, No. 2, pp. 157-173. April 2014. In this paper Harnessing energy from alternative energy source has been recorded since early history. Renewable energy is abundantly found anywhere, free of cost and has non-polluting characteristics. However, these energy sources are based on the weather condition and possess inherited intermittent nature, which hinders stable power supply. Combining multiple renewable energy resources can be a possible solution to overcome defects, which not only provides reliable power but also leads to reduction in required storage capacity. Although an oversized hybrid system satisfies the load demand, it can be unnecessarily expensive. An undersized hybrid system is economical, but may not

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be able to meet the load demand. The optimal sizing of the renewable energy power system depends on the mathematical model of system components. This paper summarizes the mathematical modeling of various renewable energy system particularly PV, wind, hydro and storage devices. Because of the nonlinear power characteristics, wind and PV system require special techniques to extract maximum power. Hybrid system has complex control system due to integration of two (or more) different power sources. The complexity of system increases with maximum power point tracking (MPPT) techniques employed in their subsystems. This paper also summarizes mathematical modeling of various MPPT techniques for hybrid renewable energy systems. 4

[2] Salman Hajiaghasi, Ahmad Salem Nia, Mohsen Hamzeh "Hybrid energy storage system for micro grids applications," IEE Proceedings- Journal of Energy Storage, Volume 21, February 2019, pp. 543-570. The author discusses in this paper about an important objective of Energy storages introduce many advantages such as balancing generation and demand, power quality improvement, smoothing the renewable resource's intermittency, and enabling ancillary services like frequency and voltage regulation in micro grid (MG) operation. Hybrid energy storage systems (HESSs) characterized by coupling of two or more energy storage technologies are emerged as a solution to achieve the desired performance by combining the appropriate features of different technologies. A single ESS technology cannot fulfill the desired operation due to its limited capability and potency in terms of lifespan, cost, energy and power density, and dynamic response. Hence, different configurations of HESSs considering storage type, interface, control method, and the provided service have been proposed in the literature. This paper comprehensively reviews the state of the art of HESSs system for MG applications and presents a general outlook of developing HESS industry. Important aspects of HESS utilization in MGs including capacity sizing methods, power converter topologies for HESS interface, architecture, controlling, and energy management of HESS in MGs are reviewed and classified. An economic analysis along with design methodology is also included to point out the HESS from investor and distribution systems engineers view. Regarding literature review and available shortcomings, future trends of HESS in MGs are proposed.

[3] Swati Negi and Line Mathew, "Hybrid Renewable Energy System," International Journal of Electronic and Electrical Engineering. ISSN 0974-2174, Volume 7, Number 5 (2014), pp. 535- 542. In this paper author discuss about Renewable energy technologies are suitable for off-grid services, serving the remote areas without having to build or extend expensive and complicated grid infrastructure. Therefore, standalone system using renewable energy sources have become a preferred option. This paper is a review of hybrid renewable energy power generation systems focusing on energy sustainability. It highlights the research on the methodology, unit sizing, optimization, storage, energy management of renewable energy system.

[4] Radharaman Shahab, This paper brought a novel approach towards the optimization of various renewable energy sources to form a cost effective hybrid renewable energy source. Due to the 5 stochastic behavior of all the RE sources, the major aspect in the design of the HRES are the reliable power supply of the consumer under varying atmospheric condition and the per unit cost of generation. The paper compared the results obtained from MATLAB simulation by considered individually the RES and then combination of the sources (HRES). MATLAB Simulation was done by considering the various parameters such as capital cost, O&M Expenses, CUF etc. and per unit cost of generation is calculated for a period of 25 years. The simulation results show that cost of generation of the electricity from the various sources shows a peak region till the breakeven point and once the payback period is reached, the cost of generation is only dependent on the Operation and Maintenance expenses of the project.

[5] Norat Mal Swanker, presented optimization of hybrid energy system for electrification at location of Rajasthan Technical University campus, Kota, Rajasthan, India. The cost of energy with grid connective system was about 4.45 INR/kWh which was suitable for application with reduction in emission due to less utilization of grid energy supply. Without grid application cost of energy was 21.68 INR/kWh which was much high for a feasible solution. The renewable energy penetration was higher in case of without grid connective system so that a reduction in the cost of storage system may increase the feasibility of hybrid energy system. The solar PV wind turbine diesel generator with battery as storage might be economical solution for supply electrical demand for remote islands and isolated village or small community applications.

[6] M. Nizam and F. X. R. Wicaksono, "Design and Optimization of Solar, Wind, and Distributed Energy Resource (DER) Hybrid Power Plant for Electric Vehicle (EV) Charging Station in Rural Area," 2018 5th International

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Conference on Electric Vehicular Technology (ICEVT), Surakarta, Indonesia, 2018, pp. 41-45, doi: 10.1109/ICEVT.2018.8628341.

Electric vehicles offer many advantages ranging from easy access and abundance of electrical energy sources. The objective of this paper is to obtain the best configuration of the hybrid power systems for charging station in a rural area such as Labuan bajo, Indonesia. Thus, the best configuration obtained is then installing with three types of energy storage namely Lead Acid and UNS Lithium battery such as Lithium Ion and Lithium Ferro Phosphate (LFP) to determine the minimum cost of operation and energy cost in a year. The results showed by implementing hybrid systems from PV and DER is the best configuration for off grid charging station. The most optimal battery in off grid system achieved by installing UNS LFP batteries. As a conclusion, by utilizing hybrid power generation technology, the potential for renewable energy in rural areas can be the main key in realizing the availability of charging stations in rural areas with affordable price for supporting electric vehicles infrastructure.

III. PROPOSED METHODOLOGY

Exiting system with single source solar system is available for energy delivery but during the un availability of solar energy load demand not satisfied . Exiting Hybrid system with Solar and other sources use conventional DC DC boost converter Proposed System Use. When designing solar power based individual system many different factors are taken into account: installation location, annual solar insolation, tilt angle of modules, number of solar modules, ambient temperature, shading, natural cooling of modules. The number of solar modules directly determines the efficiency of a solar power station. A large number of modules will increase their operating area [9]. Solar modules convert solar radiation directly into electricity through a photovoltaic effect. This is a silent and clean process that does not require movement of parts. The amount of solar radiation falling on the Earth does not depend on human activity. Therefore other parallel Sources maintain continuity of Supply but problem with existing system that DC micro grid consists more ripples using Conventional DC DC Converter.

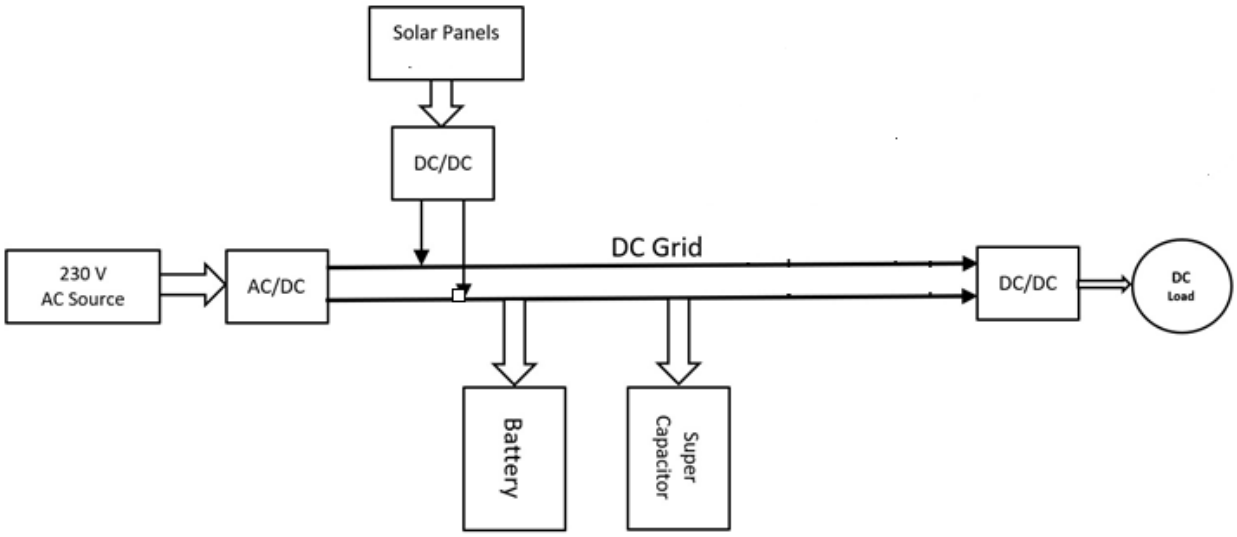

Fig -1 Block diagram of Proposed System

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