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MICROGRID STATE OF CHARGE SHARING AND REACTIVE POWER CONTROL

N Vedalakshmi[1], Dr. Narayanappa[2]

[1]*P. G Student, Department of Electrical and Electronics Engineering, Adhiyamaan College of Engineering, Tamilnadu, India*
[2] *Professor, Department of Electrical and Electronics Engineering, Adhiyamaan College of Engineering, Tamilnadu, India*

Abstract - *The Segmented Energy Storage (SES) control is the modern and normal answer of smoothing renewable strength generation fluctuations. This paper proposes a Fuzzy Logic Controlled Battery Energy Storage System (BESS) for standalone Photovoltaic (PV) powered Micro grid and coordination among them to meet the load. Due to the depletion of conventional power resources and multiplied environmental pollution, there is a want for harnessing green power to satisfy the ever growing load demand. An SES based electricity systems require an appropriate control strategy that can efficiently make use of the maximum energy output and battery State of Charge (SOC). Proposed machine affords the performance of a photovoltaic and Grid power gadget simulation analysis undertaken to enhance the smoothing overall performance of GRID power era and the effectiveness of battery SOC control. A smoothing control approach for lowering PV output strength fluctuations and regulating battery SOC below the regular conditions is proposed. A BES primarily based solar power structures had a suitable control approach that can successfully make use of the maximum electricity output from the DC to DC converter. A real-time SES primarily based power allocation approach is proposed.*

Key Words: **PV, BESS, State of Charge, Grid, DC-DC Converter**

1. INTRODUCTION

BESS gives flexible vitality the board arrangements which improves power nature of sustainable power source half and half force age frameworks. A few control techniques and configurations for half and half vitality stockpiling frameworks, for example, a battery vitality stockpiling framework, Superconducting Magnetic Energy System (SMES), a Flywheel Energy System (FES), an Energy Capacitor System (ECS), and an energy unit/electrolyze mixture framework have been proposed to smooth breeze power fluctuation or upgrade power quality.

George Hunt, [1] The development of lead–acid battery energy-storage systems (BESSs) for utility applications in terms of their design, purpose, benefits and performance. For the most part, the information is derived from published reports and presentations at conferences. Many of the systems are familiar within the energy-storage community.

Hyeon-Seok Lee,[2] Asymmetric forward-flyback dc-dc converter that has high power-conversion efficiency η_e over a wide output power range. To solve the problem of ringing in the voltage of the rectifier diodes and the problem of duty loss in the conventional asymmetric half-bridge (AHB) converter.

T. Kerekes, [3] For low-power grid-connected applications, a single-phase converter can be used. In photovoltaic (PV) applications, it is possible to remove the transformer in the inverter to reduce losses, costs, and size. Galvanic connection of the grid and the dc sources in transformer less systems can introduce additional ground currents due to the ground parasitic capacitance.

X. Li, H. Wen, [4] When the photovoltaic (PV) string is under the partial shading condition (PSC), the conventional Maximum power point tracking (MPPT) techniques may fail to track the global maximum power point (GMPP).

1.1 Conventional Method

The current technique proposes a novel stochastic looking through based enhancement calculation, named as fig.1 Conventional Block Diagram electron drifting algorithm (EDA), which fundamentally forsakes the means of particles moving in regular PSO calculation. Rather, a database is developed to spare the arrangements and their comparing wellness esteems including both better and more awful arrangements. The proposed EDA principally mirrors the highlights of electron floating. The arrangements spared in the database are utilized for shaping an electric field in the looking through space. The better and more awful arrangements, as tended to in the accompanying segment, are set apart with positive and negative charges separately.

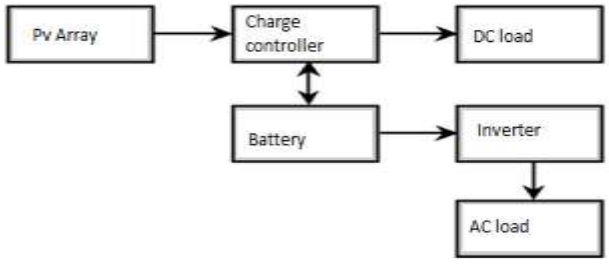

Fig -1: Block Diagram of Conventional method

The electrons, to be specific arrangements, are created indiscriminately area and float as per the electric field framed by the charges recorded in database in each emphasis. The amplitudes of repulsing and drawing in powers between each pair of electron and charge are corresponding to the amount of electric charges and contrarily relative to their separation between. The proposed EDA isn't just ready to maintain a strategic distance from the neighbourhood ideal assembly issue, yet use the arrangements which have been investigated to spare the calculation endeavours. The definite arrangement process is presented consequent segments.

1.2 Renewable Energy Storage Systems

In a steady and solid lattice, the power supply should consistently coordinate the power request. Giving the specific measure of power to the clients is a specialized testing task. Regularly, in an all-around created framework different sorts of base and pinnacle load age limits are accessible and are overseen as per the gauge request plan. Normally age depends on traditional petroleum derivative or atomic force plants, where the power yield can be controlled likewise. The sustainable power sources like breeze and sun based expands the requirement for extra control power. That could be ordinary force plants, yet age expenses would be moderately high because of a low number of full burden hours and activity at levels of low proficiency.

2. BATTERY MANAGEMENT ALGORITHM - STATE OF CHARGE

Condition of-charge estimates vitality left in a battery and it is basic for demonstrating and overseeing batteries. Creating effective yet exact SOC calculations stays a difficult undertaking. Most existing work utilizes relapse dependent on a period variation circuit model, which might be difficult to unite and frequently doesn't have any significant bearing to various kinds of batteries. Knowing open-circuit voltage prompts SOC because of the notable mapping among OCV and SOC.

2.1 Background

The general framework for SOC estimation by combining two types of estimation methods are follows

$$SOC = \alpha SOCc + (1 - \alpha)\, SOCv, \qquad (1)$$

Where, SOC*c* is the Coulomb-counting based SOC and SOCv is the voltage-based SOC. α ([0, 1]) is the weight factor. SOC*c* is estimated based on the amount of charge that has been extracted from the battery, and can be simply calculated as

$$SOCc(t) = SOCc\,(0) - 1\, QZt0I(t)dt, \qquad (2)$$

Where, Q is some constant to relate the current with charges. SOCv is an estimation dependent on the open-circuit voltage (OCV) of the battery, which is characterized as the voltage between the anode and cathode of the battery when there is no outer burden. It has been appeared in numerous investigations that there is a period free bijection among OCV and SOC. The connection among OCV and SOC is given as,

$$OCV(t) = a SOC(t) + b, \qquad (3)$$

Where a and b are some constants determined by the measurement.

SOCc has a solid reliance on history, and SOCv is less needy and is along these lines expected to evade mistake collection after some time and to address significant surprises in SOCc. Subsequently, it is important to discover some elective methodologies that can get the OCV straightforwardly from estimated voltage and current information. Towards this end, a wide range of approaches have been proposed, which are all founded on particular sorts of improved battery models.

3. PROPOSED SYSTEM

The proposed framework the present condition of the battery and the propelled models required to completely use BMS. Furthermore, framework can be utilized checking the status of battery in portable by help of framework innovation. Much of the time observing the sun oriented force age, when time of low force in PV our gadget consequently associated the source.

So as to beat the above existing downsides, the framework actualizes another strategy called Segmented Storage Energy System. The framework gives the answer for power squandered by the photovoltaic when the battery is in full charge condition. The framework has a two or more number of batteries which is incorporated with the inverter consequently the force can have appropriated to the batteries individually and it is put away. Fluffy rationale control methodology is actualized. To get an unadulterated sine wave yield we likewise present an adjusted sine wave topology.

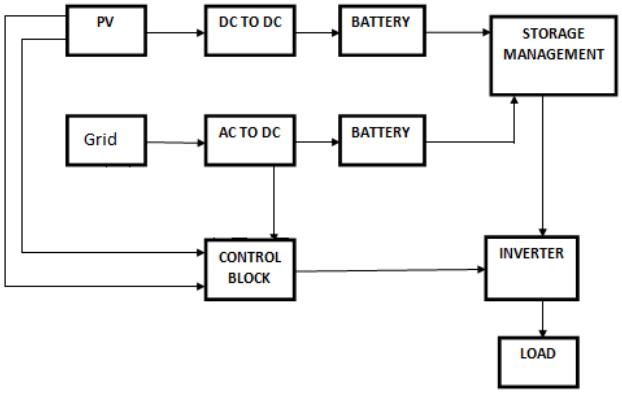

Fig -2: Proposed system block diagram of micro grid state of charge sharing and reactive power control

because of the notable mapping among OCV and SOC.
the propose a productive get precise OCV calculation that applies to all sort of batteries. Trials show that the proposed calculation is numerically steady, and acquires SOC with under 4% mistake contrasted with the itemized battery reproduction from assortments of batteries. Our OCV calculation is additionally proficient, and can be utilized as a continuous electro-scientific instrument uncovering what is happening inside the battery.

3.1 Proposed Control Technique

The significance of fluffy rationale gets from the way that most methods of human thinking and particularly good judgment thinking are surmised in nature. The basic attributes of fluffy rationale as established by Lofti Zadeh

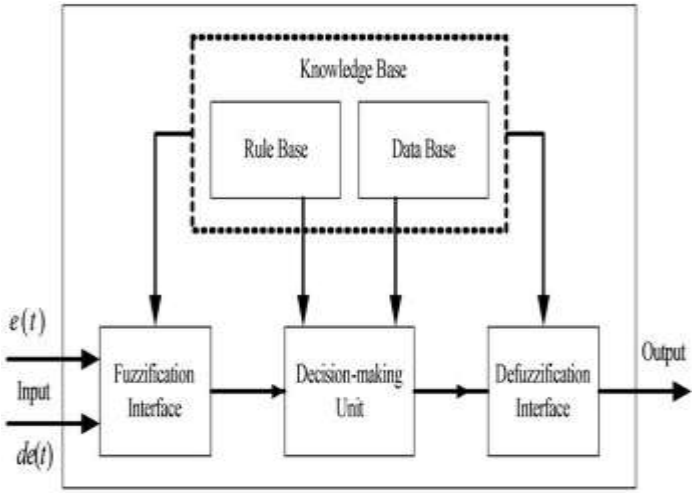

Fig -3: Fuzzy Controlled Block

Table 1: Fuzzy rules versus conventional control actions.

Fuzzy Rule	P	I	D
If error is ..., then control output is ...	X		
If error is ..., then change in control output is ...		X	
If error is ... and change in error is ..., then control output is ...	X		X
If error is ... and change in error is ..., then change in control output is ...	X	X	
If error is ... and change in error is ... and second change in error is ..., then change in control output is ...	X	X	X

4. RESULTS AND DISCUSSION

The PV cluster comprises of 4 arrangement of grid cells each have a yield voltage of 12v regarding 10w force rating. the reconfigurable board activity done by detecting the voltage as input to the controller. in light of the board. the put away voltage headed to the MPPT controller for the charging motivation behind battery appraised on 12v/4.7 amps.

The Fly back converter input source voltage is 12 VDC from the super capacitor and the yield voltage is 230 VDC. The boosting of voltage should be possible by the exchanging of S1 and S2 switches. The PWM signs to door driver unit by the Fuzzy based control system. The above controlled procedure done by shut circle technique by detecting the criticism signals with the assistance of shunt resistors. The yield of the fly-back converter given to contribution of the H-connect inverter.

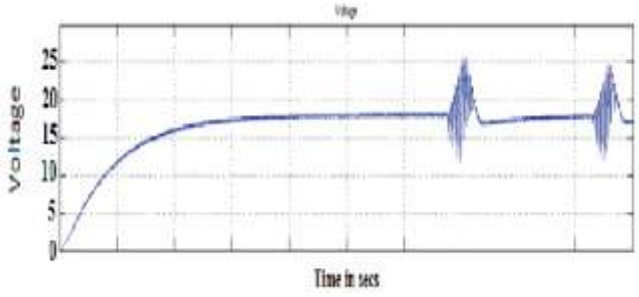

Fig -4: Output voltage waveform of PV grid

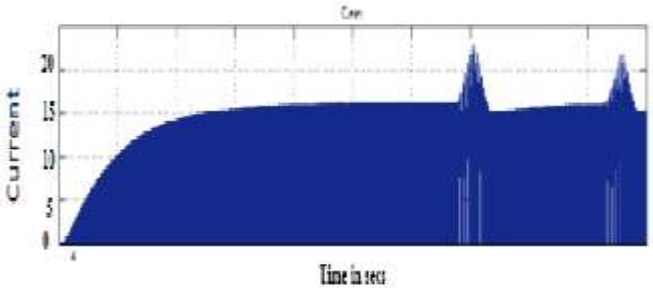

Fig -5: Output waveform of Inverter Load

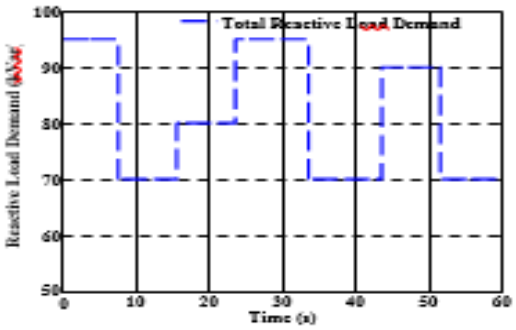

Fig -6: Reactive power load-demand fluctuates over time.

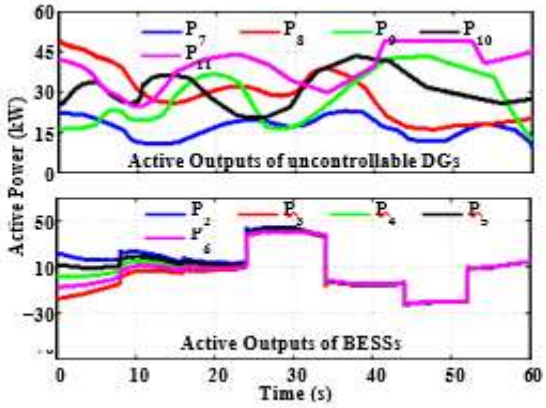

Fig -7: the active power outputs of uncontrollable BESSS.

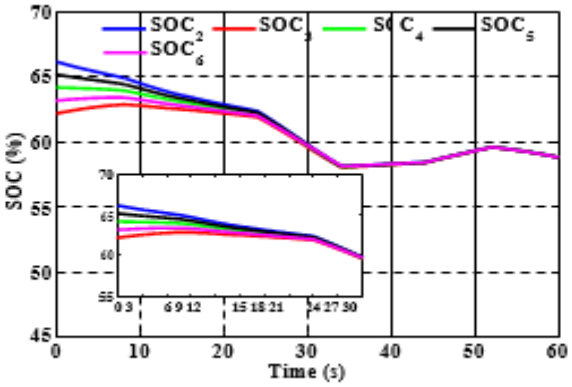

Fig -8: shows the SOC of BESSs.

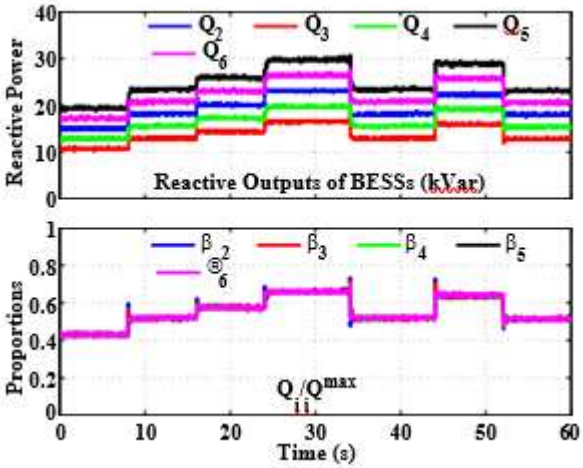

Fig -9: The reactive outputs and proportions of BESSs

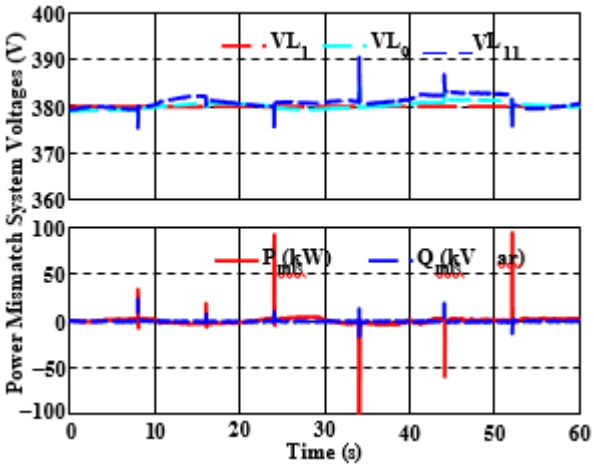

Fig -10: The system voltages and the system power mismatch.

5. CONCLUSION

This paper proposed a two layer disseminated control technique for lattice associated small scale networks to deal with the BESSs when the discontinuous yields of inexhaustible and the vacillation of burden request are considered. The lattice associated smaller scale matrix made PVs, BESSs and Loads are assessed, and operators alter the yields of BESSs as indicated by the set focuses examination by proposed system. Correspondingly, a lot of dispersed control laws for specialists are proposed from some random framework, where the quick second-request control laws and the ideal control laws are intended for SOC adjusting and receptive force sharing of BESSs, separately. What's more, two frameworks are acquainted with dissect the property of the framework power balance, the SOC adjusting and corresponding yields of maximal receptive force among BESSs so as to test the exhibition of the control laws. Utilizing MATLAB/SIMULINK, the system is analyzed.

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