Retraction

Retraction: Energy Management Optimization in a Hybrid Energy Storage System for Electrical Vehicle Transportation
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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1
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Energy Management Optimization in a Hybrid Energy Storage System for Electrical Vehicle Transportation

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Abstract. The various application such as hybrid electric vehicles, operating devices based on renewable energy, devices used for storage of energy make use hybrid energy storage system. The main purpose of hybrid energy storage system is to provide stable power and supply power to the particular application. The proposed idea in this paper is suitable for different application which are having high voltage gain or high output dc-link voltage, low-power and multi-output applications. This paper have an idea to design and control the power flow of a hybrid energy storage system. This make use of soft switching modulated dc–dc converter in the secondary side. This paper implement extended zero voltage switching range. In this paper Energy Management Optimization in a Hybrid Energy Storage System for Electrical Vehicle Transportation is simulated using Simulink model

Key words: Hybrid energy storage system, Super capacitor, Controller, DC-DC converter

1 Introduction:
In this paper super capacitor Hybrid energy storage system also with dc to dc converter in the secondary side is proposed. This paper make use of full bridge switches in the primary whose operation is complementary because it operate without phase shift. This reduces the current which is circulating significantly. We can control the output voltage by changing or controlling the duty cycle of the MOSFET which is in the secondary side of the voltage rectifier. The existing method describes the DC link which has floating the middle point voltage in which the voltage ripples at three time the fundamental frequency (i.e., 150 Hz) [1]. This paper make use of the harmonic magnitudes which are linked directly to the modulation technique. In this the voltage ripple are coupled with AC load which is highly unbalancing this may lead to very high harmonics in DC current this leads to increase in electromagnetic interference (EMI) and due to increase in thermal loss the ESS life time is reduced [2]. This paper make use of bidirectional dc-dc converter which interface the supercapacitor with the HESS because of its very high efficiency, low harmonics due to thermal distortion.

2 Hybrid energy storage system:
Hybrid energy storage system is one in which two or more types of energy storage are combined to form single system [3]. HESS combine both sprinter and marathon storage to fulfill application. HESS is combine energy storage technologies into coherent system with special control strategy energy to improve overall performance. HESS of Electrical vehicle has the advantage of high power density
supercapacitor & high energy density battery performance. Hybrid electric vehicles are the future transportation structure for better fuel economy. The battery is regarded as the primary energy sources in HESS. During the time of acceleration and regenerative braking the vehicle power requirement can be met by hybrid energy storage system. There is a power demand between charge storage and units of ultracapacitor it is splitted by using energy management mechanism. HESS can improve the efficiency of power processing during the rapidly changing drive of an electric vehicle. HESS are used to optimize the energy management for Electrical vehicle.

3 Super Capacitor:
A supercapacitor, also referred to as ultracapacitor has a much greater capacitance value than an ordinary capacitor accompanied with lower voltage limits. A supercapacitor which can also be referred to as an ultracapacitor stores up to 10 to 100 times more charge per unit volume or mass than traditional electrolytic capacitors. It can also receive and dispatch charges at a much faster rate than batteries and can withstand more charging and discharging cycles than rechargeable batteries. Due to this property of supercapacitors they are used widely in applications involving rapid recharge and discharge cycles. Supercapacitors do not use standard dielectric unlike ordinary capacitors but rather they use electrostatic double-layer capacitance and electrochemical pseudo-capacitance. In a supercapacitor there are two electrodes which are separated by a membrane which allows ions to pass through it and hence it is called as an ion-permeable membrane. It also consists of an electrolyte which connects the two electrodes ionically. When a voltage is applied the electrodes are polarized.

4 Multiple output dc to dc converters:
A Dc to Dc converter is a circuit that converts a dc voltage from one level to another level[4]. The circuit can either be used to step up or step down the voltage according to an individual’s needs [5]. The stepping up and stepping down of Dc voltage from one level to another is achieved by storing the input energy for a short duration and then releasing it at another high or low voltage level based on the application. The energy storage can be carried out by different components such as inductors, capacitors, transformers etc. In transformers and inductors the energy is stored in the form of magnetic field and in capacitors the energy is stored in the form of electric field. The conversion of dc to dc voltage can be carried out using methods like switching conversion and linear voltage regulation. However, switching conversion is proven to be more efficient (about 73% to almost 98%) than linear voltage regulation. Hence this method is used widely in different applications. The main drawback of linear voltage regulation is the dissipation of heat and this makes it an undesirable choice when compared to switching conversion. Dc to Dc converters can be unidirectional as well as bidirectional. In unidirectional circuit the power is made to flow in only one direction where as in bidirectional circuit the power can be made to flow in both the directions. Bidirectional dc to dc converters can be achieved by replacing diodes with switches like MOSFET and BJT. This method is called as Active Rectification. In a multi output dc to dc converter the output of the circuit can be given to multiple loads as input. To control the source current which is given as input, the load current or to keep the power at a constant level this controlled can be applied.

5 PIC Microcontroller:
The architecture of PIC is based on Harvard Architecture and is characterised by a small number of fixed length instructions. The advantages of PIC are that it has a small set of instructions and hence it is easy to remember. It has an entry level programming and debugging software kits which is cheap and support a wide range of interfaces and are easy to handle. PIC microcontrollers generally have flash memory, EPROM, SRAM, Sleep mode to save power, watchdog timer, external clock etc.

6 Buffer:
It is used to separate the output and the input and the resultant voltage is either zero or same as the input voltage. The buffer draws very low current and hence does not interrupt the original circuit from doing
its work. Buffers are used to transfer voltage from a circuit having high impedance output to a circuit having low impedance input.

7 Block diagram

![Block Diagram](image1)

**FIGURE 1: BLOCK DIAGRAM**

The block diagram is shown in figure 1. The input supply is given to multi output dc–dc converter by means of battery. The input supply is the dc voltage. The output from converter is given to supercapacitor for storage which in turn is connected to the load. The entire circuit is controlled by pic microcontroller. The supply for micro controller is 12V dc supply. The microcontroller output is given to buffer. The delayed output from buffer is connected to converter. The supply for the buffer circuit is 12v dc supply. Thus in this form the entire unit is connected.

8 Result & Discussion:

![Simulation Diagram](image2)

**FIGURE 2: SIMULATION DIAGRAM**

The simulation diagram of the Energy Management Optimization in a Hybrid Energy Storage System for Electrical Vehicle Transportation is shown in figure 2. The bidirectional dc to dc converter used for battery storage is directly connected to the battery. The bidirectional dc to dc converter used for super capacitor storage is directly connected to the super capacitor. These capacitors which in turn connected to RLC load. The DC supply is connected to DC–DC converter by means of DC source. The diagram is simulated and the result are shown below.
The simulation diagram of the bidirectional converter is shown in figure 3. The bidirectional converter are designed with the help of Mosfet and diode which are connected in parallel. The pulse for the Mosfet is given by means of pulse width generator. The Mosfet and diode are connected in parallel to series RLC branch and RL Load.

The following figure 4 shows the waveform of boosted input voltage which is plotted between time and input voltage.

The following figure 5 shows the waveform of boosted output voltage which is plotted between time and output voltage.

The following figure 6 shows the waveform of load current. The which is plotted between time and load current.
The following figure shows the waveform of battery voltage and current.

**FIGURE.6: LOAD CURRENT WAVEFORM**

The following figure 7 shows the waveform of battery voltage and current.

**FIGURE.7: WAVEFORM OF BATTERY VOLTAGE AND CURRENT**

The following figure 8 shows the waveform of battery soc.

**FIGURE.8: WAVEFORM OF LOAD CURRENT**

The following figure 9 shows the waveform of battery supercapacitor voltage & current. It shows the input and output waveform of supercapacitor.

**FIGURE.9: WAVEFORM OF BATTERY SUPERCAPACITOR VOLTAGE & CURRENT**

The following figure 10 shows the waveform of battery supercapacitor soc.
9. Conclusion:

Thus it is forecasted and by using MATLAB/ Simulink the model it is simulated. We can conclude from the simulation result that controller is robust against harmonics. The efficiency of the controller is verified using MATLAB/Simulink. From this we can conclude that it is efficient for electrical vehicle.

References:

[1] Dynamic Energy Management of Renewable Grid Integrated Hybrid Energy Storage System, N. R. Tummuru, M. K. Mishra, and S. Srinivas., IEEE Trans. Ind. Electron., vol. 62, no. 12, pp. 7728–7737, Dec. 2017.

[2] Energy Storage Systems for Renewable Energy Power Sector Integration and Mitigation of Intermittency, M. Yekini Suberu, M. Wazir Mustafa, and N. Bashir., Renew. Sustain. Energy Rev., vol. 35, pp. 499–514, Jul. 2018.

[3] R. Senthil Kumar, K Mohana Sundaram, K. S. Tamilselvan. Hybrid Reference Current Generation Theory for Solar Fed UPFC System, Energies, vol. 14, no. 6, pp.1527, March 2021, doi.org/10.3390/en14061527

[4] D. Devikanniga, A. Ramu, and A. Haldorai, Efficient Diagnosis of Liver Disease using Support Vector Machine Optimized with Crows Search Algorithm, EAI Endorsed Transactions on Energy Web, p. 164177, Jul. 2018. doi:10.4108/eai.13-7-2018.164177

[5] H. Anandakumar and K. Umamaheswari, Supervised machine learning techniques in cognitive radio networks during cooperative spectrum handovers, Cluster Computing, vol. 20, no. 2, pp. 1505–1515, Mar. 2017.