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Original Research Paper

Engineering

MULTI TERMINAL HYBRID POWER SYSTEM & CONTROL METHODOLGY

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ABSTRACT In this work, we inspected the protection methodologies for dc power system which also includes hybrid energy sources. The proposed protection methodology necessitates reduced time when compared with other methodologies. In this methodology, fault can be isolated and its efficiency can be improved. The performance of protection scheme was evaluated under the transmission lines.

KEYWORDS : Voltage boost up, Fault identification, multilevel inverter, battery, Fuel cell

I. INTRODUCTION

A hybrid DC power system is more reliable with high efficiency through by using hybrid energy source. However it protect the system from phase to ground fault in multi terminal hybrid DC power system.

This work provides simple and efficient techniques for a multi terminal DC power system. In various applications such as telecommunication system and distribution system involving large number of electronic loads which provide effective solution for power distribution [1]. The DC micro grids, coordinate operation of power converters and mechanical contactor can rapidly isolate the short circuit faults. However, there is a concern to protect the system from short circuit faults [2]. Event based protection scheme recently developed for AC power system [3]. The transient short circuit current contain high frequency oscillation which may cause aliasing error and saturate the analog to digital converters [4]. The load voltage can be maintained by the ultra capacitor hybrid energy storage system [5]. The power system protection includes large number of buses and feeders [7]-[9]. The protection unit is able to identify the type of event using current derivative fault identification method. Event based protection scheme has as a single alternate power supply. The performance of the event based protection scheme was evaluated under different DC feeder and bus fault. Since it is difficult to identify an interconnected feeder fault from a bus fault or an adjacent feeder fault [11]. Figure 1 shows the fault protection scheme in a multi terminal hybrid power system. The fault protection scheme can improve the efficiency using multi terminal hybrid DC power system. Here each phase can be able to identify the fault simultaneously.

II. HYBRID ENERGY SOURCE

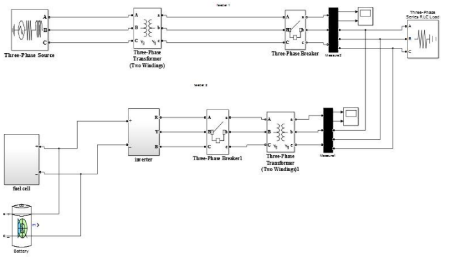


Figure.1.Protection scheme for a multi terminal hybrid power system

The proposed scheme consist of hybrid energy source such as fuel cell and battery. When the fault has been occur, the voltage may drop. The fuel cell and battery can be increase the voltage level. The hybrid DC source can be connected to multilevel inventor and then given to the power supply.

A. Energy storage system

Battery and fuel cell was used as an alternate power supply. A fuel cell was implemented as an energy storage system. The fuel cell composed of operating temperature 65 °C, pressure 1.5 and Hydrogen composition 99.95 %, the voltage and current value can be given in the fig 2. The flow rate, utilization of hydrogen and oxygen stack consumption and stack efficiency is shown in fig 3. The fuel cell converts chemical energy into electrical energy.

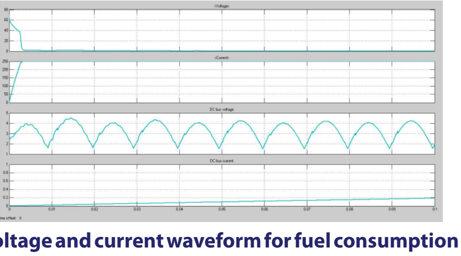


Fig.2: Voltage and current waveform for fuel consumption

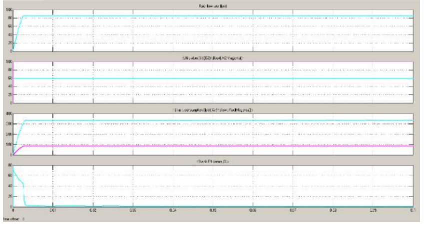


Fig.3: Flow rate of Hydrogen consumption

For the three phase system the hybrid energy source can be given as separately to improve the efficiency.

A. Multiterminal Inverter

The multiterminal inverter is to boost up the voltage when there is a sudden change in the voltage. The fault protection scheme consists of three multiterminal inverter. Each inverter has eight MOSFETs.

III. FAULT ISOLATION

When there is a phase to ground fault in a transmission line, the voltage sag and swell may occur during the time period t = 0.2s.

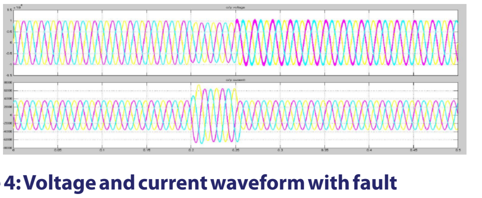


Figure 4: Voltage and current waveform with fault

Figure 4 shows the voltage and current waveform when the fault has been occur during the time of fault voltage sag and swell may occur.

Figure 5 shows the active and reactive power waveform when the fault has been occur during the time of fault voltage sag and swell may occur.

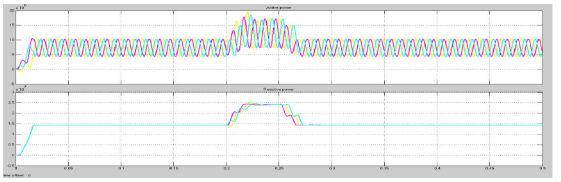
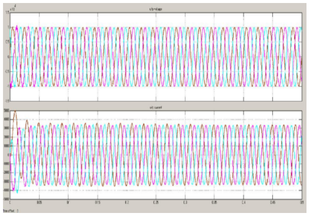


Figure 5: Active power and reactive power waveform

I.FAULT PROTECTION SCHEME

When the fault occur, the voltage sag and swell is increased. Here, the hybrid power system fuel cell and battery supplies power when there is a voltage drop, this will increase the voltage level.



The below Figure 7 shows the active and reactive power after the occurance of fault.

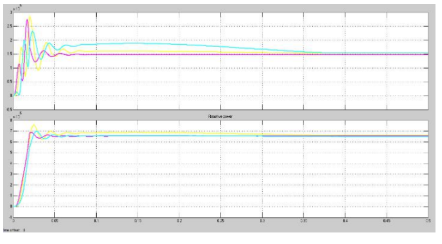


Figure 7: A active and reactive power waveform at the time of fault condition

I.CONCLUSION

An event based protection scheme for a multiterminal hybrid DC power system was investigated. The model for a multiterminal hybrid DC power system was implemented in the MAT LAB/Simulink.

In the proposed protection strategy, each phase has an alternate supply when the fault has been has been occurred. Then the voltage can be increased by using the alternate supply. In the proposed protection scheme efficiency has been increased.

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