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# ADAPTIVE DC POWER SUPPLY AND FAULT IDENTIFICATION

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**Abstract**: Fault recognition for the multi-terminal dc power system consisting of energy resources and various types of loads is proposed. The proposed system identifies the type of fault by the voltage level before the bus. The performance of proposed system has been analyzed under different types of faults such as, dc feeder and bus fault along with different types of static and dynamic load. Power converters are used as ac to dc and dc to dc converters. Load always gets supply of DC power under normal conditions and also during faulty conditions. Battery acts as backup DC power sources to compensate the system power supply. The load draws DC supply from voltage source under normal for its normal operation and from battery during fault. The battery and super-capacitor charges through bus-3 normally. The result shows the different faults conditions and uninterrupted power supply during fault.

**Key Words:** DC micro-grid, Supercapacitor, feeder, bus

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## INTRODUCTION

In modern world power demand is increased, so world requires a reliable and high efficient system for achieving its goals and needs. DC micro-grid is an effective of achieving reliability and high efficiency which consists of power electronic converters and storage energy devices offers advantages rather than ac form. Super-capacitor offers an effective way as a storage device with high power density, long cyclic life and relatively high energy density [1]-[3].In various areas such as, shipboard and spacecraft, telecommunication system and distribution system involves large number of data centers and loads. DC architecture is used to interconnect the distributed resources and sensitive electronic load [1], [8]. Also it has been concerned to protect the system from short circuit currents, in multisource systems. Protection in system is employed for bus, feeders and other devices. It can be categorized into data-based and event-based protection schemes. Data-based protection scheme is, in which voltage of bus or current of converter are measured and these data are sent to interconnected protection units for fault identification. Event-based protection method, the type of event is analyzed with help of measured fault parameters.Fig1. Shows the proposed schematic model which is understudy of dc micro-grid, with the help of MATLAB/Simulink software. In this each unit will be able to identify the fault type i.e. bus fault, feeder fault or interconnected or adjacent feeder fault. DC micro-grid includes: distributed resources, various types of load. Energy of system is mainly supplied by ac generator. Transformer will be used for stepping down the voltage and filters for eliminating harmonics. Rectifiers are connected via boost converter to dc buses for regulating injected power to the system Circuit breakers and sensors for fault detection of the system. Battery and super-capacitor are acting as energy storage system and has been used for providing uninterrupted supply to the system under fault.

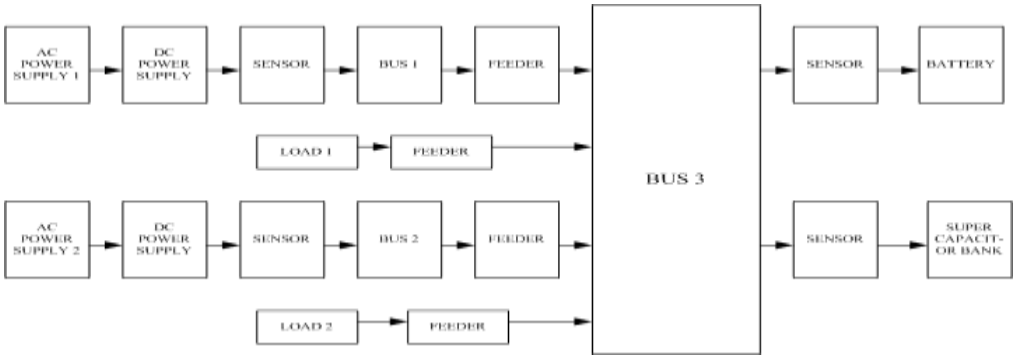


**Fig1. Proposed schematic model understudy of dc micro-grid.**

**Source: Event-Based Protection Scheme for a Multiterminal Hybrid DC Power System, IEEE Transaction On Smart Grid, July 2015**

## II. LITERATURE REVIEW

M. Farhadi (2015) proposed an event-based protection scheme for a multi-terminal hybrid DC power system that includes various loading schemes. In this the protection scheme was able to identify the type of fault event using the method of current derivative fault identification with employing an artificial inductive line impedance. Scheme was able to identify accurately the type of fault and to isolate the faulty area and restoring the system quickly[1]. In 2014, M. Farhadi analysis the harmonic and real-time operation of isolated and non-isolated dc micro-grid system. Various operating modes based on different power sharing pattern was defined. A current-voltage control technique based on master-slave control concept was proposed, in which super-capacitor bank was operating as master for controlling dc bus voltage[2]. M.farhadi (2015) investigates the real-time control and energy management of a dc micro-grid at various loading scheme. This system highly improved the grid redundancy and reduced total power losses. In this a new real-time energy management system (EMS) with Adaptive energy calculator (AEC) based on moving average measurement method was developed[3]. P. Cairoli(2013) proposed a power converters controlling sequencing and bus segmentising switches protected and reconfigured a dc micro-grid. Using traditional circuit breakers it was possible to decrease power OF the bus, eliminate the fault and then reenergize the bus much faster than ac grid[4]. J.Cao (2012) proposed a new ultra-capacitor hybrid energy storage system (HESS) for electric drive and hybrid vehicles. In this battery was providing power directly only to ultra-capacitor when its voltage dropped below battery voltage without requiring a power matching dc/dc converter[5]. V.Musolino (2013) proposed a new model which was able to represent the behavior of super-capacitor of frequency range, ranging from dc to tens of kilohertz. This shows that at higher frequencies super-capacitor does not behaves as capacitor[6]. D.Salomonsson (2009) proposed a low voltage dc micro-grid system. LV dc micro-grid interconnects sensitive electronic loads and distributed resources[7]. L. Tang (2007) proposed a solution for locating and isolating dc fault in MTDC system. This was based on ac circuit breakers which are already equipped with voltage-source converters at ac side[8]. Y.Pradeep (2012) proposed a high level event ontology for power system that are seven in count and developed with details extracted from Indian National grid. This was for handling the applications developed for intelligent software system[9]. S.R.Velazqez (1998) proposed a design algorithms for hybrid bank of filters for analog and digital conversions[10]. P.Pozzobon (1998) proposed a method for calculating of transient and steady state short-circuit currents in dc traction system with zero impedance. This was based on equivalent star representation of rectifiers[11].

## III. PROPOSED METHODOLGY

In this the proposed topology has identified the type of fault event then isolating the faulty system along with connecting the load to the backup device system for continuous supply of the power to the system. The system is proposed to achieve the following Objectives:

- To develop a multiple bus adaptive power supply for fault identification.
- To develop efficient dc power supply with lower losses.
- To improve the operation of system M.Farhadi and O. Mohammed to recognize the fault.
- To improve the system stability for multiple faults.
- To develop proposed system with less losses than occurring in existing system.

## IV. CONCLUSION

A multi-terminal hybrid dc micro-grid will be investigated with help of event-based protection scheme. An accurate model will be implemented in MATLAB/Simulink software for fault study of the system and results will be evaluated. In this each unit will be able identify the type of fault occurring in the system. Fault current method will be implemented for calculations in Simulink Model. This model will be high efficient for utilizing in high demand areas, such as Shipboard power system or data centers.

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