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EV BATTERY THERMAL ANALYSIS WITH COOLING OPERATION USING MATLAB

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ABSTRACT - The theories and methodologies in transient stability analysis are based on estimates and presumptions that are challenging to comprehend.The goal of this work is to develop a software tool that will enable users to comprehend power systems' transient stability behaviour while also comprehending the u nderlying theory and tool analysis.Systems with 15 buses or fewer are the only ones included in the study.
The software tool is only built in the MATLAB environment. For generalpurpose numerical computing, MATAL B is a stand-alone software environment. Its application in matrix manipulation is rather easy. Further, its Graphical User Interface construction tools provide the facility to develop user friendly method of analyzing the subject matter. The presentation of this thesis is developed according to the flow of simulation package. Chapter 2 describes the theories and methodologies which are frequently used in stability studies. Chapter 3 is for Graphical User Interfaces used to link the text files about utilizing the program and theory, and other GUI s which are used for entering data needed for transient stability analysis and to get the results of the analysis

I. INTRODUCTION

With the global energy crisis and the environment becoming more intense, distributed generation (DG) based on r enewable energy can significantly reduce the impact on the environment and energy. This technology has gained p opularity both domestically and internationally and is developing quickly.
Microgrid technology has emerged, nevertheless, as a result of distributed generation's unpredictability and uncont rollability. It is a modest production, distribution, and use of power. system which is composed of distributed generation, energy storage system, energy conversion device, monitoring and protection device, load and so on . It can be divided into DC microgrid, AC microgrid and AC/DC hybrid microgrid. The existing research mainly focuses on the AC microgrids. In the current era, DC loads such as electric vehicles and information equipment in urban distribution networks are increasing rapidly. Compared with the AC microgrid, the DC microgrid has the characteristics of high conversion efficiency, small line loss. Therefore, as a way of networking with higher operation efficiency, lower comprehensive cost and less space, DC microgrid has been paid more and more attention. Since there is no reactive power flow in the DC microgrid, the DC bus voltage is the only indicator to measure the safe and stable operation of the DC microgrid . By controlling the voltage stability in the DC microgrid, the stable operation of microgrid can be controlled. If the dc bus voltage is unstable, the steady

operation of load will be threatened, even lead to the false tripping of protection system, and even affect the normal operation of power network in serious cases . The stability of DC microgrid includes static stability and transient stability. In recent years, the static stability problem of microgrid has been extensively studied . However, in contrast with static stability of the microgrid, the research on transient stability of the microgrid is still limited. Static stability analysis methods include eigenvalue analysis based on state space equation and impedance analysis based on impedance model.

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II. METHODOLOGY

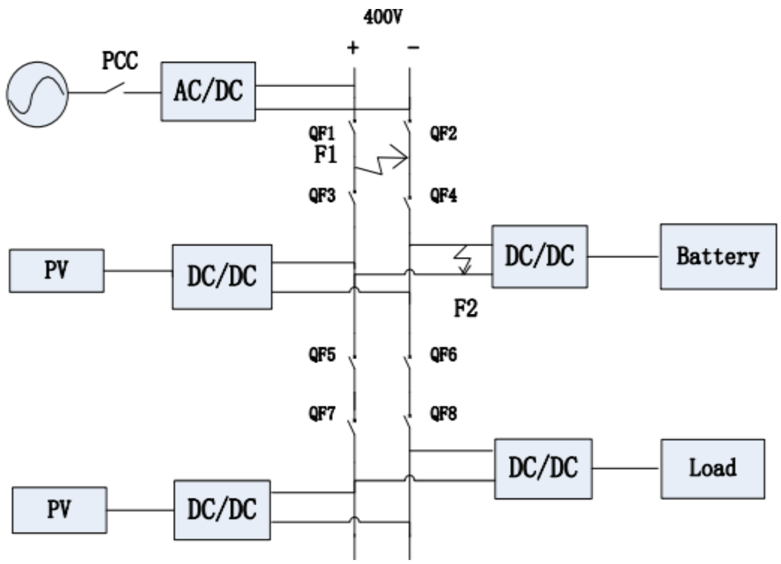

Fig.1 Methodology

A. Design Structure

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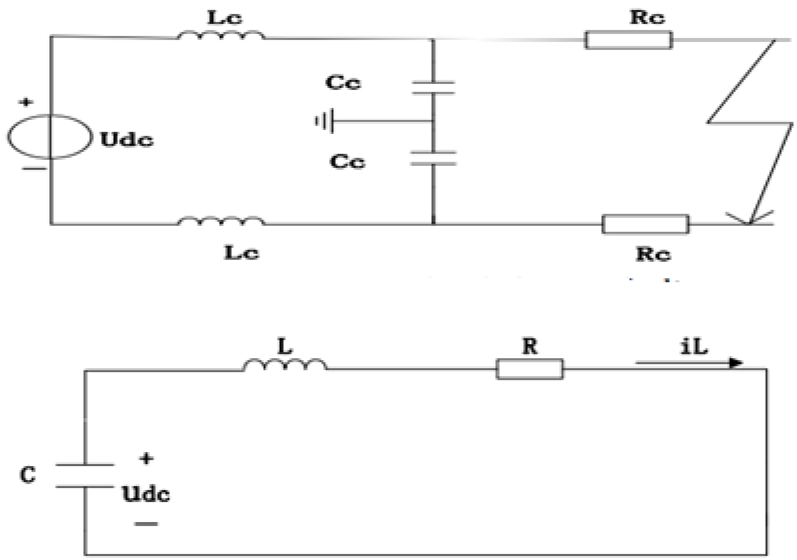

Fig.2 Testing model

Part of the fault current is provided by the battery, and part of it comes from the rapid discharge of the capacitor. The total impedance of the energy storage system is the sum of the internal battery impedance (and) and the cable impedance (and) (the cable capacitance can be ignored during pole to pole short-circuit fault) [12], so the fault current provided by the battery can be calculated as:

$i\ (t) = ubattRbatt{+}RL\ [1 - \exp(-\ \tau batt\ )]$ (1)

Where = $batt{+}\ LRbatt{+}$,

the design of the battery determines how long it can supply a short-circuit current without causing internal damage [13].

The DC/DC converter is directly connected to the bus and, hence, has a low impedance, mainly consisting of the series impedance of the capacitors and , where the latter can be neglected.Fault F1 will cause the capacitors to discharge, which results in a current with high amplitude and low rise time, but with limited duration. The capacitor fault current can be calculated as: $i\ (t) = udcRe\ \exp(-\ \tau c\ )$ (2)

Where = 2 , = 2 , = , is the DC bus voltage. When the bus has a bipolar short-circuit fault, the fault current i (t)comes from the above two parts: $i\ (t) = KAi\ (t) + i\ (t)$ (3)

Because of the current limiting effect of the circuit control module in the energy storage system, the current limiting coefficient [14] is introduced. KAdepends on the voltage level of the DC microgrid and the equivalent resistance of the fault feeder, with a value of 0.01 ~ 0.02.

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III. BLOCK DIAGRAM

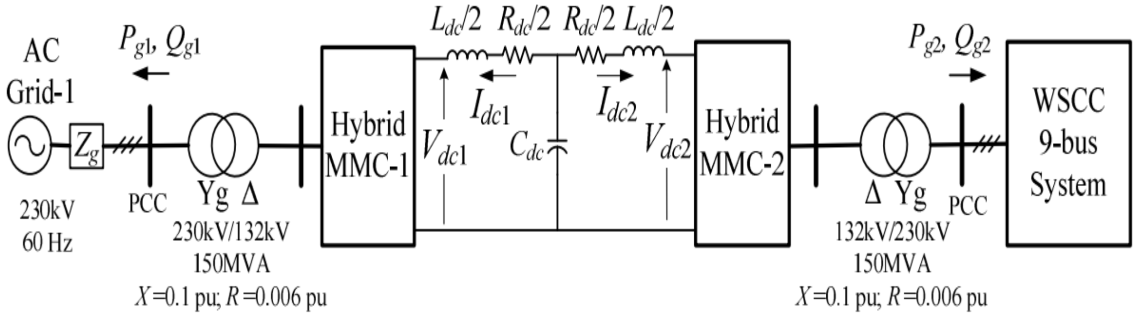


Fig.3- Block diagram

Working

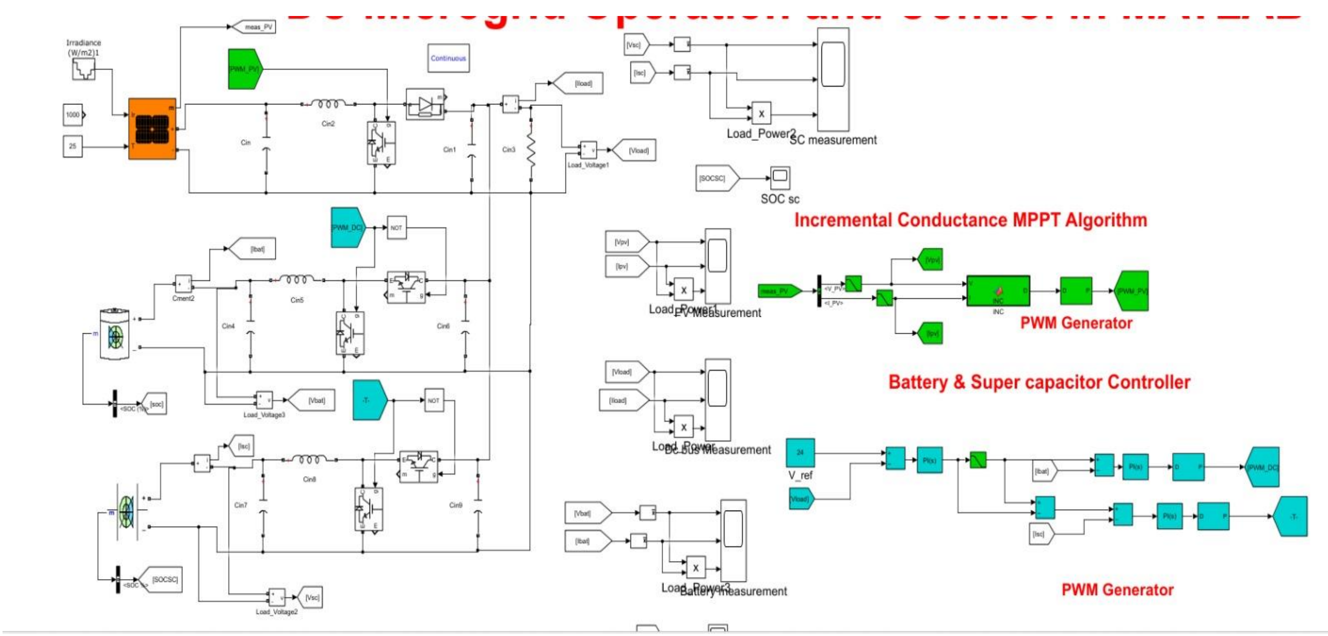
Fig shows the schematic diagram of PTP-HVDC transmission system having hybrid MMCs. Through a transformer, each MMC is connected to its AC grid at the point of common coupling (PCC). The DC terminals of both the MMCs are connected through an overhead HVDC transmission line represented using lumped 'T' model .

The information of the HVDC system parameters is shown in the Appendix. The schematic diagram of the control structure of the hybrid MMC based HVDC system is shown in fig. The ac side controllers are realized using synchronously rotating reference (d-q) frame . As shown in the figure, the active power (Pg) and reactive powers (Qg) exchange by the MMC with the ac grid are controlled through d-axis current and q-axis current respectively.

The average value of SM capacitor voltages of the MMC (Vcav_tot) can be regulated through In this work, during normal operation both the MMCs are selected to regulate Vcav_tot through by positioning the selector switch 'Sd' at 0. Similarly, the ac voltage magnitude at the PCC can be regulated using and by positioning the selector switch 'Sq' at 0, else the MMC injects fixed reactive power (Q*) into the ac grid. The dc current (Idc) controller (in Fig.) regulates the dc current injected by the MMC into the HVDC line by varying the inserted leg voltage (vleg). The Idc-controller can be used either regulate the dc power (Pdc) to its reference or can be used to regulate the Vcav_tot and can be selected with the help of the selector switch 'Sdc1'. During the normal conditions active power is regulated through Idc by Sdc1 positioning at '0'. In a PTP-HVDC system, one converter regulates the power in the dc link (termed as Psetting terminal), while the other converter regulates the dc link voltage (Vdc-setting terminal). This mode of the operation of the MMC can be selectedusing the selector switch 'Sdc2' in Fig. .

Positioning Sdc2 at '1' makes the MMC to become Vdcsetting terminal; whereas, positioning at '0' makes it to become P-setting terminal. In this work, MMC-1 (in Fig. 2) is operated as Vdc-setting terminal and the MMC-2 as P-setting terminal. The ac voltage references from the ac side controllers.

IV. RESULT



Testing results :

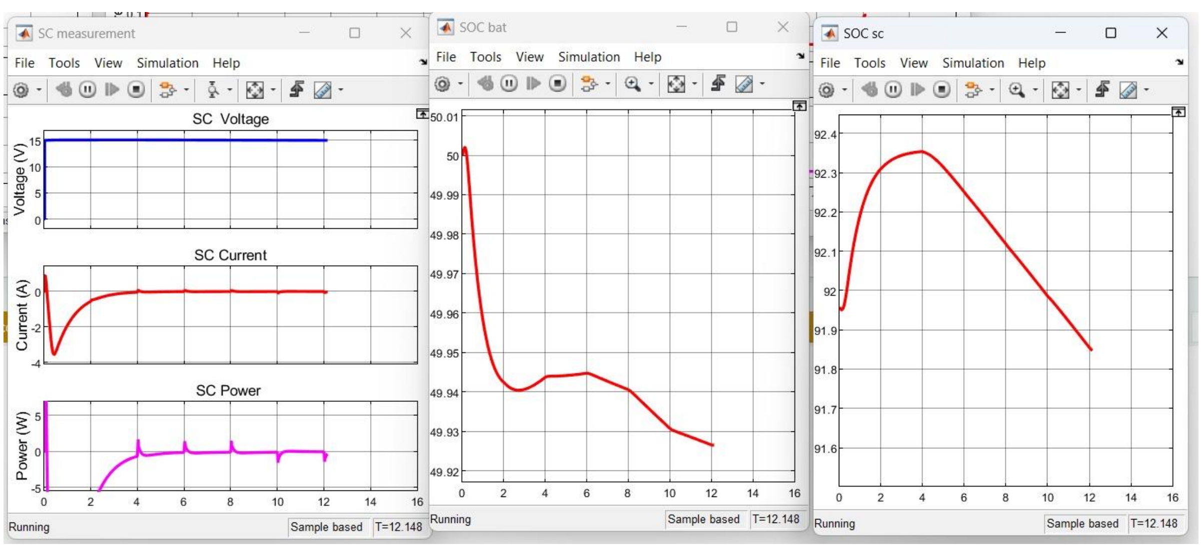


Fig 4 - The Graph of relative speed VS Time at transient (faulty system)

V. CONCLUSIONS

This chapter proposes a DC microgrid and an effective energy management system.With the exception of the D C load, every component of the DC microgrid is built for a decentralised PI controller. Depending on the energy management control approach, this controller is implemented utilising local voltage and current information for hybrid energy sources (wind, solar PV, and solar energy) and BESS.

One benefit of this suggested energy management control approach is that it eliminates the need for a communi cation link between the microgrid's local controllers. Consequently, the reliable operation of the DC microgrid is obtained in the energy management level. To evaluate the effectiveness of the proposed energy management control scheme, different operating modes are considered and simulated based on the different constraints of hybrid sources and BESSs. The simulation results show a stable operation of the DC-bus voltage while maintaining an effective power balance under different operating points of DC microgrids. Thus, the proposed energy management control strategy has the ability to maintain efficient control coordination among the hybrid energy sources, BESSs, and loads to support stable operation of DC microgrids. In future works, the proposed energy management control strategy will be implemented in a laboratory-based real-time platform.

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