Modeling and Simulation of Energy Storage System Based on Optimal Control of Energy Flow by using Fuzzy Logic Controller

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ABSTRACT

Battery energy storage systems (BESS) are required for smart grid. The reason is that the current energy distribution system of the electrical network produces large amounts of energy to promote the quality of energy; which leads to an important objectivity from the amount of consumption and energy produced. Therefore, efficient use of energy and subsequent monitoring requires a better model for such storage system. The problem of transient stability in the multi-machine model is a semi-infinite optimization problem for the non-linear event in the network of energy storage system. As it means that many sets of differential equations and algebraic obstacles; Therefore, the application of several mathematical programming techniques will not be sufficient to solve the problem. In the past, many algorithms were proposed.

Keywords: BMS, Transient, Energy, Fuzzy Logic.

I. INTRODUCTION

In the literature there is a long past of batteries integration within the grid and has acquired huge applications, and keeping in mind that battery energy storage systems (BESSs) as of now record for just a little segment of energy storage systems inside the grid, it witnessed incredible development as of late because of their flexibility, high energy thickness, and effectiveness [1-7]. The energy storage devices which are electrochemical in nature offer the adaptability in limit, and quick reaction required to meet energy demand requests over a significantly more extensive scope of capacities than numerous different sorts of storage. The power limit is around 125 GW for energy storage in the power grid and incorporates 3% of worldwide power limit [3, 4]. While numerous advancements have been produced for expansive scale energy storage applications, for example, hydro turbines, compressed air energy storage, flywheels, superconductors, capacitors, posed as an attractive form for energy storage, many are constrained in their site reliance, limit, or reaction abilities. Extra energy storage inside the grid would permit numerous more plants to run nearer to full limit and decrease energy misfortunes amid electricity transmission [5-10].

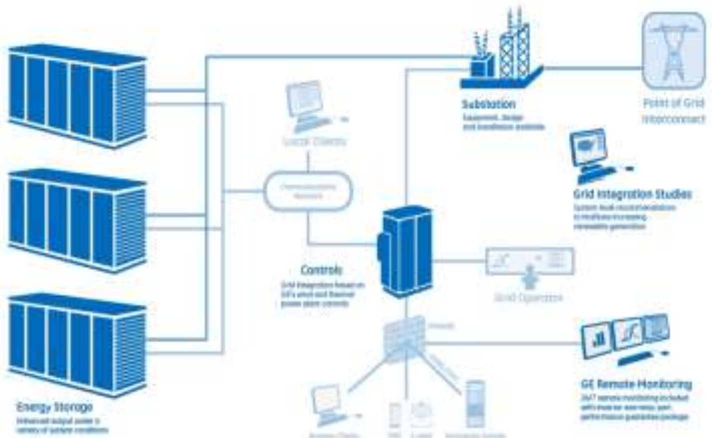

Fig 1. Generalized structure of BESS

II. METHODOLOGY

In this chapter, methodology has been proposed and try to optimize the constraints lead out by the timed simulation of battery management system for network of batteries while retaining the essential features characterizing it. The battery stack data and its usage data are taken from the server center of ISRO-National Atmospheric Research Center, Tirupati. This will allow the system to use the original data to eliminate the transient instabilities experienced by the power system for their server farms. In order to achieve this, we reduce the multi machine model to a single machine equivalent (SIME).

III. RESULT AND DISCUSSIONS

Beginning with a reformulated permeable terminal P2-D demonstrated incline in the performance, in our presented system we included conditions to display the interior temperature changes amid charging and the development of the SEI layer brought on from side responses at the anode. Be that as it may, keeping in mind the end goal to ensure long cycle life, the battery ought to restrict the measure of SEI development amid each cycle.

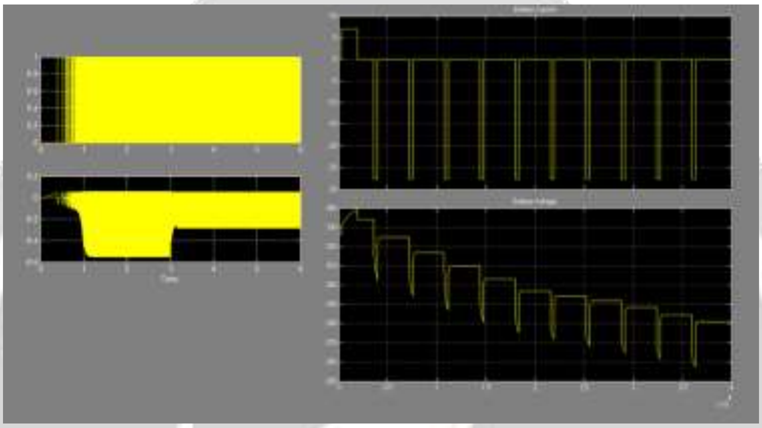

Fig 2. Results of the stability achieved through the presented BES control system while ensuring that the collective equivalent power flow model is achieved for 80 batteries connected in network

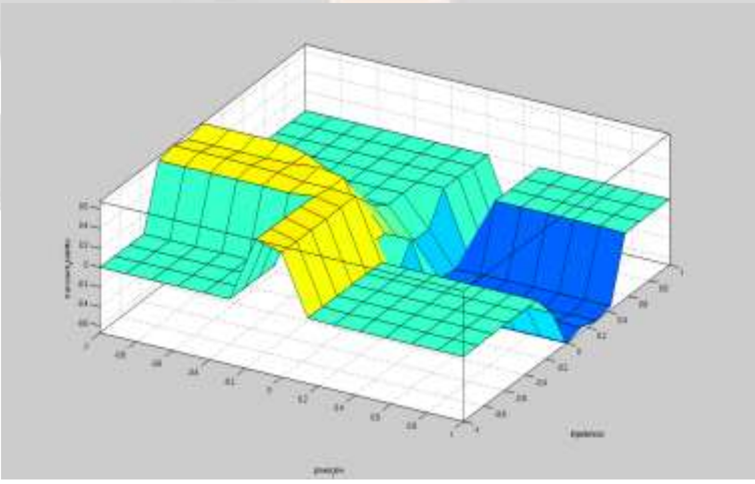

Fig 3. Surface of the decision rules generated by fuzzy method for optimizing the power flow control

This smooth blur administration will proceed until soon after 10% blur diminishment for this situation, after which the put away charge starts to diminish essentially and assist SEI layer development decrease is restrictive. Also, consistent current charging is unrealistic when utilizing sun powered power due to the non-steady state control from the sunlight-based cells.

IV. CONCLUSION

- This work studies BESS technology, applications, environmental impact, some commercial/residential options for BESS in power systems.
- BESS can be used as an efficient tool to integrate renewable energy source (RES) in power systems. BESS can mitigate some of the most important issues that RES produces in power systems. However, the maturity level of this technology, its complexity and economic problems have held back its implementation in current power systems.
- It is certain that BESS allows increasing levels of RES penetration in the power system; however, to do that it is necessary to optimize the capacity and location according to the application.
- The main goal of BESS combined with RES in a power system is not the elimination of conventional and polluting generation units; instead, the goal of BESS is to reduce the use of the units needed to complement RES in the power systems.
- Generally, units required to complement RES in the power systems are the most expensive and inefficient. Diminishing the use of these units can help to reduce costs and greenhouse gas (GHG) emissions.

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