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Hybrid AC-DC micro grids with improved power control strategy

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Abstract: ***Distributed electricity-based generators (DGs) play a major role in the generation of electricity, with the increase in global temperature. The generation distributed through the use of wind, solar energy, biomass, mini-hydro and the use of fuel cells and microturbines will provide a vital boost in the near future. Benefits such as environmental friendliness, flexibility and flexibility have enabled distribution to be distributed, supported by a variety of non-renewable and non-conventional micro source resources, an attractive option for modern electric grid preparation. The microgrid consists of a combination of loads and distributed generators that serve as one win-win system. As an integrated energy delivery system Microgrids can operate in parallel or separate from the main power grid. The Microgrid concept introduces the reduction of multiple transformers into a single AC or DC grid and helps connect various AC and DC renewable sources and loads to power systems. DG connectivity for use / grid through electrical converters has increased in concern about safe operation and equipment protection. For customers a microgrid can be designed to meet their specific needs; for example, improvements in local reliability, reduction in food service loss, support for local voltages, increased utilization of waste heat, adjustment of voltage sag or uninterrupted power transmission. In the present work the performance of the hybrid AC / DC microgrid system is analyzed in grid-bound mode. Here the photovoltaic system, wind turbine generator and battery are used for microgrid development. Control systems were also developed to enable converters to integrate the AC grid into the DC sub grid. Results are available in MATLAB / SIMULINK environment.***

Keywords: Hybrid power systems, micro grid, power management strategies, smart grid, Matlab simulation.

I. INTRODUCTION

A. General information regarding Micro grid

As electricity distribution technologies enter the next century, more and more methods are being introduced that will change the demand for energy. This refinement is driven from the demand side where high energy efficiency and performance is obtained and from the supply side where the generation of distributed and technological peaks is combined. The technical challenges related to microgrid performance and control are immense. To ensure stable performance during network disruption, maintaining the stability and quality of power in island operating mode requires the development of sophisticated control techniques of microgrid inverters to provide stable frequency and volume in the face of indiscriminately low load.

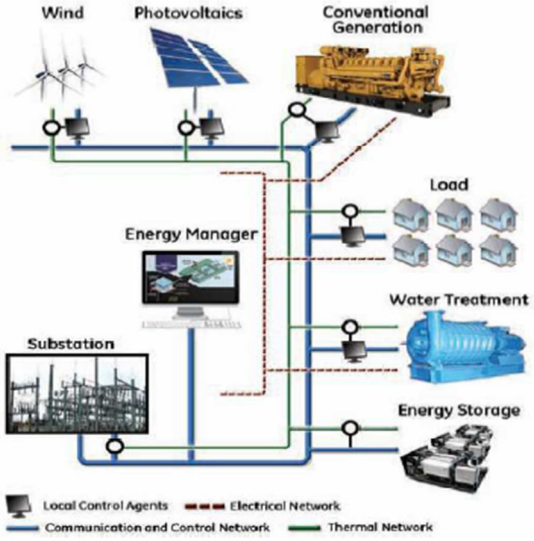

Fig 1.Microgrid power system

Due to the increased installation of different types of power generation and the grid has raised serious concerns about existing AC systems. Most of the smaller grids are DGs and renewable sources of energy that work much like AC grids. Since most of the electric grids are now ac-type, the ac grids are still prominent and the smaller DC grids are expected to originate only from the electric grids.

Therefore, smaller dc grids tend to be made in ac types even though less. As a result, linking AC grids with smaller DC grids and taking advantage of both smaller grids, has become of interest in recent studies. The idea is to integrate the ac and DC small grids through the AC / DC converter and to implement a small hybrid AC / DCGrid where the ac or dc type sources of power and loads can integrate between the smaller grids and the power can flow smoothly between two small grids. Like other small grids, a hybrid AC / DC micro grid can operate in grid-connected or island-based ways and a control system should be able to support both active and transition paths between these systems. Therefore, an appropriate control strategy to combine the performance of dc sources, ac and IC sources is very important.

II. LITERATURE REVIEW

A. *FarzamNejabatkhah ; Yun Wei Li ,"Overview of Power Management Strategies of Hybrid AC/DC Microgrid", IEEE Transactions on Power Electronics (Volume: 30 , Issue: 12 , Dec. 2015)*

This paper presents an overview of the energy management strategies of a hybrid ac / dc system, which includes different system structures (ac-coupled, dc-coupled, and ac-dc-coupled hybrid microgrid), alternative methods, a comprehensive study of various power management and control schemes in both state and temporary situations, as well as examples of power management and control strategies. Finally, discussions and recommendations for energy management strategies are presented for further research.

B. *A. A. Eajal ; E. F. El-Saadany ; K. Ponnambalam "Inexact power sharing in AC/DC hybrid microgrids" , 2016 IEEE Canadian Conference on Electrical and Computer Engineering (CCECE)*

This paper analyzes the functional aspect related to AC / DC hybrid Microgrid and that is the problem of poor power sharing. The simulation results indicate that the non-uniformly distributed power distribution of the AC microphone and the nonlinear operating voltage distribution in DC computers will migrate to the AC / DC hybrid microgrid. The results of the study also show that convergent converters experience the same problem of unequal power sharing.

C. *ReekaNarang, VarshaSharma ,"A Review on AC DC Microgrid System" , International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 , Volume: 05 Issue: 12 | Dec 2018*

In this paper the robustness of the hybrid microgrid signal analysis for analysis. In order to reduce system fit and better analysis of the proposed droop controller, the dc springs and their integrated droops create a single integrated DC source. This is done with ac, dc and ac loads. The hybrid microgrid analysis is therefore simplified from an IC perspective. A recognized control strategy based on a modified three phase droop method for blurring the AC and DC voltages. The different types of modelling are AC Modelling, DC Modelling and IC Modelling. Using the proposed droop method, the IC is able to power the sharing between two microgrids in the transition from grid connected to island input mode and during island operation. Use is guaranteed using MATLAB software.

III. MOTIVATION OF PROJECT WORK

The microgrid concept serves as a solution to the conundrum of integrating large numbers of micro-generation without disrupting the operation of the consumption network. With a logical interaction of loads and micro-generation, the distribution network system (or 'autonomid') will be much more complex to the operating network, than the conventional microgeneration. Larger micrographs can also provide auxiliary services such as local power management. In the event of a crash on a large network, microgrids can dynamically disconnect and continue operating separately. This functionality improves the quality of power for the customer. From a grid perspective, the benefit of Microgrid is that it can be considered as a controlled enterprise within a power system that can be used as a single integrated load. Customers can benefit from microgrids because they are designed and operated to meet their local heat and power requirements and provide consistent power, improve local reliability, reduce feed losses, and support suitable local voltages / sag. In addition to manufacturing technologies, the microgrid includes storage, load control and heat recovery equipment. The ability of the microgrid to work when connected to a grid and to smooth transition to and from island mode is another important task.

IV. OBJECTIVE OF THE PROJECT

The main objective of the project is the development of a hybrid microgrid that will ease the process of multiple transformations associated with the AC and DC grid by integrating the AC and DC grid, Photovoltaic (PV) system and Wind turbine generator. Developed a strategy for energy management microgrids through hybrid microgrid integration. In order to analyze the performance of the Microgrid system both model and program control are important issues.

V. CONCLUSION

The hybrid microgrid modulation of the power system configuration was performed in the MATLAB / SIMULINK environment. The present work involves hybrid bound mode for hybrid grid operation. In this paper, a new proposal was developed to develop standard distribution networks in hybridAC / DC microgrids using the capabilities of the DC microgrid and modification of the designof series and its associated controllers. The simple design of the suggested control systems assists with fast operating response. In the proposed strategy, the simultaneous access to the objectives of dynamic quality and functional compensation was provided in both grid-connected and integrated grid systems. In summary, understanding the energy quality objectives includes maintaining the quality of electricity sent to consumers, as well as the currents taken from the AC grid. As a new feature of the set plan, where a hybrid microgrid is stationed in island mode, series transformers play a role in the multiplicity of three nearly sinister phases. In this case, the energy quality of the AC microgrid is guaranteed. Finally, once we investigated the effects of estimating specific conditions on a negative energy course and demanding compensation for energy efficiency, the proposed strategy was studied.

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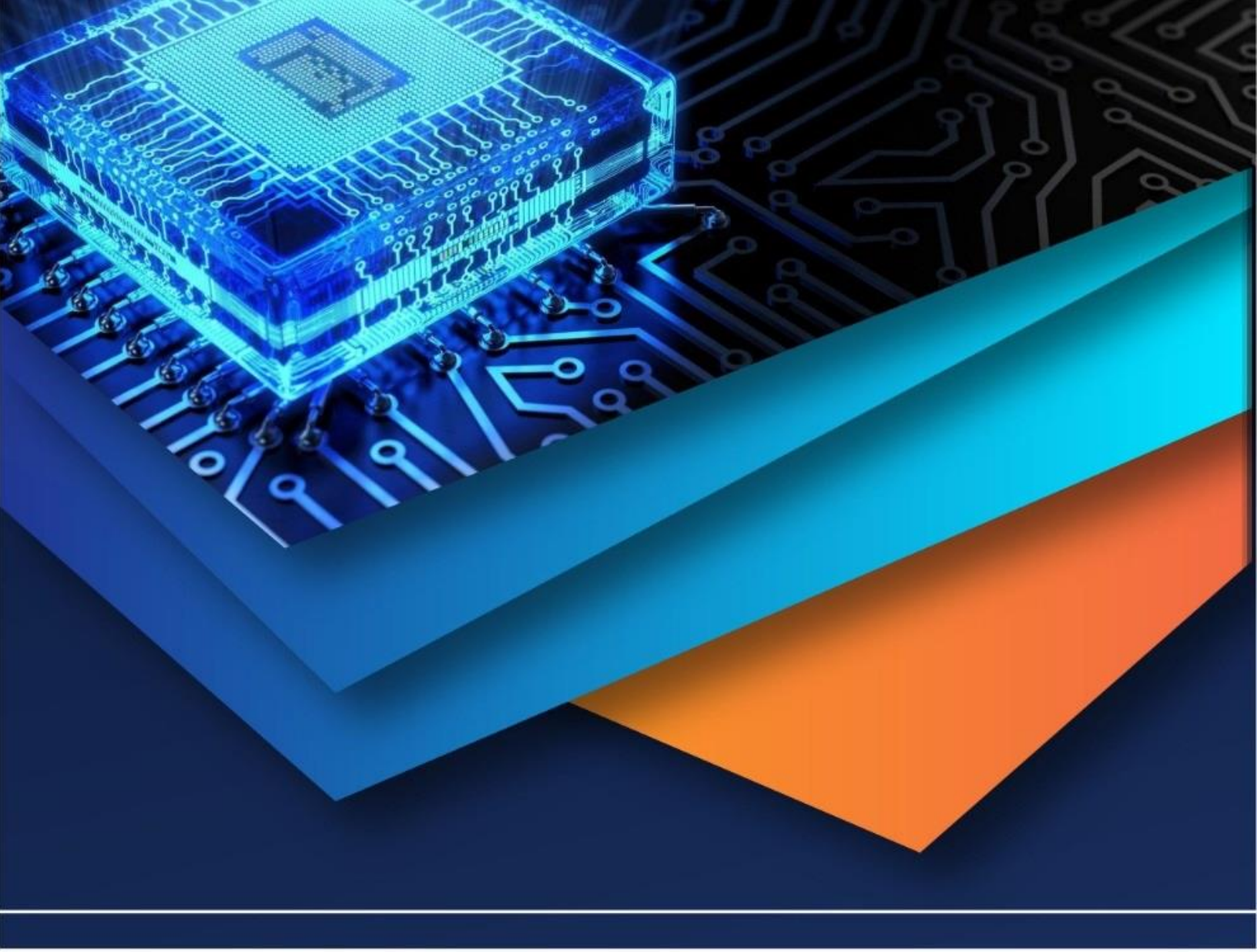

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