Review Paper on Distributed Control of Micro-Grid

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ABSTRACT

Micro grid system has received a lot of and a lot of attention internationally in recent years. Because the best sort of distributed generations, small grid system has additionally found wide applications in several areas. Micro grid is efficient thanks to manage energy storage systems, natural resources generation and numerous hundreds to produce high & smart quality power. Because of the irregularity of renewable generation, additionally as perpetually ever-changing load demand, energy storage systems area unit typically planned to balance supply-demand within the small grid. There's associate increasing a lot of interest in try targeted to the analysis and style and implementation of distributed management systems for AC Micro grids, DC and hybrid AC/DC Micro grids. The controlling Micro grid varies Equipment are used. In this project we can show the controlling of Micro grid system using Matlab Simulation.

Keywords: *Micro grid, monitoring system, control strategy.*

INTRODUCTION:

In recent years, distributed generation (DG) technologies such as photovoltaic (PV), wind turbine (WT), hybrid power generation and co-generation plants have received more interest due to their benefits such as good quality power supply, environmental preservation, high reliability and energy cost reducing [1]. However, increasing amounts of individual distributed generators will be also causes as many problems as it may solve [2, 3]. A large number of distributed generators will probably introduce difficult of control and manage. A better way to realize the emerging potential of distributed generation is to treat generation and associate loads as a system [4]. In order to solve the difference between power system and distributed generation and improvement the performance of operation of power system, micro-grid technology comes into being. Micro-grid can operate in two modes such as islanded mode or grid-connected mode and hence increase the reliability of power supplies by disconnecting from the grid in the case of network faults. Micro-grid is the most effective form of distributed generations.

Now days, considerable research has been undertaken on the micro-grid technology. As part of the research, a series of micro-grid test facilities, such as CERTS micro-grid test bed, GE micro-grid in America, Aichi, Kyoto, Sendai micro-grid in Japan, Labein, Kythnos, CESI micro-grid in Europe, have been built for possible demonstrations of advanced distributed generation system. But as a newly-

emerged thing, the practical applications of the micro-grid are still in the initial stage, and further research is still necessary. Design and control issues are the main points which decide the performance of micro-grid system. How we design the configuration and control method of micro gird systems rationally and effectively is the most important one to be solved among relevant issues.

STATEMENT OF THE PROBLEM AND HYPOTHESIS :

Micro grids are power distribution networks in which users and generators are in interconnected Connected. Generation technologies include renewable micro sources such as photovoltaic cells or wind turbines. The integration of renewable micro sources along with the Main electrical System occurring faults in systems. In this project we can find solution and monitoring the system

AIMS AND OBJECTIVE

- Controlling and monitoring micro grid system
- Observing the frequency ,voltage, power of the system
- Analysis the output of Micro-grid system

REASEARCH METHODOLOGY

The MATLAB® app is a stand-alone MATLAB program that can be used automatically to perform tasks or calculations. All the tasks required to complete the task - entering data into the application, performing statistics, and displaying results are done within the app. Applications are included in most MATLAB products.

Simulink is a simulation and model-based platform for flexible and embedded systems, integrated with MATLAB. Simulink, also developed by Math Works, is a data flow tool for data editing for modeling, simulation and analysis of dynamic systems in multiple domains. It is basically a graphical block drawing tool with a custom-made set of block libraries.

Allows you to integrate MATLAB algorithms into models and export simulation results to MATLAB for further analysis.

Simulink supports −

- system-level design
- simulation
- automatic code production
- testing and verifying embedded systems

There are several additional products offered by Math Works as well as external computer software and software products available for use with Simulink. The following list gives a brief overview of some of them.

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Simulink Coder allows for the production of source code for real-time use of automated systems.

• The xPC Target and x86-based real-time systems provide Simulink simulation and testing and real-time regional models in the virtual system.

• Embedded Code supports embedded targets.

• HDL Coder allows automatic production of VHDL and Verilog that can be merged.

• SimEvents provides a library of graphical building blocks for modeling line systems.

Simulink is capable of systematic verification and validation of models by modeling model testing, tracking required and model installation analysis. Simulink Design Verifier allows you to identify design flaws and generate test conditions for test models.

I. MICRO-GRID DESIGN

A. Optimal Configuration

In order to meet the requirement for efficiency and cost savings, the configuration of appropriate skills in components is critical to system design. A standard micro grid system which includes PV, WT, energy storage systems, loads, and other distributed generations will be considered as shown in figure 1.

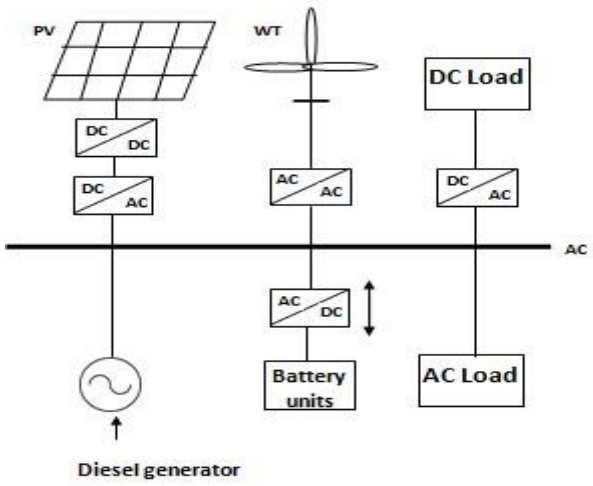

Fig. 1.Typical structure of micro grid system

In related studies, complete system configuration was performed as a summary, adopted genetic algorithm approach and using MATLAB simulation software to analyze systems. The MATLAB software is designed to analyze the configuration of renewable energy systems and can mimic Micro grid systems connected to and from off the grid. MATLAB compares different designs based on technical and economic factors in the search for appropriate solutions. At the same time, it can assist in analyzing the effects of uncertainties and changes in input data, such as input capacity to generate renewable energy, capacity storage system and resource data. A micro grid system model in MATLAB is shown in Figure 2.

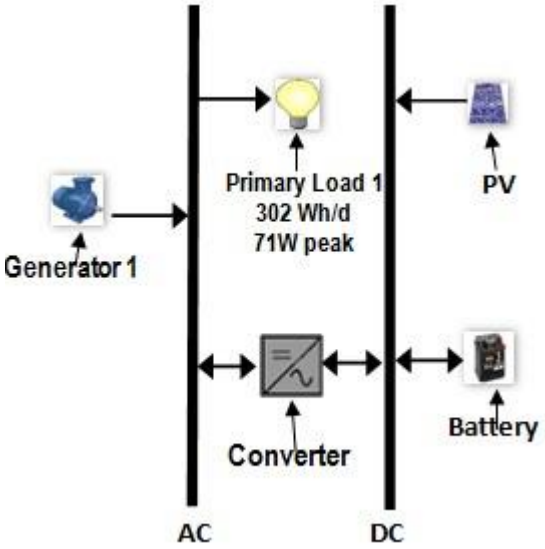

Fig. 2.The micro grid system model in MATLAB

With the restriction of trust, the economic efficiency of the renewable energy system can be greatly improved if a small portion of the annual load is allowed to be unused. For example, a solar array that does not need to meet a large load from time to time may be much smaller than it should always be. This is especially true for those heavy-duty situations that occur after a few days of cloud cover. If it is acceptable for the system to decline for a small half of the year, or if unnecessary loads can be eliminated when the battery bank is low, large capital costs could be saved. MATLAB models this scenario with the maximum annual capacity shortage constraint. Set to 0% by default (in which the system must meet the entire load all of the time) a sensitivity analysis on this variable shows that the optimal system type might change if a small amount of the annual load (1/2% to 5%) is allowed to go un-served.

B. Micro grid control

Compared to conventional thermal power, there are basic power fluctuations (such as wind and sun) and dual flow in the dynamic secondary power distribution (such as dual power flow between a small grid and a large power grid, a double-guided power bus of energy storage units) on a small grid. In addition, the subsequent load response speed of each DG unit is very different. All of these features add to the complexity of automatic grid management, especially good planning. A small grid system usually has a sequential control structure the proposed system control system comprises the following three control levels as shown in Figure 3:

1) Local micro source controllers (MC) and load controllers (LC);
2) Micro grid system central controller (MGCC);
3) Distribution management system (DMS).

The MC uses a visual power connector for DG sources. It uses location information to control the voltage and frequency of a small grid in temporary cases.

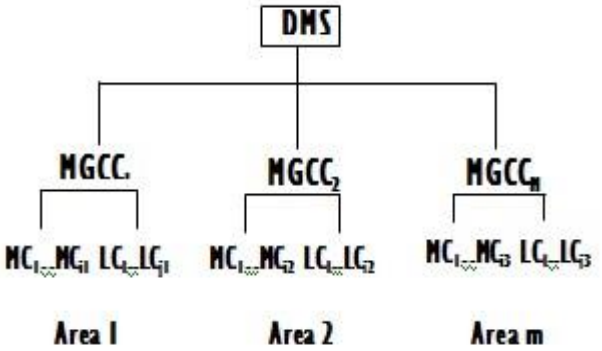

Fig.3. Hierarchical control structure of micro grid

The MCs follow the requirements from the central controller, where they are connected to the power grid, and make local improvements to the production of efficient and effective DG power, as well as tracking rapid loading following the island's living conditions. Small area load controllers installed in manageable loads provide load control capabilities following instructions from the MGCC for load control.

The MGCC is responsible for increasing the value of the grid as well as for the efficiency of its operations. It exploits electricity market prices and grid security concerns to determine the amount of energy a small grid should draw from the distribution system, thereby improving local production capacity. The specified operating condition is achieved by sending control signals to MCs and LCs. In this paper, non-critical, manageable loads can be disposed of if necessary, depending on the demand side of demand (DSB). This functionality can be considered equivalent to the secondary control of a large power system. In terms of market conditions, the MGCC may represent the activities of an aggregator or power service provider, acting in the interests of one or more micro grids.

Common DMS methods need to be developed with new features related to the performance of small grids connected to servers. The exchange of information within the normal small grid is as follows: every m min, for example, 15 minutes, each DG source bids the next-hour production bids at intervals of m-min. These bids are adjusted according to open market power prices, operating costs of DG units and the benefit of the DG owner, and other input facility requirements, such as space heating. For example, if the owner of the DG has installed a CHP unit, he may wish to supply the area temperature at a certain time. In the meantime, bids sent to the MGCC should aim to maximize this benefit by participating in the electricity market.
The MGCC improves the performance of the small grid system in terms of open market prices, bids received by DG

sources, and predictable loads, and sends a signal to MCs of DG resources to commit, and if appropriate, to determine. The level of their production. In addition, consumers within the small grid may request the provision of their luggage for the next hour at the same time or may request a reduction of their luggage. In this regard, MGCC enhances performance based on download bids and DG resources, and sends transmission signals to both LCs and MCs. Figure 4 shows the flow of information exchange in a small standard grid operating under such conditions.

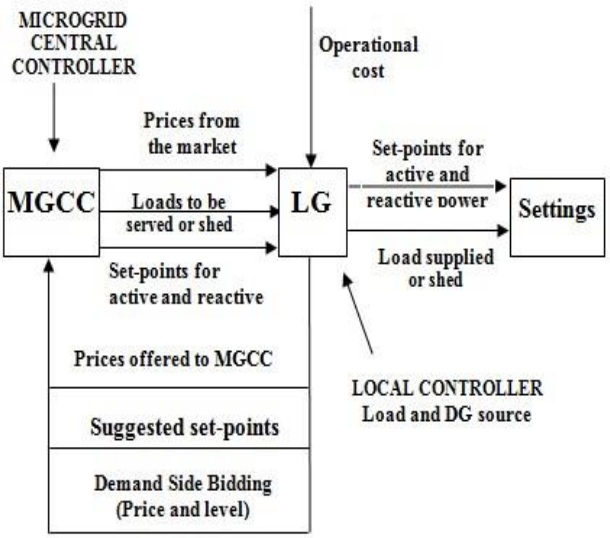

Fig.4. Information exchange flow between MCs and the MGCC

The process of optimization depends on the market policy adopted for micro grid performance.

A. Market Policies

In the first policy, the MGCC aims to provide the full potential of a micro grid, utilizing local power generation, as far as possible, without having to transfer power to the top distribution grid. With the full functionality of the distribution grid, such behavior is advantageous, because in those times of high demand, when the price of energy in the open market is high, the small grid frees up network congestion that may partially or partially meet energy needs. . On the consumer side the MGCC reduces the operating costs of a micro grid, taking into account open market prices, demand, and DG bids. Micro grid buyers share the benefits of reduced operating costs. In the second policy, a micro grid participates in open markets, buying and selling active and efficient energy in the grid system, either by collecting or providing the same energy service provider. In terms of this policy, the MGCC seeks to increase the value of a micro grid, such as increasing the corresponding revenue collection, by exchanging power with the grid. Consumers pay tribute to their use of effective and efficient energy at open market prices. The micro grid behaves as a single generator that can avoid the problem as possible network congestion not only on the small grid itself, but also by transmitting the generated energy to nearby distributors of the distribution network.

B. Demand-Side Bidding

It is assumed that each consumer has lower and higher responsibilities that allow him or her to send separate bids to the MGCC for each of them. In our application, it is assumed that each consumer places bids on two levels that reflect his or her priorities. Significant "low" loads can be satisfied at times of low value (shift) or can be given at all (reduced). The same method can be applied to more than two bid levels that accurately reflect the consumer's priorities. In addition to the control structure, the study of small grid control methods. The volatility of distributed production and the variability of distributed production units have increased complexity and control of micro complex grids.

Distributed generations in micro grid are connected to the bus bar using a power supply that is very different from generators connected directly to the grid. In addition, energy storage systems are often equipped to increase system inertia. Thus traditional control methods are no longer used effectively to control the operation of a micro grid. There are two methods of control, primary slave control and peer control. There is a main control unit in the master-slave control to maintain a constant voltage and frequency (V / F). Larger control units retain V / F control while other distributed generations use Power Quality control to generate some effective and efficient power. Each unit is balanced in peer-to-peer control, based on the path of external reduction factors. It corrects the frequency compared to the active power, the voltage compared to the active power respectively. By using a specific control algorithm, the voltage and frequency will be adjusted automatically without the aid of a connection.

CASE STUDY

The structure of the micro grid (MG) system is shown in figure 5.

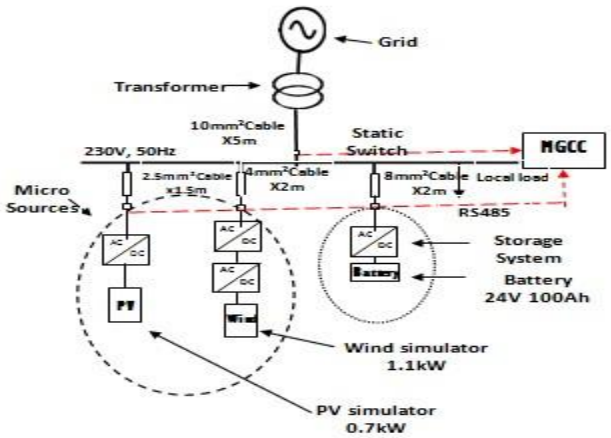

Fig.5. Schematic diagram of a laboratory scale micro grid

It is a single phase system, with 230V, 50Hz, comprising PV simulator, wind simulator and battery storage. Both of them are connected to the AC grid via flexible power electronic interface. There is also a Micro grid Central Controller (MGCC) that handles the operation of a micro grid. MGCC activities range from monitoring the efficient and effective power of distributed resources, voltage and frequency of AC bus. It is also responsible for maximizing the value of the micro grid and improving its performance by sending control signal settings to distributed resources and loads controlled by communication lines. On the MG laboratory scale, based on small-scale resource management techniques and battery storage, a series of experiments were performed, power outages of generators and battery, voltage and frequency of AC bus were real time. Measured and analyzed Power Quality Analyzer.

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