

MICROGRID WITH RENEWABLE ENERGY SOURCES IN DISTRIBUTION NETWORK

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Abstract— To rectify the gap of electricity between demands of consumers of electricity, the renewable energy source (RES) is the solution of the problem. There are many advantages which provide both from consumers and from the utility by implementation of microgrid systems. Due to many advantages of microgrid, the development carried out by the various countries of the world. The microgrid has better quality and it is also more environments friendly. DSTATCOM is a powerful tool for improvement the performance of microgrid.

Index Terms- Microgrid, REC, D-STATCOM and Distribution Network

I. INTRODUCTION

The fossil fuel energy sources are the main energy supplier worldwide, however, the environmental issues with the conventional energy resources has led to the development and implementation of renewable energy sources, such as, solar, wind, hydropower, energy storage etc. in the supply network. The increasing number of the distribution generations (DGs) penetration in the electric power system and the electrical proximity among interconnected DGs in the network, has paved the way for the microgrid system [1].

Distributed generation means small generation (50 or 100MW) units installed on particular points of distribution system. While the term DG can be integrated for supplying the generation to consumer. In distribution systems, Distributed generation can provide benefits to the utilities as well as for the consumers. A distributed power generation unit can be connected directly to the utility's transmission or distribution system or to consumer side [2]. The power quality and voltage profile is the main issue of integration of Distributed Generation (DG) to distribution network. Distributed generation is being very popular throughout the world due to environment awareness and its benefits. The power quality and voltage profile is the main issue of integration of Distributed Generation (DG) to distribution network. The literature survey shows that the great influence of the location of fault on the voltage sag of the buses due to the electrical distance between the buses [3]. Distributed energy resource (DER) is the group of various green energy resources viz. renewable energy generators, PV solar energy, wind energy, electric storage and electric vehicles (EVs). These energy

resources are located to the low voltage feeders at consumer's premises. Now-a-days, PV solar technology is the hot area for generation of green energy. The photovoltaic (PV) cells will become the major part of distributed generation from between 2010 and 2019. Electric distribution networks are a main key

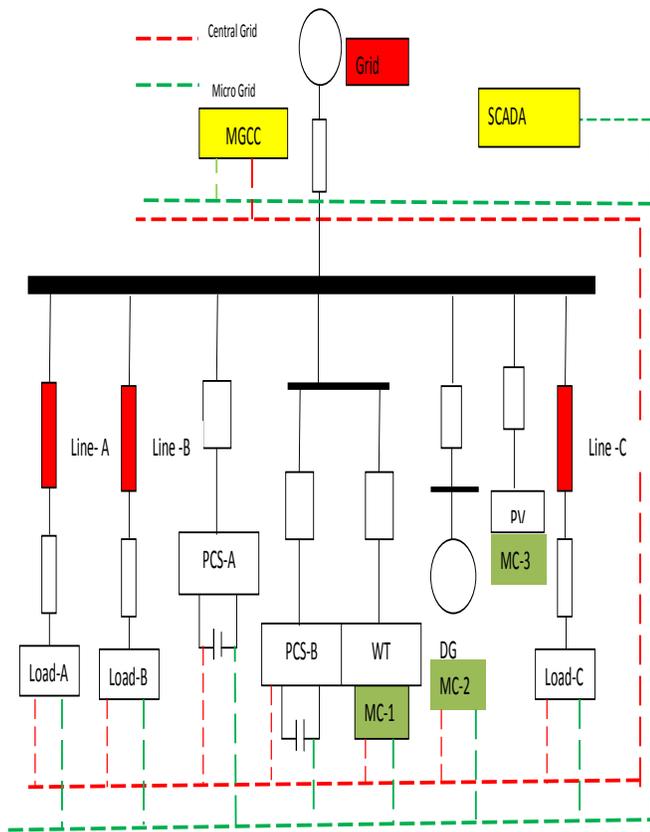
of the infrastructure which supports to the industrial, commercial, and residential facilities. The present Indian Power system is facing the no. of various difficulties viz. infrastructure, power quality, reliability and big gap between demand and generation [4]. Nowadays, these difficulties can be rectifying by development of renewable, distributed generation and deployment of Microgrids and Smart Grid.

II. MICROGRID

Now-a-days, the microgrid is not a new concept, but the microgrid is a modern structure of present power system. Microgrid is a small-scale power system, including distributed generation, energy storage and load [5]. The definition of microgrid as per US Department of Energy (DOE): "Microgrid" means a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid and that connects and disconnects from such grid to enable it to operate in both grid-connected or "island" mode. A microgrid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that act as a single controllable entity with respect to the grid [7]. The application of microgrids to provide the continuous power to remote communities during an outage of indefinite duration [6]. The Microgrid technology has been developed very fast in recent years with the trend of the integration of renewable resources and distributed generation with distribution systems, [8-12]. Microgrid can be operated in the grid-connected and the islanded mode [13]. Residential microgrids are mainly based on renewable energy sources (i.e., mainly on photovoltaic panels), energy storage systems (that enable time-shift between production and consumption), and on power converters representing control points that by proper operation ensure overall system stability and quality of power supply [14].

Basic Component of Microgrid:

The microgrid systems containing distributed power, energy conversion system (Power Conversion System, PCS), a local load, SCADA, microgrid central controller, microsource controller, load controllers, mode controller and other secondary devices. A typical microgrid structure and equipment deployment shown in Figure 1.



III. D-STATCOM Application in Micro-Grid

Mostly AC loads are consuming reactive power due to availability of reactance. Due to heavy consumption of reactive power, the power quality is getting poor. To load flow control, the reliable semiconductors devices (GTO and IGBT) are parameters, the FACTS devices offer a fast and reliable control.

The D-FACTS (Distribution FACTS) technology is used in the distribution system. It has fast and flexible control features. To improve the system stability and improvement in power quality, D-FACTS are used in microgrid. DSTATCOM is very well known family members of D-FACTS and DSTATCOM provide the effective solution regard to the cost, to compensate the reactive power and unbalance loading in distribution system. The DSTATCOM has the various advantages viz. (a) DSTATCOM is used in voltage regulation in distribution line (b) It is used to improve power factor as unity (c) It is used to mitigate harmonics in distribution system (d) It is also used for load balancing.

The incorporation of the renewable energy sources with advanced self-commutated flexible ac transmission system (FACST) devices and multipurpose storage medium has developed the concept of smart microgrid system. Compared

to the bulk power utility systems, the smart microgrid contributes in bidirectional power flow and allows customers to participate in the electricity enterprise. Moreover, the existing microgrid can reduce the power transmission

infrastructures related costs by fully supplying the required power demand on residential and commercial areas.

D-STATCOM is an important "custom power" device. Compared with the other types of devices, it can solve the grid voltage fluctuation and flicker, current distortion, three phase voltage unbalance, and other power quality problems, so it is getting much attention in distribution system and the development direction of the reactive power compensation and power quality control in distribution system at present [15].

D-STATCOM in microgrid will be widely used. D-STATCOM can be applied in distributed systems is reported in [6]. It will replace the conventional SVC and become an important device to improve the system power quality.. The D-STATCOM for voltage regulation has been discussed detailed in [8-10].The DSTATCOM applied to isolated island systems is proposed in [8]. The simulation of D-STATCOM for three-phase load voltage regulation in island system ,among recovery from the steady state, the load increase and load decrease , got results of the D-STATCOM can correct the power factor, regulate voltage and balance load.

The D-STATCOM for voltage regulation is further analyzed in [9]. The D-STATCOM which can ease voltage fluctuations, voltage regulation in micro-network system is studied in [10]. The installation location of DSTATCOM in microgrid was discussed and the conclusion is that the more the D-STATCOM far away from the voltage source, the better its voltage regulation performance is.

Conclusion

In this article, the authors discuss the importance of Microgrid in present power scenario. With the application of microgrid the gap between supply and demand can be reduced. Using the FACT devices in distribution side, the microgrid will give optimized performance.

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