



**International Journal of Allied Practice, Research and
Review**

Website: www.ijaprr.com (ISSN 2350-1294)

The Micro Grid Design Based on Dual Energy Generating Sources

**Jaffar Hussain and Nipun Aggarwal
M.Tech. Scholar, Assistant Professor**

**Department of Electrical Engineering, Jind Institute of Engineering and Technology, Jind-
Haryana, India.**

**Department of Electrical Engineering, Jind Institute of Engineering and Technology, Jind-
Haryana, India.**

Abstract - The electricity crisis is a common problem in India and there are numbers of areas mostly rural which receive electricity for very less time. Most of the areas are very rich in sources like solar and wind but still we are facing electricity shortage mostly in winters. The paper is about the design of modern grid based on hybrid policy to address the electricity shortage.

Keywords - DERs, DG, ESS, BES, MPPT.

I. INTRODUCTION

The main micro-grid elements embody masses, DERs, master controller, sensible switches, and protecting devices, similarly as communication, management and automation systems. Micro-grid masses are usually categorized into two types: fastened and versatile (also called adjustable or responsive). Fastened masses cannot be altered and should be glad underneath traditional operational conditions whereas versatile loads are conscious of dominant signals. Versatile masses might be curtailed (i.e., curtail able loads) or delayed (i.e. shift ready loads) in response to economic incentives or islanding necessities. DERs consists of distributed generation units (DG) and additionally with distributed energy storage systems (ESS) that might be put in at electrical utility facilities and/or electricity consumers' premises.

The weather and climate can't be directly controlled like fossil fuelled generation. Power networks were designed to control by electricity generated during a few massive power stations that work by fuels that are promptly out there on the international market which are manageable to varied degrees. Therefore the important increase of the input from renewable energy sources needs a revision of however power systems are designed and operated so as to accommodate these sources higher. These resources are out there within the kind that either they need to be regenerate into electricity or their electrical output should be conditioned before it may be fed into the grid. The renewable energy generator could also be represented either as standalone or grid connected. In these days, hybrid technology has developed and upgraded its role in renewable energy sources whereas the benefits it produces for autonomous power production are unquestionable. These days several homes in rural

and concrete areas use hybrid systems. many isolated islands attempt to adopt this kind of technology as a result of the benefits which can be received as compared with one renewable system.

II. LITERATURE REVIEW

Velmurugan et al (2018) the research paper entitled “Hybrid Renewable Energy Based Micro Grid” describes the effect of fossil fuels on the global warming. The paper defines the importance of micro-grid and is a concept that integrates the DER (Distributed Energy Resources) to develop an independent electric infrastructure. This paper presents the significance of the deployment of hybrid renewable energy based micro grid as a promising aspect in the future of power systems. With this intention the micro grid architecture is designed consisting of high penetration of distributed generators linked to the grid through controllable power electronic based devices, along with the inclusion of communication techniques, electrical energy storage systems.

Tiwari and Goel (2017) the research paper entitled “Design and control of Micro-Grid fed by Renewable Energy Generating Sources” describe the control of a micro-grid at an isolated location fed from wind and solar based hybrid energy sources. DFIG machine is deployed for wind energy conversion which is a doubly fed induction generator. A solar photovoltaic (PV) array is used to convert solar power, which is evacuated at the common DC bus of DFIG using a DC-DC boost converter in a cost effective way and the voltage and frequency are controlled through an indirect vector control of the line side converter, which is incorporated with droop characteristics. The system also works at the absence of wind power source. The system is a hybrid concept based on solar and wind and is designed for complete automatic operation taking consideration of all the practical conditions.

Kumar et al (2016) the research paper entitled “Grid Integration and Power Quality Issues of Wind and Solar Energy System: A Review” presents review on grid integration and power quality issues associated with the integration of renewable energy systems in to grid and role of power electronic devices and flexible AC Transmission Systems related to these Issues. In this paper, recent trends in power electronics for the integration of wind and photovoltaic (PV) power generators are presented.

Kumar and Tiwari (2016) the research paper entitled “Renewable Energy Resources with Smart Microgrid Model in India” describes energy crisis facing people of India with the increase of energy consumption. Even for electricity generation from renewable sources. Renewable energy such as sunlight, wind, rain, tides, and geothermal heat will have to depend on natural resources. This paper describes dynamic demand response and smart micro-grid for residential and industrial consumption in the context of renewable energy production, including the proposed management approach. The objectives of this research, renewable energy resources with a smart micro-grid have played an important role.

Lee et al (2016) the research paper entitled “Design and Implementation of a Microgrid Energy Management System” describes microgrid and is characterized by the integration of distributed energy resources and controllable loads in a power distribution network. Such integration introduces new, unique challenges to microgrid management that have never been exposed to traditional power systems. To accommodate these challenges, it is necessary to redesign a conventional Energy Management System (EMS) so that it can cope with intrinsic characteristics of microgrids.

Kumar and Bhimasingu (2015) the research paper entitled “Renewable energy based microgrid system sizing and energy management for green buildings” presents the hybrid power system model for building with economically optimal. The system is modelled and the optimal system configuration is estimated with the help of hybrid optimization model for electric renewable (HOMER). The logic is illustrated with a case study based on the practical data of a building located in southern India.

Zaheeruddin and Manas (2015) the research paper entitled “Renewable energy management through microgrid central controller design: An approach to integrate solar, wind and biomass with battery” describes an isolated microgrid consisting of sources like wind, solar, biogas with battery. Provision of utility grid insertion is also given if total microgrid sources falls short of supplying the total load. To establish an efficient energy management strategy, a central controller takes the decision based on the status of the loads and sources. The status is obtained with the assistance of multi-agent concept (treating each source and load as an agent).

Ravichandrudu et al (2013) the research paper entitled “Design of Micro-grid System Based on Renewable Power Generation Units” describes the importance of micro-grid based systems in future power systems. Renewable power sources such as wind and hydro offer the best potential for emission free power for future micro-grid systems. This paper presents a micro-grid system based on wind and hydro power sources and addresses issues related to operation, control, and stability of the system.

Che and Chen (2012) the research paper entitled “Research on Design and Control of Microgrid System” describes the popularity of micro-grid across the globe in recent years. The optimal configuration issue of micro-grid system is described briefly first. And then the monitoring system of micro-grid system is discussed in details. Different control methods of micro-grid system and their advantages and shortcomings are analyzed later. The comparative analysis of different control methods is carried out. Finally, a laboratory-scale micro-grid system is proposed as an example to verify the micro-grid control strategy.

Zhao et al (2011) the research paper entitled “Design and Implementation of an Integrated Micro-Grid System” describes the Micro-grid in detail with its impacts on large power grid of distributed applications. In this paper, an integrated micro-grid system with flexible structure and reliable multi-micro-grids system structure is proposed which contains a variety of distributed generations and energy storage systems. The small micro-grids can operate separately or in the form of one large micro-grid. And this system, using master-slave control strategy, can switch flexibly between grid-connected operation mode and independent operation mode.

Song et al (2011) the research paper entitled “Research on Control of Micro Grid” describes the micro-grid for future power systems. This paper proposes a hybrid control method for the whole micro grid and a systematic control method design of micro-sources in grid-connected mode and isolated mode are analyzed.

III. EXISTING SYSTEM

Wind and solar energy sources, are more favorite than bio-mass based system as latter is susceptible to supply chain issue. However, wind and solar energies suffer from high level of power variability, low capacity utilization factor combined with unpredictable nature. As a result of these factors, firm power cannot be guaranteed for autonomous system. While the battery energy storage (BES) can be helpful of lowering power fluctuation and increasing predictability, utilization factor can be increased by operating each energy source at optimum operating point. The optimum operating point also called as maximum power point tracking (MPPT), requires regulation of the operating point of wind energy generator and solar PV (Photovoltaic) array in term of speed and voltage to extract maximum electrical energy from input resource.

IV. PROPOSED SYSTEM

This proposed work is a micro-grid based on wind and solar renewable energy generating sources (REGS). DFIG is used for wind power conversion while crystalline solar photovoltaic (PV) panels are used to convert solar energy to provide quality electricity to its clients. The controls of both generating sources are equipped with MPPT and the entire approach will be designed using Matlab tool.



V. COMPARATIVE ANALYSIS OF LITERATURE REVIEW

Reference	Title	Technique	Research Findings
Velmurugan et al	Hybrid Renewable Energy Based Micro Grid	DER	Presents the importance of micro-grid and is a concept that integrates the DER (Distributed Energy Resources) to develop an independent electric infrastructure
Tiwari and Goel	Design and control of Micro-Grid fed by Renewable Energy Generating Sources	DFIG	Presents the control of a micro-grid at an isolated location fed from wind and solar based hybrid energy sources
Kumar et al	Grid Integration and Power Quality Issues of Wind and Solar Energy System: A Review	Power Electronics	Presents review on grid integration and power quality issues associated with the integration of renewable energy systems
Kumar and Tiwari	Renewable Energy Resources with Smart Microgrid Model in India	Smart Micro-Grid	Describes energy crisis facing people of India with the increase of energy consumption
Zaheeruddin and Manas	Renewable energy management through microgrid central controller design: An approach to integrate solar, wind and biomass with battery	central controller	Presents an isolated microgrid consisting of sources like wind, solar, biogas with battery

VI. CONCLUSION

The paper presents the fundamentals of a micro-grid based on hybrid energy generating sources. The paper presents the power crisis faced by the consumers and the need of modern technique to address such crisis. The paper also outlines the comparative analysis of literature review.

VII. REFERENCES

- [1] D.Velmurugan, S.Narayanan, K.Tharani, C.Praveen, “*Hybrid Renewable Energy Based Micro Grid*”, *International Research Journal of Engineering and Technology*, 2018.
- [2] Shailendra Kr. Tiwari, Puneet K. Goel, “*Design and Control of Micro-Grid fed by Renewable Energy Generating Sources*”, *IEEE*, 2017.
- [3] Varun Kumar, A.S. Pandey, S.K. Sinha, “*Grid Integration and Power Quality Issues of Wind and Solar Energy System: A Review*”, *IEEE*, 2016.

- [4] Manikant Kumar, Dr. Pratibha Tiwari, “*Renewable Energy Resources with Smart Microgrid Model In India*”, International journal of scientific & technology research, Vol.5, Issue 11, 2016.
- [5] Eun-Kyu Lee Wenbo Shi, Rajit Gadh, Wooseong Kim, “*Design and Implementation of a Microgrid Energy Management System*”, Sustainability, 2016.
- [6] Y. V. PAVAN KUMAR, Ravikumar BHIMASINGU, “*Renewable energy based microgrid system sizing and energy management for green buildings*”, Springer, 2015.
- [7] Zaheeruddin, Munish Manas, “*Renewable energy management through microgrid central controller design: An approach to integrate solar, wind and biomass with battery*”, ELSEVIER, 2015.
- [8] Dr.K.Ravichandrudu , M.Manasa , Mr.P.Yohan Babu ,G.V.P.Anjaneyulu, “*Design of Micro-grid System Based on Renewable Power Generation Units*”, International Journal of Scientific and Research Publications, Volume 3, Issue 8, 2013.
- [9] Yanbo CHE, Jian CHEN, “*Research on Design and Control of Microgrid System*”, PRZEGLĄD ELEKTROTECHNICZNY, ISSN 0033-2097, 2012.
- [10] Bo Zhao Xuesong Zhang Hangwei Tong, Li Guo Yanbo Che Bin Li, “*Design and Implementation of an Integrated Micro-Grid System*”, IEEE, 2011.
- [11] Zhou Xue-song, Cui Li-qiang, Ma You-jie, “*Research on Control of Micro Grid*”, IEEE Computer Society, 2011.
- [9] Ghazanfar Shahgholian, “*Effect of Load Shedding Strategy on Interconnected Power Systems Stability When a Blackout Occurs*”, International Journal of Computer and Electrical Engineering, Volume- 4, Issue 2, April 2012.
- [12] Jianyuan Xu, Weifu Qi, Lu Wang1 and Yuying Liu, “*Study of Load Shedding Procedure for Power System Voltage Stability*”, 2010.