International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 1, pp: 807-811 www.ijaem.net ISSN: 2395-5252

Smart Analysis of Micro Grid Using Renewable Energy Resources

Dr. PRAJITH PRABHAKAR[1], K.RAAGINI[2] ,R.DEEPA[3], P. A. NANCY ASMITHA[4] , K.DHARANI[5]
ASSISTANT PROFESSOR, UG SCHOLAR[2][3][4][5]
JEPPIAAR INSTITUTE OF TECHNOLOGY, INDIA

Date of Submission: 22-06-2020 Date of Acceptance: 10-07-2020

ABSTRACT: Micro grid is a localized group of Low- Voltage network that can effectively integrate various distributed energy resources with latest trends renewable energy system. Micro grid normally consists of a central grid controller which is maintained by any of the latest control technologies. But the smooth functioning is possible if and only if the Micro grid is controlled in a smart way. Project concentrates on the power quality issues like reactive power compensation and mitigation of harmonics. Power quality monitoring will be done in an adaptive way by the usage of more intelligent systems. The project is implemented in MATLAB/SIMULINK platform.

KEYWORD – Microgrid, Power Quality, Harmonics, Reactive power compensation

I. INTRODUCTION

Power Electronics is art of converting electrical energy from one form to another in an efficient, clean, compact, and robust manner for convenient utilization. A passenger lift in a modern building equipped with a Variable-Voltage-Variable-Speed induction-machine drive offers a comfortable ride and stops exactly at the floor level. Behind the scene it consumes less power with reduced stresses on the motor and corruption of the utility mains. Power Electronics involves the study of Power semiconductor devices - their physics, characteristics, drive requirements and their protection for optimum utilization of their capacities, Power converter topologies involving them, Control strategies of the converter, Digital, analogue and microelectronics involved, Capacitive and magnetic energy storage elements, Rotating and static electrical devices, Quality of waveforms generated, Electro Magnetic and Radio Frequency Interference Power electronic converters is used to modify the form of electrical energy (voltage, current or frequency).

Power range is from some milli watts (mobile phone) to hundreds of megawatts (HVDC transmission system). With "classical" electronics, electrical currents and voltage are used to carry information, whereas with power electronics, they carry power. Thus, the main metric of power electronics becomes the efficiency. The first very high power electronic devices were mercury arc valves. In modern systems the conversion is performed with semiconductor switching devices such as diodes, thyristors and transistors. In contrast to electronic systems concerned with transmission and processing of signals and data, in power electronics substantial amounts of electrical energy are processed.

An AC/DC converter (rectifier) is the most typical power electronics device found in many consumer electronic devices, e.g., television sets, personal computers, battery chargers, etc. The power range is typically from tens of watts to several hundred watts. In industry the most common application is the variable speed drive that is used to control an induction motor. The power ranges of VSDs start from a few hundred watts and end at tens of megawatts. The power conversion systems can be classified according to the type of the input and output power AC to DC (rectification) DC to AC (inversion) DC to DC (chopping) AC to AC (transformation).

1.1 PRINCIPLE

The instantaneous dissipated power of a device P = V*I. Thus, losses of a power device are at a minimum when the voltage across it is zero (the device is in the On-State) or when no current flows through it (Off-State). Therefore, a power electronic converter is built around one (or more) device operating in switching mode (either on or off).

II. EXISTING METHODS

In existing system the model is scalable in nature which means more renewable energy sources can be added according to design requirements. Realistic model of this type of

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 1, pp: 807-811 www.ijaem.net ISSN: 2395-5252

complex and hybrid power generation, supply and storage system which is resilient, robust and sustainable is not done. Sensitivity analysis is performed to deal with uncertainties. Designed system is cost effective and environment friendly. The green and hybrid power system designed can be adaptable to any critical and large consumers of urban buildings. High energy demand and environmental concerns in the papers smart micro grid is forced to change the existing power grid. Simulation and hardware implementation of this model and coverage internet service in rural area is not done.

III. PROPOSED SYSTEM

This project is done to analyse a micro grid smarter. It consists of the smart controller which collects the data from the micro grid and analyse it. The inverter output voltage and frequency are dependent on real and reactive power of the micro-source. It is necessary to calculate real power, apparent power, reactive power and power factor. This measurement can be made safely by using an AC to AC power adapter. It is also necessary to calculate current and voltage. Current can be measured using CT sensor and voltage can be measured using PT sensor. The controller is designed in such a way that, when the renewable energy production is more than the need then the extra energy produced is automatically given to the grid without wasting that energy.

IV. BLOCK DIAGRAM

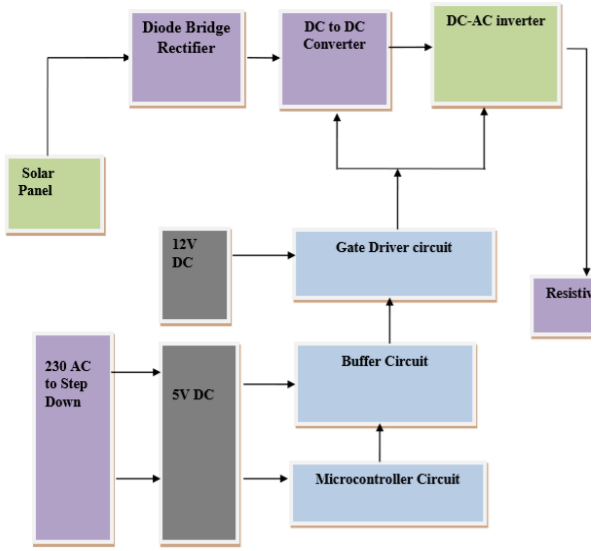

Figure 4.1 Block Diagram

V. LITERATURE SURVEY

TITLE: Smart Grid Integration of Renewable Energy Systems

Smart grid is an evolution of existing power system with close interplay among energy, control and communication infrastructure. Power processing is done using both kinds of energy systems namely conventional remote power generation and non-conventional power generation in proximity with the loads and actuation is done using power electronic devices and systems. The realization of such type of interactive, resilient and sustainable model is a challenge. In this paper, a unique modeling and control prototype is presented for renewable energy sources integration into the smart grid. The model is scalable in nature which means more renewable energy sources can be added according to design requirements. Demonstration of transitory states, overall power conditioning and the transient response of the system indicate the usefulness of the proposed model.

TITLE: Renewable energy based micro grid system sizing and energy management for green buildings

As the patterns of energy production and consumption shift, the need to distribute power more efficiently becomes imperative. This study is based on realization of an operational smart renewable energy micro grid put up by FluxGen Engineering Technologies in a remote village -- Mendil situated in reserve forest of Belgaum district in Karnataka state, India, and it's applicability in urban context; that is, the possibility of reverse innovation of smart rural micro grids for urban scenarios. As the building sector in India is growing at a rapid pace, there is a great chance that such or even enhanced micro grid systems be introduced in urban scenario. Many smart features related to grid communication, power sharing, power capping, preventive maintenance and billing management can be exercised. This paper focuses and proposes the implementation of smart micro grid systems that can perform energy monitoring, grid communications, energy auditing and power management that is well defined and designed for an apartment or a smart urban locality.

TITLE: Renewable Energy Resources with Smart Micro grid Model In India

Micro grids define a new paradigm in the smart grid concept for distributed energy resources integration. As one of the key enabling components of the smart grid, micro grids can operate independently of or in parallel with the utility grid. Since most of the distributed resources are renewable energy based, the dynamics of the system change due to their unpredictable and intermittent nature. Accordingly, for improving the performance of such existing systems, efficient and optimal control strategies for Energy Management are required. Primarily, an Energy Management System (EMS) should be capable of enforcing demand-supply balance and also meeting other requirements like reliability, operating cost reduction, fault tolerance, and flexibility. As a preliminary step, this paper concentrates on developing a micro grid test system in Mat lab Simulink for an agent based energy management system.

TITLE: Feasibility Analysis of Grid-Connected Nuclear-Renewable Micro Hybrid Energy System

In recent time, researchers are aiming to integrate renewable energy with nuclear energy to utilize the energy infrastructure at its best or to meet the local energy demand, especially for the remote places. In this paper, the feasibility analysis of the nuclear renewable energy system is conducted by HOMER (Hybrid Optimization Models for Energy Resources) software. This paper considers three modes of power supply; only renewable energy, only Nuclear Power Plant (NPP), and integration of both renewable energy; to meet the electric demand. The simulation results show that the grid-connected Nuclear Renewable Micro Hybrid Energy System (N-R MHES) is the most feasible option to meet the sizeable electrical power demand. The paper also sets the analysis guidance and criteria for the three power supply mode depending on the annual load profile of a facility.

TITLE: Smarter Micro Grid for energy solution to rural Ethiopia

Use of modern energy, like electricity, is a key factor to economic development, poverty reduction, improved health and cleaner environment for a society. Moreover, if the electricity is generated with Renewable Energy (RE) resources the benefit will be profound. Unlike the developed countries though, developing countries have little access to electricity.

The African continent for example covers 15% of the world land and has a population of about 13.4% of the total world population and is rapidly growing. But it has only 2% of the world's industrial capacity. This fact is closely tied to a limited access to modern energy, like electricity. When it comes to Ethiopia, the population who has access to electricity is less than 10% and of this figure 1% of it accounts for the rural areas where the majority of its population lives. Hence it is critical to devise a method that can increase access to electricity especially in rural areas where the national grid does not reach. Therefore, in this paper, we propose a method of Distributed Generation (DG) of electrical power units operated entirely by RE sources and a typical micro grid structure for a local village network. The DG and Local Micro Grid (LMG) layout allows reaching out for remote locations and efficient distribution in island mode. In effect, the electricity would be made available locally instead of being transported such a long distance with inevitable loss and huge capital investment. Then different village's LMGs are interconnected in ring and form a Micro Grid (MG) to increase the reliability and efficiency of electric power delivery. This MG network will be capable of interconnecting to the national grid as well as work in the ring system or autonomously at the local distribution level with a concept of Smarter Micro Grid Controller (SMGC). The longer term benefit of this system also supports the main national grid with a power network in distributed villages in order to lessen the peak hour demand.

VI. COMPONENTS DESCRIPTION

- PIC16F877A
- MOSFET
- GATE DRIVER CIRCUIT
- RECTIFIER
- RECTIFIER OUTPUT SMOOTHING
- FILTER
- MOTOR
- BUFFER
- INVERTER
- CONVERTER
- SOLAR PANEL

International Journal of Advances in Engineering and Management (IJAEM)
Volume 2, Issue 1, pp: 807-811 www.ijaem.net ISSN: 2395-5252

VII. PIN CONFIGURATION AND DESCRIPTION

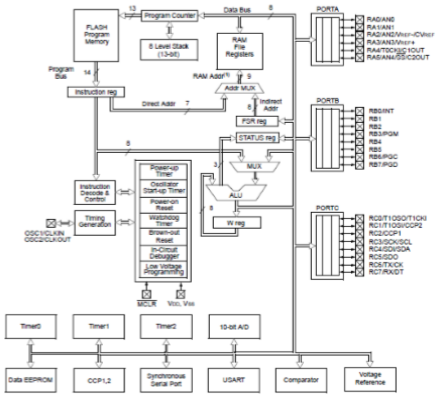

Figure 7.1 Pin Configuration and Description

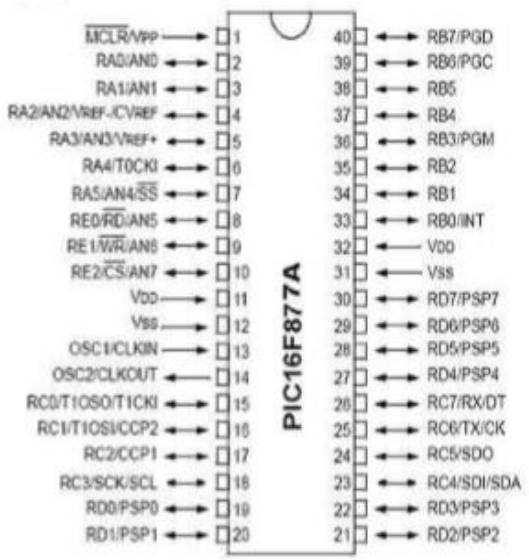

Figure 7.2 Pin Diagram

VIII. SIMULATION OUTPUT

SIMULINK

Simulink is a simulation and model-based design environment for dynamic and embedded systems, integrated with MATLAB. Simulink, also developed by Math Works, is a data flow graphical programming language tool for modeling, simulating and analyzing multi-domain dynamic systems. It is basically a graphical block diagramming tool with customizable set of block libraries.

It allows you to incorporate MATLAB algorithms into models as well as export the simulation results into MATLAB for further analysis.

Simulink supports −

- system-level design
- simulation
- automatic code generation
- testing and verification of embedded systems

8.1 SIMULATION RESULT

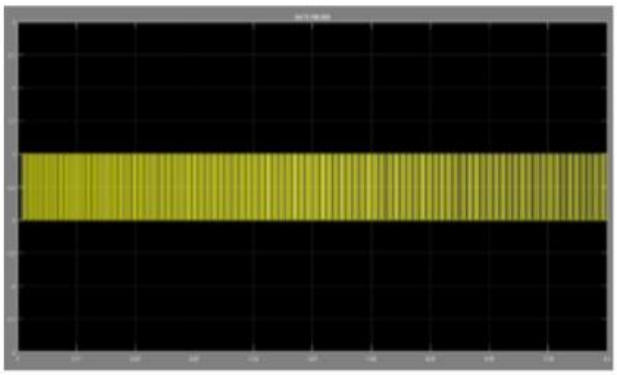

Fig: 8.1.1 MPPT output

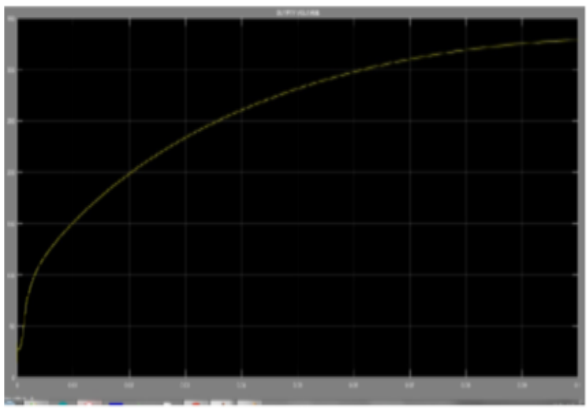

Fig: 8.1.2 Panel output

IX. CONCLUSION

Microgrid is an extension of main grid providing on-site generation capable of fulfilling its local load demand. Microgrid architecture requires to be added to the main grid to increase the reliability, improve power quality, avoid the use of depleting fossil fuels, improve the technical performance and reduce the green house gases emissions. The microgrid can be connected in an islanded or isolated or autonomous and grid connected modes. Depending on the requirement these renewable energy sources are connected in the main grid or operate separately. Because of these reasons, operation, control and grid integration of renewable resources is a task of fundamental importance in modern power system. Furthermore, as renewable energy sources are intermittent in nature, energy storage schemes are required to store the energy and retrieve the energy at times required. Thus, it is desirable to develop

reliable microgrid operation and effective energy storage algorithms which would enhance the performance of hybrid power systems.

In conclusion, it can be claimed the application of smart micro grid by using PLC network can bring revolution change in national grid of India. We identify many benefits in using the web as an integration platform for smart micro grid. There is considerable opportunity for Bangladesh to meet its future power demand and thus economic growth through renewable energy. A smart micro grid can benefit use of renewable energy without storage devices, may improve the quality of life of rural people and provide income generating opportunities with environmental impacts in India. For high performance, economy and sustainability in addition to efficiency and reliability, advanced control communication and monitoring technologies are required for realizing intelligent and scalable power system architecture. Bringing together and integrating all these technologies into one homogenized system is a modern challenge and needs a lot of attention.

REFERENCE

[1]. Renewable energy in India - a modelling study for 2020-2021 Energy Policy, Volume 28, Issue 15, December 2000, Pages 1095-1109 L. Suganthi,A . Williams
[2]. Renewable energy for sustainable electrical energy system in India Energy Policy, In Press, Corrected Proof, Available online 23 March 2010 Subhash Mallah, N.K. Bansal
[3]. National patterns of research output and priorities in renewable energy EnergyPolicy, Volume 30, Issue 2, January 2002, Pages 131-136 Ali Uzun
[4]. Energy-microfinance intervention for below poverty line households in India Energy Policy, Volume 37, Issue 5, May 2009, Pages 1694-1712 P. Sharath Chandra Rao, Jeffrey B. Miller, Young 000 Wang, John B. Byrne
[5]. Allocation of energy resources for power generation in India: Business as usual and energy efficiency Energy Policy,Volume 38, Issue 2, February 2010, Pages 1059-1066 Subhash Mallah, N.K Bansal
[6]. Rural energy planning in India: Designing effective intervention strategies Energy Policy, Volume 22, Issue 5, May 1994, Pages 403-414 Chandra Shekhar Sinha, Ramana P Venkata,Veena Joshi
[7]. Wind energy development in Tamil Nadu and Andhra Pradesh, India Institutional dynamics and barriers -A case study Energy Policy, Volume 28, Issue 3,1 March 2000, Pages 157-168 A. Jagadeesh
[8]. A history of renewable energy technology Energy Policy, Volume 19, Issue 1, JanuaryFebruary 1991, Pages 8-12 Bent Sorensen
[9]. Scenario for growth of electricity in India Energy Policy, Volume 34, Issue 17, November 2006, Pages 2834-2847 RB. Grover, Subhash Chandra
[10]. Indian scenario of renewable energy for sustainable development Energy Policy,Volume 24, Issue 6,June 1996,P ages 575-581 B. S. K. Naidu
[11]. Energy options for cooking in India Energy Policy,Volume 25, Issue 1, January 1997, Pages 63-75 N. H. Ravindranath, 1. Ramakrishna
[12]. Hydropower and environment in India Energy Policy, Volume 25, Issue 4, March 1997, Pages 435-438 V Ranganathan

International Journal of Advances in Engineering and Management
ISSN: 2395-5252

IJAEM

Volume: 02 Issue: 01 DOI: 10.35629/5252

www.ijaem.net
Email id: ijaem.paper@gmail.com