



# International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(An ISO 3297: 2007 Certified Organization)

Website: [www.ijareeie.com](http://www.ijareeie.com)

Vol. 6, Issue 4, April 2017

## Microcontroller Based Communication Agent for Rural Indian Microgrid

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**ABSTRACT:** The traditional power systems throughout world are dependent upon the conventional method of power generation of electrical power by the combination of Fossil fuels. Use of conventional fuels for power generation will lead to non availability of fuel for power generation in near future. So worldwide research activities have already had being initiated to and out the alternative source of energy through the maximum utilisation of renewable energy resources. It is realized that individual capacity of renewable energy resources such as, Photovoltaic, Wind turbine, tidal, Geothermal etc. are small compared to the traditional generation technology such as thermal power station. In this scenario micro grid system is emerging as a probable solution to solve the power crises in future. The micro grid is interconnected system of different types of energy resources such as photovoltaic, wind energy, Biomass, small hydroelectric generation statics, Fossil fuel etc. which needs proper coordination for satisfactory operation to meet the load demands. To achieve this coordination, micro grid itself requires good communication infrastructures so that it can operate in grid and Islanded mode as well as in the situation when some faults have occurred in the power network. Here communication is implemented in between the generating side and control and monitoring side, generation side control is possible in reference to the consumer demand. In the present work a detailed literature survey has been performed to identify the latest communication infrastructure and communication protocols as suggested by many researches and IEEE/IEC standards. A sample micro grid is also modelled in the project.

**KEYWORDS:** Micro controller, Communication Agent, Smart Grid

### I. INTRODUCTION

A micro grid is a small power system composed of one or more distributed generation units that can be operated independently or connected to utility. The micro grid is small scale flexible & reliable source of electricity. It is connected to both local generating system units and utility grid to prevent from power outages. Micro grid may range in size from a tiny residential load to small city.

As energy generation and distribution companies are competing in the market place, we have seen an increasing interest in renewable or non- conventional energy source. A micro grid is an energy community having clean energy sources such as solar power, wind power, and fuel cells and energy storage devices such as batteries. The energy sources and energy storage devices are distributed in the community, and they are called distributed generation systems



ISSN (Print) : 2320 – 3765  
ISSN (Online): 2278 – 8875

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(DGs) and distributed energy storage devices (DSs), respectively. Recently, attention on the micro grid has been growing as an eco-friendly power system reducing climate change. There are several reasons why micro grids are increasingly used. First they use alternate energy resources, which are more environment friendly and require fewer technical skills to operate as they rely more on automation. Finally, micro grid is the only option if new transmission infrastructure cannot be developed in a timely or cost effective fashion. Alternatively, it can provide high quality, uninterrupted power supply as needed by many companies who use highly sensitive equipment.

The micro grid can be operated by two operation modes: the grid-connected mode and the islanded mode. In the grid-connected mode, a micro grid is connected to a power system, especially a distributed system. On the other hand, the islanded mode means an isolated operation mode from any power system for the case of fault occurrence in the connected power system or geographical isolation such as a small island. In the islanded mode, micro grids should be operated to meet a power balance between supply and demand without power trade. Whenever a power unbalance occurs, the output of DGs is decreased and load shedding is used to solve the power unbalance.

The on-site generation sources give ability to isolate the micro grid from a larger network and provide highly reliable electric power. Exhaust heat from generation sources such as micro turbines could also be used for local process heating or space heating, allowing flexible trade off between the needs for the electric power and heat.

## II. RELATED WORK

H. Akagi[1] has presented the work on renewable power plants are implemented in rural areas which are far away from the main grid network and there is possibility of weak transmission line connection. The micro grid concept provides an effective solution for such weak systems. The operation can be smoothened by the hybrid generation technologies while minimizing the disturbances due to intermittent nature of energy from PV and wind generation. Also there is possibility of the power exchange with the main grid when shortage and excess occurs in the micro grid.

P. Piagi[2] has proposed the micro grid concept which acts as solution to the problem of integrating large amount of the micro generation without interrupting the utility networks operation. The micro grid or distribution network subsystem will create less trouble to the utility network than the conventional micro generation if there is proper and intelligent coordination of micro generation and loads. In case of disturbance on the main network micro grid could potentially disconnect and continue to operate individually which helps in improving power quality to the consumer.

F. Katiraei et.al[3] has presented the micro grid concept which lowers the cost and improves the reliability of small scale distributed generators. the main purpose of this concept is to accelerate the recognition of the advantages offered by small scale distributed generators like ability to supply waste heat during the time of need. From a grid point of view, micro grid is attractive option as it recognizes that the nations distribution system is extensive, old and will change will slowly. This concept permits high penetration of distribution generation without requiring redesign of the distribution system itself

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## III. PROPOSED METHODOLOGY

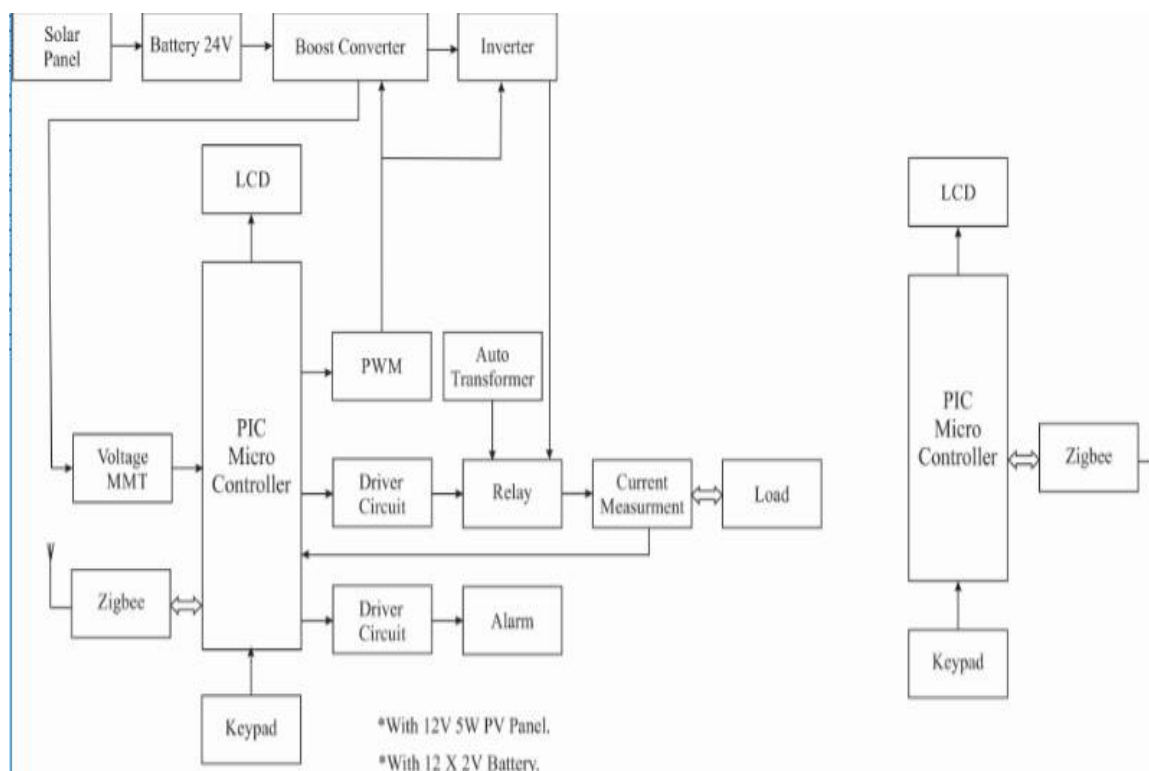


Figure :Block Diagram Of Proposed Model

In generation side, we have a PV module and a battery and their output will be boosted up and inverted. Inverter output is given to the NC terminals of the relay module. KSEB load is connected to the NO terminals of relay. A buzzer is used for indication of generation deficiency. Zigbee protocol is used for communication. The whole system is controlled by a Micro controller with LCD display.

In monitoring side, we have a Micro controller with LCD display. The keypad is used to set and send the demand value and a Zigbee module is used for communication.

The system is divided into two sections: the generation section and the control and monitoring section. The generating section consists of a solar panel and the solar out-put gets boosted up and inverted and is given to the load through a relay.

The control and monitoring section sends the demand of the consumers in terms of voltage to the generation section and if this demand voltage meets the solar production then the solar output gets connected to the load. The load current, load voltage, feedback voltage and duty ratio of MOSFET is transmitted to the control and monitoring section. During the insufficient condition that is if the production does not meet the demand then the load gets connected to the main grid and messages signifying "low voltage" and "EB is connected" will be delivered. A buzzer is used in the generation section to indicate the insufficient production.

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## IV. RESULTS AND DISCUSSION

### Overall Hardware Kit



In this work it is realized that implementation of communication technology is an essential criteria for satisfactory and fast automated operation of micro grid system. Communication between the generating side and control and monitoring side has been done by Zigbee. A buzzer circuit acknowledge the abnormalities in the generating side. An efficient communication scheme has been obtained.

## V. CONCLUSION

The Micro controller based communication agent for rural Indian Micro grid has been developed .The system can be scaled to higher limit and can work as standalone unit. It can also be used at places where grid connectivity is very poor. This communication platform can connect the Generating side as well as the control and monitoring side, thus facilitating the integration of information provided by the consumers. Moreover, a buzzer circuit has been proposed to acknowledge the operator regarding any abnormalities in transmission side. Due to the recognition of alarm, it is possible to connect the microgrid to the KSEB. Micro controller based communication agent provides a multi hope wireless network that can provide the communication infrastructure to the dense low-voltage distribution networks for active monitoring.

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