Power Grid Monitoring System

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Abstract— Smart grid is one of the trending technological innovation of the modern world, In India, present situation when the electrical industry is facing huge challenges Globally, ranging from a supply-demand gap to rising cost, global warming etc. the solution to reinvent the business is smart grid. Factors that drives for an adaptation of smart grid in India includes the need to reduce commercial & technical losses, resolve the chronic supply-demand gap & finding a revolutionize way for more advanced electricity supply leading to sustainability & high growth economic development goals. It provides real-time monitoring of data collection & remote control of system elements like, smart meters, intelligent devices, power lines, feeder switches, capacitor bank, fault analyzers & other facilities. The paper focus on (a) Current Indian Power Sector; (b) technology & devices used in smart grid; (c) Smart grid challenges; (d) current smart grid status in India.

Key words: Indian Power Sector, Smart Grid Technologies in India, Smart Grids in India, Challenges

I. INTRODUCTION

At present condition(in India) the grids are rapidly running up against its limitations slowly becoming a national challenge, the solution for this is smart grid, it is seeking attention of Central & State policy makers, Business persons & other powerful people, cause in a much less time a smart grid will function more efficiently, resulting in an expected power supply in more affordable price, along with leaving less impact in the environment. Smart Grid Pilot Projects in India is an initiative of Ministry of Power following certain objectives: (1) Increase in Power availability; (2) Reduction of AT&C losses; (3) Reduction in blackouts; (4) Managing load during peak hours; (5) Optimal Utilization of resources for sustainable.

A. Present Power Sector of India

Indian company (Power Grid Corporation of India Limited) owns & operates about 1,34,018 cktkms of transmission lines at 800/765kV, 400kV, 220kV & 132kV EHVAC & +500kV HVDC levels and 214 sub-stations [8].Also, the transformation capacity of about 2,78,862 MVA as on 31st December 2016. This gigantic transmission network, spread over length and breadth of the country, is consistently maintained at an availability of over 99%. The installed power station capacity in India as of June30, 2016 is shown in table1. According to the reports it has been observed that the Indian government encourages private producers to reach towards smart grid for a reliable power supply to the consumers end. The Indian power sector spreads in five regional grids to meet the demands, shown on table 2 . These five regional grids are different in energy generation & in consumption. The institutions India Smart Grid Task Force (ISGF) & Indian Smart Grid Forum(ISGF) joined under Ministry of Power, India to set-up an institutional frame for deployment of smart grid projects in India.

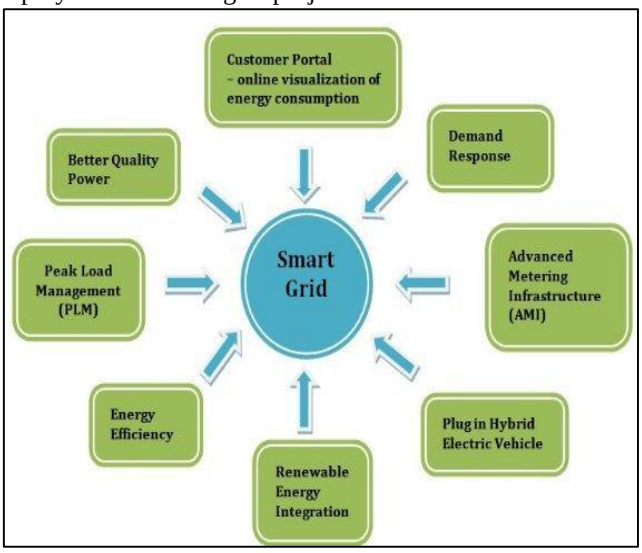

Fig. 1: The detailed overview of a smart grid

There are various technological issues of smart grids in Indian environment such as AMI-AMR developmental framework, communication technology options, home area network, single phase meter, OMS, PLM, demand response, monitoring of power quality etc.

II. LITERATURE REVIEW

Society demands energy supplies that are secure, sustainable and of high quality. In the next decade, Europe is facing potential energy shortages as oil and gas supplies run down and nuclear power facilities age. Electricity network operators are faced with significant challenges by the increase of electronic based products that present a non-linear load to the power grid, and by the planned increases in renewable generation. Both factors have the potential to induce poor power quality, which in-turn could cause widespread power failures if left unchecked. When a generator is synchronized with a power grid, normally there is a voltage fluctuation on the distribution line. During synchronization the voltage fluctuation should not exceed 3% at the at the point of common coupling.

For the synchronization of induction generators it just needs to be run up to synchronization speed and connected. For this purpose standard motor controllers will be used. To mechanically drive the generators up to synchronization speed turbine shaft power will be used. The speed of the motors depends on supplied frequency and number of poles on the generators. To supply power to the load, several power generation resources are connected to the grid such as hydel, thermal, solar, etc. According to the rules of the grid, these power generating units need to supply the power at permutable limits of the voltage and frequencies. Therefore, acceptable range of frequency and voltage is

mandatory for the power grid. With the degradation of electric power energy market, providing quality power [1-4] has become an important concern of both power supplies and customers. Aspects on power classified into three categories that is, voltage stability, continuity of supplying power, and voltage waveform. Based on this classification, several examples of power quality level definitions were represented

The main objective behind our project is to save the energy and protect the power grid. The system we thought of working on is a self-monitoring system which requires only a couple of officials to look at the system operation. The system which we are making will be implemented by using the GSM and Alarm system. In our project the power is continuously monitor by technical team at nearby substation. Also we will provide the limit for the power usage to the user so that if the user uses more power than the permissible limit than their system will trip and the message will be send through the GSM system and also alarm will be rang at the nearby substation.

A. Multi-Motor Synchronization Techniques

Multi-motor applications has become very attractive field in industrial applications replacing the traditional mechanical coupling .Applications can be found in paper machines, offset printing, textiles, differential rives, to name some examples. Multi-motor techniques are used where matched speed during acceleration, deceleration and changes in load requires "truly" speed and angle synchronization between at least two axes. Several synchronization techniques has been developed in order to fulfill those necessities, in this work the master-slave, cross coupling technique, bi-axial cross-coupled control method, electronic (virtual) line-shafting and the relative coupling strategy are compared for different industrial applications. Practical results in a two 1.5 kW induction machine test ring are presented, showing advantages and limitation of those techniques during different load conditions. The work reported in this paper makes use of a V/Hz motor control scheme, but conclusions drawn can be applied to any motor control technique. Parallel research is ongoing; results are reported on future publications.

III. PROPOSED SYSTEM

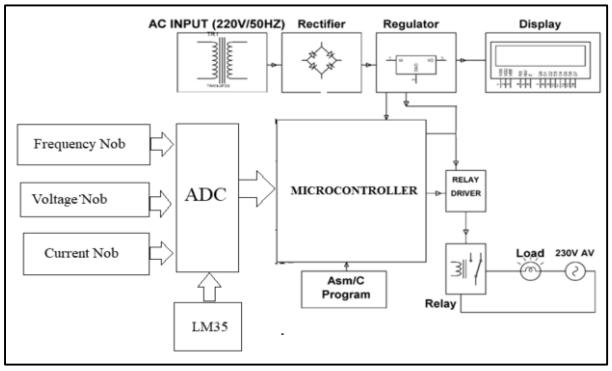

Fig. 2: Block Diagram of the System

The microcontroller monitors the under/over voltage and under/over frequency from utility grid and the processed value of voltage and frequency for turning ON/OFF the relay between a grid connected inverter and the utility grid. The project would alternatively use a variable frequency generator using 555 timers for changing the frequency while a standard variac shall be used to vary the input voltage for achieving the test conditions as stated above

IV. EXPERIMENTAL DETAILS

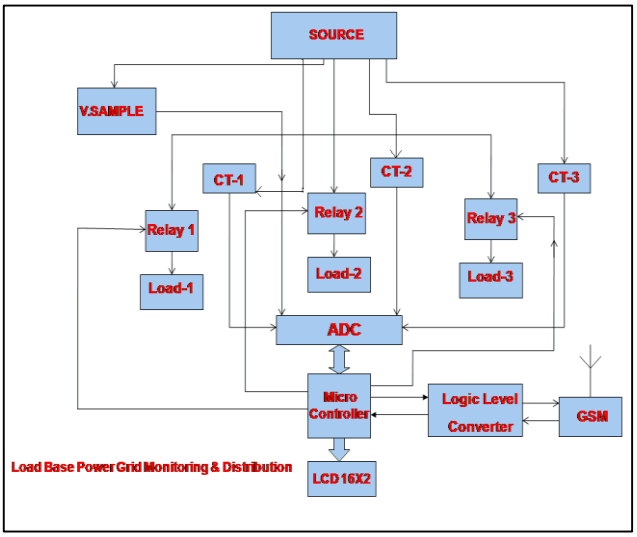

Fig. 3: Block diagram of Advanced Power Grid Monitoring

Power is derived initially from standard 12V AC/DC adapter or 12V_500ma Transformer. This is fed to bridge rectifier D1 ~ D4, the output of which is then filtered using 1000uf electrolytic capacitor and fed to U2 (voltage regulator). U2 +5V output powers the micro controller. LED L10 and its associate 1K current limiting resistors provide power indication. The unregulated voltage of approximately 12 V is required for relay driving circuit.

V. ADVANTAGES OF THE PROPOSED SYSTEM

It will help to save the electrical energy
Less wastage of electrical energy
Saving of non-renewable resource such as coal
Required less maintenance
Reduce in air pollution to some extent

VI. APPLICATIONS

This project is applicable for solar power plant where frequency varies; frequency and voltage parameters should be match with the power grid.

- This system will help us to get uninterrupted power supply.
- This system will be helpful for industrial areas where continuous electricity is needed.
- This system can also be apply on small power house to provide uninterrupted power supply in homes.

VII. CONCLUSION

This project presents the development of a microcontroller based islanding detection for grid connected inverter with very simple under/over voltage and under/over frequency islanding detection algorithms. The advantage of this project is, it's secured the Power of the Grid i.e., Power Plants should supply power to the grid rather than drawing the power from the grid. In order to protect critical loads from more severe faults in the distribution network, the series connected voltage

source to being reliable and cost effective, it was adopted to be the optimal solution for the compensation of voltage. It has been also pointed out that the zero sequence component of the voltage in impedance grounded systems must be eliminated to the control system.

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