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Power Management of Building using WSN based Sensors and Actuator

[#1]Prof. A.A.Trikolikar, [#2]Chandrakant Yankar, [#3]Akash More, [#4]Pankaj Pande

[1]cyenkar@gmail.com
[2]akashmore88@gmail.com
[3]pankajdpande@gmail.com

[#1]Prof. Department of Electronics and Telecommunication
[#234]Department of Electronics and Telecommunication

JSPM's Imperial College of Engineering and Research, Wagholi.

ABSTRACT

We proposed technique for low power consumption of a house, building or particular area using microcontroller and programming. The goal of project is to schedule the power in daily used. Technique will scheduled power as well as time for load according to the power consumption for various appliances and saves the power when power consumption is more.

Keywords :ZigBee, Curent Transformer, Potentiel Transformer, Micro Controller ARM.

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I. INTRODUCTION

A smart grid is a digitally enabled electrical grid that gathers, distributes, and acts on information about the behavior of all participants (suppliers and consumers) in order to improve the efficiency of electricity services or it is a technique used to increase the connectivity, automation and coordination between the suppliers, consumers and networks that perform either long distance transmission or distribution.

The objectives of smart grid are: fully satisfy customer requirements for electrical power, optimize resources allocation, ensure the security, reliability and economic of power supply, satisfy environment protection constraints, guarantee power quality and adapt to power market development. Smart grid can provide customer with reliable, economical, clean and interactive power supply and value added services.

Electricity losses in India during transmission and distribution are extremely high vary between 30 to 45%. For residential consumers' class, the representative daily curves by utility and by consume range were defined. For each utility, the singular ranges were grouped and were finally: 0–50; 51–200; 201–300; 301–400 kWh/month. Fig. 1 shows and curves for one of these ranges residential power utilization in 24 hours.

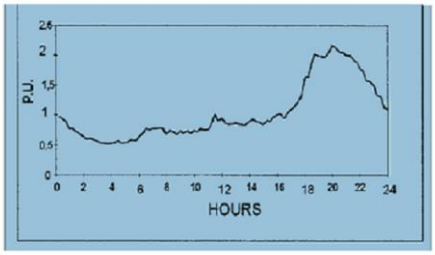

Fig1. Power utilization ratio

The proposed system with effective solutions for multiple problems faced by India's electricity distribution system such as varying voltage levels experienced due to the varying electrical consumption, power theft and transmission line fault for single phase electricity distribution system also various techniques used for the energy optimization along with the detail mathematical model of consumption scheduling algorithm using linear programming method are mentioned.

II. PROBLEM STATEMENT

Design a Power management system for a building. This system is based on WSN by Using this system intensity of

light use can be adjusted according to its application. We use microcontroller LPC2138 for interfacing purpose.

The zigbee module can use for wireless communication between Computer and Microcontroller .The computer is used for showing use of power management system for effective use of available power.

III. PROPOSED SYSTEM

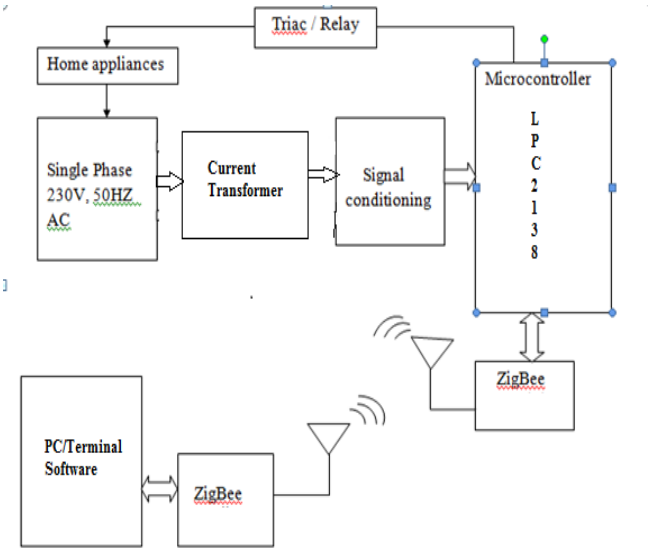

Fig 2. Block diagram

Description:

- POWER SUPPLY:-

The smart power metering circuit is connected to mains 230 V/50 Hz supply. 230V AC supply is down converted to by using rectifier, filter and regulator. 3.3 for microcontroller and 5 V for max 232 and LCD.

- HOME APPLIANCE:-

The measurement of electrical parameters of home appliances is done by Interfacing with fabricated sensing modules.

- TRIAC:-

Uses of traic with opto-isolated driver for controlling electrical appliances Household appliances are controlled. Either remotely or automatically with the help of fabricated smart sensing unit consisting of triac.

- CURRENT TRANSFORMER:-

It is an electrical device, which produce an alternating current in secondary winding proportional to primary winding. It also provide isolated lower current in secondary proportional to primary (1A:5V).

- SIGNAL CONDITIONING:-

The output signals from the sensors are passed through signal conditioning block for analog to digital conversion.

- MICROCONTROLLER:-

This is LPC2138 ARM based Microcontroller. These processed signals passed through controller and then it is integrated and connected to Zigbee module for transmitting electrical parameters data wirelessly.

- ZIGBEE: - Zigbee is used to transmit the data from microcontroller to computer and computer to microcontroller.

Energy Optimization Technique:

For non-shiftable appliances such as TV and fridge which have fixed power requirement and operation period, the optimization will ensure continuous supply of power. The scheduling optimization will be carried out mainly for the shiftable appliances. For time-shiftable appliances, such as washing machine, the smart meter will be able to control the switch and provide sufficient electricity during the scheduled periods.

For power shiftable appliances, such as water boiler and electric vehicle chargers, the smart meter will schedule flexible power and ensure the total supply.The system can be further extended to multiple users' scenario where many smart meters are connected together and they agree to achieve a cooperative scheduling. The central control node will take the overall responsibility of scheduling the whole network and assigning individual meters their corresponding tasks.

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The scheduling optimization will be carried out mainly for the shiftable appliances. For time shiftable appliances, such as washing machine, the smart meter will be able to control the switch and provide sufficient electricity corresponding to the power pattern during the scheduled periods. For power shiftable appliances, such as water boiler and electric vehicle chargers, the smart meter will schedule flexible power and ensure the total supply.

The system can be further extended to multiple users' scenario where many smart meters are connected together and they agree to achieve a cooperative scheduling.

Proposed work:

The proposed system with effective solutions for multiple problems faced by India's electricity distribution system such as varying voltage levels experienced due to the varying electrical consumption, power theft and transmission line fault for single phase electricity distribution system.

Following work is proposed for scheduling and optimizing power demand for electric loads.

1. Study of various types of load and categorizing them into power controllable, time controllable devices home appliances for load scheduling.
2. Study of integer linear programming (ILP) technique for load management in smart grid.
3. Design and development of algorithm for scheduling and optimization of load mainly for the shiftable appliances.
4. Development of communicating various electric loads through ZigBee wireless interface for controlling and monitoring electrical appliances.

5. Development of graphic user interface (GUI) for monitoring and simulation of electrical parameters.
6. Testing and analysis of overall system.

IV. CONCLUSION

This proposed architecture is an effective solution for monitoring and optimizing energy utilization. The system design mainly concentrates on single phase electric distribution system, especially suited for Indian scenario. The system provides the solution for some of the main problems faced by the existing Indian grid system, such as wastage of energy. The proposed integer linear programming based optimization mechanism for the home demand-side management in smart grid is able to schedule the optimal power for power-shiftable appliances and time-shiftable appliances respectively.

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