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Demand Based Efficient Electricity Distribution for Household Using Iot

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Abstract: ***The electricity demand is increasing with the rise in the number of appliances that is being used at household. These resources are to be conserved by understanding the patterns of the consumption and tracking the daily usage of the consumer. This project presents the design of IOT based efficient electricity distribution system for household. The application aims in monitoring the power consumption and supplying only limited power without complete shutdown during certain identified peak hours. The application allows Electricity board to control the system in a centralized manner, demand based fashion and the consumers to analyze their power consumption patterns.***

Keywords: Demand Based Electricity distribution, Electricity Consumption pattern analyzing.

I. INTRODUCTION

The main aim of is to overcome the excess current usage in order to maintain a balance between the power generation and the total power consumption. By power generation we mean the amount of electricity that is being generated to supply throughout the locality, and as of total power consumption, it is defined as the predicated amount of power that a particular locality would need on a periodical basis. According to a recent survey, only about 30% to 35% of electrical energy is used for domestic consumption, most of the rest is roughly, evenly split between industry and commerce with between 1% and 3% being used in agriculture and for transport. It would be very difficult to match generating capacity to such a peaky demand profile. Fortunately the aggregate demand for all industrial and domestic consumers in a particular community tends to smooth out the overall demand profile and although the aggregate demand varies during the day and also over the course of the year, it does so in reasonably predictable patterns. By supplying the power to the household and to the industrial regions on the demand basis, there was a huge possibility to overcome this lagging in power supply. The usage of two phase and the single phase load was beneficial in order to maintain the current usage possibilities during both the peak and non-peak hours. This helps both the user and the board to study and find the difference between the use and the actual need. The paper brings forward an overall solution, and the feasibility of the proposed solutions based on their operational functions, their technical viewpoints and economic implemtation.

II. LITERATURE SURVEY

The authors Peter Palensky and Dietmar Dietrich, convey the necessity measure in order to understand the consumption of power in the complete energy system [1]. The improvisation includes improving every unique part of the system, which includes by alternating the material used to provide energy distribution, changing the tariffs analysing the pattern of power consumption, and providing the monitoring an analysis. In the proposed model, the authors have distinguished the response as incentive and time based, and provided typical solutions, with the distinguish in distributed spinning reserve and Demand shifting. The author Pierluigi Siano explains that smart grid can deliver electricity in a controlled, smart way from points of generation to active consumers [2]. Demand response offers a vast range of benefits on system efficiency. B improving the reliability of the power system and by lowering peak demand, we can reduce the cost investments is what the paper provides. The paper is a survey of DR potentials and benefits in smart grids is presented. Innovative enabling technologies and systems bring great efficiency in industrial projects and various other designs.

authors S. Q. Ali, S. D. Maqbool, T. P. Imthias Ahamed and N. H. Malik proposed a model where the power system is being de-centralized as it moves towards becoming a smart grid [3]. The various steps of loading and storage are done centrally reliability of the installed system should be more than expected. This paper proposed focuses mainly on the price based demand response (PBDR) schemes with a two part tariff based on Time of Use Pricing (ToUP). This motivates the consumer to shift between various loads in a day and the saving can be achieved. The motivation for the consumer is the potential savings he can achieve. The combinational optimization is used here as a constraint. The performance of the algorithm thus analysed.

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Authors Thillainathan Logenthiran, Dipti Srinivasan and Tan Zong Shun explain the importance of smart grid, which has a high importance in the role of demand side response, which helps the user in understanding the profile of consumption and reshaping the profile data [4]. The increase the sustainability and reduces the cost. This paper presents a demand side management strategy based on load shifting technique for demand side management of future smart grids with a large number of devices of several types which is mathematically a minimization problem. By solving minimization, we get a heuristic algorithm which deals with residential, commercial and industrial customers. This system's outcome thus provide energy and cost saving pattern. The authors Dae-Man Han and Jae-Hyun Lim provide a system for Wireless personal area network and wireless sensor networks, where Working Group has defined no less than different standards of applications [5]. The personal networks has gained widespread usage in everyday activities. The paper further describes that organizations use IEEE 802.15.4 and ZigBee to effectively deliver solution commercial and residential uses. This paper introduces smart home interfaces and device definitions for proposed home energy control systems design that provides intelligent services for users. This supports energy management service in various uses.

III. EXISTING SYSTEM

A. Power Consumption Analysis

The amount of power consumed is analysed for a very small area, and is patterned for a huge location. This might not be appropriate if the sample space considered is in inactive state, i.e. if the particular locality uses the minimal power on the sampled period, this might lead to the failure predications. The consequence may lead to power shut down.

B. Manual bill Calculation

In order to note the reading of the power consumed by the consumers, a person from the EB department if sent over every respective location and is made to note down the readings manually from every EB box that is allocated to that particular consumer. This is a traditional process that is being used to measure the readings, and is considered a hectic one, too. If the person makes any erroneous note taking, it might be a loss to either the consumer or the board.

C. Consumer Read

The consumer can check the units of power consumed in the EB meter as and whenever wanted. But the process may not be cross verified and may lead to less understanding of the power consumption pattern. The consumer would only be able to check the units that has been consumed, but not rectify or have a clear understanding of the same. The user won't cannot perform the monthly calculation, nor know power shut down in prior.

D. Disadvantages

1) Power cuts due to unequal power distribution i.e. providing electricity to one locality, and complete shutdown in another locality.

2) Inefficient power consumption due to lack of monitoring and analysing by consumers, as only the consumed units are available to the user.

3) Lack of centralized control and management by Electricity Board and no proper overview of location to location overview.

4) There is no consumer side demand of electricity during unavoidable circumstances or required periods.

IV. PROPOSED SYSTEM

The proposed system enables the Electricity board to monitor the power consumption details of consumers using a web application through internet. This may be digital, graphical or comparative. This allows the consumers to efficiently utilize power by analysing their daily consumption patterns. The important feature of this system is to limit the power supply during peak hours and ensure that all households get at least basic power supply. Additional power(with extra charges) is given to households when demanded through web application

A. Techniques Used

1) Current and Voltage Sensors
2) Arduino Board.
3) Gsm module 800 sim.
4) Client and Server Communication

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1) Current and Voltage Sensor

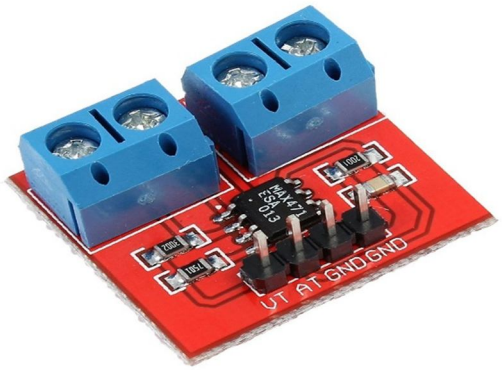

Fig 1: Current and Voltage Sensor

The current and voltage sensor is a device that is used to measure the current and voltage that is consumed by the load that is connected, and the values are analogue, which are in turn passed to the Arduino board for further processing of the data.

2) Arduino Board

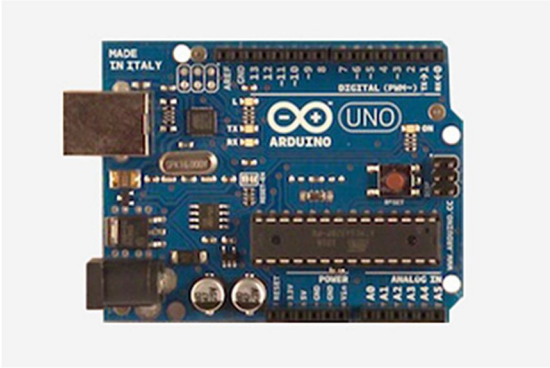

Fig 2: Arduino Board

The Arduino Board is used to convert the analogue values from the sensors to digital values. These values are further carried to the GSM board that updates the data in the server.

3) SIM800 IOT ver0 BOARD

Fig 3: Sim800 IOT ver0 board

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The SIM800-IOT VER0 board is used to update the measured values to the server as data. This data can be viewed by both the client (consumer) and the server (EB board) and can be used to analyse consumption pattern, predication and for balanced distribution.

4) *Client and server:* The client (consumer) can view the power consumed and can analyse the pattern. During peak hours only single phase is provided to the consumer, and if he needs more he needs to request additional power to the EB board, which is the concept of Demand Based power distribution**.** On the other hand, the server can view a locative usage of power, and can shut down only the three phase and two phase supply during peak hours, which allows the consumers to at least use the basic needs. On request, the EB board provided the demanded power for feasible situations, not leading to complete shut down and balanced distribution.

B. Proposed Architectur

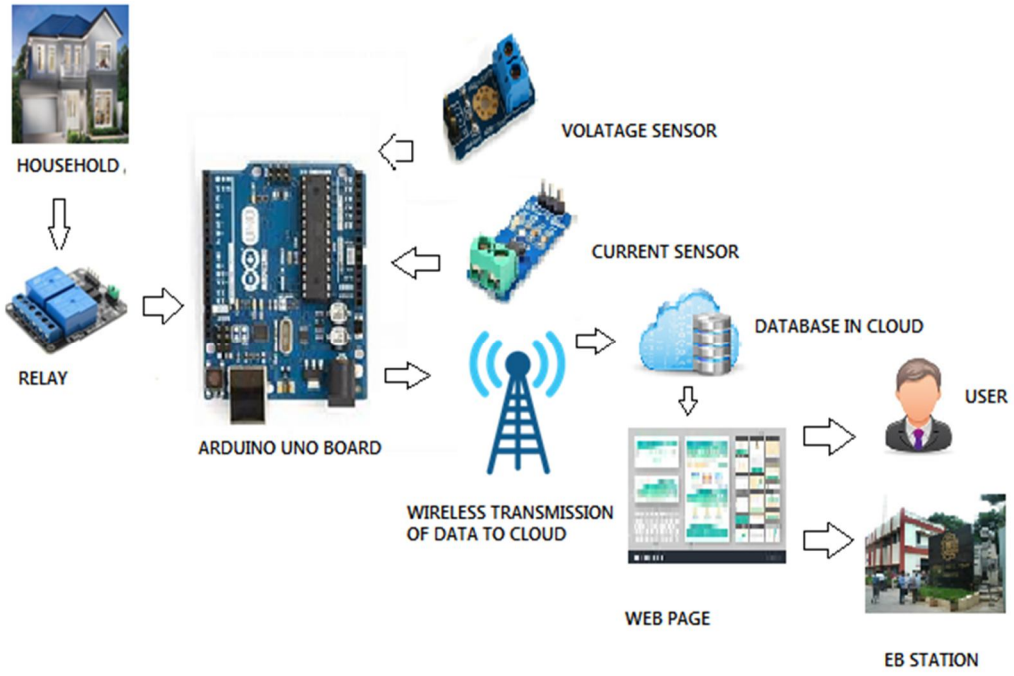

Fig 4: proposed architecture diagram

The power consumed in each household is measured using sensors and is stepped down using relays as the Arduino boards cannot handle high voltage current. The measured current is provided to the Arduino board, which is used to conver. With the help of SIM800 IOT ver0, is used to update the data to the server webpage. The web pages for the user and the server can be respectively viewed.

V. MODULES OVERVIEW

A. Control of power supply to devices

The Electricity plays a major role in the control of the supply of the current. Here by control we mean the restriction or free flow without any restriction. When the power generated is enough to run the particular essential needs of the locality, then there is no restriction in the supply (i.e.) components of all the phases can be utilized. This period is also know was non-peak hours. But when he generated amount of power is not enough for the entire locality, the EB restricts the supply to two phase or single phase. By this, no locality faces complete shutdown, but can at least use the basic amenities. This overall control of what supply is to be provided is provided after deep analysis of data by the EB, and hence remove the problems of power shut down.

B. Measuring of power Cosumption

Once the components run, the values of the voltage and the current used up by the loads are measured by the sensors. This values are calculated as a cumulative for all the components connected to the meter.

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C. Conversion of data using arduino board

The data that is measured is in the form of analogue values. Now that the consumer needs to find power consumed on timely intervals and daily basis, the values are to be converted. The Arduino board is used to convert the data as readable form or in other words, digital.

D. Uploading the details to the cloud server

The details are uploaded to the cloud server, where the user and the server can see the details. The data differs for both the client and the server.

E. Login Module

The user her refers to the consumer and the server is under the authorization of the electricity board. In order to view the data that has been viewed by the EB meter box, we have webpages, where both the user and the server are able to understand the pattern of consumption and get a better understanding.

F. User view and server view

The user can view the details such as the current and voltage running at the present time, history of data for particular devices and the monthly bill. The automatic messaging system allows the user to know the peak hours at which the power will be stepped down, in advance.

The server view allows the data to be monitored such as, the geographical location of the consumer, the amount of electricity consumed and the timing details.

G. Advantages

1) Eliminates complete power shut downs by providing limited power supply during peak hours.

2) Allows consumers to request for additional power by demand based power distribution feature.

3) Enables efficient power consumption by allowing consumers to monitor and analyse their power consumption patterns.

4) Ensures centralized control and management of the entire system by Electricity Board.

VI. CONCLUSION

This project plays an important role to recover from the major threat to India. The demand of electricity in India is very high as the generating power was less when compared to the power demand. There are multiple problems which include the power shut down as a major problem, manual power reading, no client to server demand based system and no automation. Thus, the concept of power supply based on the request and response, based on the needs, connect the loads automatically to the single phase and two phase supply is an essential steps towards the conservation of electricity.

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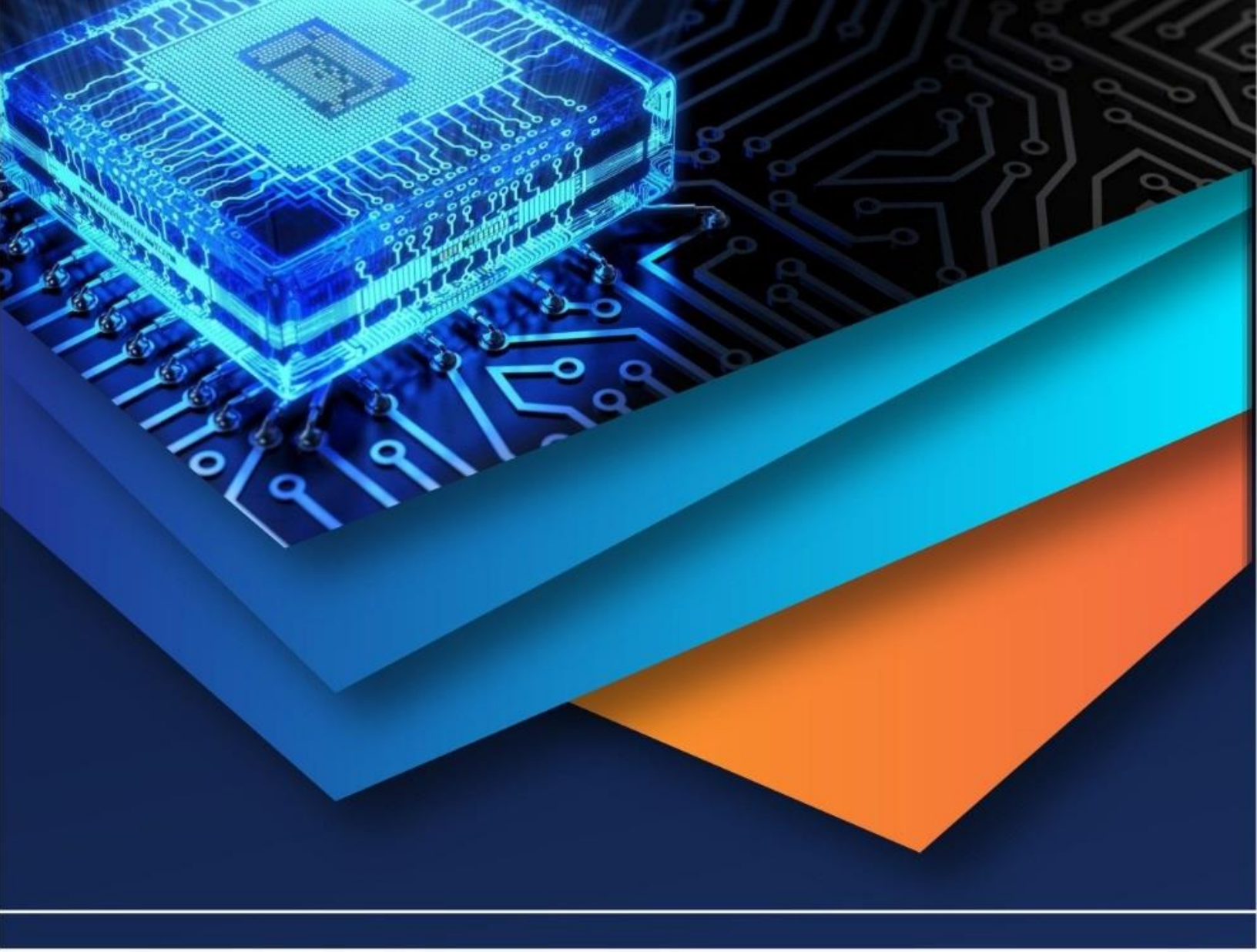

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