IOT Based Smart Metering and Remote Electricity Disconnection: Impacts on Consumers and Utilities

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ABSTRACT

The project introduces an IoT-Based Remote Electricity Cut-Off System for Non-Payers, which uses smart meters, IoT controllers, and cloud-based monitoring to enable utility providers to manage power distribution remotely and efficiently. The proposed system uses wireless communication (Wi-Fi, GSM, or LoRa) and microcontroller-based relay switching to control the electricity supply. Authorities can track consumer payment status and execute disconnection or reconnection commands with ease thanks to an intuitive web dashboard or mobile application. The growing demand for smart energy management has prompted the adoption of IoT-based solutions for real-time monitoring and control of electricity distribution.

KEYWORDS: Disconnection of Power Remote, Electricity Cutoff for Nonpayment, Disconnecting the Smart Meter.

I. INTRODUCTION

At the present time, along with the development of the Internet, automation becomes a very interesting theme to debate. This project discusses the development of automation system for residential electricity cut off using network based embedded controller. Nowadays everyone talks about the problem faced by government regarding electricity. Based on this situation, it becomes an extrinsic motivation to develop an automated system for residential electricity device.

The system consists of an embedded device to control power supply main switch and update the data into data center. Cut-off warning message is send to users via GSM and short message services. The system helps the electricity provider to reduce the operation cost as the system could cut off electricity automatically when the usage limit is exceeded In some areas consumers are non-bill paid consumers which intentionally does not pay bill and when the MSEB officials visit to the particular site for disconnecting the supply some consumers try to bypass the connections of the meter and also some consumers try to settle the matter by giving bribes ultimately it regards to electricity power theft. Therefore this project helps the government by gaining the profit by receiving the bill on time. Utilities in electricity system are destroying the amount of revenue each year due to energy power theft. It causes shortage of power supply to residential as well as commercial premises.

The aim of the project is to design and control a system which will automatically cut-off the electricity connection directly from the electricity pole for those consumers who fail to pay electricity bill on time. When M.S.E.B officials arrive at that particular site to cut-off the supply, some consumers argue with the officials and try to settle the matter by giving bribes. Even if after disconnecting the supply, some consumers may bypass the system and connect the home appliances from the service mains.

So to overcome all these issues a prototype is proposed which includes NodeMCU ESP8266, relays through which it will automatically cut-off the electric supply as per given instruction by microcontroller from the pole itself for that particular consumer who does not pay electricity bill within a specific given period. Also power theft will be taken care by this proposed Smart energy controlling system. A power theft is of various types such as direct hooking from line, bypassing the energy meter, injecting foreign element into the energy meter, physical obstruction, and ESD attack on electronic meter.. Hence this system is very useful as it can detect / monitor and overcome all the issues of power theft.

The cost of this system is economical without compromising the functionality and accuracy of the system. The paper proposes automated billing of energy meter. It is just like postpaid mobile connection. In the proposed work, the front end is user friendly and one can work on this software with minimum knowledge of computers and can read the meter by sitting in the office. This is useful for billing purpose in electricity board authority. A GSM modem is connected to the energy meter. Each modem will be having its own SIM (usual mobile phone SIM).

II. LITREATURE RIVIEW

The paper proposes the development of a firmware for a Smart Switch, which can control the on-off of any electrical device at home by using internet. The Smart Switch is connected to internet via Wi-Fi, through a computer, smart phone, tablet or any device with internet access. In order to perform this connection, it is necessary to write the IP pre-programmed into the Smart Switch in a web browser (Internet Explorer, Chrome, Firefox, etc.) with the purpose to load the Smart Switch server, which will open a configuration page to write the data of the user's network. Then, the user will select in automatic mode the network, the security type, and the user must have written a passphrase. Once these information is uploaded and saved, it is necessary to restart the Smart Switch in order to get access to internet, from which the user can control the Smart Switch simply sending a number one or a number zero to switch the electrical device, this process is done in principle via the internet, but it can be done without the use of internet, i.e. by using a local network. [1].

The paper proposes a new network communication system for energy meter reading by integrating communication technology and software system along with the existing meters. A wireless or wired communication system will be integrated with electronic energy meter to have remote access over the usage of electricity. Even though they are two

different modules, energy meter deliver the reading details as on when it demands by the communication system. The communication system is further connected with electricity regional/sub-regional office, which will rather act as a base station. Instead of creating a separate communication system and backbone, any of the secure existing communication service infrastructures may also e utilized to avoid any initial investments. The communication channel is identified by the consumer's number and it is secured by any cryptographic standards. Base office can verify the energy meters performance by checking the day to day consumption of energy. This will also help to avoid any tampering or break down of energy meter. [2]

III. RESEARCH METHODOLOGY

Our motivation behind this project is that When M.S.E.B officials arrive at that particular site to cut-off the supply, some consumers argue with the officials and try to settle the matter by giving bribes. Even if after disconnecting the supply, some consumers may bypass the system and connect the home appliances from the service mains. So to overcome all these issues a prototype is proposed which includes NodeMCU ESP8266, relays through which it will automatically cut-off the electric supply as per given instruction by microcontroller from the pole itself for that particular consumer who does not pay electricity bill within a specific given period.
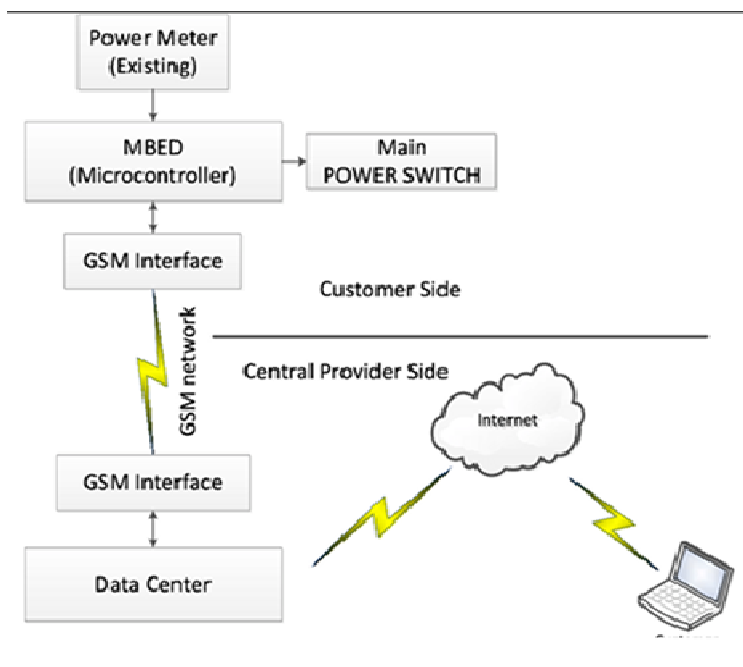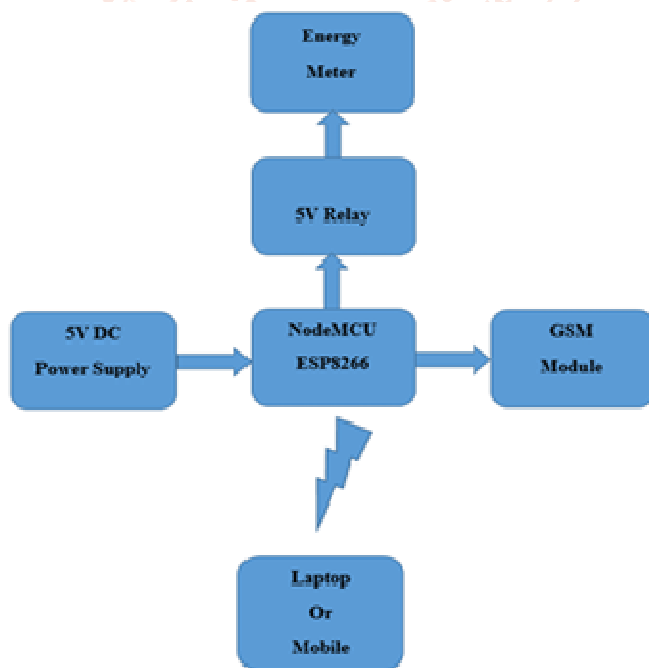

Fig 1. Block Diagram

Fig 2. Flow Diagram

In this project we proposed a system to improve services efficiency by implementing the automatic cut off system once the customer's power consumptions reach to the limit. The system consists of network embedded devices which are integrated with the main management system in data center. The management system includes billing module, alert module and

application module. This system consists of two subsystem; Central provider side and Customer side as shown in Figure 1. Meanwhile at customer side, the subsystem, which is the meter reading, is done by a microcontroller. The Microcontrollers are a series of ARM-based microcontroller development boards designed for fast, flexible and low-risk professional rapid prototyping. By summation of the energy meter readings they calculate the Energy Power theft. In order to overcome all the drawbacks of conventional system we are designing "Smart energy controlling system".

The system architecture of Smart energy controlling system consists of NodeMCU ESP8266, GSM800l and Relays. The energy consumptions was calculated by MSEB person monthly. And if any consumer not pay the bill then the online system will turn OFF the grid and SMS will send to the consumer. MSEB fetches the load supply to the consumers. Data Base Center of M.S.E.B contains all the statistical usage data of electricity consumption of particular consumer. With the help of the controller, MSEB will Control the Consumer's load supply as per their Electricity bill payment. Control panel online has all the details to turn ON or turn OFF the grid supply for the respective consumer.

IV. RESULTS AND DISCUSSION

This project proposed an IoT Based Grid Cut-Off System for Non-Bill Paid Consumer which is helpful to track the energy consumption for the user & Control grid status when he/she not pay electric bill using remote location . This data can be accessed by the user through a web page. So there is no need of human intervention. This system also provides a facility to send SMS to consumer. When they not pay bill and grid supply is cut-off by MSEB user will get an alert notification. This feature helps control the energy consumption. Hence, it reduces the wastage of energy and helps in creating the awareness about energy consumption.

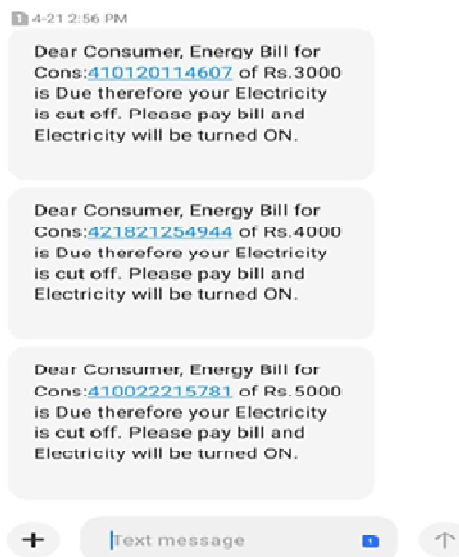**IoT Based Grid Cut-Off System For Non-Bill Paid Consumers.**

Consumer No.	Consumer Name	Check Bill	Grid Status	Grid Switch
310230913225	Sindhubai Babarao Pachade	Click Here	ON	OFF
410015823791	Narendra badiramji Hunne	Click Here	ON	OFF
410012006504	Hiralalji Kanojiya	Click Here	ON	OFF

Fig 3. – Website screenshot when Grid Supply is ON

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Fig 4. – Website screenshot when Grid Supply is OFF

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Dear Consumer, Energy Bill for Cons:410120114607 of Rs.3000 is Due therefore your Electricity is cut off. Please pay bill and Electricity will be turned ON.

Dear Consumer, Energy Bill for Cons:421821254944 of Rs.4000 is Due therefore your Electricity is cut off. Please pay bill and Electricity will be turned ON.

Dear Consumer, Energy Bill for Cons:410022215781 of Rs.5000 is Due therefore your Electricity is cut off. Please pay bill and Electricity will be turned ON.

Text message

Fig 5. Alert SMS send to consumer.

V. CONCLUSION

The project model reduces the manual manipulation work. Use of Esp8266 in our system provide the numerous advantages of wireless network systems. In this project we proposed a system to provide early warning to the users of electric power which provided by government. In the present situation all costumers are using manual communication. To reduce the manual efforts and human errors, we need to have some kind of automated system monitoring all the parameters and functioning of connections between the customers and electricity board .Also by implementing this system we can control the usage of electricity on consumer side to avoid wastage of power. Since there is need to utilize energy in better and efficient way which is beneficial in power sector.

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