INTERNET OF THINGS (IOT) BASED SMART ENERGY GRID

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Abstract : This paper deals with energy meter monitoring and management with the help of internet of things (IOT). Smart grid it is one of the features of smart city model. Smart Grid is the intelligent power grid and could be seen as the largest installation in the future. It is energy consumption monitoring and management system between the costumer and owner. The issues with the present outdated grid are efficiency it becomes overloaded during peak times and it is also possible to hack and take free energy. By using smart grid there will be two-way communication the costumer gets daily electricity consumption reading and owner can cut the supply remotely through internet when bill is not paid. The data collected by the smart grid should not be accessed by unauthorized entities. In case meter tampering happens, customer and owner get message and owner can act accordingly. There is a hidden switch inside the smart meter which detects the theft whenever any person trying to open the box and the meter switch will get open and sends the message to owner and customer. The main part of the project is smart meter. Smart meters add continuous communications to facilitate monitoring in real time, when LED in meter blinks for 3200 times it means one unit of energy is consumed. One more feature of the project is control meter if bill is not paid owner can cut the power supply. The advantage of the project is to reduce cost and save power and also reduce human interface and time consumption.

IndexTerms - Internet of things, Sensors, Smart Grid, Smart Meter, Theft.

I INTRODUCTION

Internet of things (IOT) enables us to connect day to day devices with each other over the internet. The devices connected through IOT concept can be controlled and analyzed from any place remotely. The IOT concept provides the basic infrastructure and opportunities to form a connection between physical world and computer-based system. IOT is a concept that considers presence of variety of things/objects that through with wireless or wired connections. The goal of the internet of things is to enable things to be connected anytime, anywhere with any path/network or any service. Internet of things is anew revolution objects make themselves recognizableand they obtain intelligence by making related decisions. The concept has gained importance with more and more wireless devices that are increasing rapidly in the market. It connects the hardware devices with each other over internet. The WiFi module present in the system provides the connectivity with the internet. Now-a-days the demand for electricity is increasing at a constant rate throughout the population and is being utilized for various purposes like agriculture, industries, household purposes, hospitals etc. So, it is becoming more and more complicated the handle the electricity maintenance and requirements.

Smart grid (SG), the intelligent power grid could be seen as a largest instantiation of the IOT network in next future. The whole power grid chain from energy power plant generation to the final electricity consumers, including transmission and distribution networks is filled with intelligence and two-way communication capabilities to monitor and control the power grid from anywhere. The aim of the smart grid is to keep real time balance between energy generation and consumption by monitoring and control over the power chain. The Internet of things will deliver a smarter grid to enable more information and connectivity throughout the infrastructure and to home. Through the IOT consumers, manufactures and utility provides will uncover new ways to manage devices and ultimately conserve resources and save money by using smart meters, smart plugs and connected appliances.

II PROBLEM DEFINITION

The proposed system provides a technical twist to the present energy meters with IOT technology also there are other issues that we have to address such as power theft and meter tampering which in turn generates economic loss to the nation. Monitoring, Optimized power usage and reduction of power wastage are major objectives that lie ahead for the better system. The present system depends vastly depends on human billing. Billing requires a human individual to visit each and every customer's energy meter and generate the bill by taking the unit reading from the energy meter this is time consuming process and to avoid the possibility of hacking the system and take free electricity and to cut the supply remotely if bill is not paid through internet.

III. BLOCK DIAGRAM DESCRIPTION
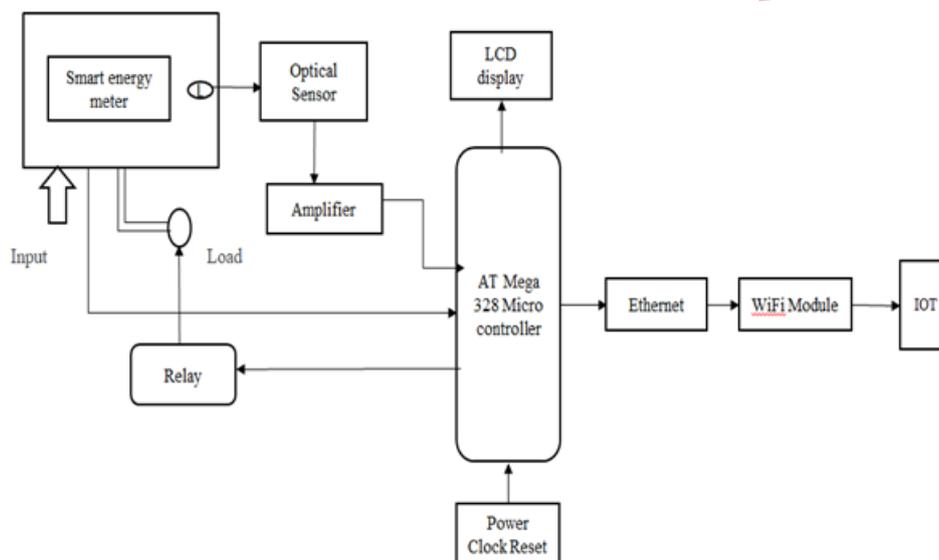
Fig1: Block diagram of IOT Based Smart Energy Grid

Block diagram description:

There is a circuit fitted i.e smart meter in consumers house so from that we acquire the data and after acquiring we will upload /update the data on cloud service so that owner of smart grid and consumer can access that data. The smart meter consists of an LED which blinks 3200 times means one unit of energy id consumed.1unit electricity consumption for 3200 blinks i.e 3200 impulse=1KWH. To pick the pulses one photo detector is present next to the LED it detects the light and output signal is sent to amplifier which is present next to it. The signal of the photo detector is weak so it is amplified by the amplifier. When LED blinks light of LED falls on the photo detector so the amplifier junction will break, because of light junction breaking will lead to flow of leakage current which results into enabling of amplifier. Second thing there is a fixed micro switch inside the meter it is to prevent meter tampering means to detect the power theft. Basically, there is a hidden switch inside the meter whenever any person tries to open the box the switch will pop up and after controller sends the message to owner and customer that meter has been tampered. Daily consumption units and micro switch data readings are displayed on LCD display. When theft is detected the relay contacts will get opened and electricity supply of the meter will get cut.

IV. HARDWARE DESCRIPTION

Arduino ATMega328:
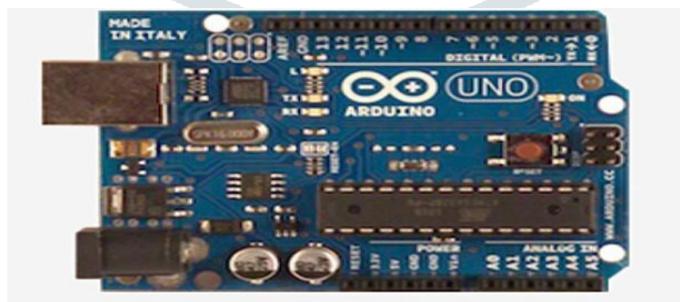
Arduino is a microcontroller broad and it is based on the ATMega328. It consists of 14 digital I/O pins and 6 analog pins and a crystal oscillator of 16MHZ frequency, a power supply jack and a USB port to dump the code and a reset button. It can be powered with a power jack at a start and later can be powered with AC to DC adapter or with a battery.

WiFi Module:

The ESP8266 WiFi module is a low cost with which manufactures are making wireless networkable microcontroller module. This WiFi module is a system on chip with capabilities 3.2 GHz range. WiFi unit performs IOT operation by sending energy meter data to webpage which can be accessed through IP address. The TX, RX pins are connected to the 7 and 8 pins of the Arduino microcontroller.

LCD Display:
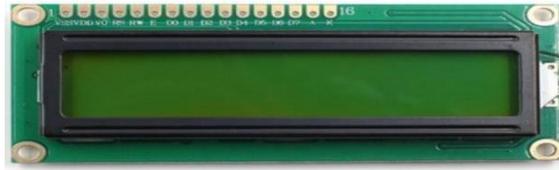
LCD (Liquid Crystal Display) screen is an electric display module and finds a wide range of applications.16*2 display means that it can display 16 characters per line there are 2 such lines. The 11,12,13 pins of the display are data pins used for Arduino interfacing.

Relay: Relay is of 12v which is SPDT means Single Pole Double Throw relay. If first relay is get triggered then load will cut off. If second relay is triggered then we get buzzer means if any problem is occurred control unit gives the trigger, so because of triggering both relay get activated and power will cut off.

Working of Energy meter:

The meter which is used for estimating the vitality and used by the electricity board is called vitality meter. The vitality is the aggregate power expanded and is used at specific interim of time. It is used as a part of residential and mechanical AC circuit for estimating the power utilization. The meter is more adorable and precise.

Essential unit of energy is watts. The energy meter consists of LED which blinks for 3200 times that means one unit of energy is consumed. LED gives the pulse according to the load. On meter calibration is written. When LED gives 3200 impulses, means 1kw-hour unit is get consumed.

V. CONCLUSION

In the era of smart city advancement, this project is concentrated on the connectivity & networking factor of the IoT. A revolution in energy domain is underway, namely the Smart Grid. Smart Grid is owner as well as user friendly technology. User can check daily consumption from any location using internet. Owner can control customer meter from control unit. Smart grid represents one of the most promising and prominent internet of things applications. More efficient transmission of electricity. Quicker restoration of electricity after power disturbances. Reduced operations and management costs for utilities, and ultimately lower power costs for consumers. Time saving technology. Control on Meter tempering. The main cause for the design of IOT based energy meter is to reduce the power consumption in house. It avoids the human intervention reduces the cost, save human power. This meter sends billing directly to mobile before due date without causing human intervention. This computerization for diminish the work costs as well as makes the framework more effective and exact. The system is mainly intended for smart cities with public Wi-Fi hotspots. The project is based on the internet of things concept. This is aimed at replacing the old energy meters with an advanced implementation. It can be used for automatic power reading by which one can optimize their power usage thereby reducing the power wastage. The readings from the meter are uploaded where a channel with the energy usage for a particular energy meter can be viewed by both the service end and the customer.

VI. FUTURE SCOPE

> Smart meters have been introduced as a means to modernise the grids and to bring about operational changes such as reduced nontechnical losses, introduce remote reading and switching or simply the billing procedures.

➢ Our honourable prime minister of INDIA SRI NARENDRA MODI initiated 'DIGITAL INDIA' where some cities will be converted into smart cities where smart grid will be implemented to materialize the smart city into reality.

➢ It is risky because of financial developments and regulations.

➢ But in the long run attitude will change, wide spread usage of smart grid from every business to every home just like the internet

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