IOT BASED ENERGY MONITORING AND SMART AUDIT REPORT GENERATION SYSTEM

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ABSTRACT: An energy audit can convert from a simple survey to a stage that involves several steps. These categories include simple research, followed by energy monitoring consumption in the field services and then analyzing the model of the sector's performance through computer simulation. Therefore, the difficulty of auditing is directly related to the end of the power management system or to a higher level and the cost of the audit work. Remote monitoring and control refers to the industrial automation sector entering a new era with the construction of wireless sensing devices. Remote sensor monitoring in a variety of fields, equipment, energy, or electrical panels are highly sought after products and many organizations are working on them. This document is a study of energy monitoring systems and their use.

Keyword: EMS, BMS, MODBUS

I. INTRODUCTION

Energy can be considered through a simple survey from one side that can be assigned to many locations. These features include a simple due diligence survey that tracks a significant portion of energy use in industry services, followed by computer-assisted analysis similar to industry simulations anywhere. Thus, audit flexibility is closely related to the score or grade obtained from energy management and the results of the audit process. Soon, please come back to the industry as it enters a new era with the development of wireless sensors. It is more than a challenge in various areas of industry, industry, energy or other sectors, the most important problems and crises in which it operates. The system that has been identified to address these challenges will focus on the various environmental impacts on energy sources in rural and industrial areas. This study is only for the Central India region, which is one of the hottest regions in the country. The system saturates the remote energy meter of the energy analysis and analysis platform. The office business units will be devices with built-in functionality that will act as web clients so that you can easily access web services. Providing microcontroller web entertainment over the Internet over the Internet, and Modbus instrumentation constitute an essential part of the system's components.

Definition and purpose of electricity management the simple intention of power management is to provide goods and offer services with minimum price and minimal environmental impact. The term energy control manner many stuff to many human beings. A greater comprehensive definition is the motive of electricity management to acquire and keep most useful power buy and use at some stage in the organization and to reduce environmental fees/waste without affecting manufacturing and pleasant to reduce environmental influences. The power audit is the important thing to a scientific technique to choice-making inside the subject of power control. It tries to balance total energy enter with its use and serves to pick out all power streams in a facility. It determines the intake of energy consistent with its discrete functions. An business power audit is an powerful tool in defining and advancing a comprehensive power management software. In line with the

electricity conservation act, 2001, an power audit is described as "the submission of technical reports for hints on electricity performance to reduce power intake, the verification, monitoring and analysis of power use, which include tips on energy efficiency has been carried out."

Power audit requirement in any industry, the 3 top running fees are regularly observed within the shape of power (each electric and thermal), hard work, and substances. If one turned into worried with the management capability of cost or capability cost savings in every of the above components, power could usually emerge as a top rank, and accordingly the power management function constitutes a strategic area for value reduction. Power audits will assist to recognize greater about the methods wherein energy and gas are used in any industry, and will help become aware of regions wherein waste may also occur and where there exists scope for improvement. Energy audits will give a high-quality orientation to electricity price discount, preventive renovation and fine manipulate applications which can be crucial for production and utility activities. Such an audit application will assist to focus on the version in energy charges, availability and reliability of energy supplies, decide on the best energy blend, become aware of power conservation technologies, retrofit for energy conservation equipment, and so on. In widespread, there's power audit. Translation of conservation ideas into truth, by lending technically viable solutions with monetary and different organizational concerns within a given time frame. The primary objective of an power audit is to determine approaches to lessen power consumption per unit of product production or lessen working prices. Energy audit offers a "bench-mark" (reference factor) for the control of power inside the business enterprise and additionally provides the basis for making plans for greater powerful use of energy at some stage in the employer.

EMS is a software-based platform and this technology used to identify and monitor energy usage at different users or the customers. EMS software system allow user to monitor and analyze the use of power in various appliances or pattern in a very easy manner. These system features includes energy use, user demand, power W-VAR-VA and more. A high level of reports can be generate to fully understand and assess how power can be used within different users or the industries.
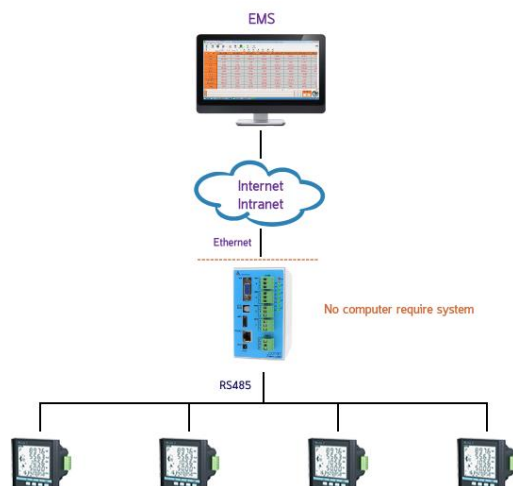

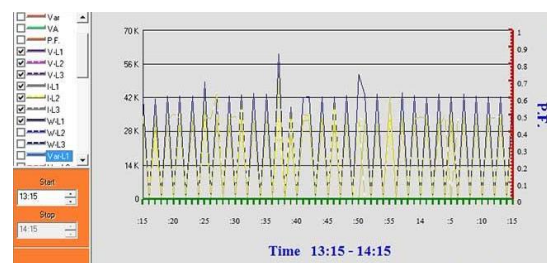**Fig -1-(A):** System diagram of EMS

Fig-1-(B) Analysis report

Fig.1-(A) describes the EMS system (power management system) diagram, in which it outlines the transmission of system data transmission and connection system. Complete the following EMS,

- *Multifunctional Electric Smart Devices:* These Smart Devices are designed for industry needs and contain small processing power that can calculate different power parameters such as amps, watts, volts, etc. in the input phase. These meters can be transmitted via various communication protocols such as Modbus, serial to detect parameter values in the system.

- *Data Logger / Communicator:* These Data Loggers allow the power smart electric device to transfer data in a single process or to communicate with a remote device to share data.
- *Monitoring Software:* These software will download data from the smart electric device and allow the user to observe a graph or prepare an analysis report for future use.

Fig. 1-(B) Shows the specific graphical representation of the various energy parameters and its values from the specified node. These parameters are usually measured by a smart electric monitoring device. The monitoring software simply logs in and indicates those values.

II. PROPOSED SYSTEM

Since industry power auditing is required to save unmanaged energy consumption and to know the exact specification of each unit or division requirements, the proposed system is taking this development to the next level by raising the term IoT (Internet of Things).) Industrial monitoring parameter remote power systems. The advantages of wireless sensor nodes in addition to traditional hearing have made them a better platform for remote monitoring systems. The purpose of this energy study is to identify the ultimate power consumption in the industry, as well as the feasibility study that has led to the implementation of the energy management system. Audit procedures can be extended as required at different stages of the energy system, each successful phase providing more information on energy use and more opportunities to increase energy efficiency.
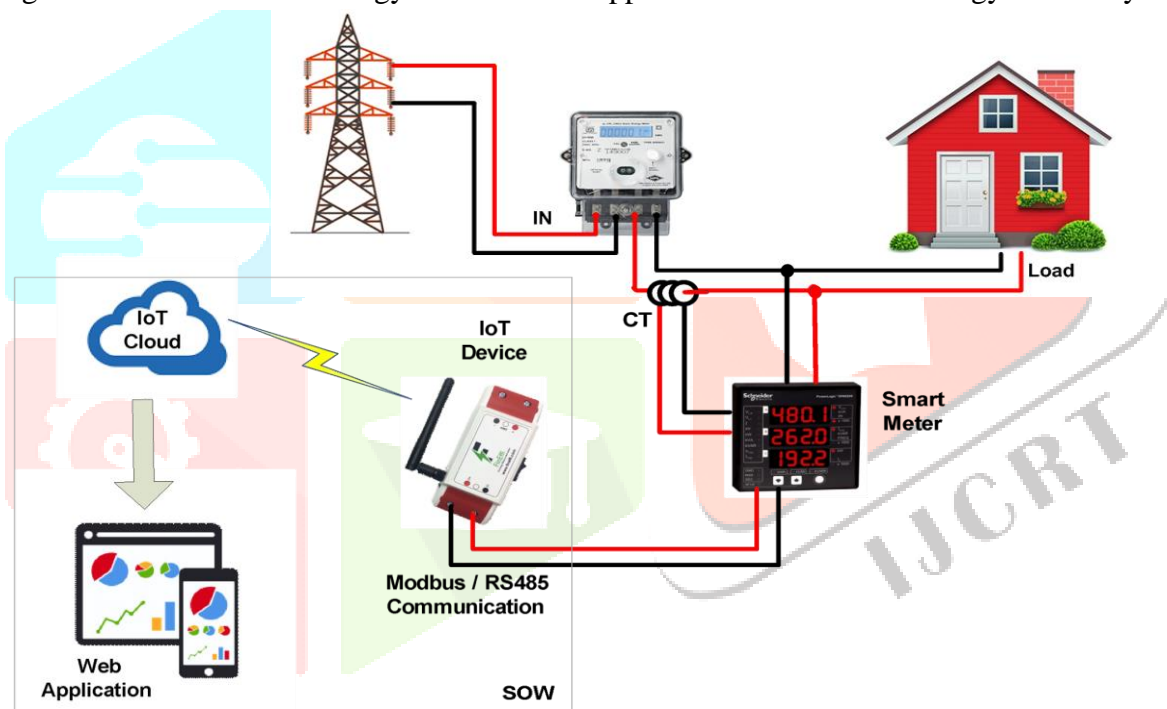

Figure 2.0 System architecture

Before going in details about the proposed system let's first understand the standard metering and industrial smart meters. The diagram above shows the typical implementation of MSEB meters and these meters are capable of showing increasing power consumption by a few digits, although we cannot and do not see the exact loads such as voltage, current, power factor, etc. Daily consumption, day time consumption, night time consumption etc. To solve this problem we have smart meters, these meters can store logs for a month as well as show many parameters, but this again exacerbates the problem, these meters can transmit this information to another device and not be able to manually note all the readings from time to time. So then we need to develop an IoT-based device that can read all the parameters from the meter through the MODBUS protocol and upload this information to the IoT server so that the user can graphically view the power parameter usage using the web or mobile application. It is therefore the perfect scope for developing IoT based devices, running IoT servers and developing web applications for data analysis.

The objective of the thesis is to provide brief idea regarding following points:

- To build a remote data acquisition system provided by microcontroller-based for energy parameter Monitoring.
- To implement centralized data gathering and management applications.
- To develop a web service for interaction between web applications and microcontrollers.
- To develop an internet enabled graphical data analysis tool.

III. PROPOSED METHODOLOGY

Thesis provides designing and fabricating procedure for microcontroller-based EMS and BMS, this thesis can also be used by a new learner for developing .net based graphical user interface accessible over internet. While designing RMS the steps involved can be specifically understood by using this thesis along with these steps the appropriate use of industrial based wireless communication systems can be understood. In order to control and monitor the communicator system, they need to deal with a series of software which will internally communicate with each other and all software must follow some standard formulations. Fig. 3.0 will describe the series in detail.
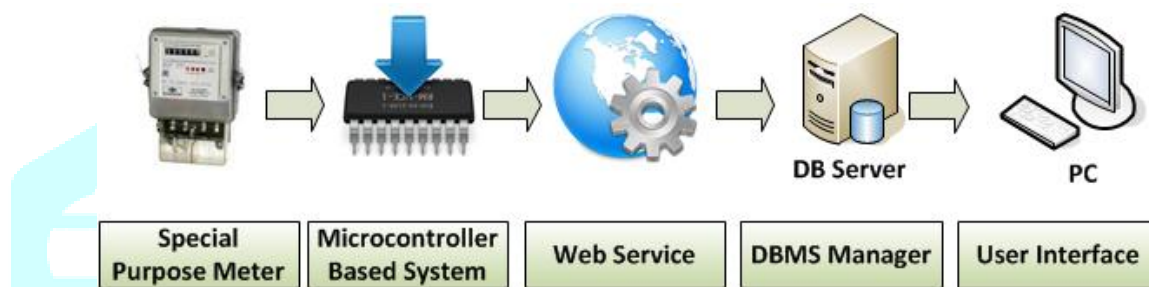

Fig. 3.0 Data process flow

As all the monitoring or the IoT devices works the proposed system implements the same process, in figure 3.0 we can see different stages of the data uploading and monitoring. First phase is to collect the energy parameters information from smart meter with the help of IoT device. Secondly as IoT device works as a middleware between hardware and software it will push the data to web service which will then store the data in database in tabular format for further analysis along with timestamp.

With the help of timestamp, we can get the data from any date time slot. Now this data can be fetched by graphical analysis tool in charts, graphs or the tabular report format. Using ML or AI predication system or notification system in case of abnormal behavior can be generated.
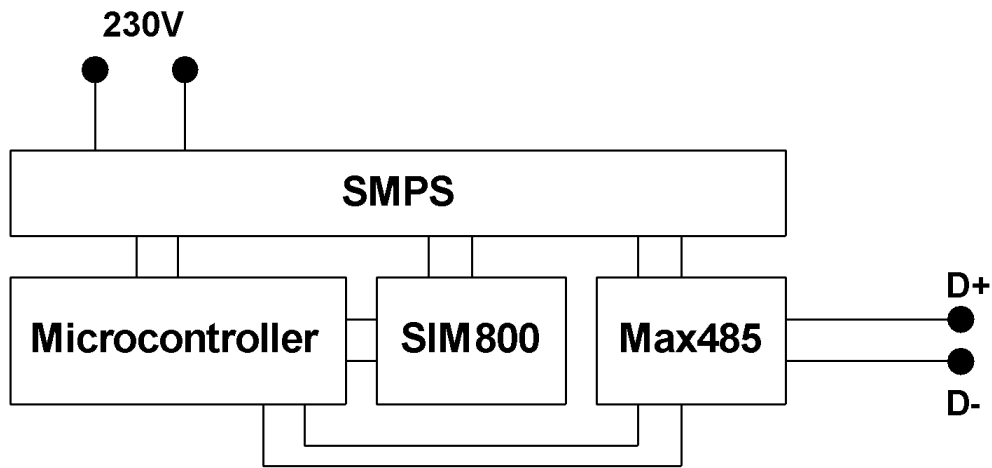
Figure 4.0 proposed hardware modelling

As we have seen the working strategy of the proposed system and its functionality, let us look at the internal clock of the IoT device to see what we are discussing. The proposed IoT device will have the following block, where the first block will communicate with the smart meter, as the smart meter will run on industrial Modbus or RS485 protocol, which converts Rs485 to RS232 so that the microcontroller can understand. There will be a GPRS modem to communicate with the web system related to internet communication and finally this device is deliberately designed for an industry where static power source is very important, we will need to combine all these into one SMPS power supply module. Result in IoT based EMS.

IV. CONCLUSION

The proposed system takes the term IoT (Internet of Things) to the next level, due to the industry's need in energy auditing to save unwanted energy consumption and to know the exact specifications of each device or equipment.) For industrial remote energy parameter monitoring systems. The advantages of wireless sensor nodes over traditional sensing have made them a better platform for remote monitoring systems. The purpose of the energy audit is to identify the ultimate use of energy in the industry and to implement the energy management program as a feasible study. The audit process can be expanded as needed at different stages of the energy program, with each subsequent step providing more information about energy consumption and more opportunities to increase energy efficiency.

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