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IOT Based Smart Switching System

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Abstract — **Energy efficiency plays a vital role in the development of an intelligent grid in the energy system. Therefore, proper monitoring and control of power consumption is a key to a smart grid. The existing power meter system has many problems associated with it and one of the main problem is no full duplex connection. To solve this problem, an intelligent energy meter is proposed based on Internet of Things (IoT). The proposed smart energy meter controls and calculates power consumption using ESP 8266 12E, a Wi-Fi module and uploads it to the cloud from where the buyer or producer can view the reading. Therefore, power analysis by the consumer becomes much easier and more manageable. This program also helps in detecting energy theft. Therefore, this smart meter aids in home automation using IoT and allows wireless communication which is a good step towards Digital India.**

Reference Conditions— IoT, ESP 8266 12E, intelligent energy meter.

I. INTRODUCTION

Internet of Things (IoT) is a network of intelligent connected devices that enable data transfer. The 'object' in IoT can be a person with a heart monitor or a car with sensors built-in, i.e. objects that are given an internet address and capable of collecting and transmitting data over the network without manual assistance or intervention. Embedded technology helps objects adapt to the internal environment or external environment, which in turn influences decisions made. With rapid growth and development, the energy crisis has become a major issue. An effective system must be developed to analyze and control energy consumption. The existing system is flawed, time consuming and time consuming [1]. The prices we get from the current system are inaccurate and inaccurate although it may be digital but it is always necessary that a concerned person from the energy department should visit the customer house to comment on the details and make a mistake. in each step. Therefore, the solution to this solution is a smart energy meter. The smart grid plays a big role in our current society. Tens of millions of people's daily life will be degraded dramatically because of the unstable and unreliable power grid [2]. Smart meter is a reliable mode for real-time monitoring, automated data collection, user interaction with the power control device [3]. It provides two-way information flow between consumers and providers that provide better control and efficiency [4]. Provides real-time usage information that provides power consumption control [5]. Whenever the maximum customer load exceeds the maximum value, the supply of electricity to the customer will be disconnected with the help of an intelligent energy meter [6]. In a good environment with a normal working load, the duration of the smart meter is 5 to 6 years [7 - 8]. But in reality the intelligent energy meter encounters environmental problems and reduces its life span by using energy in an unusual way [9]. Factors affecting the life expectancy of a smart meter include life expectancy (LE), genetics (GE), environmental factors (EF), transition time (CT) and moderate longevity (LL) [10]. The IoT-based power meter system mainly consists of three main components namely the controller, Wi-Fi and the theft detection component. Whenever there is any error or theft, the theft sensor detects the error and the cycle response depending on the information you receive. The controller plays a major role in the system to ensure that all components function properly. Therefore, IoT can improve the performance and efficiency of a smart grid especially in three phases. First, it increases reliability and durability. Second, it focuses on empowering i.e. data collection and analysis to manage active devices within a smart grid.. Finally, control can be done by analyzing the result obtained in the second phase which helps the grid department to make a better decision for future development. The available energy meter can now control and monitor customer energy consumption. An intelligent energy meter made using a power cord (PLC) aids in energy loss [11]. Several systems using Arduino

and microcontroller have been developed although the efficiency of measuring power consumption has greatly increased but due to low cost it may not be considered appropriate. The consumer cannot have a good and accurate track of the use of excess power the base of the interval .Mypical meter has some common similar errors [12]

• Time consuming.
• Opportunity to steal.
• Error while retrieving information and additional personal involvement.
• User cannot receive daily updates of his or her usage.

Therefore, we have developed a smart system that allows the consumer and the manufacturer to monitor and control energy consumption very quickly.

II. PROPOSED SYSTEM

The proposed system is cost effective and integrated, therefore, installment becomes much easier. The result is always uploaded to a cloud area called "Thinksspeak" and monitoring can be done by buyer / customer as well as supplier / manufacturer. In the proposed system, the power meter is connected to ESP8266 12E via optocoupler. The OLED display is also connected to the system. In the driver cycle, ULN2003 is used to drive a relay to shift loads. The current sensor is also equipped to detect power theft. Figure 1 shows a working block diagram of the proposed smart monitoring system.

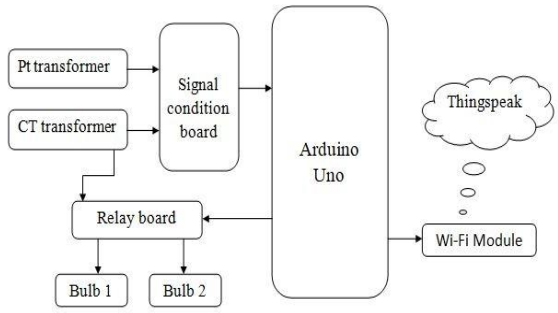


Fig. 1: Drawing a functional block of a smart grid

The main operating unit of this program will be discussed later.

• WiFi Module: - ESP 8266 12E is used here which is a standard module with 80 MHz Micro controller. Since the module does not have a separate USB port, we need to use an external USB adapter in the Serial adapter like our FT232R Serial to the UART board to upgrade the code using this module.

• OLED display: - A 0.96 inch OLED display is used here that does not require background lighting. The display can illuminate itself with high resolution.

• Power meter: - The analog meter used here is 3200imp / kwh. The optocouple feels led measured from the power meter and sends the output to ESP 8266 12E.

• Optocoupler: Contains an infra-red LED and a semiconductor photo-sensitive device used for infra-red detection red beam. The Optocoupler 4N35 is used here to detect Cal impulse from a power meter.

- Current sensor: - The current ACS712 sensor provides accurate current measurement of both AC and DC signals. These are great sensors for measuring meters and measuring the total power consumption of systems. The current ACS712 sensor measures up to 5A for DC or AC current. In this system it is used to measure energy theft.
- Driver: - The transmission driver is used to change the load connected to the system.ULN2003 is used here.
- Load: - 100W lamps connected as loads in the system.
- Power supply: - 230V ac power supply to the system to power the power meter. Wi-Fi module power is provided by 5 V DC.

III. PRACTICAL IMPLEMANTATION

In order to analyze the proposed energy monitoring system, the system is used in the lab. Details of actual use are described below: Initially the system is not connected to the main feed i.e. the system is in OFF mode. Figure 2 shows the hardware launch without connecting the main supply. After verifying all hardware connections, the supply is delivered to that hardware system. Figure .3 shows that the system is up to date. As soon as the Wi-Fi module is connected to the server to transfer power and load capacity.

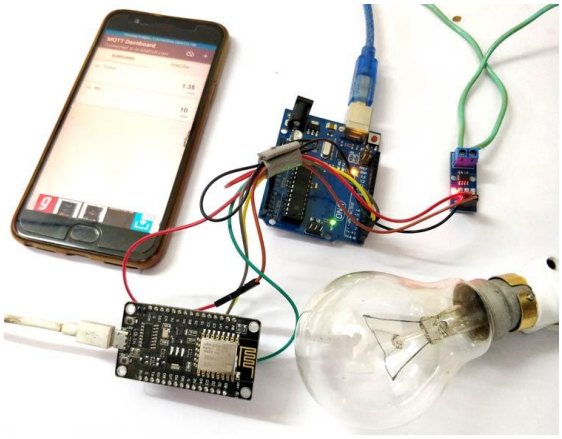
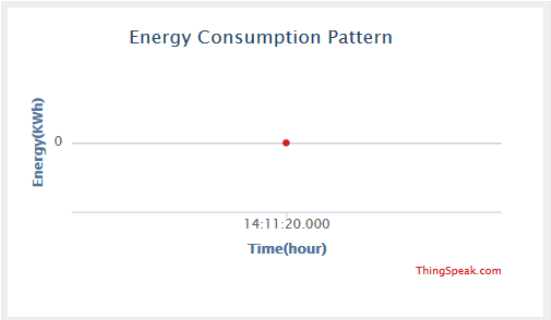


Fig.2: System in OFF condition.

After connecting to Wi-Fi via that system, the system is ready to provide information about the load or power consumption by customers. Figure 2 shows the initial information on the OLED display when the load is not power i.e. there is no load connected to the system. As a result, the OLED display displays a reading of '0 '. Fig. displays readings on the OLED display when the system starts to take pulses on the power meter. indicates that when the system is idlepulses, the system detects that there is a power Theft in the system and OLED displays the same information. After the power theft, the system is shut down completely as shown in Fig. At the same time the system contacts the Department of Energy to provide information about the Power Steal and the Steal data is uploaded to the cloud again.

IV. RESULT AND DISCUSSION

The resulting result is uploaded to the IoT open space "ThingSpeak" which helps us store, collect, analyze data from arduino and other supporting computers. Initially, no information is transferred to the cloud via ESP 8266 12E (Wi-Fi Module) as the load is not power on the system. After connecting the load, the information is transferred to the cloud using a Wi-Fi module. Figure 3 shows the initial data transferred to the cloud via a load connection



. Fig. 3: Energy consumption data

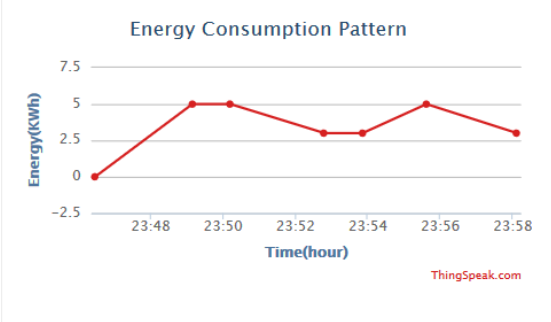


Fig. 4: Energy consumption pattern for first load set

To verify the system, experimental result is obtained for various load connection of the system at a particular time. Fig. 4 and fig. 5 respectively shows the energy reading for different loads connection of a system at a particular time. Here, we kept the system ON for a while in order to obtain the results. . Fig. 6 shows the theft data consumed by the system.

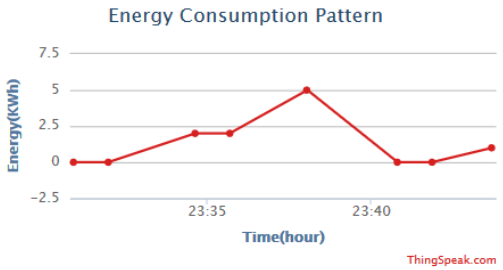


Fig. 5: Energy consumption for second load set

Fig. 6: Theft Data

V. CONCLUSION

This paper provides a wireless meter reading system that can monitor and analyze data at all times and provide accurate results with minimal error. Some of the benefits of this clever program are: -

- Energy saving.
- More time and energy saving from the electricity department.
- Automatic power meter control.
- Enabling the consumer to keep track of the energy meter.
- Power theft detection. Some of the disadvantages are: -
- Sometimes the system takes time to load data depending on internet speed and Module billing rate.
- The IoT concept can also be used in a variety of workplaces such as home automation, automatic water level detector and traffic congestion system etc.

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