

Automatic Meter Reading and Theft Detection Along with Nett Metering for Renewable Energy Harvesting on Roof Tops

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ABSTRACT

The power of development of any nations is considered an important item. Global economic growth has put enormous demand on its energy resources. The power gap between generation and demand will be balanced by the addition of renewable energy output to the current conservative power generation. Centered generating facilities are partially responsible for a smaller, more distributed generation, due to the loss of traditional economic status. Many technologies such as miniature turbines, photovoltaic's, fuel cells and air power switching systems have fewer emissions to reduce the cost of traditional financial measurements. Power utilities have caused huge losses in different countries due to electric stolen. This paper proposes the use of electric stolen control using the prepaid energy metering system. In this system a smart energy meter is installed on each user unit and the server is maintained by the service provider. The meter and server have a GSM module that facilitates bidirectional dialogue. Using SMS users can recharge their power meter by sending a pin number hidden in a scratch card to the server. Using SMS, bidirectional GSM communication ensures the effect of these actions. Inflation of electricity will decrease significantly by adding the proposed measures along with the prepaid metering scheme. Legal actions against fraudulent users are also taken into this system

Keywords: SCU, current transformer, Arduino nano, raspberry pi, solar panel, theft load, GSM module.

INTRODUCTION

With the rapid development of wireless communication technology by the use of microcontrollers, there are a number of improvements in automating many industrial items to reduce manual efforts. Traditional manual meter reading is not suitable for long operating purposes, since most human and physical resources are spent. It brings additional problems in manually calculating readings and billing. Now the number of power consumers is very high for a day. It has become a difficult task to maintain and maintain energy according to the growing needs. Power management is also an important task as the customer goes home and produces a bill according to the meter reading. If the user is not available, the billing process will be pending and the human operators will have to look back again. Every customer is going to go home and create a bill is very tough and requires a lot of time. It will be very difficult during the rainy season. If any customer does not pay the bill, the operator must go to their home to disconnect the power supply. These processes are time consuming and difficult to maintain. Furthermore, manual operators cannot

detect unauthorized connections or abuses managed by the user to reduce or stop meter reading / power supply. The human error reader can open the possibility of corruption. So the problem arising in the billing system is inaccurate and inefficient. So we got a feeling, nett metering.

Solar energy is an important part of our country's current power mix and our clean energy plays a key role in the future. Today there are many days of utilization of large utility utilities, residential roof solar panels and more green energy, solar energy. Large amounts of solar projects will be able to generate 60 percent of the country's solar energy capacity and three times the capacity of 2016 by the end of 2016. These projects are the most cost-effective way to increase the consumption of solar consumption to all power consumers.

As Utility Solar projects grow, there is also an interest in using other small-scale, on-site power sources called roof solar panels and distributed generation (DG). When these systems were first introduced market years ago, many states accepted the billing system called Net Metering. Net metering systems vary in the state, while consumers

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with roof solar or other DG systems are in the power supply radiate at the power grid to generate and sell their local power consumption to a higher power supply. Electric Utility is required to purchase this power, although they generally cost less to produce electricity or purchase power from other power suppliers in the wholesale market.

EXISTING SYSTEMS

In these existing systems different types of detection of power theft takes place but it only specifies a single or required output let describe about those types i.e. RF communication is used at both distributor side and consumer side for intimation of electricity theft and this communication is through WIFI but WIFI has limited range[1], theft intimation through GSM is only intimates about theft[2], intimation of electricity through a wireless communication (RF reader) but RF reader is short range[3], prepaid billing and theft intimacy is through microcontrollers[4][5].

Smart meter data analysis is used for data analysis that which losses are technical or non technical. Technical losses are common if a non technical loss is detected then it is intimated that there is a illegal usage of power[6], a IEEE 802.15.4 standard protocol used as a standard protocol for theft intimacy[7], GSM modem and PIC microcontroller is used for both theft intimation and prepaid billing[8],[9],[10].

PROPOSED SYSTEM

Intruding electricity creates intangible loss to revenue department of government. Though the former methods of monitoring electricity didn't go vain, they are not effective in detecting theft over long distances. Continuous monitoring through WIFI over long distances is a major drawback in earlier systems. Our system proposed overcomes this limitation by placing a GSM module in between the source and destination. This GSM module emphasizes long distance monitoring. The illicit usage of electricity can be detected by using a

power sensor connected to ADC. If any theft occurs, the power sensor senses the theft and sends signal to ADC which is connected to Raspberry Pi-3 kit. The signal is further processed so that it activates a buzzer to inform theft. To further reduce the expenses this system generates electricity using solar panels. The electricity thus generated is traded to pay the prepaid or postpaid billing by GSM.

Problem Statement

There are two types of losses technical and non technical. Technical losses are due to long distance communication of fiber optical cables these can be neglected when a non technical losses are observed then there is a illegal activity is observed by this illegal usage there is a lot of loss to the revenue department, Further expenses bidirectional metering along with prepaid and postpaid billing systems are included and introduces in this project.

Block Diagram for Bidirectional Meter

In proposed system a bidirectional meter is used for which both for consumption and generation, that which consumption is from electric grid and calculated each electronic appliances in each home that how much a home consumes the power if the power is beyond that threshold values this system alerts through beep sound from buzzer and sends SMS to both user and higher authority like theft detected please alert, if the transmitted units is equal to the consumed units the generated bill is send to users mobile to recharge. A postpaid billing facility also installed to reduce the human effort and also prepaid billing also install that which how and when user want to choose.

Normally generated power is consumed through user but it gives less advantage than to sell government. Government pays money for generated power for high cost, Then the bill generated like if generation > consumption then generation-consumption you have this much of balance or if consumption > generation then bill generated like consumption-generation you need to pay this much of balance.

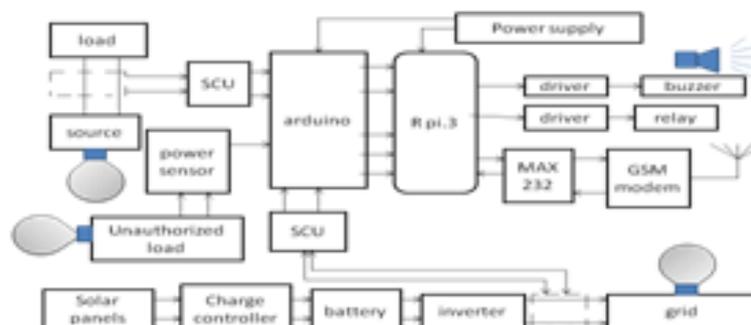


Fig1. Block diagram for bidirectional meter

Working of Bidirectional Meter

This bidirectional meter contains

- Theft detection
- Prepaid billing
- Postpaid billing
- Nett metering

Theft Detection

Continuous monitoring of each home appliances is noted through the ARDUINO whenever the consumption of home appliances beyond the threshold value theft of electricity is identified, the identification of unauthorized load is sensed by power sensor this power sensor activates power supply then 5v of power is generated which is connected to buzzer this buzzer alerts by this 5v of power at the other end of buzzer raspberrypi is connected to the pin19 of raspberrypi. This raspberrypi sends alert to GSM module to send SMS to both higher authorities and user.

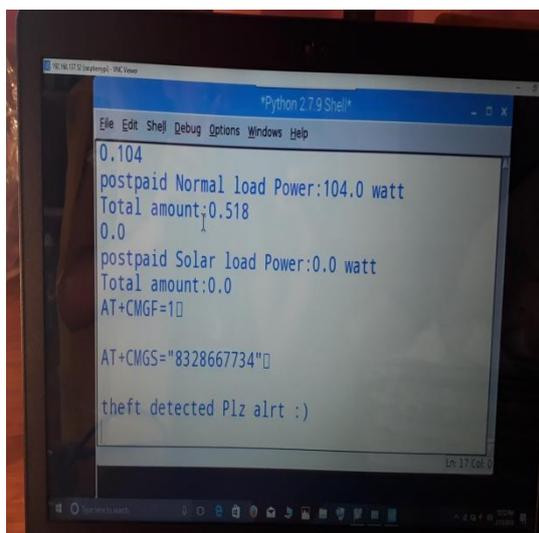


Fig2. Alert with SMS both user and service provider

Prepaid Billing

If the values are equal with threshold value then everything is normal. Then bill is generated how and when user chooses. There is a mode switch to switch between prepaid and postpaid. If it is switched to prepaid mode then it consumes the power until the balance is finished and also it alerts before balance is going to end via buzzer and sends message to recharge. A recharge app also installed this app has to link with bank account and simply recharge is done.

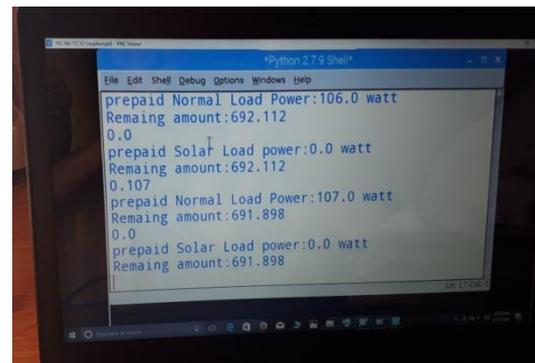


Fig3. Diagram shows the consumption of power in prepaid mode

Postpaid Billing

If the mode switch is switched to postpaid billing then payments are through as per prior arrangement with network operator. This is a normal process of bill generation but in this project to avoid human effort online payments are used.

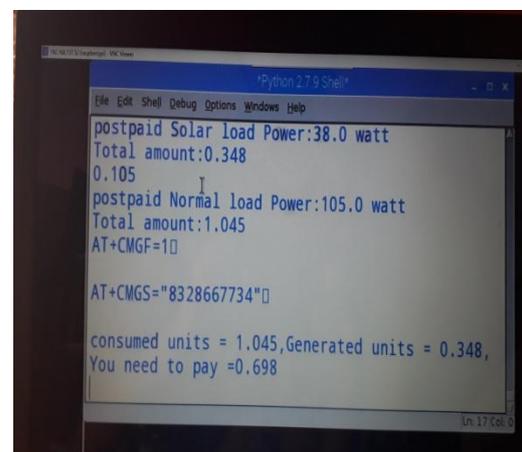


Fig4. Figure shows the consumption and generation in postpaid mode

Nettmetering

This is a great technology which both user and government is beneficial i.e. the power is generated by user send it to transformers by a separate line then government gives the money whenever bill generates,

Generation > consumption

Generated power - consumed power = you have

Generation < consumption

Consumed power - generated power = you need to pay

Every information regarding of payment is send to user by SMS, By this processes user can have information about each and everything and also distributor too

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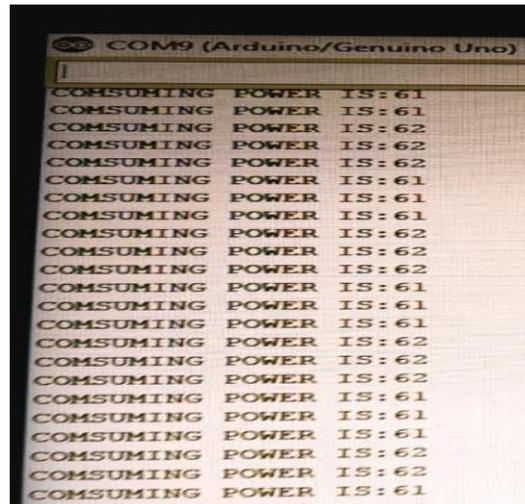


Fig5. Shows the monitoring of each appliance in a home.

Modules at user's house are shown in below figure



Fig6. Block diagram for modules in the home meter.

Sms alert for user about each and every change in the system like billing and theft alerts.

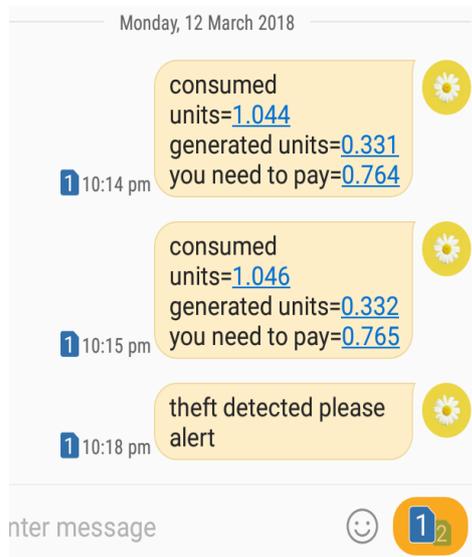


Fig7. Shows SMS alert to user about billing and theft.

CONCLUSION

In this proposed system a prepaid energy meter, which takes advantage of the GSM network that has access to almost every home and region in different countries? GSM is not only implementing the idea of communication of electricity, but also using our smart energy meter to facilitate the use of energy stolen. In this system, information of electric theft is directly reported to central authorities and users. Therefore, legal action can take immediately against and hence controls the power stealth within the jurisdiction. The proposed meter is highly beneficial by using nett metering that which one can sell the power to government and gains the money.

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