

High Energy Theft Detection with Remotealert System

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Abstract-Presently smart home, smart meters and Internet of Things are being included hugely to supplant the conventional analog meters. This helps in digitalizing the collected data and the reading in the meters. This data can be transmitted through wireless medium and minimizes the manual work. However, this also involves the risk of theft. These thefts are not detected accurately due to the lack of certain methods in the existing solution. The objective of the proposed project is to architect a system to track the electricity spent per load and to trace, banish the theft of electricity in current line and meter. This project also involves informing the customer about the theft occurred by using GSM and Arduino Uno. A network of devices such as sensors are connected together which helps in transmitting transmit real-time data over the Net. Here, the Arduino Uno is used to recognize energy theft and pass the information to the GSM module which in turn passes the information of the theft to the customer. The practical usage of this project, saves a lot of electricity thus improving the country's economic conditions. Keywords: Smart Metering, Internet of Things (IoT), Energy Theft Detection, Arduino Uno, GSM Communication, Real-Time Monitoring, Wireless Data Transmission.

1.INTRODUCTION

Control on Electricity theft is inevitable because of its impact on the cost of electricity to consumers and stability of utility companies. The common Electricity theft can be in the form of meter tampering, stealing, illegal connections like hookups, bypass, billing irregularities, and unpaid bills. Electrical power theft is the main cause of Non- Technical Losses (NTL) in the electrical power system. The NTL comprises of illegal connections, meter tampering, billing errors etc. out of which electricity theft through meter tampering and direct from the transmission or the distribution line contributes higher percentage of loss of electricity. In United States of America, the NTL are estimated to about 0.5% to 3.5% of the gross annual revenue. In developing countries like India, the loss of electricity due to theft is projected to about 20% to 30% of the overall loss in Power utility. Particularly taking about Nepal, 6.2 billion of rupees was net lost in 2014/2015 fiscal year due to technical and non-technical losses. While at the

same time period there was 24.4% loss against the total available electricity. Interestingly, only 15% attributed to technical loss and rest to theft. Some of them are (1) Preventive measures like injection of a narrow band power line carrier signal into the distribution power line along the power frequency signal (230V, 50Hz) can be applied. (2) Detection of power theft can also be done using power line communication. (3) Comparison between the total load supplied by the distribution transformer and the total load used by the consumer and the error signal is used to identify the power theft using fuzzy logic. The inclusion of embedded based AMR and GSM technology to indicate any type of theft at local substation. In general practice, measures like increasing load-shedding hours in those feeders having higher leakage, not put them in the priority list for maintenance like changing transformers, and may eventually cut off power if leakage is not controlled. But this method is not reliable since all users are treated belonging to the same feeder. Electricity theft behaviours can also affect the power system safety. For instance, the heavy load of electrical systems caused by electricity theft may lead to fires, which threaten the public safety. Therefore, accurate electricity theft detection is crucial for power grid safety and stableness. The layout of a power theft monitoring system saves time and maximizes the profit of the utility company working on an electrical distribution network. There are many ways to steal electricity and there is no solution to this problem in existing systems.

2.PROPOSED SYSTEM

The propose system has transformer to step down the AC input voltage of 220V AC to 12V AC. The 12V AC is given as an input to the rectifier. The rectifier does the function of converting AC to DC. The rectifier output is fed to the MT3608 2A Max DC-DC Step Up Power Module Booster to step up the DC voltage and to get pure DC output. The voltage sensor does the function the voltage sensing. The GSM is used to detect any drop in the voltage in any of the three phases. The alert system function by sending message or call to the registered mobile number. The experimental set up is verified by disconnecting the transformer, there by alert systems come in to action, so we receive an alert message with the call to the registered mobile number. Similar process occurs when either of the

phase is disconnected one by one with the message that particular phase is disconnected or there is a voltage drop in the particular phase.

Code:

```
#include <SoftwareSerial.h>
SoftwareSerialsgsm(2,3);
int voltageSensor1 = A0;
int voltageSensor2 = A1;
int voltageSensor3 = A2;
int voltageSensor4 = A3;
float vOUT1 = 0.0;
float vIN1 = 0.0;
float vOUT2 = 0.0;
float vIN2 = 0.0;
float vOUT3 = 0.0;
float vIN3 = 0.0;
float vOUT4 = 0.0;
float vIN4 = 0.0;
float R1 = 30000.0;
float R2 = 7500.0;
int value = 0;
void setup(){
Serial.begin(9600);
sgsm.begin(9600);
delay(100);
pinMode(A0,INPUT);
pinMode(A1,INPUT);
pinMode(A2,INPUT);
pinMode(A3,INPUT);
Serial.println(" Measure > 25V ");
delay(100);
}
void loop(){
float value1 = analogRead(voltageSensor1);
float value2 = analogRead(voltageSensor2);
float value3 = analogRead(voltageSensor3);
float value4 = analogRead(voltageSensor4);
vOUT1 = (value1 * 5.0) / 1024.0;
vIN1 = vOUT1 / (R2/(R1+R2));
Serial.print("Input1 = ");
Serial.println(vIN1);
delay(400);
vOUT2 = (value2 * 5.0) / 1024.0;
vIN2 = vOUT2 / (R2/(R1+R2));
Serial.print("Input2 = ");
Serial.println(vIN2);
delay(400);
vOUT3 = (value3 * 5.0) / 1024.0;
vIN3 = vOUT3 / (R2/(R1+R2));
Serial.print("Input3 = ");
Serial.println(vIN3);
delay(400);
```

```
vOUT4 = (value4 * 5.0) / 1024.0;
vIN4 = vOUT4 / (R2/(R1+R2));
Serial.print("Input4 = ");Serial.println(vIN4);
delay(400);
if(vIN1<1){
sgsm.listen ();
sgsm.print("/r");
delay (100);
sgsm.print (" AT+CMGF=1\r");
delay(100);
sgsm.print ("AT+CMGS=\"+919597834183\"\r");
delay(500);
sgsm.print (" column 1 Voltage is very low");
Serial.println(" Voltage is very low ");
sgsm.print (vIN1);
delay(500);
sgsm.write (0x1A);
delay(10000);
sgsm.println("ATD9597834183;");
delay(10000);
}
if(vIN2<1){
sgsm.listen ();
sgsm.print("/r");
delay (100);
sgsm.print (" AT+CMGF=1\r");
delay(100);
sgsm.print ("AT+CMGS=\"+919597834183\"\r");
delay(500);
sgsm.print (" column 2 Voltage is very low");
Serial.println(" Voltage is very low ");
sgsm.print (vIN2);
delay(500);
sgsm.write (0x1A);
delay(10000);
sgsm.println("ATD9597834183;");
delay(10000);
}
if(vIN3<1){
sgsm.listen ();
sgsm.print("/r");
delay (100);
sgsm.print (" AT+CMGF=1\r");
delay(100);
sgsm.print ("AT+CMGS=\"+919597834183\"\r");
delay(500);
sgsm.print (" column 3 Voltage is very low");
Serial.println(" Voltage is very low ");
sgsm.print (vIN3);
delay(500);
sgsm.write (0x1A);
delay(10000);
```

```
sgsm.println("ATD9597834183;");
delay(10000);
}
if(vIN4<1){
sgsm.listen ();
sgsm.print("/r");
delay (100);
sgsm.print (" AT+CMGF=1\r");
delay(100);
sgsm.print ("AT+CMGS=\"+919597834183\"\r");
delay(500);
sgsm.print (" column 4 Voltage is very low");
Serial.println(" Voltage is very low ");
sm.print (vIN4);
delay(500);
sgsm.write (0x1A);
delay(10000);
sgsm.println("ATD9597834183;");
delay(10000);
}
}
```

3.CONCLUSION

GSM based device which we designed is easy to installation and beneficial for both energy supply authority and consumer. It also provides additional feature such as power disconnect due to outstanding dues, power cut alert, tempering alert. The statistical load used and profile can help customer manage their energy consumption. This system is secure and reliable because it can be accessed only by an authorized person. If any unauthorized person tries to access the system this system sends an alert to energy provider. This device has the capability to revolutionize the energy meter market and will become help to country revenue by stopping the current theft and punishing the dishonest customers. Energy metering of our system that provide more solutions for implementing multiple layers of tamper detection implemented as a part of hardware and software solution. A network of devices such as sensors are connected together which helps in transmitting transmit real-time data over the Net. Here, the Arduino Uno is used to recognise energy theft and pass the information to the GSM module which in turn passes the information of the theft to the customer.

4. REFERENCE:

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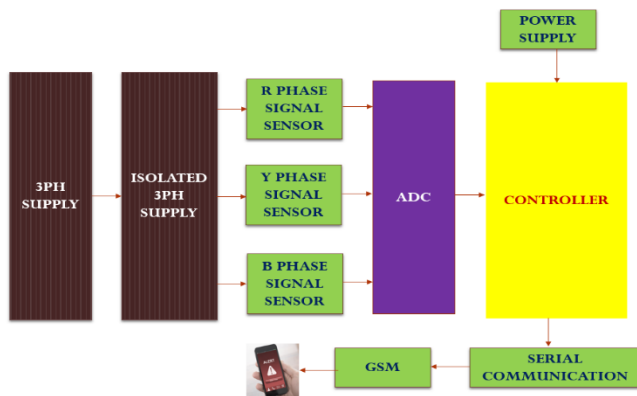


Fig: Block Diagram of the proposed system



Fig: Hardware Set up