WIRELESS POWER THEFT DETECTION USING ZIGBEE TECHNOLOGY

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***Abstract*: Power theft is one of the major issues of electricity transmission and distribution. It is prominent in developing countries and pilots to annual losses of around INR 3000 crores in India. It is estimated that power theft accounts to 1.5% of gross domestic production (GDP) which is significant and cannot be negligible. Power theft prevention is a system used to perceives and prevent illegal load tappings on distribution lines. Many schemes are available for the same. A wireless ZigBee module is employed for this purpose. An automatic control unit is used to inject frequency distribution in L.V lines, after disconnecting the legal consumer's loads once power theft is detected. A simple design for single phase distribution system is proposed for analysis and same can be implemented for three phase system by adding relevant features.**

INTRODUCTION:

Electricity has become the priority for every organization and individual due to the emerging developments and growing demands in all sectors. The essential process of a power supply includes power generation, power distribution, and power transmission to different destinations. Few technical faults and losses may occur due to power dissipation by some devices. These faults and losses can be minimized using the fast developing technology. However, there are other kinds of losses which are caused deliberately by humans for the sake of illegal access to the power distribution. This is nothing but power theft.

Due to huge power theft, India is losing billions of rupees because of unbilled consumption and illegal power usages. If you add all the unpaid bills to this loss, then the electricity distribution companies and boards will be in a huge loss. The recent estimates say that only half of the revenue is realized. As per a world bank's report, there are two components of losses which are technical and non-technical. Technical losses are mainly because of power supply dissipation due to faulty transmission and distribution lines, measurement systems and transformers. Here are other power losses which incurred as a result of actions that are outside the control of the power supply like errors in accounting and record keeping.

Whatever the type of loss is, there should be a proper process to avoid these unlawful activities so that most of the power loss will be saved. Technical losses will always arise as the behaviour of electricity transport means that, no power system can be flawless in its delivery of energy to the end customer.

LITERATURE SURVEY:

Electricity theft causes dangerous and severe impacts. Generally electricity theft affects the utility company revenue and then its customers.

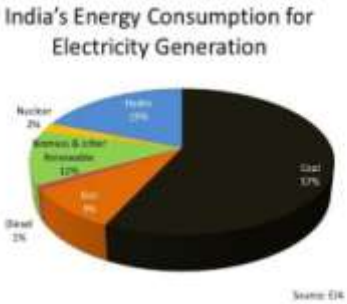
Chandigarh: Accelerating the campaign to curb electricity thefts in Haryana, the power utilities have detected

26,899 such involving an amount of cases **51.65** crore in the state in January and February. Of the total, Rs **16.75** crore has been recovered from defaulters, officials said. The Uttar Haryana Bijli Vitran Nigam (UHBVN) had detected 13,855 cases of electricity theft to the tune of over Rs 29.26 crore, of which Rs 11.82 crore has been recovered, a spokesman of the utilities said here today.

According to figures compiled by the Centre and released recently, 45,982 cases have been booked by the state government for power theft in the last three years. AP recorded a mammoth 5.91 lakh cases during same period, while the all-India figure for the last three years stands at 7.42 lakh cases. In 2013-14, the government registered over 16,000 cases. There were 14,435 cases in 2014-15 and 14,841 in 2015-16."Electricity theft is one of the major factors impacting the financial health of power supply agencies, resulting in frequent load shedding and unscheduled outages. The financial health of power utilities is also a criterion for assessing the viability of new investment," the central report said.

Total power generation in the state till June is 6,822.77 MU (million units), with thermal power contributing 4,527.51 MU. The hydro-sector generated 2,295.26 MU. In a special drive conducted from March 1 to 15, the Vigilance Wing of

Hubballi Electricity Supply Company has registered 57 cases of power theft, 177 cases of power misuse and four cases of power theft from "Nirantara Jyoti" feeder lines. In all, a fine of Rs. 55.69



lakh had been imposed, a release said. 8,410 power theft cases detected in State…

In Karnataka, A record number of 8,410 power consumers have been found to be stealing power, during a State-wide drive conducted by special inspection and vigilance teams of five electricity supply companies. A penalty of Rs. 12.57 crore had been imposed on them.

According to a release from **KPTCL's** Vigilance and Enforcement Cell, the teams inspected 65,663 electrical installations across the State of which 8,410 electrical installations were booked for offences. They include seven high tension consumers, 921 industrial consumers, 1,806 commercial consumers, 4,788 domestic consumers, and other 988 under other tariff categories. The team noticed the guilty consumers used to steal/misuse power by way of using high tech remote control devices, manually reversal of meter readings, altering of CT wiring and other methods. As many as 55 installations had been levied a penalty of more than Rs. 1 lakh each. They include Malaprabha Cooperative Spinning Mills Ltd.,

Belgaum (Rs. 3.48 crore); Parivar Pet Products, Bangalore (Rs. 74.19 lakh); Gojau Petrol Bunk and Service Station, Bangalore (Rs. 14.34 lakh); Bharati Airtel and Associates, Bangalore (Rs. 9.12 lakh);

Balaji Plastic Industry, Bangalore (Rs. 9 lakh); Mahesh Plastic Industry, Bangalore (Rs. 7.10 lakh);

Power theft prevention, is a system used to perceive and prevent illegal load tapings on distribution lines, the module can be placed at near to the distribution transformer which includes transmitter.

State capacity-total demand

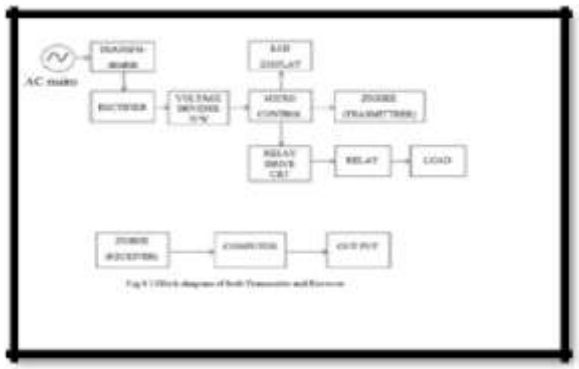
31/03/2017

FREQUENCY: 49.94	STATE UI:133
STATE DEMAND	9463
STATE	5735
GENERATION	
CGS	3127
NCEP GENARATION	599
BESCOM:4509	
HESCOM:1698	GESCOM:995
CESCOM:989	MESCOM:986

The transmission of data can be taking care by the module. If any tapping or faults occurs, the transmitter module can sends a signal to authorised device which is called receiver end. If line value varies beyond 20% the whole circuit can be isolated. Hence by adopting this module the power theft can be reduces as maximum as possible.

BLOCK DIAGRAM:

The supply of 230v is from the AC mains is fed to the stepdown transformer.in the stepdown transformer the 230v is stepdown to 12v AC, then this stepped down voltage is fed to the Bridge Rectifier. In bridge rectifier AC voltage is converted in to the DC voltage. Then this rectified voltage is fed to the voltage divider network, here the voltage is divided for driving the relay drive circuit, driving the microcontroller and also for the LCD display, it also drives the Load.

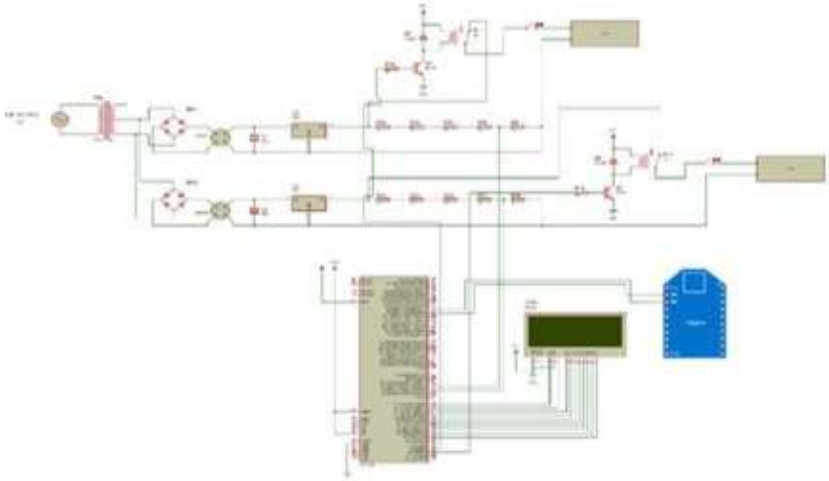


If the load exceeds means the voltage drop across in the line below 180v, the relay circuits sends the signal to the micro controller. Then the micro controller send this information to the ZigBee module, which is called Transmitter. Then ZigBee module transmits this information to the receiver end through RF communication. The Receiver module receives the information from the transmitter module through RF communication. Then this receiver ZigBee module interfacing with the computer and display the result.

CIRCUIT DIAGRAM:

The supply of 230v which is taken from the AC mains is connected the stepdown transformer. The stepdown transformer is connected to the bridge rectifier, one of the point of bridge is connected to the VIN port (positive Terminal) of the voltage divider network and another point is directly connected to the load.

The capacitor filter is connected across the voltage divider circuit. And the output of the voltage divider V0 is connected to relay circuit RL1. The switch point of relay circuit is connected to the load through the load switch. The point of the relay is connected to the microcontroller port P1.28. The divided voltage between R9 -R10 and R26-R27 are connected to the microcontroller pin P0.28 P0.29 respectively. The microcontroller from Port0, the pin P0.8 is connected to the ZigBee (TX) pin and pin P0.9 is connected to the ZigBee (Rx) pin.



From microcontroller to LCD, pin P1.16 is connected to the Rs port.P1.17 which is connected to the enable switch E. from P1.8 to P1.25 pins are connected to the D0 to D7 of LCD ports.

OPERATION:

The supply of 230v is taken from the AC mains, then this 230v supply is transfer to stepdown transformer to reduce the voltage level from 230v to 12v. This 12v output from stepdown transformer is given to the bridge rectifier. The bridge

rectifier converts 12v AC to 12v DC. Then this 12v DC supply is given to the voltage divider network. In a voltage divider network, the voltage divided in equal manner (2.4v across the resistance terminals). Then the voltage divided network is connected to the one end of the relay circuit.

The relay is normally in a closed condition, at this condition the relay does not operate. In normal condition, load drives normally at full load. If the any line is tapped by someone or if any fault occurs, the relay coil opens and sends the information to the microcontroller. The microcontroller process the data and this will be displayed in LCD and also the microcontroller sends the data to the ZigBee module and transmits the processed data. The receiver end, receives the data through wireless antenna and it processes the data and displayed on a computer.

Advantages:

1. The details reports that Electricity Board suffers a total loss of 22% in revenue due to power theft every year, which can be controlled, know.
2. The consumer will also get the benefit because in most of the cases consumer does not aware of that someone is tapped his line and he has to pay extra charge.
3. With the help of this project we can reduce the total illegal use of power and saves electricity.
4. This method will reduce the energy wastage and save a lot of energy for future use.
5. Optimized use of energy.
6. It can be installed in grid system to identify the theft.
7. It will identifies the major loses in transmission system also

Disadvantages:

1. One major disadvantages of this project is that it is not capable of detecting exact location from where the power is being stolen giving only an approximation to that place.
2. Can't determine who is stealing, but even no other existing system is capable of doing this.
3. If implemented on a large scale it may take a lot of tome and manual input.

CONCLUSION:

This wireless ZIGBEE technique based system is much useful to detect the stealing of the electricity worldwide. To control the revenue losses the authorised officials needs to detect the theft of the electricity it means the theft of tapping is the most effective one over the whole world comparing to the other techniques used to steal the electricity. By this design it can be concluded that power theft can be effectively curbed by detecting where the power theft occurs and informing the authorities. The application of this technique is used in sugar industries, power distribution sector and also in cogeneration. The ability of the proposed system to inform or send the data to a receiver through wireless antenna link adds a large amount of possibilities to the way the power supply is controlled by the electricity board. This system will reduce the energy wastage and save a lot for future use.

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