IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

AUTOMATIC ELECTRICITY THEFT DETECTION AND SECURITY METERING SYSTEM

[1]Kishorkumar B.Patil, [2]Ranjitsinh S. Patil, [3]Dr.D.S.Bhangari, [4]Amarsingh S. Chavan, [5]Yash D. Bhandare.
[1]Student, [2]Student, [3]Professor, [4]Student, [5]Student,
[1-5] Department of Electrical Engineering,
[1-5] ATS's Sanjay Bhokhare Group of Institutes, Miraj India

Abstract*:* In a present-day Distribution Companies are facing many problems like Energy Theft, Disconnection of Consumers, Billing mistakes. In recent systems we are trying to create the system which reduces the energy theft and the effort required for climb the poles for disconnecting. To make these possible multiple inventions are going on. In our project we are trying to overcome certain problems and we are designing and implementing a circuit for Energy theft detection and disconnect the supply when there is the energy theft. Billing is made easier. Due to this Energy theft is not possible and billing system make much easier. In that interconnected circuits are used due to that if service breaks automatically supply get disconnected.

INTRODUCTION

In this modern world, energy has become a basic necessity for national development; its availability in the required quantity enables reduced work hours, better agricultural yield, optimized industrial production, superior health conditions, more reliable transportation infrastructure/machines and even more nourishing diets. Different forms of energy exist but electrical energy is by far superior to other forms of energy due to its ease of conversion/control, lower cost, transmission efficiency and reduced pollution. Generally, development indicators tend to increase with improved electric power availability.

Power theft is the menace of electric utilities from rural cooperatives to large investor-owned and municipal providers. Utility companies have been plagued with non-technical losses almost since their inception. As early as 1899**,** the Association of Edison Illuminating Companies addressed the problem of tampering with screws that adjusted meter damping magnets. Over 36 years ago in 1984, the New York Times published an article citing ConEd and the potential of "1% of power customers of stealing services." As power generation and electric utility proliferation moved into developing countries, many more providers confronted new challenges and obstacles to combat non-technical losses and the issues it causes. No utility provider is immune to attempts to steal power.

The financial losses, also known as non-technical losses, include metering inaccuracy, non-payment, billing, and rate class errors and simple to complex energy theft. The two dominant components of non-technical losses are non-payment and energy theft. Non-payment refers to customers who are unable or unwilling to pay for their electricity, which can lead to significant revenue loss if the utility fails to handle nonpayment situations quickly. However, electricity theft usually impacts a utility more than non-payment problems. Until recently, there were few effective solutions for this problem. Labor-intensive premise inspections and account auditing often costs more than the actual value of the losses, enforcement is always challenging, and previously Advanced Metering Infrastructure (AMI) was not cost effective in many countries. Regulators typically do not require utilities to absorb the costs. Instead, electricity ratepayers subsidize the thievery. So non-technical losses are often hidden costs and have received little public attention, but they have enormous costs for utilities, customers and governments. The idea that energy theft is a victimless crime is clearly wrong.

According to estimates, theft and fraud of electricity costs the industry as much as $96 billion[2] every year globally, with as much as $6 billion[3] every year in the United States alone. This $96 billion global problem not only results in higher prices for paying customers and costly government subsidies but is also a public safety crisis in some countries with dangerous illegal power connections. In many countries, high non-technical losses threaten the financial sustainability of the energy utilities.

Meanwhile the issue of theft and fraud leaves utility managers with a powerless feeling in their ability to prevent or confront the issue. However, this trend is rapidly changing. Utilities now have many tools to reign in losses and detect unauthorized theft and fraud before it creates a significant drain on resources and company revenue. Many of these tools are provided through the installation of AMI and the additional visibility of the low-voltage grid that these systems provide.

Non – technical Losses-

They are caused by actions external to the power system and consist primarily of electricity theft, non – payment by customers, and errors in accounting and record – keeping.

Metering and billing for electricity actually consumed by users is integral to commercial management of an electricity utility.

Background-

Electricity theft is nothing new and can be a complex phenomenon with many facets. Theft of power is common in many countries and a considerable amount of energy is stolen every year from the electric low voltage grid. An electric utility low voltage grid can never be one hundred percent secure from theft and fraud due to the number of distributed end points which sit largely unmonitored in public accessible locations.

The problem has socioeconomic, political, environmental and technical roots, but the solution is generally sought solely through technical measures. In many systems the amount of energy theft is relatively small (1–2%) in terms of the electricity generated. But, the financial loss is high due to the large amount of electricity being distributed.

The financial losses are critical to many electric power utilities. Lost earnings can result in lack of profits, shortage of funds for investment in power system capacity and improvement, and a necessity to expand generating capacity to cope with the non-technical losses. Some electric utility companies in the worst affected countries are near bankrupt from the impact of year over year losses.

Many electric utilities are embarking on specific programs to reduce electric energy losses on their low voltage grids, both as a measure of energy conservation and as an alternative to adding generation capacities. One of the primary sales drivers for advanced AMI systems during the last few years has been the potential to reduce non-technical losses from a theft and fraud prospective. The upward industry trend seems to be that more and more utilities seek the ability for much more stringent practices in theft detection and ability to discover fraud.

LITERATURE REVIEW

2.1 Mrs. Surekha S. Bhalshankar & Mr. C.S. Thorat "Smart Grid Advanced Metering Infrastructure and Drone Operated Technology for Controlling Theft by Direct Hooking*"* IEEE WiSPNET 2017, 978-1-5090-4442-9/17. the method of power theft detection for meter tampering and direct hooking of overhead conductors. The developed system is Man-Power less, simple, easy to operate and cost effective. It saves time as well as revenue losses for the utility company. We have investigated the system model for both methods. Finally, we discuss the challenging issues in energy theft detection and provide some research directions. In the future, the smart grid requires more accurate and efficient energy theft detection designed.

2.2 Mr. Jaco Engelbrecht, Mr. Gerhard P. Hancke & Mr. Martins O. Osifeko "Design and Implementation of an Electrical Tamper Detection System" IEEE 2019,978-1-7281-4878-6/19. The detection device is able to classify a user as either clean or fraudulent according to their energy consumption behavior. The test bench was implemented in such a way that the load profile which is measured matches that of a typical household. The test bench is controlled with simple commands and the parameters of the pseudo-randomly generated load profile that can be easily adjusted. The detection device functioned as expected. This work proves that an SVM model can be used to classify a consumer as either a clean or fraudulent user by comparing past energy consumption patterns to real-time energy consumption measurements. The accuracy and precision of the energy metering system are good enough to be classified as a class 2 energy meting system, the current sensor proved to be accurate for near rated values and an accurate representation of the load profile can be generated using only purely resistive loads.

2.3 Mr. Mohd. Uvais "Controller Based Power Theft Location Detection System" IEEE 2020, 978-1-7281-5846-4/20. the proposed system is having capability to resolve the most prevalent issue of Power theft. It uses the wireless network for data communication which will increase the reliability and effectiveness of the system. The system is based on real time detection and the location of power theft can be easily determined with the help of received data i.e. current and voltage readings.

2.4 Mr.Sitao Li & Mr. Haibo Yu, Helong Li China"An anti-power theft method for secondary circuit of energy meter current transformer" ICSAI 2017, 978-1-5386-1107-4/17.Transient anti power theft method based on the secondary circuit of the energy meter current transformer. At AC signal zero-crossing moment of the secondary circuit of the energy meter current transformer, the circuits are orderly applied two adverse test pulses. According to the variation and the transient values of the current in the circuit at the two different moments, the values of equivalent resistance and equivalent inductance of the circuit are obtained by rigorous mathematical derivation. Compared with the original values of equivalent resistance and equivalent inductance of the circuit, power theft methods can be detected, including open circuit, series diode, parallel shunt resistance, short circuit and other stealing methods. The range of anti-power theft is larger than other methods. This method almost has no effect on power measurement. It is characterized by simplicity, accuracy and reliability, which is a new antipower theft method of the energy meter.

SIMULATION DESIGN

The below circuit implemented with the use of proteous simulation software. So in this simulation we have implemented the voltage monitoring system as shown below the simulation, for the simulation we have use the simple variable resistor to reduce the input voltage as we have required. A 16*2 LCD is used for display the present voltage and current consumed by the user. Whereas CT is used for current sensing and potential transformer for voltage. GSM used for to send text message to Distribution Company to user and vice versa.

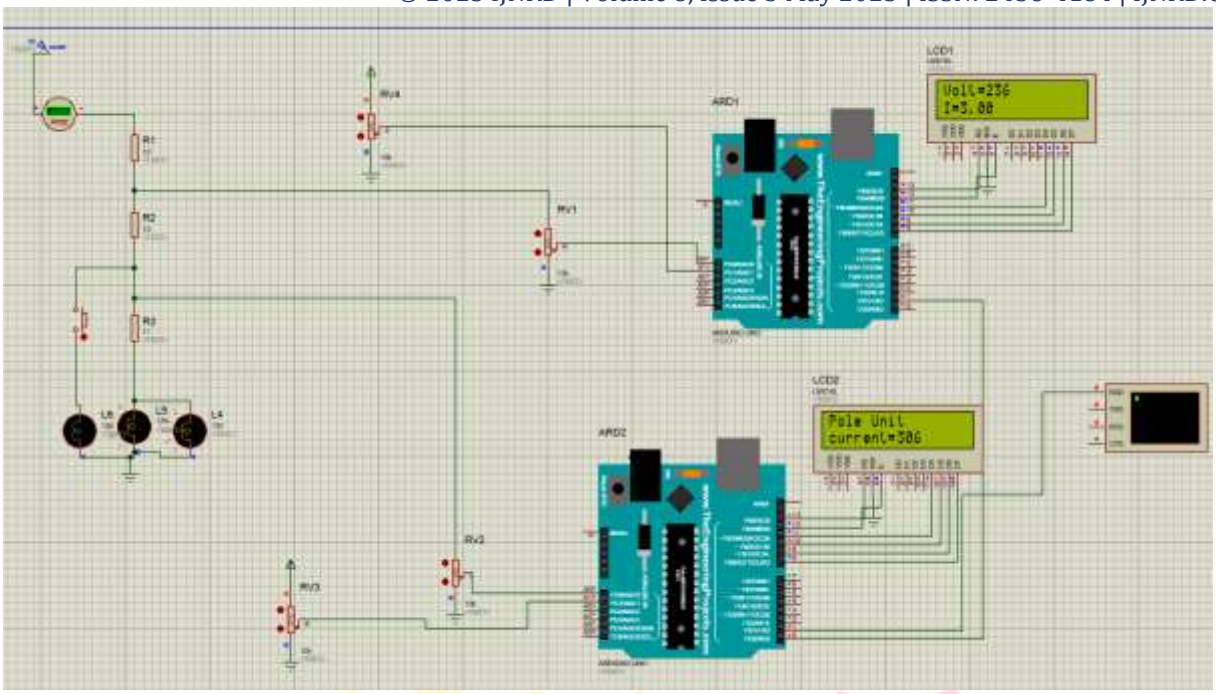

Figure 2

RESULTS

Case 1 monitoring input voltage-

In this case the ardiuno will monitor input voltage which is received from the mains and display on consumer unit.

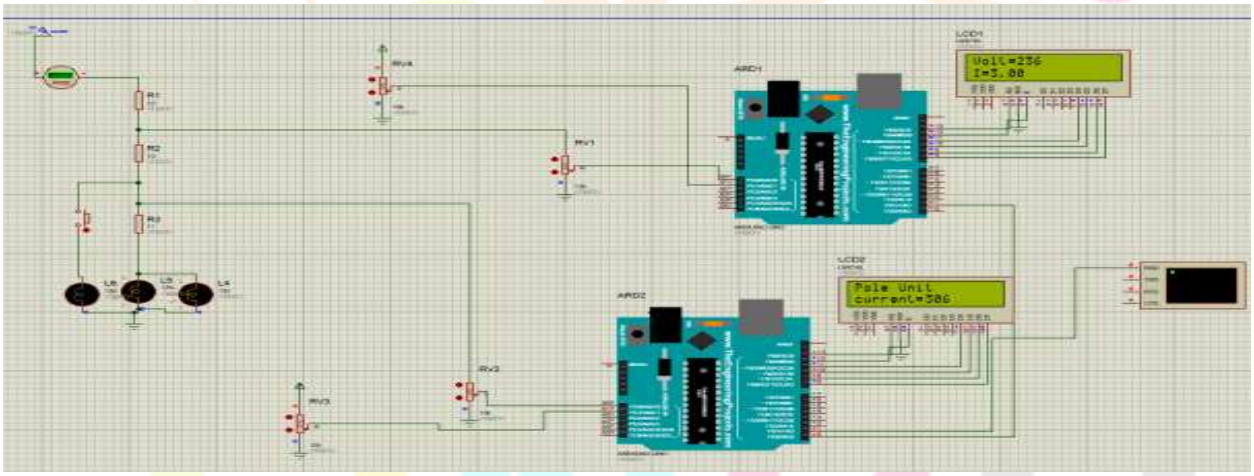

Figure 3

Case 2 Monitor the consumer used current-

In second case CT is used for detection of current and to display on consumer unit as well as pole unit as shown the fig above. This is the normal case i.e. consumer load delivered only from the pole unit so theft not occurred it also shown on LCD both the current are same.

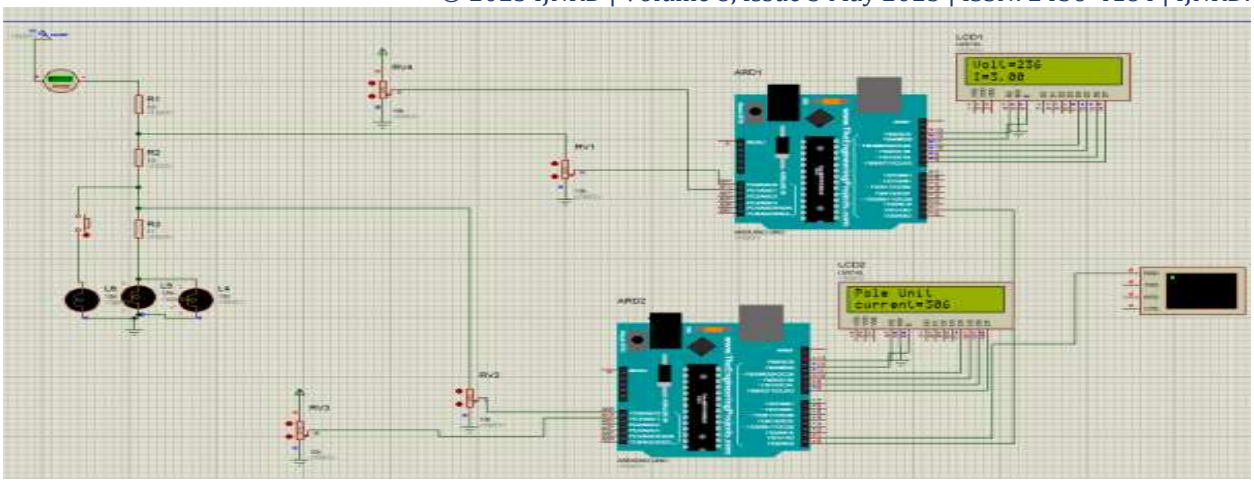

Figure 4

Case 3 Theft occur-

In this case theft occurred which is sensed due to the difference in the pole unit circuit and consumer unit system hence the result is that theft occurs and, in such cases, the ardiuno will send the text msg to MSEB for theft detection. As shown the current shown on the both the LCDs which is 3A and 2.12 Amp

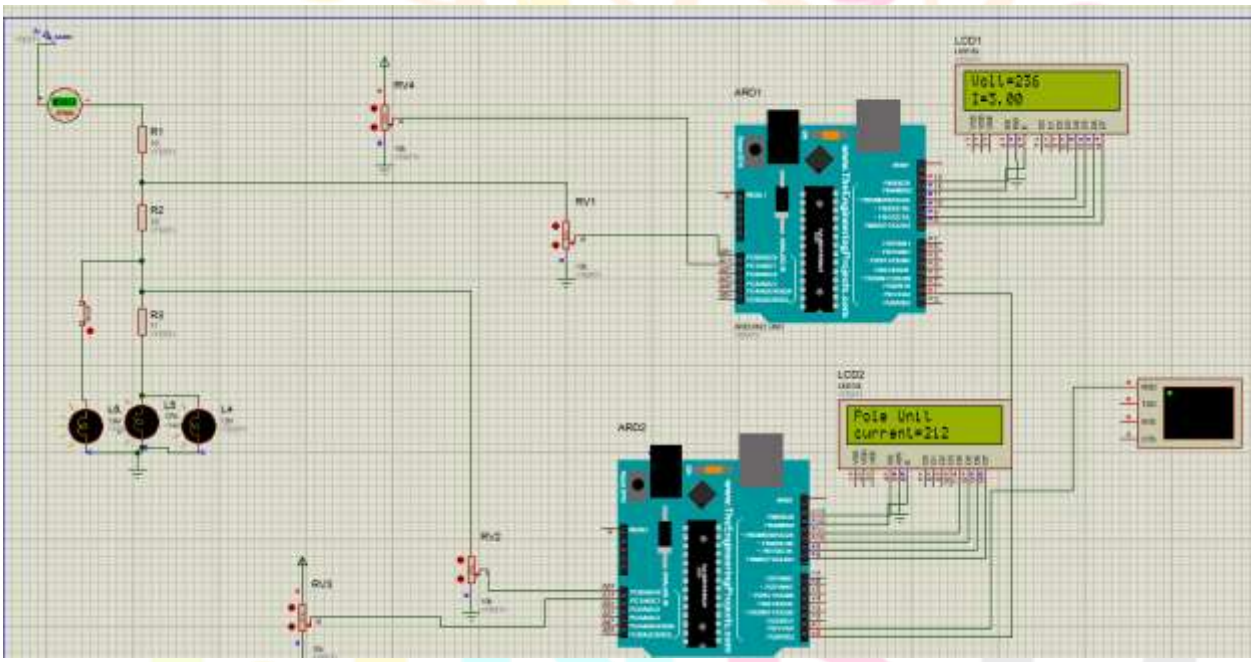

Figure 5

FINAL HARDWARE

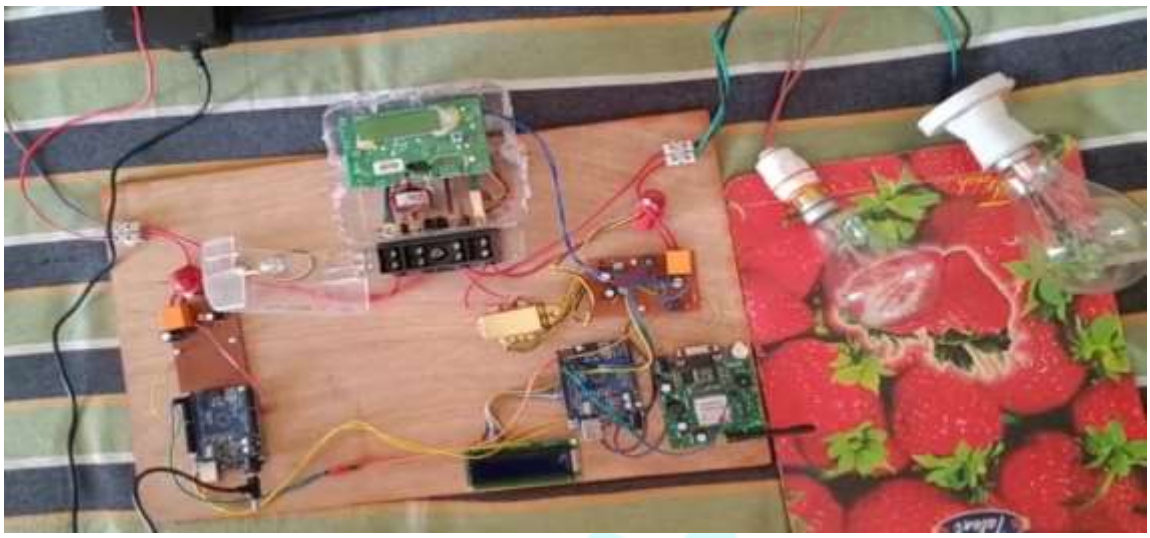

Figure 6

FUTURE SCOPE

1. The unit can be made small as possible.
2. Wireless Communication.
3. Addition of Direct Hooking Theft Detection.

PROJECT APPLICATION

1. For electricity distribution board.

CONCLUSION

By using Automatic Electricity theft detection Security Metering System, we can overcome the problems we observed in the system. Main advantage is energy losses are reduced and due to paperless billing, we save the money and environment.

REFERENCE

1) Mrs. Surekha S. Bhalshankar & Mr. C.S. Thorat "Smart Grid Advanced Metering Infrastructure and Drone Operated Technology for Controlling Theft by Direct Hooking" IEEE WiSPNET 2017, 978-1-5090-4442-9/17.
2) Mr. Jaco Engelbrecht, Mr. Gerhard P. Hancke & Mr. Martins O. Osifeko "Design and Implementation of an Electrical Tamper Detection System" IEEE 2019,978-1-7281-4878-6/19.
3) Mr. Mohd. Uvais "Controller Based Power Theft Location Detection System" IEEE 2020, 978-1-7281-5846-4/20.
4) Mr.Sitao Li & Mr. Haibo Yu, Helong Li China"An anti-power theft method for secondary circuit of energy meter current transformer" ICSAI 2017, 978-1-5386-1107-4/17