

A Survey on Power Theft Detection

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ABSTRACT: Now a day's electricity theft is a major issue face by all electricity companies. Since electricity theft directly affect the profit made by electricity companies, detection and prevention of electricity theft is necessary. In this paper we present a broad introduction about electricity theft. We also presented the work done in this area up till now, talk about techniques used and their performance. Finally comparison of these techniques is done.

KEYWORDS: Electricity Theft, ELM, Transmission Loss, Non-transmission Loss.

I. INTRODUCTION

As we know electricity theft is a major problem for all electricity companies. This problem is not related to Indian companies only; other country's electricity companies also face this problem. Electricity companies losses money every year due to theft. There are two types of losses namely transmission loss and non-transmission loss, some research papers uses term technical loss and non-technical loss respectively. Transmission loss occurs while transmitting energy form generation side to consumer's side.

Non-Transmission losses occur due to wrong billing, false meter reading, electricity theft, etc. First two losses can be prevented by taking proper meter reading and calculating accurate bill for electricity consume, but electricity theft is hard to prevent since no one predict about which consumer is honest or dishonest. Still losses due to electricity theft can be reduce by detecting theft or fraud consumer and taking actions accordingly.

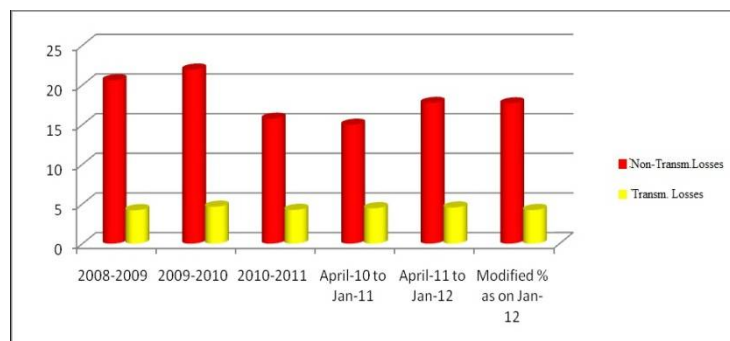


Figure 1. Ration of Electricity losses [1]

Theft detection is done manually by inspecting consumers. This is time consuming process and requires large number of field staff. The cost for this process is too high and detection rate is not so high. To overcome these costs, now a day some data mining, knowledge discovery methods, etc. are used to detect theft.

II. RELATED WORK

Several techniques proposed and developed for detection and estimation of electricity theft. [1] This paper presents a framework to identify power loss activities. They used automatic feature extraction methods for customer profile with ELM, OS-ELM and SVM to identify customer who is doing fraud. They extracted consumption patterns using data mining and statistical techniques. ELM, OS-ELM and SVM classifies profiles for fraud detection. They use outlier



International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Vol. 4, Issue 1, January 2016

detection to find fraud customer profiles, if outlier find and it is due to power loss activity they use this profile as reference when new data is load. ELM and OS-ELM used as main classifier for their framework. They also present customer's consumption analysis and its correlation with other factors. [2] This paper talks about Advanced Metering Infrastructure. To address the electricity theft challenge this paper discuss about AMI and security requirements Advanced Metering Infrastructure should meet. They explained about various attacks on AMI. They also presented current power theft detection techniques and classify into three categories as classification-based, state estimation-based and game theory-based and discuss about them and comparison is done between these categories. Finally they discuss about various challenges arises in power theft and gives some future directions. [3] This paper discusses the problems while doing theft detection and previous ways to reduce the theft. In this paper they developed approximate patterns for classification using customer load profiles. Approximate consumption patterns are designed using load profiles and artificial intelligence tools. Then they trained the SVM to classify data based on the suspicious energy consumption. They developed data based on patterns using historical data. They also analyse the effects of power theft on electricity utilities by comparing load with and without power theft. [4] This paper presents a framework to detect non-technical losses. They use an automatic feature extraction for data with support vector machine to identify fraud customer. They use Genetic algorithm and support vector machine for their approach. Their approach selects the suspected customers for onsite investigation so theft can be identified. [5] In this paper they present consumption based power theft detector. They use distribution transformer meters to identify high power loss areas, in these areas using patterns they listed suspected fraud customers. Their approach overcomes the problem which is present in classification based systems. They use multiclass support vector machine, support vector machine is trained using historical data and developed attack's dataset. Then they perform three experiments using variants of support vector machine and compare detection rate and false positive rate between these experiments. [6] This paper use knowledge discovery with artificial neural networks to identify fraud. For training they use multilayer perceptron with back-propagation algorithm.

Reference paper no.	Technique used	Accuracy rate (%)
3	Support vector machine	98.4
4	Genetic Algorithm and SVM	62
5	Multiclass Support vector machine	90
6	Artificial Neural Network	87.17

Figure 2. Comparison of detection rate between techniques

III. CONCLUSION

This paper presents a survey on electricity theft. In this paper we discuss about what is power theft. We also explained about various types of losses regarding electricity, how power theft is big issue for electricity utilities. Then we presented a detailed information about what is done up till now in this research field, available scope in this field. Finally compare accuracy rate between methods explained in above reference papers. Since power theft is serious problem faced by electricity companies more accurate theft detection system is needed which is generalize one and not specifically related to region.

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ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Vol. 4, Issue 1, January 2016

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BIOGRAPHY

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