Review of methods of power theft in Power System

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Abstract— The power theft had become a major problem in India. The power system consists of generation, transmission & distribution. The power theft is happening only in transmission & distribution side. In order to reduce the power theft , there are so many methods have been proposed to control power theft. Many papers discussed about the power theft and control in power system. This paper also discuss some of the methods of power theft and control in power system. There are many technical losses present in transmission & distribution , at the same time due to non-technical losses power theft is more . Hence there would be lot of loss for the government. This paper proposes some reviews about the power theft & control over power system. This paper is going to analyze the review about methods of power theft & control over power system.

Index Terms—Power theft, Transmission, Distribution.

1 INTRODUCTION

Technical & non-technical losses are occurring only in transmission & distribution but not in generation. It is very difficult to find non-technical losses occurring in the system . There are so many methods of power theft or theft of electricity . Some of them are direct hooking from line, injecting foreign materials into the meter, drilling holes in the electro mechanical energy meter. Electromagnetic meters are tempered by depositing a highly viscous fluid , by injecting film , by using strong magnets , for the interruption of disc. Even the electricity theft is happened by exposing meter to mechanical shock. Even by using the external phase before meter terminals.. Subscribers free energy without any record. In other way switching the energy cables at the meter connector box , in this way the current does not pass through the current coil of the meter , so the meter does not record the energy consumption. The methods which we discussed above will apply for both digital & analog meters. Theft of electricity become a notorious problem in the modern power system. There are various control methods in the power theft , but it comes very difficult to eradicate or reduce the problem . Because of political influence , other factors are influenced to encourage this problem. Some of the methods to control power theft were reviewed in this paper. Due to theft of electricity there are so many problems facing by our Indian government not only India whole world is facing this problem. The theft capacity has increased worldwide , because of that we are losing $20 billion dollars every day. Hence, India losses $12 billion dollars every year in the form of electricity theft. In India alone we can recover nearly or approximately 10% of non-technical losses can able to conserve 93,000 Gwh (Giga watt hours) power annually or yearly . It has been reported that annual losses due to theft of service in the united states alone as estimated 6billion dollars . In the 20th century , there has been door-to-door meter reading meters had been employed . `There has been many drawbacks of artificial reading , but it will increase high time cost, labor cost , error-prone reading, etc. because of all these reasons power theft has increased and there are some of the methods have been proposed to control power theft Advance metering infrastructure (AMI) .The aim of the AMI is to protect and provide automatic measurement and transmission of the meter reading. In this paper we are going give some review about electricity theft and control in power system.

Types of Electricity Theft

Direct hooking from line
Injecting foreign materials into the meter
Drilling holes into electromechanical energy meter
Inserting film
Depositing a highly viscous fluid
Using strong magnets like neodymium magnets
Changing the incoming and outgoing terminals of the meter
Damaging the pressure coil of the meter
Resetting energy meter reading
Exposing the meter to mechanical shock
Improper or illegal calibration of energy meters

2 REVIEW METHODS OF POWER THEFT CONTROL

a. Detection &identification based on hvds system
b. Using neural networks/svm model
c. Using smart meter/nefarious meter inspection

d. Advanced metering infrastructure

e. Power theft control amr via plc system

f. Intelligent modelling scheme for detection of line losses in power distribution system

a. DETECTION AND IDENTIFICATION OF POWER USING HVDS SYSTEM

Here in this system generally the distribution line consists of 230v, but we need to step-up the line voltage to 350v by an voltage regulator, therefore the line consists of 350v.But when it comes to distribution side, the voltage is again stepped down to 230v ac . whenever , the voltage is at 350v in distribution side , if any one tries to tap or direct hooking from line, the electrical apparatus will get damaged due to 350v . So this also the best method for the control in power theft

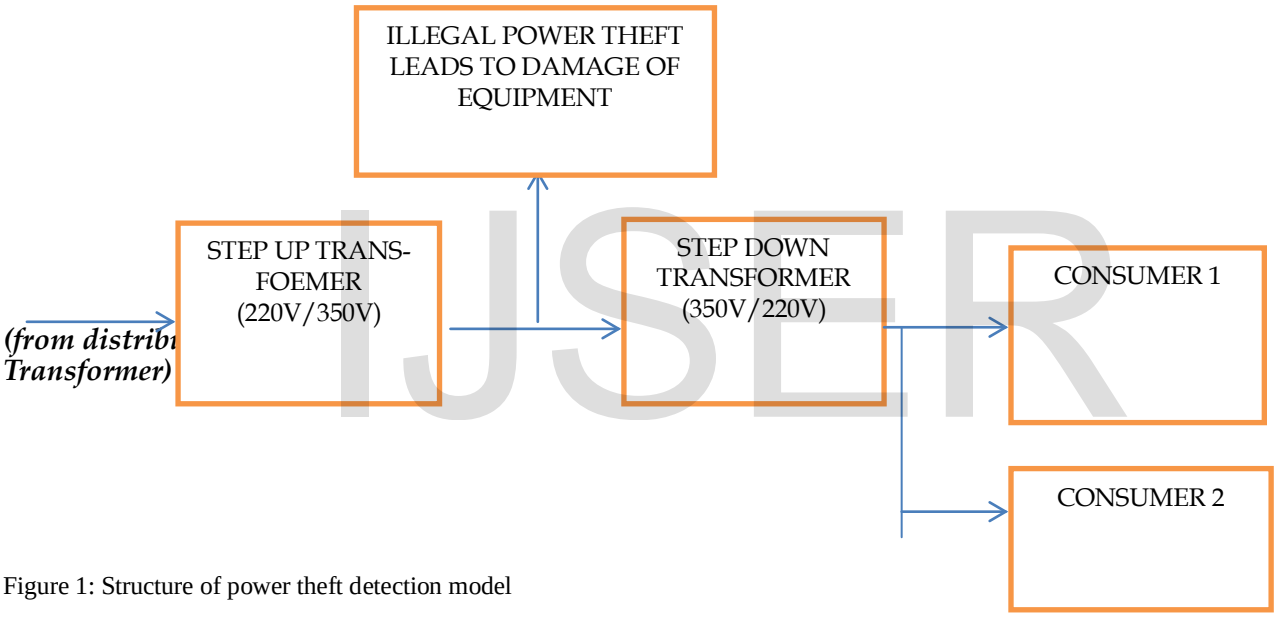


Figure 1: Structure of power theft detection model

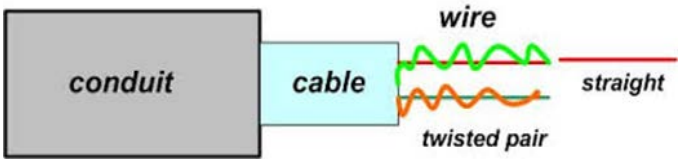


Figure 2:Power line Cable

b. USING NEURAL NETWORKS/SVM MODEL

Generally, these neural network model is an efficient tool to detect & classify the appropriate patterns. Here a neuron represents the strength or weight of interconnection , generally back propagation or evolutionary techniques were used.

Here the back propagation can't get an exact solution but while in mutation or crossover technique we can able to achieve the genetic algorithm(GA).

Here 4-inputs & one output. Hence one hidden layer is present i.e., the input is given to hidden layer from that output .Hence we can detect & classify the theft by neural network model.

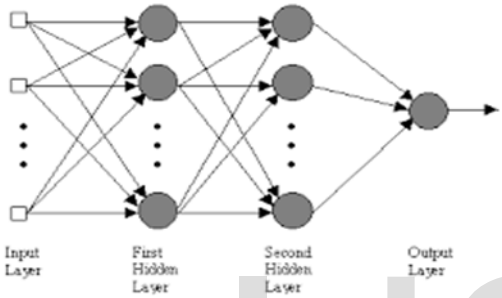


Figure 3: Neural network model

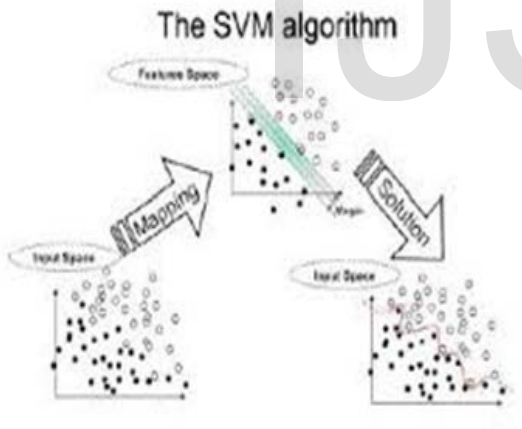


Figure 4: SVM algorithm

c. ADVANCE METERING INFRASTRUCTURE

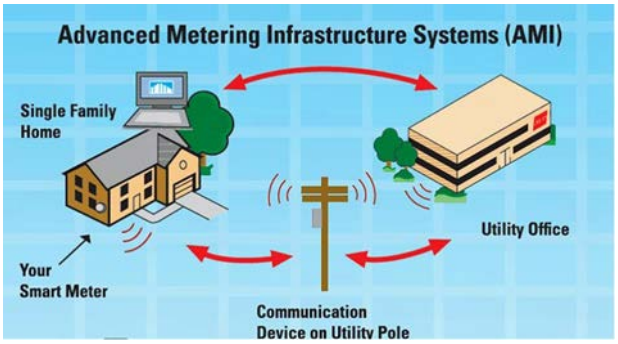
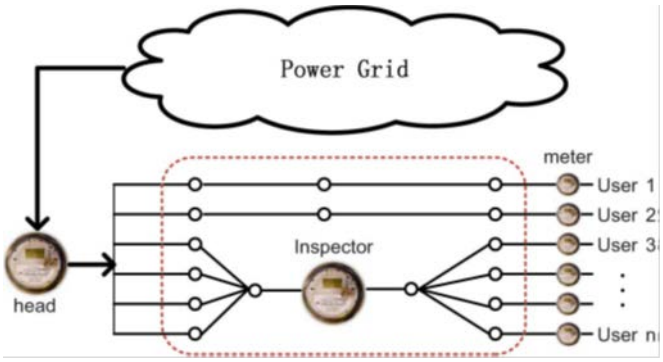


Figure 5 Structure of advance metering infrastructure



Here, smart meters were used in this method to control power theft, hence samrt meters are electronic meters which are used to calculate consumption of energy its a twoway communication any power theft or problem in power system it recognises.

Here in this method we are going to use smart meters to control power theft . Generally consider an apartment consists of 'n' number of users . In the middle we need to set up an inspector box and another two meters from transmission & receving side. The current flows through head , inspector & users . If theft happens then current flow differs hence an alarm is given by the inspectro there by we can control the power theft.

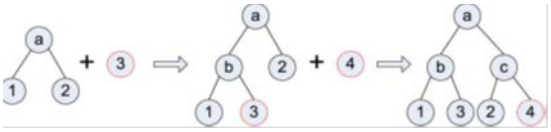


Figure 6: Pull down operation.

d. POWER THEFT CONTROL USING PLC SYSTEM

AMR(automatic metering system) is the method used for controlling power theft . The main components in AMR are:

Meter interface module: it consists of power supply, sensors, controlling mechanism

Communication systems: it used for the transmission of data, telemetry.

Modems, upload links, receivers ,data concentrators

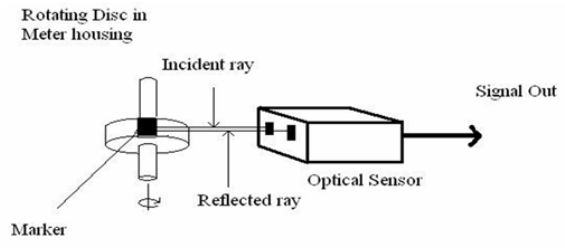


Figure 7:Advance Smart Meter

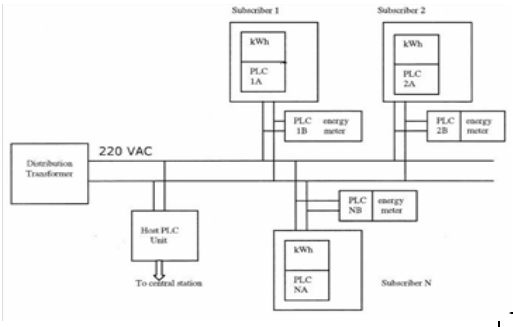
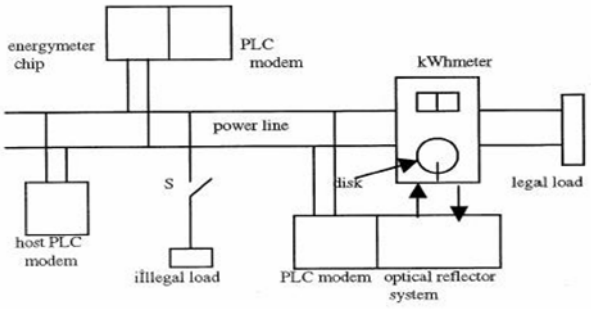


Fig (8): model to detect power theft

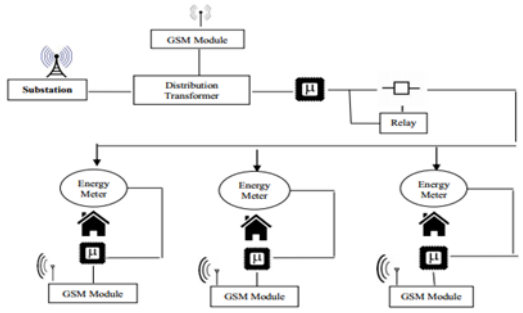
Here in this method we are going to see about plc.'s in power theft control from the above diagram it is concluded that an distribution transformer and subscriber 1,2,……n. Whenever power is distributing from the transformer each AMR is connected with an energy meter with meter chips hence energy will be recording in it. Whenever the power theft occurs the readings must be equal to host PLC and subscriber plc. if not error signal is generated and theft can be easily identified.



Fig(9):model to detect power theft

Here in the above diagram the disc rotates and energy value will be recorded in kilowatt-hour and it is converted to digital data using by optical reflector sensor here the legal loads are connected to the modem hence disc rotates and reading is noted. Here the power through legal load and host PLC modem should be equal . If illegal load is switch on then the energy difference comes between both host PLC modem and PLC modem error arises. Then we can rectify the

5. Intelligent Modeling Scheme for Detection of Line Losses In Power Distribution Svstem



Fig(10): model to detect power theft

S.NO	CONTROLLING METHODS	SYSTEM RELIABILITY	ECONOMY	SYSTEM EFFICIENCY
1.	Detection Identification based on HVDS system	Normal	Less	poor
2.	Using Neural Networks	good	Mathematical model cost less	Average
3.	Using Smart Meter	Perfect	High	High
4.	AMI(Advance Metering Infrastructure)	perfect	Average	Average
5.	Using PLC(Power Line Communication)	Good	Normal	High
6.	Intelligent Scheme	Perfect	High	High

Here in this method power theft control can be done by using a microcontroller and GSM module. Starting from the sub-station distribution transformer energy meter every thing is connected in wire less communication. Power transmits from transmits from sub-station to consumers here every consumers homes are connected or inetrfaced with a microcontroller .In this model energy from the sub-station is received to consumers, hence as we have connected a memory chip and GSM module it records the energy even we can communicate with consumer to sub-station vice-versa .Even our energy consumed charges can be paid by using GSM communication. Hence if any illegal theft or tappings happens we can easily find the consumers id by tracking through GSM.

COMPARISION OF THE CONTROLLING METHODS

CONCLUSION&FUTURE SCOPE

Here we have reviewed some methods of power theft and control over power system .This consists of methods & controlling techniques of power theft loses ocuring in transmission are of two types technical&non-technical losses.technical loses are common but these non-technical losses can not be controlled hence we have so many techniques to control like HVDS distribution system,using smart meters,neural networks,using PLC(power line communication).These controlling methods were explained and reviewed in this paper.We have thoroughly studied and compared different types of power theft and methods to control them.

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BIOGRAPHY

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