

## **A Study on the Malpractices in Electricity Meters in Saurashtra Region of Gujarat State**

**Jignesh C. Raychura<sup>1</sup>, Reena Patel<sup>2</sup>**

*<sup>1</sup>Paschim Gujarat Vij Co Ltd, Bhavnagar-364001, Gujarat, India.*

*<sup>2</sup>School of Management, RK University, Rajkot-Bhavnagar Highway, Rajkot-360020, Gujarat, India*

**Abstract:** Electricity loss due to malfunction practices create a huge loss to the companies and create lot of problem and challenges. Current research work is aimed to study the various type of malpractices done by different institute/peoples at different time in a year. Researchers collected data through structured questionnaire from 100 employees of electricity companies. Findings reveal that there are many type of malpractices like tempering of seals, MMB tilting, change of tariff etc are happening and being done by various parties at different time frame. Researchers conclude research work with suggestive note to the companies.

**Key words:** Malfunction in Electricity Distribution, Loss due to Malpractices, Electricity Distribution,

### **1. Introduction:**

India has the 5th largest electricity generating capacity and is the 6th largest energy consumer amounting for around 3.4 % of global energy consumption. India's energy demand has grown at 3.6 % pa over the past 30 years. The consumption of the energy is directly proportional to the progress of manpower with ever growing population, improvement in the living standard of the humanity and industrialization of the developing countries. Very recently smart grid technology can attribute important role in energy scenario. Smart grid refers to electric power system that enhances grid reliability and efficiency by automatically responding to system disturbances.

Government is trying hard to provide energy to every household, despite of it 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. According to the annual Emerging Markets Smart Grid: Outlook 2015 study by the Northeast Group, LLC, the world loses US\$89.3 billion annually to electricity theft. The highest losses were in India (\$16.2 billion), followed by Brazil (\$10.5 billion) and Russia (\$5.1 billion). President

of Northeast Group Ben Gardner stated : "India loses more money to theft than any other country in the world. The state of Maharashtra—which includes Mumbai—alone loses \$2.8 billion per year, more than all but eight countries in the world. Nationally, total transmission and distribution losses approach 23% and some states' losses exceed 50%."

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.

In this paper, researchers have focused on non-transmission losses due to malpractices at various level. For this, researcher conducted research with employees of an electricity company and identified the various malpractices. First researcher conducted literature review then frame research methodology later on analysis data and on the basis of data, researcher suggest input for the betterment of industry.

## **2. Literature Review:**

**Konstantinos B., Georgios S. (2019)**,conducted a research on efficient power theft detection for residential consumers using mean shiftdata miningknowledge discovery process in Greece with an attempt to detect and reduce non-technical losses is a challenging task due to insufficient inspection methods. Researchers mentioned that with the evolution of advanced metering infrastructure (AMI) in smart grids, a more complicated status quo in energy theft has emerged and many new technologies are being adopted to solve the problem. Researchers also highlighted that in order to identify illegal residential consumers, a computational method of analysing and identifying electricity consumption patterns of consumers based on data mining techniques has been presented. Researchers work has shown encouraging results in residential consumers' power theft detection that will help utilities to improve the reliability, security and operation of power network.

**Tarannu M., Sharma D., Dr Singh D. (2017)**, conducted a research on the electricity theft: its measure and solution. In this research work they analysed the effect of power theft on distribution of power. Researchers highlighted the various techniques of electricity theft and these are: Direct connection from the pole; Use of Remote; Phase-to-phase connection; Using alternate neutral lines; Meter tampering/breaking seal; and Other methods of electricity theft include. Researcher also suggested ways to control the electricity theft and these are: Set up vigilance squads; Severe penalties need to be imposed; Energy audits and personal responsibility need to be fixed on the district officers (executive engineers); Installation of tamper-proof meter boxes ; Providing adequate meter testing facilities. Researchers conclude that To prevent this the central or the state governments should draw plans to provide financial support to the utilities for installations of meters on at least all the distribution transformers in a phased manner and The central or the state governments should draw plans to provide financial support to the utilities for installations of meters on at least all the distribution transformers in a phased manner also Schemes for incentive awards to utilities who are able to reduce T&D losses beyond a certain pre-fixed limit.

**Saurabh M. Jain, A. M. Karandiakr (2016)**, studied various methods used to detect power theft of electricity and researcher mentioned about the usages of automatic feature extraction methods for customer profile with ELM, OS-ELM and SVM to identify customer who is doing fraud. Researchers also explain about the Advanced Metering Infrastructure and security requirements. At the end researchers suggested that more accurate theft detection system is needed which is generalize one and not specifically related to region.

**Sardar S, and Ahmad S (2016)** conducted a research on *Detecting And Minimizing Electricity Theft: A Review*. Under this researchers paper researchers reviewed three schemes for controlling electricity theft. Advance metering infrastructure introduces a smart meter and communication path way between user and consumer which is an efficient work for controlling theft through data management and load controllers. Advance metering infrastructure is applied on a wider range of consumers which can somehow reduce the observability of each and every consumer in a short time period, therefore introduction of central observer meter can modify these broad range of consumers to number of grouped consumers. In this scheme each group will be observed by load controllers and if any miss act is found in consumption of electricity the user will be tripped from the circuit. This central observer meter scheme is better than advance metering infrastructure but before tripping the

user it would be best if it first alert or warn the user .Therefore dwelling towards prepaid energy meters used for theft control are more efficient. Consumers are under supervision of prepaid energy metering scheme, and they get alerts on every instant and are coerced for recharging the cards for further energy usage. In this scheme theft is controlled in an affable way.

**Dangar D., Joshi S.K. (2014)** conducted research on Electricity Theft Detection Techniques for Distribution System in GUVNL. This paper presents a new approach towards Distribution Power Loss analysis for electric utilities using a novel intelligence-based techniques like Extreme Learning Machine (ELM), OS-ELM & Support Vector Machine (SVM). The main objective of this study is to assist Gujarat UrjhaVikas Nigam LTD (GUVNL) to reduce its Distribution Power Loss due to electricity theft. Researchers proposed a model preselects suspected customers to be inspected onsite for fraud based on irregularities and abnormal consumption behaviour. This approach provides a method of data mining and involves feature extraction from historical customer consumption data. The approach uses customer load profile information to expose abnormal behaviour that is known to be highly correlated with Power Loss activities. The result yields classification classes that are used to shortlist potential fraud suspects for onsite inspection, based on significant behaviour that emerges due to irregularities in consumption. Simulation results prove the proposed method is more effective compared to the current actions taken by GUVNL in order to reduce Power Loss activities.

**Saikiran B., Hariharan R. (2014)** studied the Review of methods of power theft in Power System. For this researchers studied about the way of power theft and these are: *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.*

Researchers studied about the power theft control methods and these are: *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.*

**Golden M. (etal) (2012)** conducted a research on Theft and Loss of Electricity in an Indian State of Uttar Pradesh. Researchers Utilize data from the power corporation of Uttar Pradesh, India's most populous state, Researchers studied the politics of electricity theft over a ten year period (2000–09). Research results show that electricity theft is substantial in magnitude. The extent of theft varies with the electoral cycle of the state. In years when elections to the State Assembly are held, electricity theft is significantly greater than in other years. Theft is increasing with the intensity of tube wells, suggesting that it is linked to unmetered electricity use by farmers. Incumbent legislative members of the state assembly are more likely to be re-elected as power theft in their locality increases. However research fail to substantiate that theft is linked either to political criminality or is the product of weak institutions.

### **3. Research Methodology:**

Research Methodology is a way to systematically solve the research problem. The purpose of this section is to describe the methodology carried out to complete the work. The effectiveness of any research work depends upon the correctness and effectiveness of the research methodology. This section deals with research design used, data collection, methods used and sampling methods used.

#### **Objective of Study:**

1. To know the ways of malpractices with electricity distribution.
  2. To know the peak time of malpractices.
  3. To know the various persons doing malpractices
  4. To identify the relationship between location and ways of malpractices.
  5. To know the relationship between experience of meter reader and error found in meter reading.
- **Structure of Research:** To fulfil research objective, researchers prepare structured questionnaire, where electricity companies' employees were responded and filled the questionnaire.
  - **Type of Research:** Current research work is descriptive research in nature.
  - **Population:** Employees of electricity companies.

- **Sample Unit:** employees of electricity companies who read the electric meters.
- **Data Collection:** Primary data is collected through structured questionnaire from the employees of electric companies.
- **Hypothesis:** Researchers have developed following Hypothesis:  
*To know the relationship between location and type of malpractices.*  
 H<sub>0</sub>: There is no statistical relationship between location and type of malpractices.  
*To know the relationship between experience of meter reader and malpractices observed.*  
 H<sub>0</sub>: There is no statistical relationship between experience of meter reader and error in meter reading in various users

**Limitation and Future scope of Study:** Current research work is based on the responses of employees who go to read meters, so they can be biased, another limitation is that it’s only cover Ahmedabad region. Current research work is only covering the malpractices happening not providing solution for these malpractices. In the future, research can be done by providing the solution of these malpractices.

**Data Analysis:**

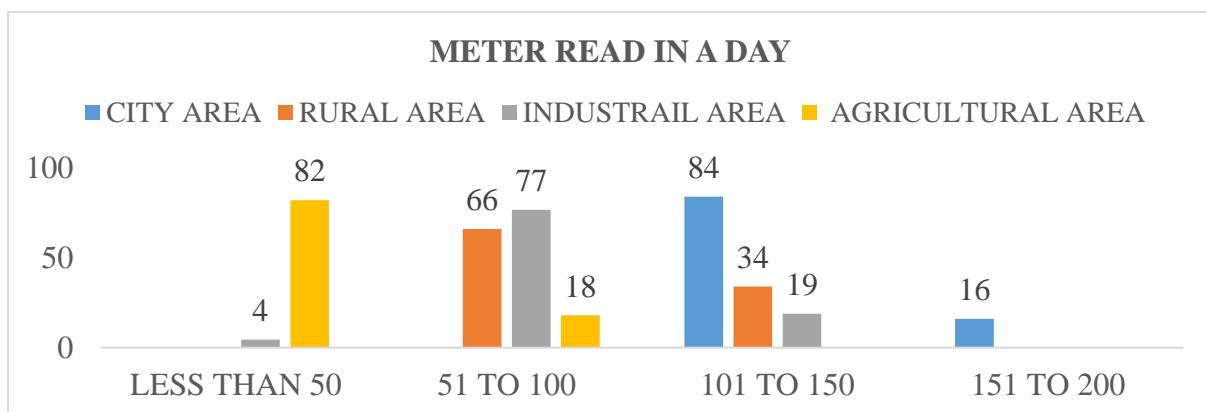


Chart: 1 (Meter Read in a Day)

Above chart reflect the numbers of meters read by electricity company’s employees in various areas within a day. In Agricultural area less number of meters were read in a day. Whereas electricity employees read maximum 151 meters in a day in city area. In industrial area 51-100 meters can be read by electricity company’s employees.

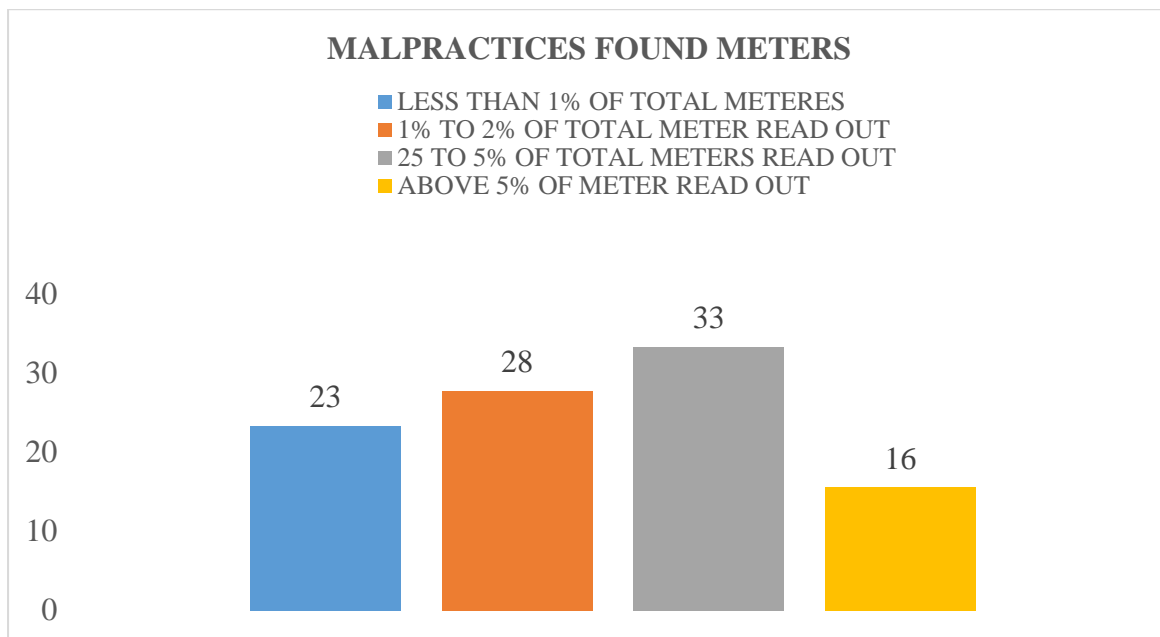


Chart: 2 (Malpractices Found Meters)

Above chart explain about the number of malpractices found in total meter reading. More than ½ of the total meter read were suffering from malpractices.

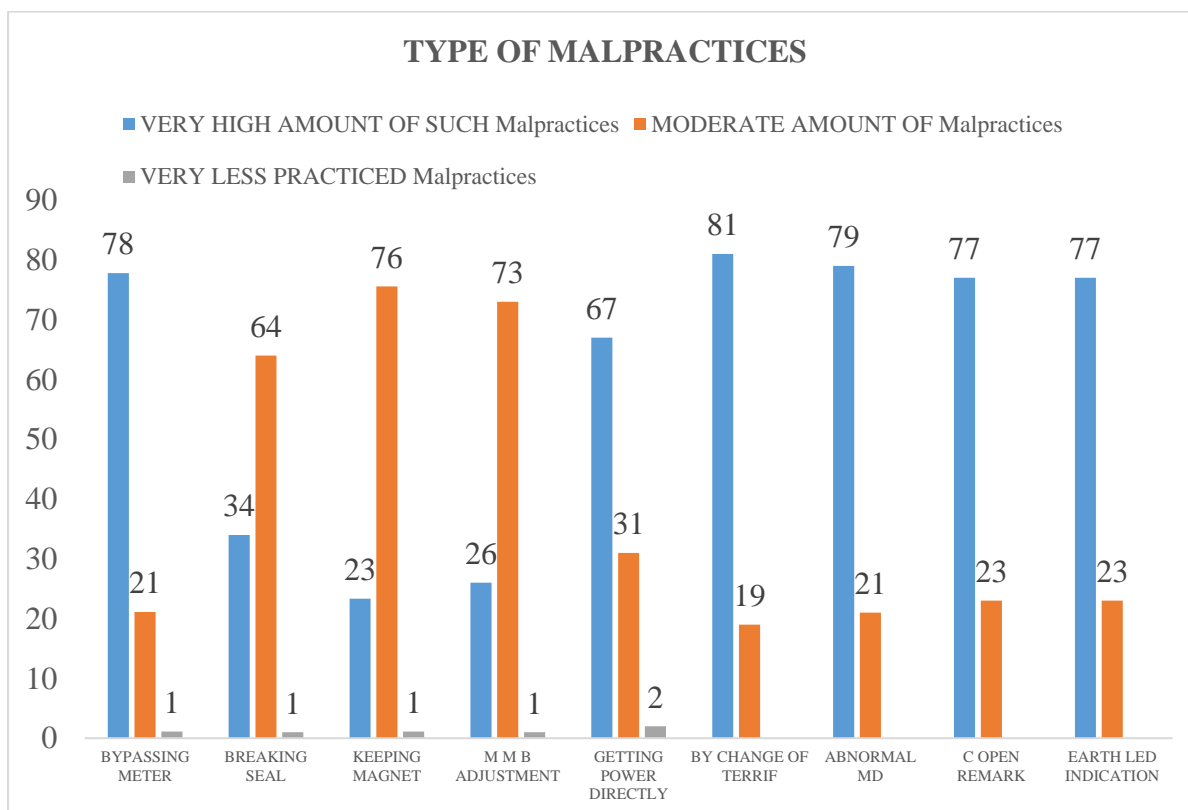


Chart: 3 (Types of Malpractices)

Above chart explain about the malpractices noticed by electricity company’s employees. Most common used malpractice is CHANGE OF TARIFF which is found in 81% of meters. Other highly used malpractices are Abnormal MD (79%), C Open remark (77%), Earth LED indication (77%), by-passing (78%) meter. Other moderate used malpractices are keeping magnet, MMB Adjustment, and breaking seal.

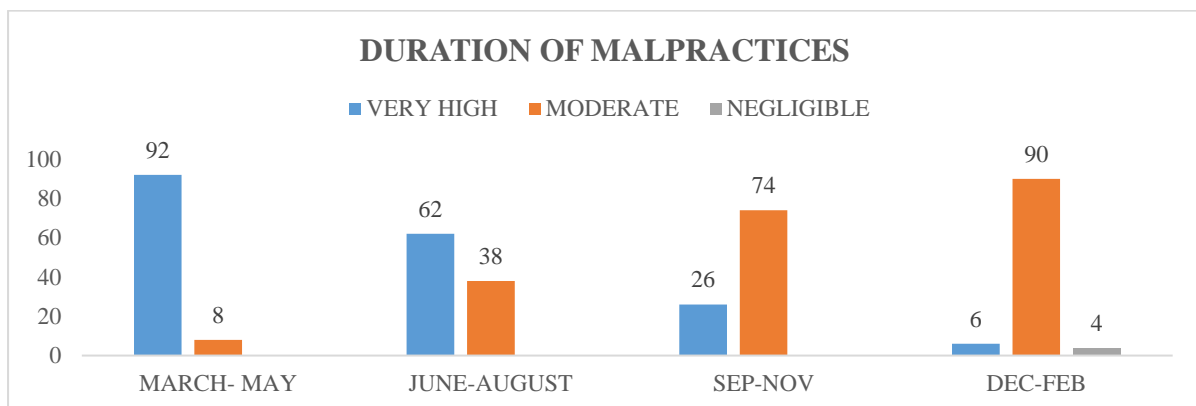


Chart: 4 (Duration of Malpractices)

Above chart explain the frequency of malpractices. And its reflect that during the month of March-April-May most malpractices are being used (92%), followed by June-August (62%), Sep-Nov (26%) and lest in Dec-Feb (6%).

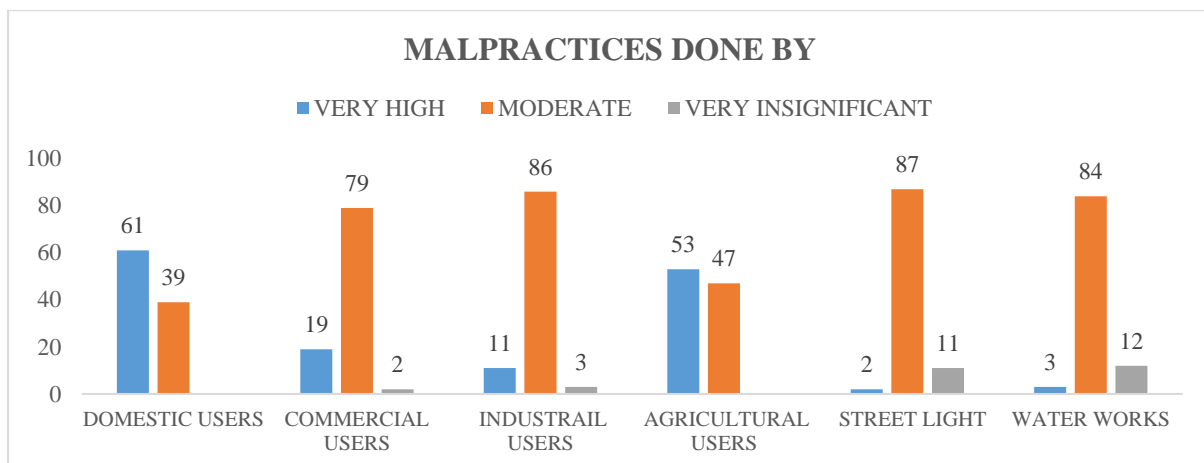


Chart: 5 (malpractices Done By)

Chart 5 explain about the level of malpractices. And as per the data reflected, it can be observed that under domestic users (61%) malpractices are very high, followed by Agricultural users (53%). Moderate level malpractices are being done by Industrial Users, Govt. for street light (87%), water workers (84%), and commercial users (79%).

**Hypothesis testing & Result:**

To know the relationship between location and type of malpractices.

*H<sub>0</sub>: There is no statistical relationship between location and type of malpractices.*

<b>Type of Malpractices</b>	<b>Asymp. Sig. (2-sided)</b>	<b>Accepted/Rejected</b>
Bypassing Meters	.548	H <sub>0</sub> Accepted
Breaking Seal	.604	H <sub>0</sub> Accepted
Keeping Magnet	.892	H <sub>0</sub> Accepted
MMB Adjustment	.797	H <sub>0</sub> Accepted
Power Directly	.625	H <sub>0</sub> Accepted
Change in Tariff	.550	H <sub>0</sub> Accepted
Abnormal MD	.620	H <sub>0</sub> Accepted
C open Remark	.445	H <sub>0</sub> Accepted
Earth LED indicator	.445	H <sub>0</sub> Accepted

Explanation: Above result shows that significant value is more than 0.05, hence researcher conclude that there is no relationship between location and mode of malpractices. Which explain that there is no uniformity of malpractices in locations.

Hypothesis: To know the relationship between experience of meter reader and malpractices observed.

*H<sub>0</sub>: There is no statistical relationship between experience of meter reader and error in meter reading in various users.*

<b>Area Covered</b>	<b>Asymp. Sig. (2-sided)</b>	<b>Accepted/Rejected</b>
Domestic Users	.688	H <sub>0</sub> Accepted
Commercial Users	.091	H <sub>0</sub> Accepted
Industrial Users	.272	H <sub>0</sub> Accepted
Agricultural Users	.109	H <sub>0</sub> Accepted
Government Street Light	.415	H <sub>0</sub> Accepted
Water Works	.212	H <sub>0</sub> Accepted

Explanation: From the above chi square test, researchers found that significant values are more than 0.05, hence, there is no relationship between experience of meter reader and error found. Which explain that even though a new comer employee can capture the malpractices.

**6. Findings:**

After data analysis, researcher explain the findings. Here researcher explain findings according to objectives.

From the data analysis, researcher found that CHANGE OF TARIFF is common and highly used mode of malpractice. Other malpractices modes are Abnormal MD, C Open Remark,

Earth LED indication, Bypassing meter, Breaking seal, Keeping magnet, and MMB Adjustment.

From the data analysis research found that March-April-May are those months when malpractices happen highest. This may be because of the cooling equipment are being used in household and industry as well as at other places. Least malpractices happen in the month of Dec-Jan-Feb.

Researchers found that maximum malpractices are being done by domestic users, followed by Agricultural Users. Other practices done by Commercial users, Industrial users, Govt. itself, and water workers.

Researcher apply chi-square test to know the relationship and found that there is no relationship between location of meter reading and ways of doing malpractices. It means that consumers adopt the various ways to do malpractices.

Researchers apply chi-square test to know the relationship and found that there is no relationship between age and error conducted while reading meter. Even a new employee can read meter correctly.

## **7. Recommendation and Conclusion:**

On the basis of the findings, researchers recommend to the companies, that they need to take strict action against those who do malfunctioning. Here research do agree with **Tarannu M., Sharma D., Dr Singh D. (2017)** to draw an action plan by governments to stop such malpractices. Research also have similar views as given by **Saikiran B., Hariharan R. (2014)** to control the malpractices. Further researchers suggest that electric companies need to keep doing the good practices like training to new employees, so they can read meter correctly.

Here researchers would like to conclude research that malpractices in electricity distribution not only create loss for the companies, but it's also a loss to the GDP of economy. So such practices need to be stopped immediately.

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