

COMPARISON OF POWER THEFT TECHNIQUES AND THEIR IDENTIFICATION: AN OVERVIEW CONCERNING PAKISTAN

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ABSTRACT: Energy shortfall has become a big problem around the world generally, but particularly in Pakistan it has become a matter of great concern because of the administrative and management issues and problems. Beside the other cause of short fall of electricity in Pakistan, one of the major reasons is the considerable amount of electricity theft in almost all the districts of the country. There are 111 districts and 27 divisions in Pakistan. The major channels of theft of electricity are meter tampering, connections without meter and connections (Direct Hook; Kunda System) and unpaid bills. The evidences show that the theft is continuously increasing in most of the regions of the country. Due to the financial impacts of the theft, the losses are redistributed on the rest of the consumers who are regularly paying electricity bills, which in turn invite those regularly paying consumers for the theft also. Electricity theft depends upon the level of good or bad governance, the higher levels of the theft in the country is because of ineffective accountability, political instability, stumpy government efficiency and high levels of exploitation. Theft can be reduced by restructuring of Water and Power Development Authority (WAPDA) and an introducing technically more sound tamper-proof meters, effective administrative approaches such as streamline inspections and modernize monitoring system, in short all the suggestions can be practiced if strong political will is present.

Keywords: Power theft, hook/kunda system, connections without meter, unpaid bills, meter tampering.

INTRODUCTION

The electronic energy meters is capable of taking readings and store it in its memory. Reading taken from energy meter is time consuming and expensive task. LCD is attached to electronic meters which show the total energy consumed, amount of charge and power factor. Power lines give the communication between central energy distribution office and energy meters [1]. The reasons behind the lack of trust on electronic devices have slower pace and new kind of clever tampering, fraud and collusion. These facts provide challenging service and imposing great revenue losses. The collusion and fraud depict our attention for the concerned amount of losses caused to the provider and techniques applied to hide fraud evidences [2]. Pakistan faces widespread electrical energy and peaking shortages. These shortages had harmful effect on overall economic growth of the country. The distribution power losses occur from different areas including theft, errors due to approximation of un-metered supplies, un-billed accounts, customer accounts and metering errors. Thefts are in form of stealing (illegal connections), fraud (meter tampering), unpaid bills and irregularities in billing [3]. Presently Pakistan faces serious energy crises, but no serious steps are taken to install new generation capacity from the required energy sources [4]. To find incident of great electrical fraud by means of illicit connections to energy main, concealed by means of perforation in walls and sidewalks. Line detector is the most effective tool which indicates the illegal connections. This tool reduces 50 percent theft at the time of detection [5]. Electricity consumer dishonesty/fraud is a severe problem faced by all utilities. Now to find effective measurement for detecting fraudulent energy usage, intelligent/smart electronic meters are used which make fraudulent actions more difficult and easily detectable [6]. The corruption increases day by day and

became ingrained where favors can be bought from the employees of power sector in the form of allowing illegal connections and inaccurate billings. Interfere of political leaders are to certify that their supporters and companions are not prosecuted [7].

MAJOR CHANNELS OF THEFT OF ELECTRICITY

- Hook / Kunda System.
- Connections without meter.
- Unpaid bills.
- Meter tampering.

Hook / Kunda System

Direct hook system is more likely to be a robbery not theft actually, which is more common in villages in Pakistan, which encounter a great damage loss of electricity but is concerned more with supervisory staff and law enforcement agencies rather than with technical staff. It can easily be minimized with streamline supervision and law enforcement. The researches revealed that the underground electrical cabling can also minimize this kind of theft.



Fig. 1. Hook/Kunda System

Connections without meter

Connection without meter is also one of the big problem in energy losses, during the research survey it was revealed that most of the connection bearers without meter had the plea that they have submitted demand notice to WAPDA but they have not yet installed meter. It was also not sure that whether they have really submitted or not, but again it is negligence of WAPDA officials.

There is need of quick response to all this kind of applications/ demand notices.

Unpaid bills

A huge amount of money outstanding in the account of Unpaid bills, there are many causes of unpaid bills, overbilling, high cost per unit and high rate of taxes have paralyzed the customers. If we summarize aforementioned thefts and this kind of theft, the main cause is the bad governance.

A strong political will, professionally sound and honest staff can bring a paradigm change. In 1998 the government of Pakistan took action to recover the Water and Power Development Authority (WAPDA) dues. For that recovery they employed 35,000 army men and restrain the theft [8].

Meter tampering

The research revealed that the most frequently electricity theft has been done with meter tempering. The procedure being followed, the techniques being used vary from meter type to type, the research has tried to disclose all the prevailing theft techniques in different kinds of meters.

THEFT TECHNIQUES IN ELECTRICAL ENERGY METERS

In this section, various theft techniques in electrical energy meters are discussed. To keep the theft in control, WAPDA in Pakistan, installed different types of meters from time to time. In the following sections, the theft techniques in these meters are given in detail.

- Old Non PC Type (Non Poly Carbonate type).
- PC Type (Poly Carbonate type).
- Digital type.

OLD NON PC TYPE (NON POLY CARBONATE TYPE)

Different techniques are used for theft in Non PC single phase and three phase energy meters.

NON PC SINGLE PHASE

- **Phase-to-phase:** In this technique, the incoming and outgoing phases are exchanged which were resulting in the slowdown of meter running in heavy load and was used to stop at light load. This was the most common, easy and commonly used theft technique. As shown in Fig. 2

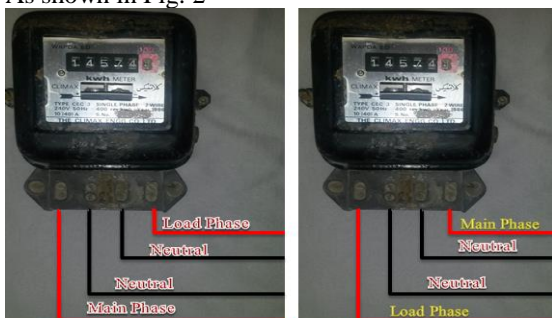


Fig. 2. Phase to Phase

- **Loop System:** In loop system the wire was directly taken from incoming phase or Main Phase before entering into the meter. In this technique the heavy load of electricity was kept outside meter and some of the load was kept on the meter. As shown in Fig.3

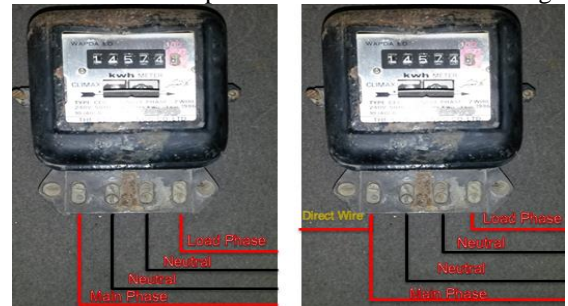


Fig. 3. Loop System

- **Fine Iron Filling:** In this technique small amount of iron powder / fine iron pieces are entered with the help of syringe or any other way between magnetic shells in which the disk is rotating under the influence of magnets, which cause slowdown the rotation of disc. As shown in Fig. 4



Fig. 4. Fine Iron Filling

- **Strip System:** In this technique a thin x-ray strip was used to be inserted from protected side or from bottom side, which could directly touch the disc and stop the disk, it was mostly done during night time when the user had no fear meter inspectors for putting heavy load and was removed during day time for low consumption. As shown in Fig. 5



Fig. 5. Strip System

- **Seal Broken:** In non PC meters, the seal was located outside so it could be easily tempered and replaced. As shown Fig.6. After seal broken/tempered, the shunted wire technique and gear cut/change are possible.

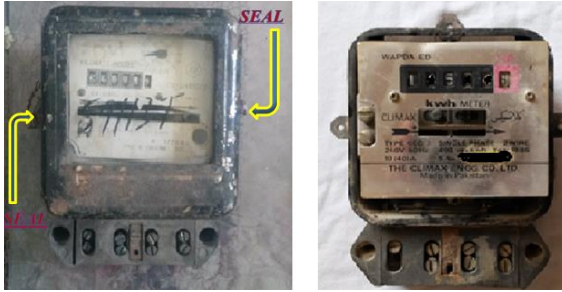


Fig. 6. Seal Broken

- Shunted Wire Technique:** In this technique an extra copper wire was attached between the incoming phase wire and outgoing phase wire (phase to phase). In this way the some of the current was used to be passed without passing the current coil and potential coil which makes the disc move. As shown in Fig. 7

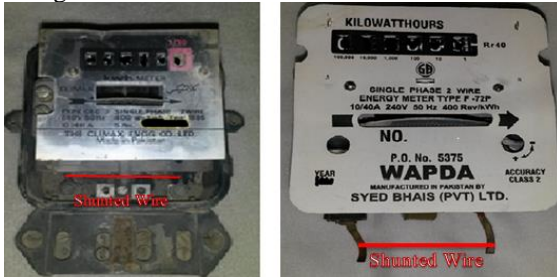


Fig. 7. Shunted Wire Technique

- Gear cut/Gear change:** In this technique some of the teeth of the gear were removed, which resulted in slowing down the turning speed of the measuring unites from 10 percent to 95 percent. The more teeth are removed the more it become slowdown the turning of unites.As shown in Fig. 8

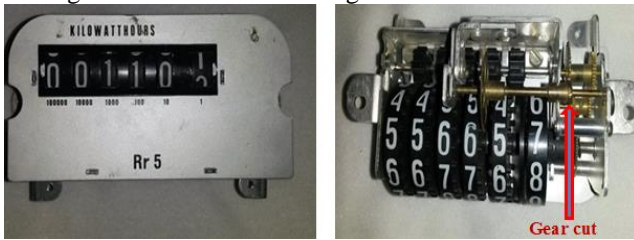


Fig. 8. Gear Cut/Gear Change

NON PC THREE PHASE

In three Phase non PC different techniques are used for electricity theft.

- Phase to phase:** The three phase meters were consist of three main phase wires red, blue and yellow and one neutral (incoming) and the same wires on the load side (outgoing). The theft was done on phase to phase technique, one of the incoming phase was used to be exchanged with the corresponding outgoing phase wire, which would result in slowing down up to 66 percent of meter. If the two phase wires were exchanged with the corresponding two outgoing wires, it would result the complete stoppage of meter, even on a very heavy load. This technique was used by the heavy consumers of electricity i.e.

the industries, mills and factories etc. As shown in Fig. 9

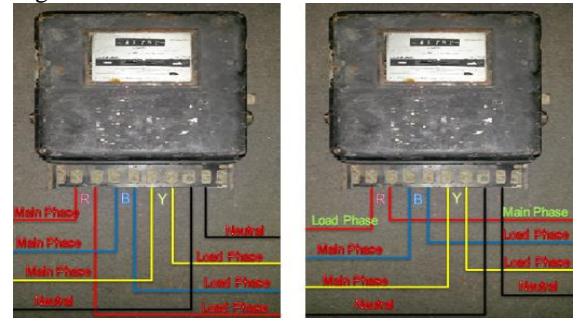


Fig. 9. Phase to Phase

- Strip System:** In three phase meters the strip technique was also used in the same way as already discussed in single phase meter. A thin x-ray strip was used to be inserted from protected side or from bottom side, which could directly touch the disc and stop the disk; it was mostly done during night time when the user had no fear meter inspectors for putting heavy load and was removed during day time for low consumption. As shown in Fig. 10



Fig. 10. Strip System

- Seal Broken:** In non Pc three phase meters the seal was also located outside so it could be easily tempered and replaced. As shown in Fig. 11

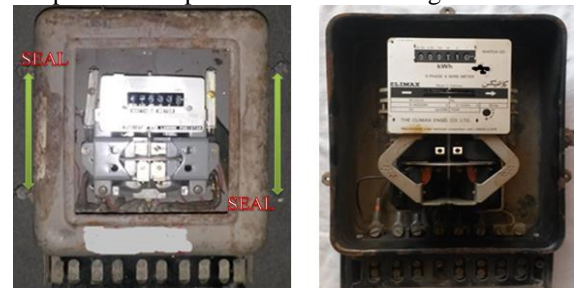


Fig. 11. Seal Broken

- Shunted Wire Technique:** In this technique all the three incoming phase wires were shunted with the three outgoing phase wires. In this way the some of the current was used to be passed without passing the current coil and potential coil which makes the disc move. As shown in Fig. 12

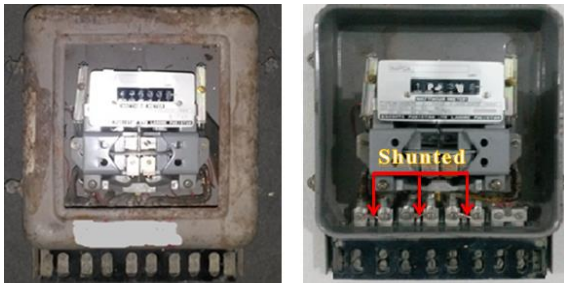


Fig.12. Shunted Wire Technique

- **Gear cut/Gear change:** In this technique some of the teeth of the gear were removed, which resulted in slowing down the turning speed of the measuring unites from 10 percent to 95 percent. The more teeth are removed the more it become slowdown the turning of unites. As shown in Fig.13

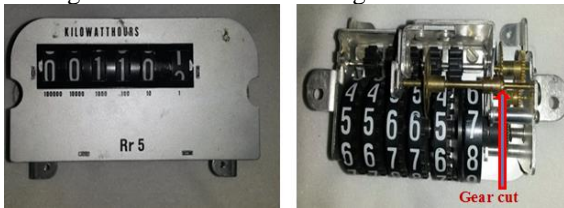


Fig.13. Gear Cut/Gear Change

- **Potential Coil (PT cut):** In three phase meter there are three discs simultaneously moving, each of which is connected with a potential coil and current coil. Each potential coil comprised upon two wires one is connected to current coil incoming and the other is connected with neutral. The wire which was connected with incoming was cut down, which slowdown up to is 33 percent. If all the two discs were treated the same way it would have resulted in 66 percent and if all the three discs it would completely stop the meter.As shown in Fig.14

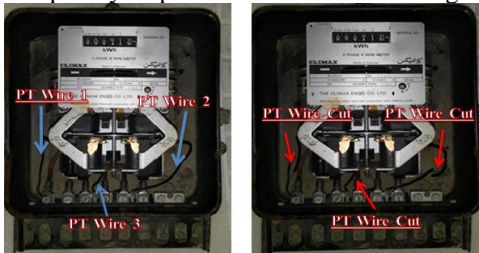


Fig.14. PT Cut

PC TYPE (POLY CARBONATE TYPE)

First we shall discuss the difference between Non PC and PC Meters.

In Non PC meters the seal is not covered completely and can be easily tempered, while in PC meters the seal is completely covered and cannot be tempered easily. The incoming and outgoing wires are locked through plastic strip.In PC meters the X-ray strip insertion technique, shunted wire and gear cut techniques are blocked. Because for these techniques we must remove the protecting cover of the meter. But still the some of the techniques are not blocked even in the PC type meters.

PC SINGLE PHASE

Three techniques are used in PC single phase meters for electricity theft.

- **Phase to phase:** In this technique the incoming phase was replaced by outgoing phase and the outgoing phase was shifted to incoming phase which were resulting in the slowdown of meter running in heavy load and was used to stop at light load. This was the most common, easy and commonly used theft technique. As shown in Fig.15



Fig.15. Phase to Phase

- **Loop System:** In loop system the wire was directly taken from incoming phase before entering into the meter. In this technique the heavy load of electricity was kept outside meter and some of the load was kept on the meter.As shown in Fig.16

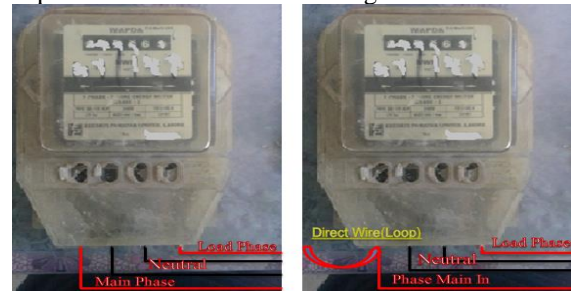


Fig.16. Loop System

- **Fine Iron Filling:** In this technique small amount of iron powder / fine iron pieces are entered with the help of syringe or any other way between magnetic shells in which the disk is rotating under the influence of magnets, which cause slowdown the rotation of disc.As shown in Fig.17



Fig.17. Fine Iron Filling

PC THREE PHASE

In PC three phase the electricity theft technique are,,

- **Phase to phase:** In this technique the incoming phase was replaced by outgoing phase and the outgoing phase was shifted to incoming phase which were resulting in the slowdown of meter running in heavy load and was used to stop at light load. This was the most common, easy and commonly used theft technique.As shown in Fig.18

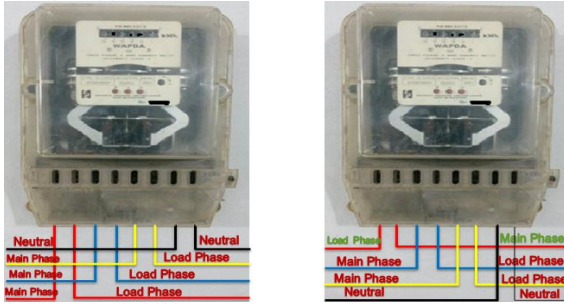


Fig.18. Phase to Phase

DIGITAL TYPE

Different techniques are used for theft in Digital single phase and three phase energy meters.

DIGITAL SINGLE PHASE

- **Shunted:** This technique is possible in digital single phase but the whole body of the meter is to be tempered but that can be easily detected. As shown in Fig.19

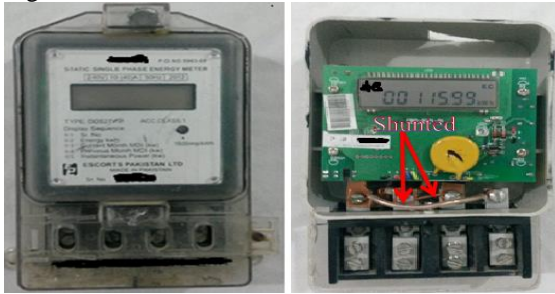


Fig.19. Shunted

Remote Control System: In this technique a switch and sensors are connected between the potential coil and display but for this purpose again the meter is tempered.

DIGITAL THREE PHASE

- **Shunted:** This technique is possible in digital three phase also but the whole body of the meter is to be tempered which can be easily detected. As shown in Fig.20



Fig.20. Shunted

- **Remote Control System:** In this technique a switch and sensors are connected between the potential coil and display but for this purpose again the meter is tempered.

CONCLUSION

In this paper, we have analyzed various channels of theft of electricity including meter tampering, Hook system, unpaid bills and other irregularities. We have analyzed these methods in various regions of Khyber Pakhtunkhwa, Pakistan. We

have pointed out tempering of meters in different version of meters and showed how the consumers slow down their meters. We have also analyzed that electricity theft also depends on the level of good or bad governance. We have come across the conclusion that power theft can considerably be reduced by restructuring of Water and Power Development Authority (WAPDA) in Pakistan and introducing technically more sound tamper-proof meters, effective administrative approaches such as streamline inspections and modernize monitoring system, in short all the suggestions can be practiced if strong political will is present.

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