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# CONSUMERS PERCEPTION AND SATISFACTION OF SWITCHING FROM POSTPAID TO PREPAID MODEL IN ELECTRICITY CONSUMPTION

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# ABSTRACT

The payments of most of the utilities have been on postpaid mode in India except telecommunication which has both the facilities for the consumers. Many utilities are not even able to recover the amount that they bill. Through digitizing the post paid model to prepaid model customers can be made accountable for the amount of resources they consume. One of the most viable resource is electricity. The financial health of State Electricity Boards (SEBs) has always been the matter of concern for policy makers. Most of the electricity distribution utilities in the country are encountering a heavy Aggregate Technical & Commercial (AT&C) loss which has increased in many states over the last few years. Pre-paid metering is currently at an emerging stage in the country. Poor financial health of DISCOMs has hampered its ability to provide secure, reliable and good quality power leading requirement of expensive backups which have higher carbon footprints. Poor quality of supply leads to burnouts of home appliance, use of voltage stabilizers and inverters all of which are energy inefficient. Pre-paid meter system will decrease bad debts, working capital requirement, and associated cost (reading meter, billing and dispatch) and will increase collection efficiency and cash flows. Maharashtra has become the first state in the country to launch prepaid meter system in 2011. The meter is installed inside the apartment. The consumer can make out how much units are consumed. The paper attempts to study how consumers have perceived pre-paid meter system for electricity in Pune city. To what extent they are satisfied as compared to post-paid meters. The researchers have conducted a survey to find out the perceived convenience of consumers with respect to billing, purchasing card, recharging outlets, charging process, intention to switch and so on.

**Keywords:** Postpaid Meter, Prepaid Meter, Discoms, Electricity, Consumer Perception, Consumer Satisfaction.



#### INTRODUCTION

Prepaid or pay as you receive is receiving more and more attention worldwide as utilities are looking for ways to improve quality of customer service, cash flows and minimize risks. Everything else in life (cooking gas, DTH, mobile, grocery, cloths etc) is billed after it is consumed. While electricity supply is the only commodity which is billed after it is consumed. To improve the revenue collection efficiency power utilities have strived to give best possible support to the customers. Meter reading, preparation of bills, distribution of bills and collection of payments undergo a considerable about of efforts , time and cost. This is eliminated by the prepaid meter system. Thus, postpaid electricity meter system is a problem from consumer side as they do not have control on usage of electricity and from producer side meter reading and generating the bill. Peoples must also contribute to save electricity and resources which are utilized for the generation of electricity.

### Conceptual background:

Historically, prepaid metering system started 100 years ago. The first prepayment meters were manufactured by GE in the year 1899 which were coin operated like telephone booths. Technological advancement saw new generation of Prepaid Meters using Magnetic cards and then Smart cards. The present generation uses keypad technology, wherein there is a telephone like keypad on the meter for recharging. In India power sector prepaid metering system is gaining popularity and importance. Journey of prepaid meter system has started few years back. Power utilities from Delhi, West Bengal, Himachal Pradesh, Gujarat, Rajasthan, Haryana etc are gradually joining this system. Geographically, prepaid meter system has been deployed across the globe. UK and South Africa has deployed this system in huge volumes and have been successful. Other than India, Brunei, Poland, USA, Argentina, Malaysia, Israel, Zimbabwe, New Zealand, Bangladesh, Kuwait and France has also deployed this system. Pike Research had forecasted the worldwide prepaid meter device market will reach about \$1.2 billion in 2012, but will drop somewhat over time, starting in 2013, as prices decrease and utilities are less likely to use the more expensive prepaid meters with a disconnect collar. Instead of using these older types of prepaid meters, utilities will increasingly rely on smart meters with embedded prepay functionality. By 2017, utilities around the world are expected to spend about \$743 million, representing a negative 2010-2017 CAGR of -4.7%. (Hedin Marianne, Strother Neil, 2012)

The benefits which a power utility will derive are as follows:

- Earlier cash flow for utility as the payment will be made before consumption.
- No unpaid bills, so collection of arrears will not be a pain.
- Meter reading will be eliminated.
- Accurate Billing.
- No customer queries related to meter reading.
- Demand side load can be maintained.
- Zero possibility of tempering or fraud.
- Prevents theft of electricity.

Benefits to the customer are as follows:

- Buy electricity as per requirement.
- No need to stand in long queues for bill payment.
- Consumer can monitor consumption.
- Consumers will become energy conscious.

According to the **Electricity Act 2003** "47-(5) A distribution licensee shall not be entitled to require security in pursuance of clause (a) of sub-section (1) if the person requiring the supply is prepared to take the supply through a pre-payment meter".

As per **National Electricity Policy** "5.4.9 The Act requires all consumers to be metered within two years. The SERCs may obtain from the Distribution Licensees their metering plans, approve these, and monitor the same. The SERCs should encourage use of pre-paid meters. In the first



instance, TOD meters for large consumers with a minimum load of one MVA are also to be encouraged. The SERCs should also put in place independent third-party meter testing arrangements."

**National Tariff policy** intervention was "If the State Government wants to reimburse even part of this cost of electricity to poor category of consumers the amount can be paid in cash or any other suitable way. Use of prepaid meters can also facilitate this transfer of subsidy to such consumers."

MSEDCL has planned to install prepaid meter system in phase manner in various parts of Pune since 2011. In the first phase 6000 meters were made available for Pune and Pimpri –Chinchwad areas. According to MSEDL power supply will not be disconnected at odd hours at night, or on national holidays if the meter has not been recharged. It is estimated MSCDL has installed 2644 prepaid meter in 2012 in first phase.

Nanded City is a township located in the South-West of Pune, India. The township has taken many initiative some of them are implemented while some are to be implemented in future for instance, Eco-Stream Park, Ornamental Landscaping, Prepaid Water and Electrical Meters, Soil and Waste Management etc.

#### **Literature Review**

Yadav Shraddha, Pandey Prateeksha (2015), have discussed the technique used for prepaid scheme using smart meter included the embedded system and GSM for sending and receiving the SMS through GSM network. Smart meter is a meter which is attached with the existing meter in embedded system which helps the consumer to send a SMS for their day to day power consumption. The aim of their project is to control the consumption of electricity in consumer side, establish a communication network between the consumer and service provider using GSM, then the service provider verify the meter id and card number and accept the request and recharge the meter, to minimize the queue at the electricity billing counters and to retrieve the electricity automatically and propose a system that will reduce the loss of power and revenue due to power theft and other illegal activities. According to the researcher automated billing system will keep doing of real time consumption and will leave little scope for disagreement on consumption and billing. The researcher paper also addresses about various debugging tools. The researchers conclude that smart meter enable two - way communication between the meter and the central system. They are less costly alternative to traditional time of uses meter and are intended to be used on a wide scale with all customer classes.

Prajapati Jignesh, Patel Ashwin, Bhankhariya Vyom (2016), have proposed the prepaid electricity billing system replacing the existing postpaid billing system. The proposed system uses any type of communication media like GSM, optical fiber, Microwave etc. for establish the communication link in between power meter of customer and a centralized system (server). With the help of flow charts the researchers have discussed modified architecture of Electricity Distribution Network (EDN) and Pre-paid electricity billing system.

Yueming (Lucy) Qiu, Bo Xing (2015), paper demonstrates using basic economic theory that there are four possible channels via which a reduction in electricity consumption can be achieved by the adoption of a pre-paid plan: nudging, price effects, information provision, and costs of being disconnected. By using customer level residential billing data from 2008-2010 of a major utility company in Phoenix metropolitan area, this study adopts a matching approach and a difference -indifferences method to estimate empirically the impact of a pre-paid electricity plan on residential electricity consumption, after correcting for selection bias. Results show that the pre-paid program is associated with a 12% reduction in electricity usage, customers with lower level of wealth or those with higher amount of arrear prior to switching to the pre-paid program tend to save more electricity after switching, and pre-paid customers save more electricity in the summer than winter. Wimberly Jamin (2014) of EcoAlign, a strategic marketing agency focused on energy and environment, and DEFG (Distributed Energy Financial Group) of USA, a management consulting firm specializing in energy, conducted 1,001 online interviews based on the Russell Research Omnibus Methodology. They submitted four consumer survey reports to address prepayment. According to the researcher prepayment allows consumers to pay for energy in advance and to monitor their usage and account balance through daily communications from their supplier. The daily information changes their behavior and facilitates energy management to help the home budget.

Usman Abdullateef (2013), paper focuses on the determinants of electricity consumers' satisfaction in selected electricity distribution zone in Nigeria. To achieve the objective, the paper designs a scheme for evaluating customer's satisfaction with a view to determine their level of satisfaction and in the process compute satisfaction index. The paper observed that consumers are at corner solution until the unbundling of the sector into DISCOs. It employed the Fussy Entropy to identify three classes of determinants of consumers' satisfaction. The resulting indexes of consumers' satisfaction shows that the consumers are not satisfied with the services of the DISCO. The paper concludes with policy recommendation to all stakeholders.

Quayson-Dadzie (2012), John has examined customers'perception and acceptability on the use of Prepaid Meter in Accra West Region of ECG. The main aim of the study is to improve customer acceptability by determining the level of acceptability of Prepaid Meters, analyze the factors customers considers before accepting the use of Prepaid Meters, and determine management strategy in promoting prepaid usage. One of the major findings of the study is that customers consider a number of factors before accepting the prepaid meter for use and these include user friendliness of the prepaid meter, durability of the prepaid meter and access to prepaid meter vending points. It is therefore being recommended that management should consider improving durability and access to prepaid meter vending points in order to improve customer acceptability on the use of prepaid meters.

Mathenge Pauline (2015) study investigates the influence of the prepaid electricity meters adoption on the level of customer satisfaction in Thika Sub County, Kenya. The objectives of the paper are: to establish the extent to which the supply reliability in prepaid meters adoption has enhanced the level of customer satisfaction ,to determine the extent to which accessibility of power supply through prepaid electricity meters adoption has enhance the level of customer satisfaction into determine the extent to which customer consumption control provided by the adoption of prepaid electricity meters has enhanced the level customer satisfaction and to establish the influence of customer bills accuracy provided by the adoption of prepaid meters in enhancing the level customer satisfaction in Thika sub county, Kenya. This survey based research had contacted 196 respondents. Quantitative data from the customer and Staff questionnaire were collected and were analyzed using descriptive statistics. Data were analysed using chi-square test. The findings of the survey are: there is a reasonable minority of respondents experiencing payment related problems with the smart meters. There is a need for more pay points. There was a lack of proper understanding regarding the prepaid meter billing system and smart meter usage.

Malama Albert et.al (2014), paper is based on research conducted in Kitwe, Zambia on the effects of the introduction of prepayment meters on the energy usage behaviour of domestic consumers in the Low, Medium and High Income categories. The research was motivated by the fact that there is very little information exists on the subject in Zambia and world-wide. The paper has identified some key issue vis-a-viz: behavioral change as a result of the introduction of the prepayment meters, debt recovery and reduction of pilferage, disconnection of consumers and alternative energy sources and feedback. The data was collected in Kwacha (Low Income), Ndeke (Medium Income) and Parklands (High Income). This was both quantitative and qualitative data. Quantitative data was collected through structured questionnaires of which 151 were collected in total as follows: 59 (Kwacha); 50 (Ndeke) and 42 (Parklands). The qualitative data was collected



through detailed interviews conducted with four households in each of the three household categories. The major findings are that there is general satisfaction from the households on the introduction of the prepayment meters citing control over expenditure and no disputes on bills as the main reasons. Many of the households also reported an improvement in their budgeting for electricity and there seems to have been a drop in the numbers of households with historical debt. Many households in Ndeke and Kwacha reported spending less on electricity after the introduction of the prepayment meters which has been attributed to the fact that they are no longer on flat tariffs and also they are now able to conserve electricity as they are more conscious about expenditure on the same. Many households in Ndeke and Kwacha also reported being disconnected because they run out of credit due to lack of money. Rationing was also reported to be actively being used by households in Ndeke and Kwacha as a way of extending their credit in times when they do not have money to buy credit. Disconnections and rationing were not widely reported in Parklands as households are not stressed with expenditure on electricity. This is because the people in Ndeke spend twice as much on electricity (as a proportion of their income) as do those in Parklands. The expenditure by households in Kwacha is even more. Finally, the study has found that 21% of all the households have moved from using electricity for cooking to charcoal. This is likely to have some negative consequences for the environment as it might lead to deforestation. It is strongly recommended that a study be done on this subject to establish the true impact of this switch from electricity to charcoal by households.

Makanjuola N. T. et.al (2015), study investigates the problems and challenges faced by the prepaid metering system and efforts geared towards in resolving the identified issues using a humansurvey approach termed questionnaires to the EKEDC (Eko Electricity Distribution Company) officials and customers. Some of the identified challenges are: absence of vending infrastructure, nontripping of the contractor, the cost of acquiring the meter, and delays in receiving and installation of prepaid meters. The analysis of this study is based on the feedback mechanism and results received from the members of the public via questionnaire. The obtained results enabled this study to get to the far-reaching recommendations which are considered to be ideal for the successful implementation of the Prepaid Metering System. These include high quality meters, provision of electricity at all times, computerization of the Prepaid Metering System, introduction of prepayment metering country-wide and periodic training of electricity staff members and officials.

Mburu P. T (2014), case study examines the perceptions of the consumers after the switch over from post-paid to pre-paid electricity billing model by Botswana Power Corporation and at different parameters that measure the satisfaction of customers on the utility service provided by service providers. The study also focused on customer perception on how the Botswana Power Corporation managed the change with a view to see whether the overall satisfaction had increased or decreased. A non-probability type of sampling is used and questionnaires were used as data collection instrument. The findings indicate that the customers have embraced the pre-paid billing system and that they have recognized the benefits of conversion to the pre-paid model. The positive perception on the prepaid system requires that the Botswana Power Corporation should make certain that quality service, better network, and regular check on the meters are carried out to ensure that the positive perception is maintained at the highest level. The researcher has also recommended that in future, consumers are consulted and changes communicated to them in good time to address any possible negative perception about the change. Such a move will also ensure easy customer buying-in to the changes.

#### **Objectives:**

The study is based on following objectives:

1. To study the consumer preferences of switching from Post paid to Prepaid metering system.



- 2. To explore the factors influencing the level of satisfaction of the consumers of Prepaid metering system.
- 3. To investigate the perceived utility for prepaid meter among the consumers.

## Hypothesis:

H1: Consumers prefer prepaid meter system over post paid meter system.

H<sub>2</sub>: Consumers are satisfied with the prepaid meter system.

# **Research Methodology:**

The paper is an outcome of a descriptive research with the application of cross-sectional design. A questionnaire was designed and distributed among 300 selected respondents using prepaid meters residing in Nanded city township, Pune. The 300 respondents are from various residential size, educational background, gender and income group. The collected data is analyzed with different statistical tests: Correlation, t-test, Factor analysis with principal component method where varimax rotation is used. The factor analysis output used as input for further model preparation with linear regression analysis where ANOVA is part of the model preparation

| Variable                |            | Frequency    |
|-------------------------|------------|--------------|
|                         | Male       | 170 (56.67%) |
| Gender                  | Female     | 130 (43.33%) |
| Age Group<br>(in years) | 18-28      | 90 (30%)     |
|                         | 29-45      | 190 (63.33%) |
|                         | above 45   | 20(6.67%)    |
| Education               | HSC        | 10 (3.33%)   |
|                         | Graduation | 60 (20%)     |
|                         | PG         | 230 (76.67%  |
| Residence Size          | 1BHK       | 60(20%)      |
|                         | 2BHK       | 160(53.33%)  |
|                         | ЗВНК       | 80(26.67%    |

### Demographics (N=300)

# **Discussion and Findings:**

A paired sample t- test is carried out for the satisfactions regarding prepaid and post paid, the t-value 2.327 is found very significant at p-value 0.027 < 0.05, hence, the null hypothesis is rejected i.e., H<sub>0</sub>: consumers prefer post paid meter system rather than prepaid meter system. There present correlation coefficient 0.247 which is insignificant at p value 0.188 > 0.05, due to the fact that the postpaid as well as prepaid meter systems share the same employee, similar government policies, same infrastructure, etc. From the above findings it can be concluded that consumers prefer the prepaid system over post paid, confirming the alternative hypothesis, H<sub>1</sub>.

In all eight components extracted from 28 with principal component analysis and renamed as supply as per requirement, online recharge facilities, availability of recharge outlets, knowledge about recharge procedure, transparency in billing, electricity fluctuations, maintenance of electricity meters, monitoring electricity units consumption. This dimension reduction is found significant p-value 0.000 < 0.05, with KMO 0.147, and Bartlett's Test of Sphericity, Approx. Chi-Square value of 830.935. For which the screen plot is displayed in figure-1 below:



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Scree Plot



Further output of the principal component analysis, i.e., 8 factors were input for the linear regression analysis. The model is significant with F = 5.53 and p value 0.01 <0.05, explaining the 67.80% in the satisfaction for the prepaid meter system, and which can be written as:

S=3.133 + 0.69 (X1) - 0.60 (X2) + 0.43 (X3) + 0.27 (X4) - 0.05 (X5) - 0.66 (X6) + 0.4 (X7) + 0.68 (X8)

Where, satisfaction, S in the equation with the prepaid meter system, is found significant from ANOVA, which allow researcher to reject the null hypothesis that consumers are not satisfied with the prepaid meter system, accepting alternative hypothesis, H<sub>2</sub>: Consumers are satisfied with the prepaid meter system. The constant 3.13 and coefficients monitoring electricity consumption, fluctuations in electricity supply, availability of recharge outlets, and supply as per requirement are significant with p- values 0.003, 0.045, 0.004, and 0.003 respectively which are far less than 0.05. It is found that the prepaid meter system is facilitating the provision to monitor the units consumed which leads to the control over the consumption of units. Fluctuations in the electricity supply are seen as positively contributing to the satisfaction. Numbers of outlets available are negatively contributing to the satisfaction; people are fed up with the delayed services, and long queues at the outlets. Online recharge facility is quite preferred by the technology savvy people adding value to their satisfaction even if it is not found significant with a p value 0.062 which is greater than 0.05. Similar case found with the transparency in billing, adding to the satisfaction by showing there is a little positive change in the billing system that adding to the trust of people upon prepaid meter system, but not to the extent which can make it significant enough. Maintenance of electricity meters factor is on negative side with an insignificant p-value 0.77, people look at maintenance activities as inefficient system, without which the faults in the supply, meter, and other instruments would not have taken place. A similar case found with the knowledge about recharge procedure and the factor is insignificant with a p-value 0.819 making a ditch in the satisfaction level of the customers which is due to the unawareness of the new system of recharging among customers, and kind force for using scratch cards.

People must get use to Pre-paid electricity as it helps in consuming electricity carefully. The positioning of the 'electricity meter' can be improved. Light and Electricity meter are way too high. One needs to climb on something to reach there. Thus, recharging of electricity can be a pain at times. The number entered in a freedom unit is sometimes very long. It is at times 64 digit number. One mistake and the recharge process have to be repeated again. Which many a times annoys the customer. Thus, recharge of electricity meters online is suggested. At the same time, it conserves and monitors electricity leading to conservation of resources.

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