

# **Managing Problems of Electrical Power Distribution: The Case of Western Addis Ababa Region EEPCO**

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## **1. Background and problem statement**

Ethiopian Electric Power Corporation as a sole power utility in the country is responsible for generating, transmitting, distributing and selling of electricity across the nation. According to the findings of earlier studies, the existing distribution network of the Addis Ababa Region EEPCO is not capable of satisfying the ever growing demand of its customers. Recently, there is an increasing mismatch between customers demand and EEPCO's power supply. Secondly due to absence of rehabilitation, upgrading and maintenance works, the quality of the supply has been deteriorating and consequently customer complaints have been exacerbated. EEPCO's management, therefore, faces crucial managerial challenges which need to be resolved.

## **2. Objectives of the study**

The study aims at surveying major power distribution constraints and techniques employed to guarantee supply to customers. With this general objective in mind, the study will try to:-

- identify the most crucial problems pertinent to electric power distribution.
- assess the frequency of power interruption and power overloading.
- assess the frequency of power interruption as well as the speed and sustainability of maintenance work.
- find out the amount of insurance costs incurred by the corporation because of power overloading (power releases over/above the standard 220 volts).
- suggest recommendation and possible solutions to EEPCO's distribution managers on the planning and improvement of the system.

### **3. Research Questions**

The study attempts to answer questions on the most serious problems in the distribution network system and these includes the following.

1. How often does power interruption take place and how long it takes?
2. What is the degree/severity of the problem?
3. What damages and economic losses are facing EEPCO customers?
4. What and how EEPOC conduct preventive maintenance on faulty network components?
5. What are some of the recommendation and possible solutions to EEPCO's on the planning and improvement of the system?

### **4. Research methodology**

The study employed descriptive research method. The study considers western Addis Ababa Region EEPCO customer and management staffs as a population of the study. Participants of the study were selected using non probability sampling i.e. convenient sampling. Questionnaire and interview were the two data collecting instruments used for the study. Primary data was collected through structured questionnaire and secondary data through document analysis from literatures, magazines, brochures as well as internet web pages. The questionnaire was used to collect data from customers of EEPCO and interview was conducted with management groups and technicians of EEPCO. The questionnaire designed incorporated thirteen close ended questions and was distributed to ninety one customers. Out of the total respondents, 80 of them returned the questionnaire. This makes the response rate (87.90%). Where as, seven interview questions was provided to twelve technicians and eight management staff.

The quantitative data gathered has been tabulated, analyzed and interpreted. Frequency and percentage were used to analyze the responses. Besides interview results was transcribed to substantiate the quantitative result.

## **5. Review of related literature**

### **The Concept of Power Distribution System**

Electrical power travels from the power generation plant to our house through an amazing system called the power distribution grid. A distribution system originates at a distribution substation and includes all the facilities and equipment like the lines, poles, transformers and other equipment need to deliver electric power to the customer at the required voltage. The definition of electric power system includes a generation (production), transmission and distribution system. According to Gonene T. (1986:1, the privately owned power utilities include 80% of all the electric utility in the United States. The major operation and maintenance expense has been in the production sector following by the distribution sector.

According to Pansini A. (1983:14) with the expansion in the use of electricity, the demands on the distribution system become grater and more complex. They not only serve greater number of consumers, but also supply reliable service that could late only fewer interruptions of shorter duration. At this point the design, construction, maintenances and operation of distribution system become a science in the filed of engineering.

A good distribution system planning should provide for an orderly development of the system to meet the power requirements for a period of about five years and obtain optimum benefit from the available resources (Raina K.B et.al (1985:183)).

### **5.2. Review of studies in the Ethiopian context**

The Urban Distribution Network and Expansion Project (2003) final report stated that the existing distribution network of Addis Ababa is not capable of satisfying the growing power demand. Besides, due to absence of rehabilitation, up grading and maintenance work, the supply quality in the major supply center have deteriorated. It is characterized by frequent outage interruption and high distribution losses.

In order to alleviate the distribution problem, EEPCO has designed a distribution Network Rehabilitation Program which aims at satisfying the growing power demand of potential customers with the following objectives:

- Enhancing quality of power supply
- Reducing voltage drop and overloading and mitigate voltage constraint at the end users.
- Rehabilitating the existing distribution network components to enhance reliability and safety.
- Promoting sound customers relations.

On the other hand, however, statistics from EEPCO shows that number of calls dealt with by the emergency section increase from 44,251 in 1999 to 57,247 in 2000,

## 6. Results and Discussion

This section deals with the results obtained from the survey questionnaire collected and interviews conducted. The following tables present respondents perception on the problems of electric power supply.

**Table 1: Causes of electric power interruption**

Item	Response	
	No	%
Which one of the following is the major cause of electric power interruption?		
Natural Catastrophe	7	8.75
Maintenance work	21	26.25
Power shortage	29	36.25
Deliberate action for the purpose of construction and project work	13	16.25
Accidents	10	12.5
<b>TOTAL</b>	80	100

As it can be seen from the above table, Majority of them i.e. 29 (36.25%) responded that power interruption is mainly caused due to shortage of power supply. This clearly

indicates that the power generated at the different power generation plants are not capable of satisfying the growing demands of customers.

**Table 2: Time of power interruption**

Item	Response	
	No	%
When does power interruption usual occur?		
Morning 6:00AM – 12:00 PM	22	27.5
Afternoon 1:00 PM – 6:00 PM	9	11.25
Evening 7:00 PM – 12:00 PM	41	51.25
Midnight 1:00 AM – 6:00 AM	8	10
<b>TOTAL</b>	80	100

As shown in the above table, 41 (51.25%) of the respondents indicated that power is usually interrupted during evenings. This implies, due to absence of light, different shops and business centers will not be able to operate, theft and robbery which poses security threat to the people is likely to occur.

The following table indicates the type of damage suffered by customers because of power overloading (electric current > 220 volts)

**Table 3: Damage caused by power overloading**

Item	Response	
	No	%
What type of damage you have noticed due to power overloading?		
Audio (Radio, Cassette player)	17	21.25
Video (TV, VCD, DVD)	20	25
Others (Computers, printer, fax, mail)	38	47.5
Life casualties (Human and/or animal)	5	6.25
<b>TOTAL</b>	80	100

Table 3 reveals responses of customers about the type of damage the suffered due to power overloading. Accordingly, 38 (47.5%) of them indicated that equipments like computers, printers; photocopy machines and the like were damaged. Besides they also indicated that repair and maintenances cost was very expensive. On another dimension 5 (6.25%) of the respondents indicated that power overloading caused life casualties on human and animal.

According to the data obtained through interview from the management staff, from Hamle 1/1998-Senie 30/1999 budget year, the following amount of money was spent for public liability insurance.

1. Property damages (Computers, TV, Radio, Telephone)	Br, 135,426.38
2. Life casualties (People)	Br, 26,480.00
3. Life casualties (animals)	Br, 3, 747.99
	<b>Total Br, 165,654.37</b>

This data shows green light to EEPCO so as to improve its power distribution system.

**Table 4: Compatibility of power supply with customers demand**

Item	Response	
	No	%
<b>Do you agree that EEPCO's power supply is compatible to your power demand?</b>		
Strongly agree	7	8.75
Agree	13	16.25
Do not agree	22	27.5
Strongly disagree	36	45
Indifferent	2	2.5
<b>TOTAL</b>	80	100

According to the above table, 36(45%) of the respondents strongly disagree that EEPCO’s power supply is compatible with their power demand. This indicates that customers are not satisfied with the present current supply of EEPCO

**Table 5: EEPCO’s preventive maintenance of power interruption**

<b>Item</b>	<b>Response</b>	
	<b>No</b>	<b>%</b>
<b>How often does EEPCO conduct preventive maintenance before power interruption occurs?</b>		
Frequently	6	7.5
Sometimes	27	33.75
Occasionally	35	43.75
Not at all	2	2.5
Not known	10	12.5
<b>TOTAL</b>	80	100

From the above table one can see that 35 (43.75%) of the respondent indicated that EEPCO occasionally conducts preventive maintenance. This can imply that lack of on time preventive maintenance can lead to frequent power failure which can cost the corporation a huge amount of money and can even aggravate customer dissatisfaction.

**Table 6: Performance/service of Emergency Maintenance of EEPCO**

Item		Response					
		excellent	Very good	good	Average	Poor	Total
<b>What is your point of view about the performance/service of the Emergency Maintenance Unit of EEPCO?</b>							
Time it takes to repair the faulty network	No	10	17	21	24	8	80
	%	12.5	21.5	26.2	30	10	100
Speed in answering the emergency calls.	No	7	14	16	20	23	80
	%	7	14	16	20	23	100
Location of the branch to report power failures	No	23	20	18	13	6	80
	%	28.75	25	22.5	16.25	7.5	100
Handling customers request for repair and maintenance works	No	-----	23	26	31	---	80
	%	-----	28.75	32.5	38.75	-----	100
Sustainability of the repair and maintenance works	No	5	11	16	21	27	80
	%	6.25	13.75	20	26.25	33.75	

The above table indicates that

- 24 (30%) of respondent replied that the time it takes to maintain the faulty network lines was average.
- 23 (28.75) of the respondents indicated that the speed is answering the emergency calls from complaining customers is poor.
- 31(38.75) of the respondents indicated that the customer handling quality of the unit is not bad. But, still it needs to be improved.
- 27(33.75) of the respondents indicated that sustainability to the repair and maintenance of defects is poor

Taking into account all the data collected so far it is evident that the time it takes to repair faulty network lines, the customers handling quality, the sustainability of repair and maintenance of defects are satisfactory. Unless these problems are improved they can hamper sound customer relation. It can be concluded that without the provision of proper customer service and implementation of fair power distribution schemes, it would be difficult for EEPCO to satisfy the needs of its potential customers.

## **8. Conclusions and Recommendations**

### **8.1 Conclusion**

Based on the findings obtained, the following conclusions are drawn.

- Shortage of power supply and untimely maintenance on faulty network lines contribute to the problem of power interruption and can aggravate customer dissatisfaction.
- Power interruption especially in the evening can cause security problem where by theft and robbery can prevail.
- Customers are affected by power over loading problems causing property damage which cost them a lot of money.
- Failure to quickly respond to emergency calls by customers, longer maintenance time, unsustainable repair and maintenance is likely to result in disruption of customer-organization relationship.

### **8.2 Recommendations**

Based on the conclusions drawn above, the following recommendation is forwarded:

- EEPCO should continuously check if proper supply of electric power is maintained taking into account the ever increasing power demand.
- Maintenance should be employed to reduce the frequency of power interruption to the minimum.
- Power interruption especially in the evening must be taken care of in order to enhance security of the public.
- Substantial effort should be made by the emergency maintenance unit of EEPCO to see to it that power is not disrupted.

- The power distribution division should make a considerable effort to apply safety measure to avoid power overloading which can damage customer properties and even lives of people and animals. Power should be regulated and proper amount of voltage must be supplied to end point users.

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