



INTERNSHIP REPORT

ON

A COMPREHENSIVE OVERVIEW OF DESCO OPERATION

By

Md. Sabit Hasan Siddique

Md. Nahid Hasan


Submitted to the

Department of Electrical and Electronic Engineering
Faculty of Sciences and Engineering
East West University

in partial fulfillment of the requirements for the degree of
Bachelor of Science in Electrical and Electronic Engineering
(B.Sc. in EEE)

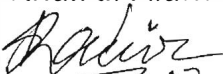
Spring, 2010

Approved By


7/10/2010

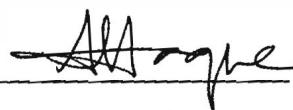
Academic Advisor

Dr. Khairul Alam


07.10.2010

Academic Advisor

S. M. Shahriar Rashid


07.10.2010

Department Chairperson

Dr. Anisul Haque



**Dhaka Electric Supply Company Limited
(DESCO)**

Certificate

Awarded to Md. Sabit Hasan Siddique

Student ID : 2006-2-80-019

**Of Electrical & Electronic Engineering Department
of EAST WEST University**

For successful completion of the Internship in DESCO

Held from 21 January, 2010 to 22 February, 2010.

Engr. Md. Golam Rabbani
Manager, HRM&D

A. H. M. Nurul Huda
Company Secretary

Issue date: 22 February, 2010



**Dhaka Electric Supply Company Limited
(DESCO)**

Certificate

Awarded to Md. Nahid Hasan

Student ID : 2006-2-80-009

**Of Electrical & Electronic Engineering Department
of EAST WEST University**

For successful completion of the Internship in DESCO

Held from 21 January, 2010 to 22 February, 2010.

Engr. Md. Golam Rabbani
Manager, HRM&D

A. H. M. Nurul Huda
Company Secretary

Issue date: 22 February, 2010

Undergraduate Internship

Acknowledgement

At the very beginning, we would like to thank to the Almighty Allah for giving us the opportunity to complete our internship and preparing the internship report. We also acknowledge the encouragement and assistance given by a number of people and the institution.

We are very much grateful to Dhaka Electric Supply Company Limited (DESCO) to give us the chance to complete our internship in their organization. We want to mention the name of Engr. Md. Golam Rabbni, Manager (HRM&D) and Mr. Reazul Hossain Talukder, Assistant Manager (HRM&D) for allowing us to do the internship in the organization.

We are also grateful to our honorable supervisors, Dr. Khairul Alam, Assistant professor, Dept. of EEE, East West University(EWU) and S. M. Shahriar Rashid, Research Lecturer, Dept. of EEE, East West University(EWU), for providing us needed assistance and diluting time constraints and also to encouraging us to prepare the internship report . We are also thankful to Dr. Anisul Haque, Chairperson & Professor, Dept. of EEE, East West University (EWU) and Dr. Isfaque Raza (Associate Professor), Dept. of EEE, East West University (EWU), for giving us the support and encouragement to attend the internship program.

Finally, we would like to thank some honorable persons of DESCO who had given us appointment from their precious time to collect related data of our report and also helped us to understand many related matters and gave us their precious time more than once, they are:

01. Engr.A.K.M Akhtaruzzaman, Deputy Manager (SO),Kallyanpur S&D Division.
02. Engr. Mohammad Shafiqul Islam, Deputy Manager, Pallobi S&D Division.
03. Engr. Khandoker Istiaque Ahmed, AM (Grid & Protection)
04. Engr.Mohammad Raihan Habib , DM,(Prepaid Metering Pilot Project)
05. Engr.Md. Shah Alam, DGM (System Engineering And Division)
06. Mr.Mamunur Rashid, DM (CP&MIS)
07. Engr.Golam Mowla, AM (Grid and Protection)
08. Engr.Mirza Abu Nasher, DM (Tongi West S&D Division)
09. Engr.Md. Shawkat Ali, DM (Tongi East S&D Division)
10. Engr.Md. Golam Faruk, Assistant Manager(System Operation)
11. Engr.Jyotish Chandra Roy, Manager (Project).
- 12.Engr.Habibul Hasan Chowdhury, Assistant Manager(I/T), Kallyanpur S&D Division.

Executive Summary

Dhaka Electric Supply Company (DESCO) is one of the best electricity distribution companies among its kinds. We started our internship in DESCO on 21, January 2010. Before starting in DESCO, an internship schedule and a group list were provided with the internship placement letter by DESCO.

During the internship we visited several Sales and Distribution (S&D) divisions and substations of DESCO. We also went for several field trips with the DESCO officers. In our internship we knew about DESCO's commercial operations, technical operations, maintenance works, major projects and future plans. During the internship, new connection, disconnection/reconnection, metering, one point service center, billing/collection, complain center, IT section, 33/11 KV substation, prepaid meter, operation of prepaid meter and Prepaid Meter Production Unit, e – governance, technical activities, major projects and future plans, grid substation, S&D system operation, load sanction and load retention, temporary connection and new connections, load management, control room activity, power factor monitoring and upgrading, substation maintenance and line main maintenance, wireless and telecommunication and DAS were discussed by the DESCO officers in different schedule day. On each schedule day, one or two designated officers discussed the specific topics in their office room with the support of the related official documents and guide lines. The officers also showed us different kinds of electrical parts, equipments and machineries according to the needs of the discussion. We kept notes on the discussion. We got the chance to observe some maintenance work, such as circuit breaker maintenance work, line maintenance work and also got chance to visit DESCO's Prepaid Meter Production Unit. At last, after finishing the internship we prepared our intern report to submit in DESCO Headquarter and collected our certificates.



TABLE OF CONTENTS

Contents

1. Introduction of DESCO.....	8
1.1 Introduction	8
1.2 Foundation of DESCO	8
1.3 Journey of DESCO	9
1.4 Mission, Vision and Corporate Philosophy	9
1.5 Structure of the DESCO.....	10
1.6 Map of DESCO Area	13
1.7 Infrastructure	14
1.8 Data	14
2. Detail of internship work	18
2.1 Introduction	18
2.2.1 Commercial Operation.....	18
2.2.2 Billing and Collection	18
2.2.3 One Point Service Center	22
2.2.4 Disconnection and Reconnection.....	22
2.2.5 New Connection	23
2.2.6 Load Sanction	24
2.2.7 Temporary Connection	25
2.2.8 Electricity Tariff	25
2.2.9 Load Retention	29
2.2.10 Energy Metering	30
2.2.11 Complain Center.....	31
2.3.1 Overview of Substation.....	31
Department of Electrical and Electronic Engineering, East West University	3

Undergraduate Internship

2.3.2 Function of Substation.....	32
2.3.3 Equipment of Substation	33
2.3.4 Maintenances of Substation	46
2.4.1 Operation of Prepaid Meter.....	46
2.5.1 E-Governance	48
2.5.2 Customer Management System.....	48
2.5.3 Generation and Collection System	48
2.5.4 Local and Central Store Management System	49
2.5.5 Maintain the Sub-station by DAS	49
2.5.6 New Connection	49
2.5.7 One Stop Service point	49
2.6.1 Technical Activities, Major Projects and Future Plans.....	49
2.6.2 Step of Planning.....	50
2.6.3 ON Going Project.....	53
2.6.4 Future Project.....	54
2.6.5 Future Infrastructures.....	55
2.7.1 Prepaid Meter Production Unit.....	56
2.7.2 Structure of Prepaid Meter	56
2.7.3 Testing of Energy meter.....	59
2.8.1 Operation of Bashundhara Grid Station	60
2.9.1 Sales and Distribution.....	60
2.9.2 Commercial Operations	60
2.9.3 Technical Operations.....	60
2.10.1 Temporary and New Connection	61
2.11.1 Load Sanction and Load Retention	61

Undergraduate Internship

2.12.1 Load Management.....	61
2.12.2 Control Room Activities	62
2.13.1 Line Maintenance	62
2.14.1 Power Factor Monitoring and Upgrading	62
2.15.1 New Control Panel.....	63
2.16.1 Substation Maintenance.....	65
2.17.1 Wireless and Telecommunication Unit and DAS.....	66
2.18.1 Report Submission and Certificate Collection.....	67
3. Conclusion.....	68
3.1 Conclusion.....	68
References.....	69

LIST OF FIGURES

Undergraduate Internship

Figure 1.1: DESCO Board	10
Figure 1.2: Core Management of DESCO	11
Figure 1.3: Map of DESCO Area	13
Figure 1.4: System Loss	14
Figure 1.5: Income, Expense and Profit.....	15
Figure 1.6: Consumption growth pattern.....	15
Figure 1.7: Maximum Demand	16
Figure 1.8: Sales and Collection.....	16
Figure 2.1: Meter Reading Schedule.....	19
Figure 2.2: Meter reading Card.....	20
Figure 2.3: Meter reading Sheet.....	20
Figure 2.4: Bill Acknowledgement Sheet.....	21
Figure 2.5: Different type of lighting Arresters.....	34
Figure 2.6: Low Pass Filter and Voltage Transformer	34
Figure 2.7: Isolator	35
Figure 2.8: Current Transformer.....	36
Figure 2.9: Potential Transformer.....	36
Figure 2.10: Circuit breaker	37
Figure 2.11: Electromechanical Relay	38
Figure 2.12: Static Relay	39
Figure 2.13: Microprocessor Based Control Panel.....	39
Figure 2.14: Power Transformer.....	40
Figure 2.15: Tap Changing Instruction	41
Figure 2.16: Cooling Fan	41
Figure 2.17: Silica Gel.....	42

Undergraduate Internship

Figure 2.18: Switching Panel.....	42
Figure 2.19: DC 110V Battery Charger Panel.....	43
Figure 2.20: LDC.....	45
Figure 2.21: Prepaid Card.....	47
Figure 2.22: Prepaid Meter.....	47
Figure 2.23: Internal Structure of a Prepaid Meter	56
Figure 2.24: SMPS	57
Figure 2.25: Current Transformer (CT).....	57
Figure 2.26: Smart Card Reader.....	58
Figure 2.27: Latch Relay	58
Figure 2.28: Energy Meter Testing Lab	59
Figure 2.29: Line Maintenance	62
Figure 2.30: Switching Panel.....	63
Figure 2.31: Inside of Switching Panel	64
Figure 2.32: Front View of Control Panel	65
Figure 2.33: Migger	66
Figure 2.34: Oil Centrifugal Machine	66
Figure 2.35: Oil Centrifuging.....	66
Figure 2.36: Changing of Breaker's Oil.....	66
Figure 2.37: DAS.....	67

LIST ● OF TABLES

Table 1.1: Yearly Report	17
Table 2.1: Tariffs and Rates	27

1. Introduction of DESCO

1.1 Introduction

In 1996, the franchise area of DESA handed over the distribution networks outside Metropolitan Dhaka City to PBS's under REB, and formed a corporatized Dhaka Electric Supply company (DESCO) which initially took over part of the distribution network of DESA and ultimately took over all its assets. The formation of this company is seen as an essential step towards "corporatization and commercialization" of the sector and to reduce the excessive inefficiency in the distribution network within the capital city, Dhaka.

1.2 Foundation of DESCO

Foundation of Dhaka Electric Supply Company is a part of the reforms being initiated by the Government. Due to paucity of financial resources with the Government, there is an urgent need to induct private sector participation in the power sector. This participation will not be forthcoming unless the financial inflow to the sector enables the sector to earn a positive return. Since cash inflows to the sector come only from distribution agencies, there is an urgent need to improve their efficiencies, if private sector investments are to be attracted in any part of the power system. The Dhaka area is the largest single distribution territory consuming about 50 percent of the total electricity sold in Bangladesh. DESA, which is the distribution agency for the Dhaka area has a poor performance record with respect to system losses and accounts receivables. Although the performance has improved considerably since 1992 on account of intensive monitoring, there is a limit to the gains that can be made and it is felt that further progress can be achieved on a sustainable basis only if there is a change in the business environment, both external and internal to the organization, which will enable introduction of more sophisticated control and management systems, and also organizational accountability.

The current organizational arrangements including management structure, employee compensation, delegation of authority, conduct, discipline and appeal rules and promotion policies are based on the civil service rules and arrangements which is not well suited to the functioning of a commercially oriented sector such as the power sector. It is therefore necessary to create new organization with its own rules and regulation that is more suited to the new business environment that is now being created in the power sector.

The new company (DESCO) was being created as a public sector company, incorporated under the Companies Act 1994 as a subsidiary of DESA. Now shares of the company already offered to the private sector, other power sector entities and the general public to make the DESCO's management more responsive to its consumers.

Undergraduate Internship

1.3 Journey of DESCO

DESCO was constituted to provide uninterrupted & stable power supply, better consumer service, reduce system loss. DESCO started its operational activity since September 24, 1998 by taking over of Mirpur area from DESA.

Following are the initial activity of DESCO which includes:

- Operation & Maintenance of Sub-Stations & Lines.
- Commercial functions i.e. billing, consumer accounting, disconnection & re-connection of consumers, testing & installation of consumer meters etc.
- Planning, Design and installation of Sub-stations & lines etc.

Mirpur area bounded by RokeyaSarani and low lying area in between Mirpur and Cantonment in the East, Agargaon road in the South, Mirpur Road and Turag river in the West and North. The area covered under the 151 phase was taken over by DESCO on September 24, 1998 from DESA.

Gulshan Circle including Mirpur Area bounded by Balu River in the east, Turag River in the west and Turag and Balu River in the North and Mirpur Road, Agargaon Road, RokeyaSarani, ProgotiSarani, New Airport Road, Maymenshing Road, MohakhaliJeel, RampuraJheel connected with Balu River in the South. The additional area covered under the 2nd phase, was taken over by DESCO on April 09, 2003 from DESA.

1.4 Mission, Vision and Corporate Philosophy

Mission

Service to the utmost satisfaction of consumers through reliable and uninterrupted power supply and provide value for money. Provide congenial working environment for employees.

Vision

To be a role- model electric supply company in the region using most dependable technologies and be a development partner in the continuous welfare of the society.

Corporate Philosophy

Service excellence with integrity and corporate social responsibility.

Undergraduate Internship

1.5 Structure of the DESCO

DESCO incorporated under the Companies Act 1994 with its own Memorandum and Articles of Association.

they are responsible for policy decisions. The appointed managing Director and two full time members of the Board Directors after appointment. The organizational of the company is as follows:

- The Chairman DESA being the Board of Directors on his nominee till such time DESA owns the majority of the shares in DESCO.
- The Managing Director acts as the Chief Executive Officer of the company and responsible for overall management of the company.
- The Director (Technical) responsible for development planning supply demand management and operation and maintenance of the system.
- The Director (Finance) responsible for all financial matters and commercial operations of the company.

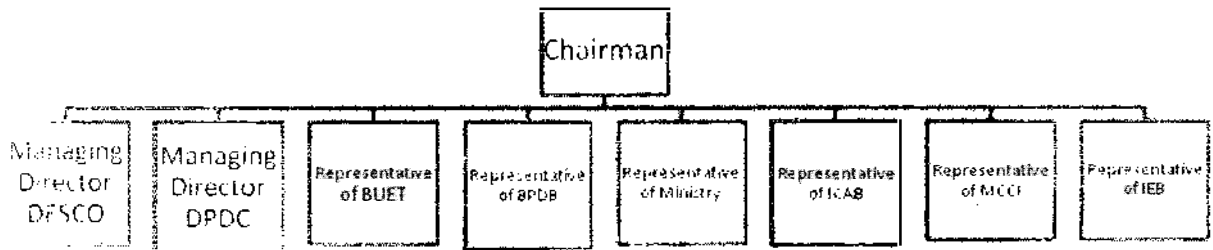


Figure 1.1: DESCO Board

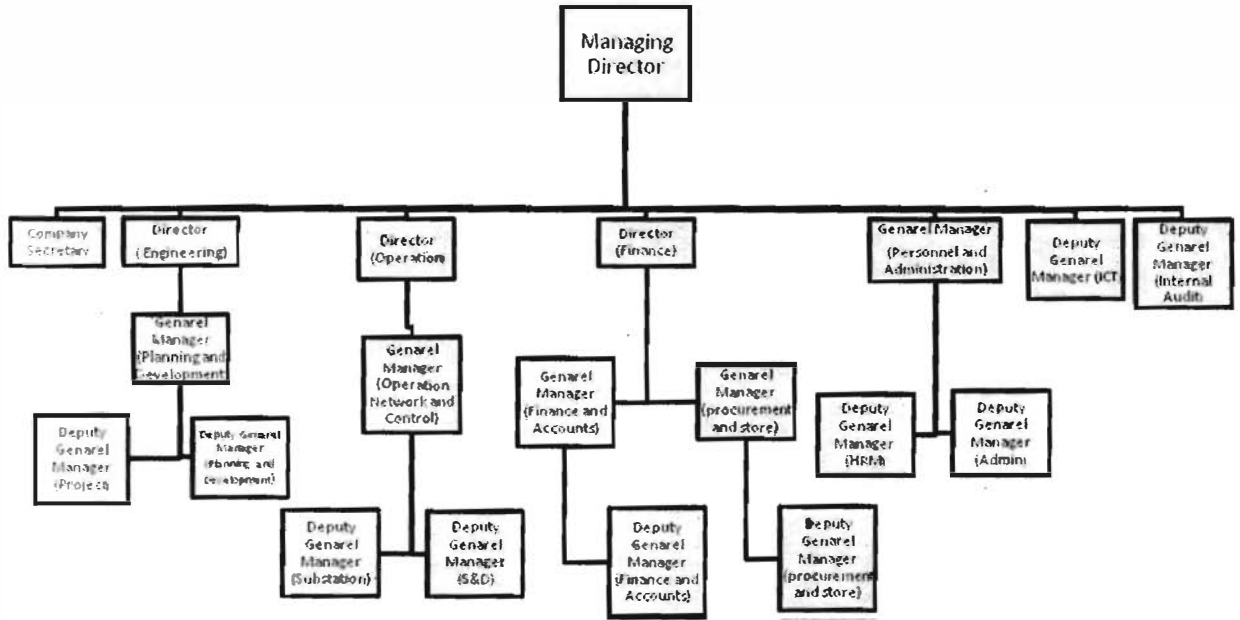


Figure 1.2: Core Management of DESCO

DESCO recruited its employees through open advertisement. The qualification and experience requirement were fixed up according to the requirement for performing their duties and responsibilities against the respective post. Mainly those who have sufficient experience in the field of utility organization are selected on a merit basis. They were employed on long-term contracted basis under the DESCO's service rules approved by its Board of Directors.

Undergraduate Internship

Top Management:

Engr. Saleh Ahmed	Managing Director
Engr. Md. MonzurRahman	Director (Technical)
Mr. QudrateKhuda	Director (Finance)

G.M. Office:

Engr. Md. Shahjahan Mia	G.M (Engineering & System Control)
Mr. Md. Shafiqul Islam Chowdhury	G.M (S&D Operation),Incharge

Head Office:

Engr. S. M. HabiburRahman	DGM(Administration)
Mr. Md. RofiUddin	DGM (Finance & Accounts)
Engr. Md. Shah Alam	DGM (S. E. & D.)
Mr. A.H.M. Nurul Huda	DGM (Company Secretary)
Mr. KhandakerNajibulAlam	Manager (Procurement & Contract Management)
Engr. Md. GolamRabbani	Manager (H.R.M. & D.)
Engr. Abdus Salam	Manager (C.P. & M.I.S.)

Sales & Distribution Division:

Mr. Md. Shafiqul Islam Chowdhury	DGM, Baridhara Sales & Distribution Division
Engr. A.K.M. Mostafa Kamal	DGM, Gulshan Sales & Distribution Division
Engr. Nur Mohammad	DGM, Uttara Sales & Distribution Division.
Engr. ShamimAhsanChowdhury.	Manager, Kallyanpur Sales & Distribution Division
Engr. A.K.M. Mohiuddin	Manager, Kafrul Sales & Distribution Division
Engr. Md. Mafizul Islam Bhuiyan.	Manager, Pallabi Sales & Distribution Division
Engr. Md. ZakirHossain.	Manager, Dakshin Khan Sales & Distribution Division
Engr. Md. Shariful Islam	Manager, Tongi (East) Sales & Distribution Division
Engr. Jogodish Chandra Mandol	Manager, Tongi (West) Sales & Distribution Division

1.6 Map of DESCO Area

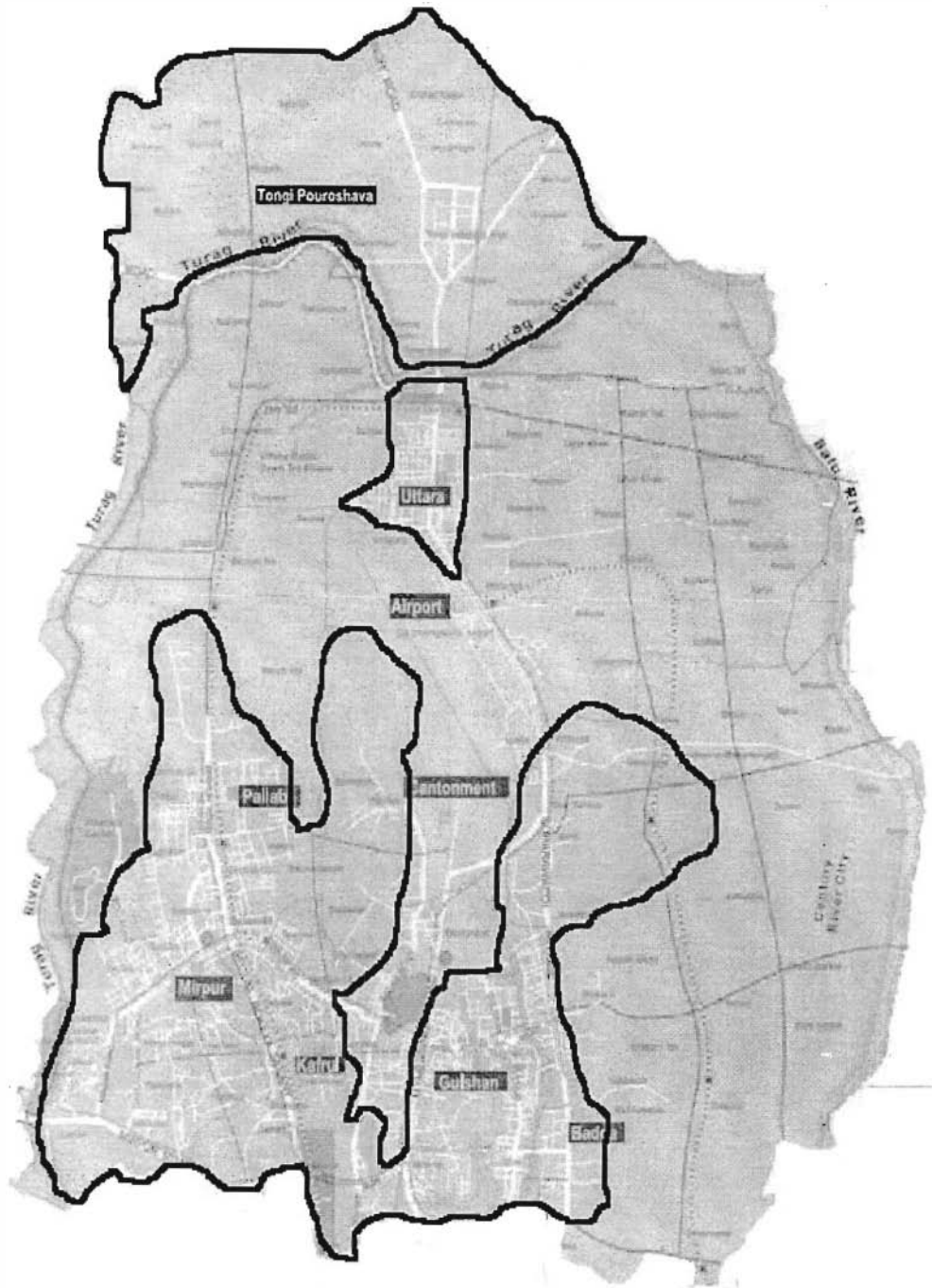


Figure 1.3: Map of DESCO Area

Undergraduate Internship



1.7 Infrastructure

Source line (33 KV)	268KM
Distribution line (11 KV)	2838 KM
No. of sub-station (33/11 KV)	21
Installed capacity	760/1064MVA
Max Demand	545 MW
Distribution transformer	4613
132/33 KV grid Sub-station	7
No of consumers	428098
System loss	9.79%
Prepaid metering	9780 Consumers
Sales and distribution division	9

1.8 Data

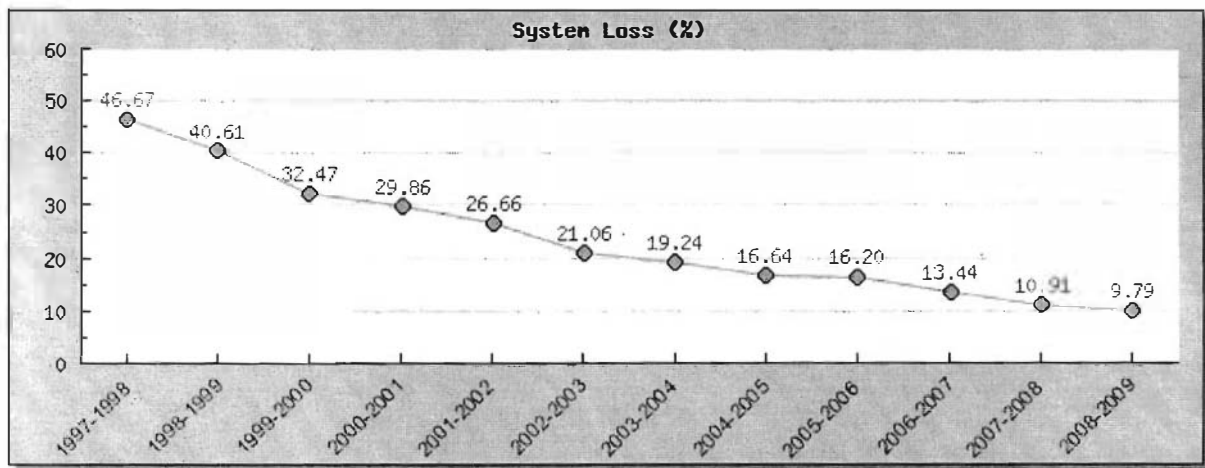


Figure 1.4: System Loss

Undergraduate Internship

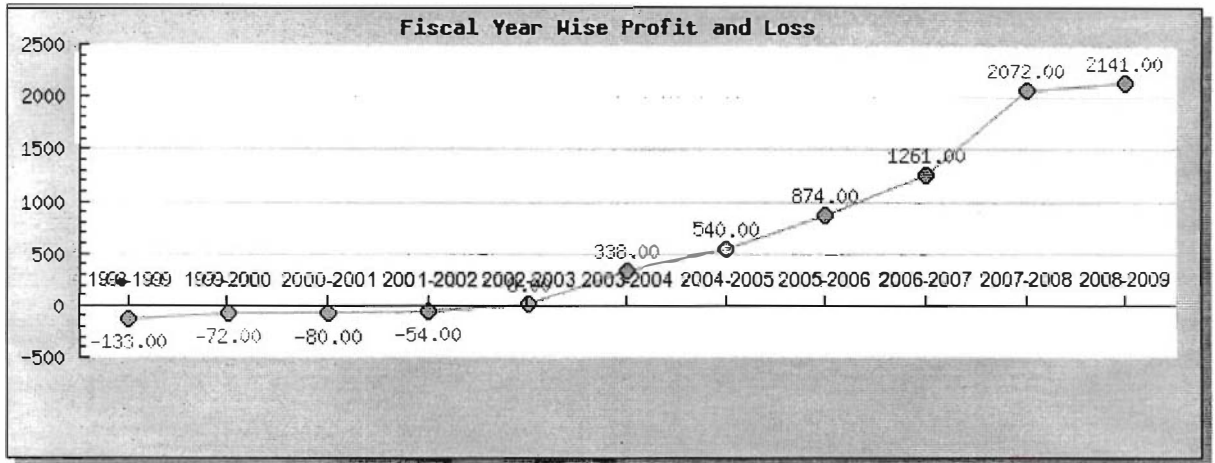


Figure 1.5: Income, Expanse and Profit

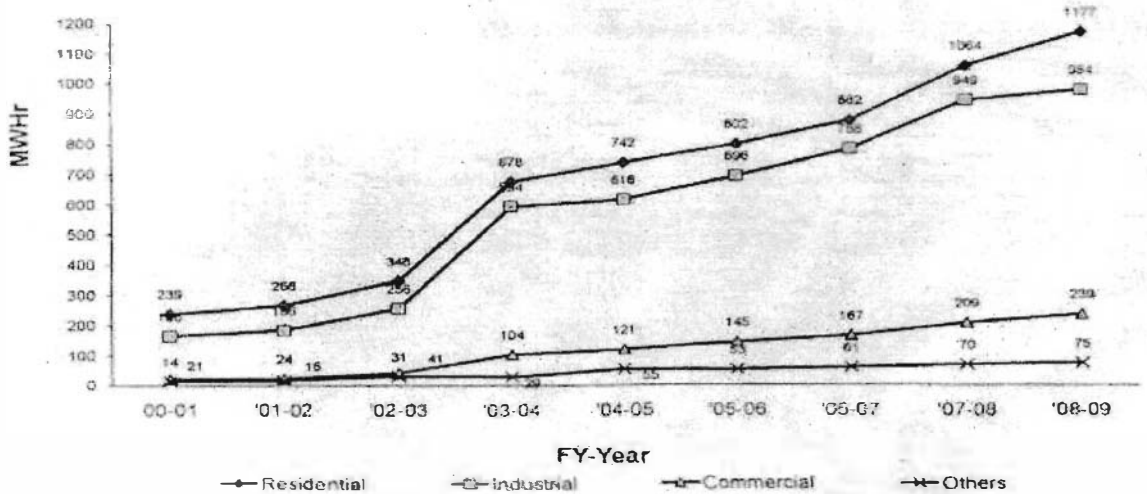


Figure 1.6: Consumption growth pattern

Undergraduate Internship

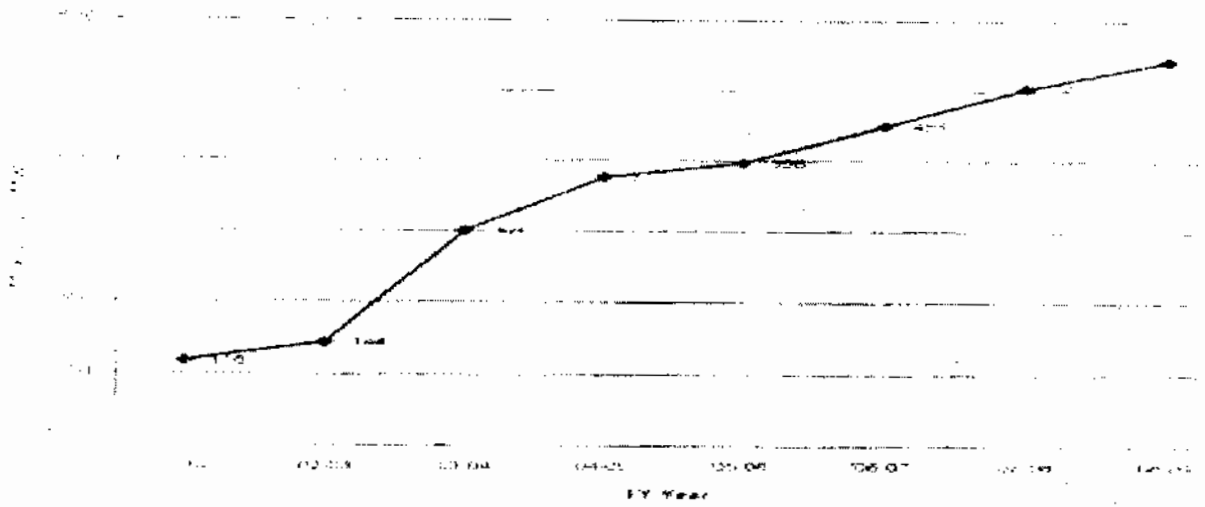


Figure 1.7: Maximum Demand

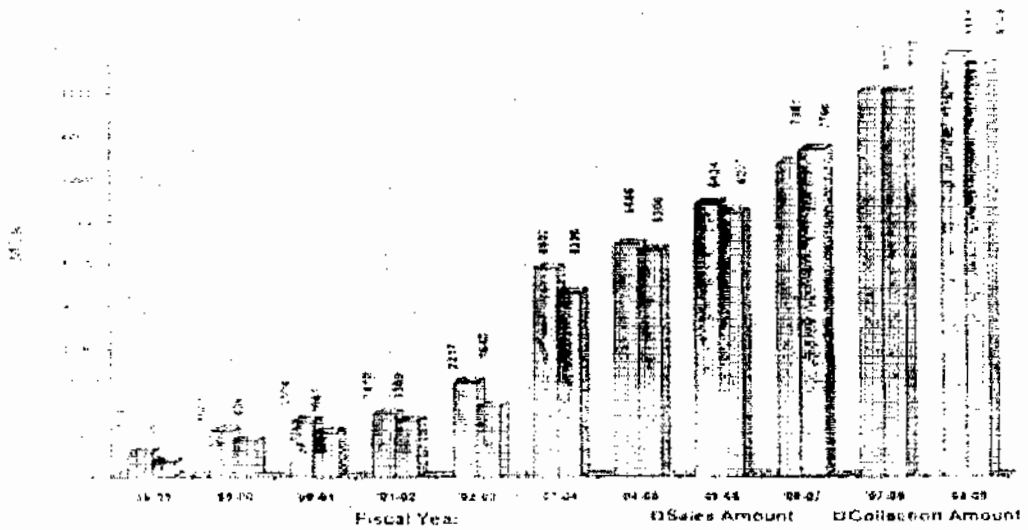


Figure 1.8: Sales and Collection

Undergraduate Internship

Yearly Report

Table 1.1: Yearly Report

Particulars	Unit	FY 2001-2002	FY 2002-2003	FY 2003-2004	FY 2004-2005	FY 2005-2006	FY 2006-2007	FY 2007-2008
Energy Import	MKWh	673.091	855.786	1739.871	1842.891	2023.223	2191.463	2573.763
Energy Sold	MKWh	493.616	675.565	1405.039	1536.310	1695.554	1897.007	2293.027
System Loss	%	26.66	21.06	19.24	16.64	16.20	13.44	10.91
Billed (Retail)	MTk	1470.034	2216.749	4902.323	5466.085	6423.744	7380.98	9094.192
Collection (Retail)	MTk	1308.979	1642.667	4305.930	5305.853	6207.451	7705.856	9095.304
Total Account Receivable	MTk	886.047	1460.129	2056.522	2216.754	2393.631	2068.755	2067.643
Collection Ratio	%	89.04	74.10	87.83	97.07	96.63	104.40	100.01
Collection/Import Ratio	%	65	58.50	70.93	80.92	80.98	90.37	89.10



2. Detail of internship work

2.1 Introduction

From the first day of our internship in DESCO we began to know about DESCO and its operation. We started our journey in DECSO on 21, January 2010, from Uttara Training Center, Uttara S&D Division, DESCO. On that day, Engr. Golam Rabbani, Manager (HRM&D), and Mr. Reazul Hossain Talukder, Asstt Manager (HRM&D), gave a welcome speech and talked about DESCO and its operation which were mainly the Company Profile. According to that talk Chapter 1 has been written. So, in this chapter, detail of internship work of after 21, January 2010, will be explained.

2.2.1 Commercial Operation

On 25, January 2010, we visited the Kallyanpur S&D Division and Pallobi S&D Division as both the divisions are in the same building. In there, Engr. A. K. M. Akhtaruzzaman, DM (Kallyanpur S&D Division) and Engr. Mohammad Shafiqul Islam, DM (Pallobi S&D Division), explained us the commercial operation of DESCO and its Billing and Collection.

According to them, co-ordination and monitoring of all support system to perform or run the system smoothly is the main function of commercial operation. Major activities of commercial operations of DESCO are operated by outsourcing.

Outsourcing Activities of Commercial Operation are:

- Collect meter reading.
- Bill distribution
- Disconnection and reconnection activity
- New meter and service drop installation
- Defective or faulty meter and service drop change
- Notice and certificate distribution.
- Consumer related data collection
- Disconnection of illegal connection.

2.2.2 Billing and Collection

On that day, after talking about the outsourcing activities the officers told us about their Billing and Collection section and showed their IT section where Bill and Collection are processed.

Undergraduate Internship

According to the given information, in billing and collection section, first a reading schedule is prepared in every month and engages meter reader to take meter reading according to the schedule. Electricity Bill is prepared according to this Meter Reading.

Meter Reading Schedules are as follows:

1. LT (Low Tension) Consumer: Normally from 05th to 25th of each month.
2. LTI (Low Tension Industry) Consumer: Normally from 26th (current month) to 05th (next month).
3. HT (High Tension) Consumer: Normally from 28th (current month) to 03th (next month).

The image shows a table titled "Meter Reading Schedule Cycle by Date". The table is organized into columns for different months and rows for different consumer categories. The text is illegible due to the quality of the scan.

Figure 2.1: Meter Reading Schedule

Meter Readings are collected through Meter Readers as per Schedule. They go from door to door of Consumers once in a month according to Schedule Date. They note down Meter Reading in a Meter Card that is preserved in Consumer end.



Undergraduate Internship

Meter Card No. _____ Pump No.: 004

Disako Electric Supply Company Ltd. (DESCO)
L.T. METER CARD

A/C No. _____ SANCTIONED LOAD KW
NAME _____ TYPE OF LOAD _____
ADDRESS _____ METER NO. _____

Date	Reading	Meter & Temperature	Comments

Figure 2.2: Meter reading Card

They also note down Meter Reading in a Meter Book which is preserved in DESCO Office.

DESCO
Meter Reading Sheet

Form No.: 005

DESCO Form No.

Date	Meter No.	Reading	Meter	Temp	Remarks	kWh
12						
11						
10						
09						
08						
07						
06						
05						
04						
03						
02						
01						
12						
11						
10						
09						
08						
07						
06						
05						
04						
03						
02						
01						

Meter No. _____ Meter _____ Date _____ Date Received _____

Name _____

Signature/Last _____

Name/Name _____

Address _____

Phone No. _____

Pin _____

Figure 2.3: Meter reading Sheet

All reading is collected from consumers end by meter reader as per reading schedule. Meter reports of faulty or defective meter are generated by meter reader. The reports are collected from meter reader and necessary actions are taken to solve this defect. After taken the meter reading, reading book is submitted to IT section within 2 days to prepare bill. After completing the bill

Undergraduate Internship

process, the printed bills are handed over to the contractor for distribution to the consumer end for payment. After every three months, meter readers are changed in DESCO area.

Bills – for electricity – should always be dated and contain the following information (usually on the first page of the bill):

- Your name and address
- Billing month
- Issue date
- Due date
- Tariff
- Zone/block
- Power Factor Correction Charge
- Transformer loss
- Demand Charge
- Service charge
- Supplementary charge
- Meter rent charge
- Your customer account or reference number (always quote this when you contact your supplier)
- The name of your supplier and its contact details
- How much you need to pay (including any money owed from previous bills) and when you need to pay by

After completion of bill distribution, contractor submits bill distribution acknowledgement sheet which is signed by consumer and motivate the consumers to pay bill within due date.

Form No. - 005

Dhaka Electric Supply Company Ltd. (DESCO)
BILL ACKNOWLEDGEMENT SHEET

Billing Month: _____

Name & Address	Phone	Signature of Consumer

Signature of Supervisor
DISTRIBUTOR

Signature of Bill
CONSUMER

Figure 2.4: Bill Acknowledgement Sheet

Undergraduate Internship



Home users can pay their electricity bill through:

- Cash payment
- Auto debit system
- Easy pay machine
- Ready Cash
- GP Auto Bills Pay

After payment of all types of bill, bank statements are collected from bank by revenue section. Verification of these bills is completed by revenue section and sends this verified bill in IT section to update data. Posted bill and collected bill are verified by IT and revenue section. At the end of the calendar year IT issued bill clearance certificates against regular payment of bill. Issued bill clearance certificates are handed over to the respective consumer to preserve.

2.2.3 One Point Service Center

On 26, January 2010, we went to the same office to know about the One Point Service Center of DESCO. In there, Mr. Akhtaruzzaman and Mr. Shafiqul Islam told us about the needs and the operation of One Point Service Center and also showed us their Kallyanpur One Point Service Center. According to the explanation of Mr. Akhtaruzzaman and Mr. Shafiqul Islam about One Point Service Center, it is found that DESCO always strives to offer excellence service to its valued consumers. DESCO also believes that customer satisfaction is the key to success of any business. As a result, DESCO introduced **CUSTOMER'S ONE POINT SERVICE CENTER** in each of the sales and distribution divisions to provide maximum customer satisfaction by attending customer's complaints from one place. Consumer complaints in terms of billing error, rectification of names and address are seriously attended in One Point Service Center. During the year 2009 10,638 bills were corrected and records of 1,629 names and addresses were rectified on receiving complaints from the consumers in One Point Service Center.

Any consumer coming to DESCO's Sales & Distribution office can get his/her desired service and solution from the ONE POINT SERVICE representatives. It covers:

- New connection
- Load extension
- Service renovation or relocation
- Billing and collection related complaints
- Reconnection of disconnected lines and other related services

2.2.4 Disconnection and Reconnection

On 27, January 2010, we visited the Kallyanpur S&D Division and Pallobi S&D Division to know about DESCO's disconnection and reconnection process from Mr. Akhtaruzzaman and Department of Electrical and Electronic Engineering, East West University

Undergraduate Internship

Mr. Shafiqul Islam. On that day, we also went with the Disconnection and Reconnection Team and with the assistance of associated officer to observe disconnection and reconnection process practically. In the field visit, we saw two disconnections and one reconnection of DESCO consumer. From the explanation about DESCO's disconnection and reconnection process and field visit, we found that DESCO's prime tool to recover dues is disconnection. Defaulting consumer service were disconnected with help of magistrate and by company's own staff. Disconnection activity continues for nonpayment of bill.

There are main four reasons for disconnection:

1. Disconnection for non-payment of electricity bill
2. Disconnection for illegal electricity used.
3. Disconnection for electric safety.
4. Disconnection for consumer demand.

Before reconnection it will be ensure that all dues are paid by consumer and complete all official formalities.

2.2.5 New Connection

On 28, January 2010, we went to the same office to know about the new connection and energy metering from Mr. Akhtaruzzaman and Mr. Shafiqul Islam. On that day, the officers also told us about temporary connection, electricity tariff, load sanction and load retention and showed us their metering section. According to the information given by Mr. Akhtaruzzaman and Mr. Shafiqul Islam, in DESCO area there are three types of consumer and the processing are short of different from each other for new connection.

Type of consumer:

1. Domestic consumer.
2. LT Commercial consumer.
3. HT Commercial consumer.

For new connection consumer have to collect application and agreement form by paying application fees.

Application fees for different connection:

Single phase (230V)	100Tk.
Three phase (400V)	1000Tk.
Three phase (11KV)	1000Tk

Some documents have to submit with application. Necessary documents are:

- Consumer's two passport size photo.
- Attested Photocopy of land paper.

Undergraduate Internship

- Design and map of house which is approved by RAJUK.
- Demand load
- House rent paper.
- Landlord's witness paper
- All previous payment documents if there are any connection.
- Temporary connection paper if there are any temporary connections.
- Wiring certificate
- Trade license
- Map of the connection place
- Design paper and details of power factor improvement plant

If the demand load is equal or above 50KW

- Design paper of substation of the connection place.
- Single line diagram
- Meter box room
- All the test report of the equipment of the installed substation

For industrial Connection

- The approval notice from environment office.
- The approval notice from fire service.

After processing those papers DESCO S&D division send an investigation team to the location for investigation. the office. After approval of new connection office issue a demand note for consumer. pay the demand charge and service charge and deposits.

Demand charge for load:

Single phase for tariff A	375 Tk. per KW
Three phase for tariff A	550 Tk.
Single phase/three phase for tariff C	600 Tk.
Three phase for tariff F	375 Tk.

After completion of all the processes DESCO give connection to the consumer within 7 days and the deposits will be adjusted with the monthly bill.

2.2.6 Load Sanction

From the information given by the officers, we found that DESCO maintain a flow of process for new connection. Load the beginning consumer give a list of load and apply for a load which is called demand load. After that DESCO investigation team goes to the location for investigation and verifies the load point. For load sanction DESCO maintains a calculation rule.

Undergraduate Internship



2.2.7 Temporary Connection

After telling about the new load sanction the officers told us about the temporary connection. Temporary connections are taken by consumers in construction period. Consumers have to collect application form from one point service center by paying fees for temporary connection.

Temporary connection application form fees:

Single phase (230V)	250Tk.
Three phases (400V)	1000Tk.

After that consumers must install meter board and grounding rod for temporary connection. Then consumers have to submit some extra documents with application paper at one point service center.

Documents are:

- Application and agreement form with sign of author or land owner.
- Photocopy of payment receipt.
- Attested photo of consumer.
- Photocopy of paper of land.
- Map of the location
- Paper of holding number which is given by RAJUK.
- Approved plan copy.

After processing those papers, DESCO send an investigation team to the location for investigation. They submit a report to the office. After approval of temporary connection, office issues a demand note for consumer. Consumers have to pay the demand charge and service charge and deposits. Demand charge and service charge are double of normal demand charge and service charge for temporary connection and deposits fees is equal to the cost of unit charge of 6 hour per day. After completing all the processes DESCO give connection to the consumer within 7 days and the deposits will be adjusted with the monthly bill.

Unit charge for temporary connection:

230/400V user
Per Unit charge= Double of Tariff E (flat rate)

2.2.8 Electricity Tariff

According to the given information by the officers, there are ten types of electricity tariff. These are:

Undergraduate Internship

Category - A : Residential light and power

Applicable to the electricity service through a single watt hour meter for lighting and appliances used in a dwelling place including related grounds and buildings, having sanctioned load up to 50 KW.

Category - B: Agricultural pumping

Applicable to the electricity service through a single watt hour meter for irrigation and drainage of the land for the purpose of cultivation, having sanctioned load up to 50 KW.

Category - C: Small industrial

Category-C is applicable to the electricity service through a single watt hour meter for small industry, where articles or substances are produced, adopted, manufactured, altered, repaired, ornamented, finished, packaged or treated from raw materials with a view to their use, sale, transport, delivery and disposal having a sanctioned load up to 50 KW.

Category - D: Non-residential light and power

Applicable to the electricity service through a single watt hour meter for hospitals, educational institutions, religious & charitable establishments and all classes of consumers other than those specified under category A, B, C, E & J having sanctioned load up to 50 KW.

Category - E: LT Commercial

Applicable to the electricity service through a single watt hour meter for offices, trading and commercial enterprises such as shops, businesses, hotels & cinema halls, having sanctioned load up to 50 KW.

Category - F: Medium voltage general purpose (11 KV)

Applicable to the electricity service through energy and demand meters for all classes consumers having sanctioned load up to 5 MW, where the consumer provides his own sub-station, including transformer, high tension control, protection and power factor correction equipment.

Category - G: Extra high voltage general purpose (132 KV)

Applicable to the electricity service through energy and demand meter for all classes of consumer receiving power at 132 KV having sanctioned load above 15 MW upto 50 MW, where the consumer provides his own sub-station including transformer, high tension control, protective and power factor correction equipment.

Category - H : High voltage general purpose (33 KV)

Applicable to the electricity service through energy and demand meter for all classes of consumers other than REB/PBS receiving power at 33 KV, having contracted load up to 15 MW other than REB/PBS where the consumer provides his own sub-station, including transformer and high tension control, protective and power factor correction equipment. In absence of maximum demand meter the maximum demand of the

Undergraduate Internship

consumers' categories G2 & H may be calculated-as follows :

- 100% for the first 75 KW of Connected Load
- 85% for the next 75 KW of Connected Load
- 75% for the next 75 KW of Connected Load
- 65% for the next 75 KW of Connected Load
- 60% for the rest

Category-I : High voltage bulk supply for rural electrification of board

Applicable to the electricity service through energy and demand meter for REB/PBS receiving power at 33 KV, having contracted load up to 15 MW, where the consumer provides his own transformer, high tension control, protective and power factor correction equipment.

Category- J: Street light and water pumps.

Applicable to the electricity service through a single watt-hour meter for Municipality, WASA and Public Health for the purpose of street lighting and drinking water pumping stations having sanctioned load up to 50 KW.

Table 2.1: Tariffs and Rates

Consumer Category	Range	Rate/KWh	Charges		
			Demand	Service	Minimum
Domestic Category-A	000-100 KWh 101-400 KWh 401 & above for all units in KWh	Tk. 2.50 Tk. 3.15 Tk. 5.25	Tk. 10.00 Per KW sanctioned load	Tk. 5.00 Per month for single phase &Tk 25.00 per month for 3-phase	Tk. 100 Per month
Agricultural Pumping Category – B	Flat	Tk. 1.93	Tk. 35.00 Per KW Per month (for sanctioned load above 30 KW)	1 Phase Tk. 5.00 3 Phase Tk.25.00 per month	Tk. 125.00 Per H. P. (per month during season)
Small Industry Category-C	Flat Peak Off peak	Tk. 4.02 Tk. 5.62 Tk. 3.20	Tk. 35.00 Per KW per month sanctioned	Tk. 60.00 per month	Not applicable

Undergraduate Internship

			load (above 40KW)		
Non-Residential Category-D		Tk. 3.35	Tk. 10 Per KW of sanctioned load	1 Phase Tk. 5.00 3 Phase Tk.25.00	Tk. 100
Commercial Category-E	Flat Peak Off peak	Tk. 5.30 Tk. 8.20 Tk. 3.80	Tk. 20.00 Per KW Per month (for sanctioned load above 40 KW)	Tk. 5.00 Per month for single phase &Tk 25.00 per for 3-phase	Tk. 125 Per KW of sanctioned load per month
Medium Voltage 11 KV General Category-F	Flat Peak Off Peak	Tk. 3.80 Tk. 6.73 Tk. 3.14	Tk. 40.00 Per KW of sanctioned load per month	Tk. 350.00 per month	Tk. 80.00 Per KW sanctioned load but not less than Tk. 8000.00 per month
Extra High Voltage 132 KV General Category-G	Flat 2300-0600 hrs 0600-1300 hrs 1300-1700 hrs 1700-2300 hrs	Tk. 2.82 Tk. 1.49 Tk. 2.48 Tk. 1.66 Tk. 5.52	Tk. 35.00 Per KW of sanctioned load.	Tk. 80.00 Per KW sanctioned load	Tk. 60.00 Per KW of connected load
High Voltage 33 KV General Category-H	Flat Peak Off Peak	Tk. 3.58 Tk. 6.45 Tk. 3.03	Tk. 35.00 Per KW of sanctioned load per month	Tk. 400.00 Per month	Tk. 80.00 Per KW of connected load
Category-I-1	REB 1)132KV 2)33KV	Tk. 2.34 Tk. 2.05	Not Applicable	Tk. 400.00	Not Applicable

Undergraduate Internship

	- Economically unsolvent	Tk. 2.05			
	- Economically Margin	Tk. 2.39			
	- Economically solvent				
Category-I-2	DESCO -132KV -33KV	Tk. 2.34 Tk. 2.39	Not Applicable	Tk. 400.00	Not Applicable
Category-I-3	WZPDCL -132KV -33KV	Tk. 2.34 Tk. 2.39	Not Applicable	Tk. 400.00	Not Applicable
Category-I-4	Distribution Of BPDB -132KV -33KV	Tk. 2.34 Tk. 2.39	Not Applicable	Tk. 400.00	Not Applicable
Category-I-5	Distribution Company in Future -132KV -33KV	Tk. 2.34 Tk. 2.39	Not Applicable	Tk. 400.00	Not Applicable
Street Lights & Pump Category-J		Tk. 3.86	Tk. 35 Per KW sanctioned load	Tk. 200.00	Not Applicable

2.2.9 Load Retention

The officers also told us about load retention. They told us that when consumers need to increase their demand load then the term is called load retention. For load retention, consumers have to pay load retention fees, agreement changing fees, demand charge fees, service charge fees. If the service and meter are needed for changing the load, consumers also have to pay for this. After all the process completed load will be increased in 7 days.



Undergraduate Internship

2.2.10 Energy Metering

After telling about load retention Mr. Akhtaruzzaman and Mr. Shafiqul Islam told us about energy metering and showed us their metering section. According to the information of Mr. Akhtaruzzaman, Mr. Shafiqul Islam and the metering section staff, an energy meter is a device that measures the amount of electrical energy consumed by a residence, business, or an electrically-powered device. Electric meters are typically calibrated in billing units, the most common one being the kilowatt hour. Periodic readings of electric meters establish billing cycles and energy used during a cycle.

Type of Energy Meter

According to the data processing there are two type of energy meter using in DESCO

- Analog energy meter
- Digital analog meter

According to phase there are two types of energy meter

- Single phase energy meter
- Three phase energy meter

According to the elements there are two types of energy meter

- Two elements energy meter
- Three elements energy meter

According to CT and PT there are two types of energy meter

- Whole current energy meter
- CT/PT operated energy meter

Accuracy Class of Meter

Accuracy class of a meter indicates the difference between meter energy consumes and actual energy consume. E.g. A meter is class 2 meter

Actual energy consume = meter Energy consume \pm 2%

According to the class of meter there are 5 types of energy meter:

- Class 2 meter
- Class 1 meter
- Class 0.5 meter
- Class 0.2 meter
- Class 0.

Undergraduate Internship

2.2.11 Complain Center

On 31, January 2010, we visited the Kallyanpur S&D Division and Pallobi S&D Division to know about the complain center of DESCO from Mr. Akhtaruzzaman and Mr. Shafiqul Islam. On that day, we also visited Agargaon Complain Center. According to the information of the officers and the complain center staff, in DESCO there are 9 complaining Center. Those are in Kalyanpur, Pallbi, Kafrul, Gulshan, Baridhara, Uttarra, Dokhinkhan, Tongi east, Tongi west.

There are two type of complain

1. Technical complain.
2. Commercial complain

Technical complain

All the technical complains of DESCO are solved by technician gang. There are several teams in DESCO. All the gangs are operated by contractor. When consumer give any complain to complain center, the operation officer note this complain and pass the information to the technician gang by wireless. DESCO try to give best service to the consumer for that reason complain center try to solve the entire problem in 1 hour. Types of problem, duration of solve the problem, contractor name, etc. information is stored by operation manager.

There are 3 types of technical gang:

1. Breakdown technical gang
2. Maintains technical gang
3. Servicing technical gang

Commercial complain

Commercial complain are solved by one point service center.

2.3.1 Overview of Substation

On 1, February 2010, we went to the Uttara 33/11 KV substation, Uttara S&D Division, to know about their substation, operation and maintains of substation. In there, Engr. Khandoker Istiaque Ahmed, AM (Grid and Protection), told us about the substations of DESCO and showed us Uttara 33/11 KV substation. According to the information given by the officer, we found that in distribution side, a sub-station is a subsidiary station of distribution system where voltage is transformed from high to low using transformers. Electric power may flow through several substations between generating plant and consumer, and may be changed in voltage in several steps.

A sub-station has a step-down transformer which decreases the voltage while increasing the current for domestic and commercial distribution. Substations generally have switching,

Undergraduate Internship

protection and control equipment and one or more transformers. Substations may be on the surface in fenced enclosures, underground, or located in special-purpose buildings. High-rise buildings may have several indoor substations. Indoor substations are usually found in urban areas to reduce the noise from the transformers, for reasons of appearance, or to protect switchgear from extreme climate or pollution conditions.

Type of Substation

In distribution side, there are three types of sub-station

1. Grid substation.
2. 33/11 KV Substation.
3. Distribution Substation.

Grid Substation

Grid substation takes power from grid line and distributes it to 33/11KV substation.

33/11 KV Sub-station

A 33/11 KV sub-station transfers power from the grid substation to the distribution area. It is uneconomical to directly connect electricity consumers to the high-voltage main transmission network, unless they use large amounts of power, so the distribution station reduces voltage to a value suitable for local distribution. The input for a 33/11 KV substation is typically come from at least two grid sub-stations or 33/11 KV substation. Input voltage for 33/11 KV sub-station is 33KV is common in DESCO. The outputs are a number of feeders. Distribution voltages are typically medium voltage 11KV. The feeders will then run overhead, along streets or under streets, in a city and eventually power the distribution transformers at or near the customer premises. Besides changing the voltage, the job of the distribution substation is to isolate faults in either the transmission or distribution systems.

Distribution Substation

Distribution substations are placed in the load end. Distribution substations are take power from 11KV feeder and step down it to 0.4 KV for distribution purpose.

2.3.2 Function of Substation

The officer told us about the function of substation. He told us that an important function performed by a substation is switching, which is the connecting and disconnecting of transmission lines or other components to or from the system. Switching events may be

Undergraduate Internship

"planned" or "unplanned". A transmission line or other component may need to be reenergized for maintenance or for new construction; for example, adding or removing a distribution line, a transformer or new connection. To maintain reliability of supply, no company ever brings down its whole system for maintenance. All work to be performed, from routine testing to adding entirely new substations, must be done while keeping the whole system running.

Perhaps more importantly, a fault may develop in a distribution line or any other component. Some examples of this: a line is hit by lightning and develops an arc, or a tower is blown down by a high wind. The function of the substation is to isolate the faulted portion of the system in the shortest possible time.

2.3.3 Equipment of Substation

After telling about the function of substation, Mr. Istiaque showed us Uttara 33/11 KV substation. At that time, he also explained different equipments and parts of substation. According to those explanations we knew the following information about different equipments and parts of substation.

Lightning arrester

A lightning arrester is a device used on electrical power systems to protect the insulation on the system from the damaging effect of lightning. The typical lightning arrester also known as surge arrester has a high voltage terminal and a ground terminal. When a lightning surge or switching surge travels down the power system to the arrester, the current from the surge is diverted around the protected insulation in most cases to earth. It's diverting the high voltage surge to earth and maintain continuity during normal voltage.

Advantage:

- Freedom from persistent arcing grounds.
- The voltages from healthy phase with respect to neutral are established by neutral earthing.
- The neutral earthing is useful in discharging over voltage due to lightning to the earth.
- Simplified design of earth fault protection.
- The grounded system requires relatively lower insulation levels as compared with ungrounded systems.

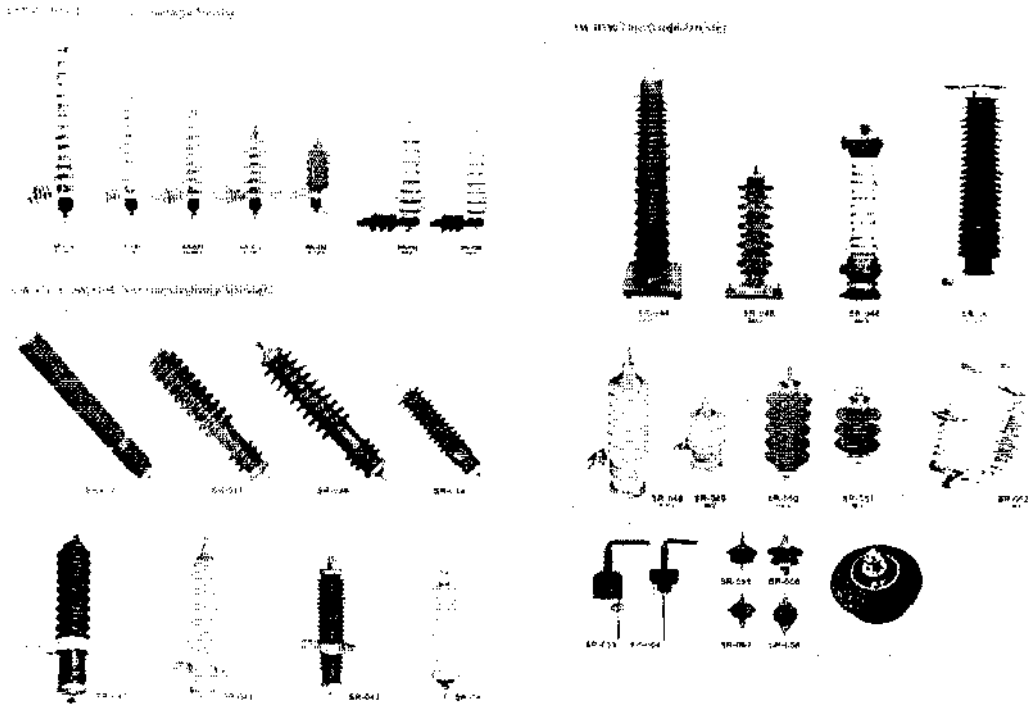


Figure 2.5: Different type of lightning Arresters

Low Pass Filter

Low pass filter is using for communication purpose. It is connected in series with the power (transmission) line. It blocks the high frequency carrier waves (24 KHz to 500 KHz) and let power waves (50Hz - 60Hz) to pass through. It is basically an inductor of rating in mili Henry. The collected frequency are used for internal or external communication pupose of sub-station.

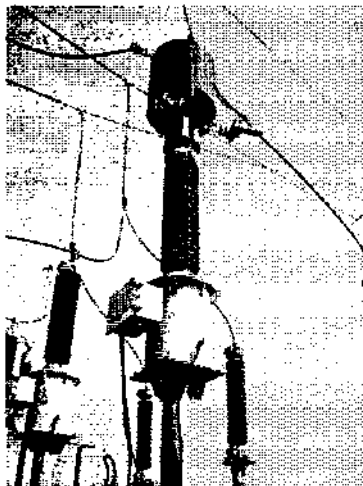
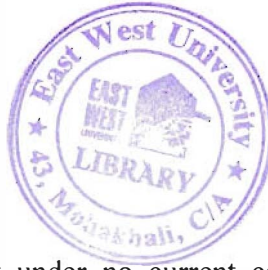


Figure 2.6: Low Pass Filter and Voltage Transformer



Isolator

Isolator is used to disconnect a circuit under no current condition. There are two isolators installed along with circuit breaker. One is before circuit breaker and other is after the circuit breaker. The circuit breaker is shut down before opening the isolator. After opening the isolator, the earthing switch must be closed to discharge the trapped electrical charges to the ground.

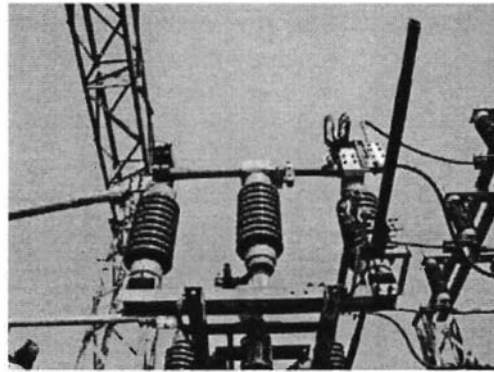


Figure 2.7: Isolator

In DESCO there are two type of isolator:

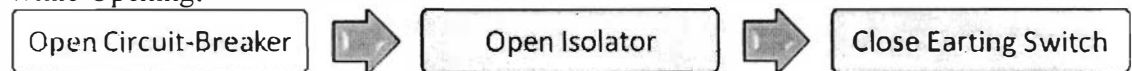
1. Vertical break type.(33KV)
2. Horizontal break type.(33KV,132KV)

Earth switching

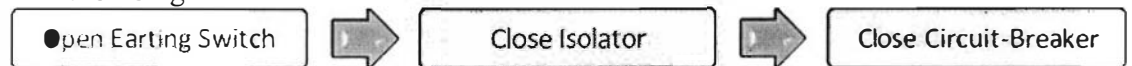
Earth switching is used to discharge the voltage on the lines to earth after disconnecting the source. Earth switching is connected between the line and the earth. Normally it is open. When the line is disconnected, the earthing switch is closed so as to discharge the voltage trapped on the line.

Sequence of operation of earth switching:

While Opening:



While Closing:



There are also some subsystem used for earthing the substation equipment

1. Earth Mat
2. Earthing Spikes
3. Earthing riser

Undergraduate Internship

Those earthing system are used for connecting neutral points, equipment body, and support structures to earth. For safety of personnel and for enabling earth fault protection to provide the path for discharging the earth current from neutrals, faults and surge current.

Current Transformer

Current transformers are used for transforming the current to a lower value for the purpose of measurement, protection and control. Three pole current transformers are used in three phase line. Each physical unit of current transformer contains three current transformers in it.

Those are used for:

1. Measurement
2. Protection relay
3. Differential relay

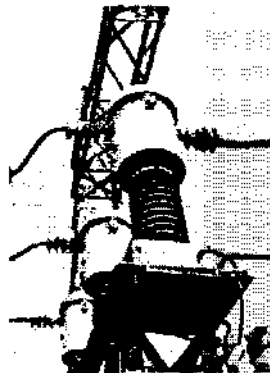


Figure 2.8: Current Transformer

Potential transformer

Potential transformers are used for stepping down the voltage for the purpose of protection, measurement and control.

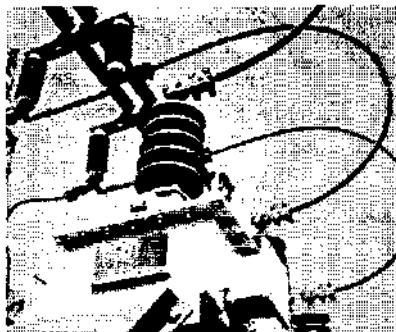


Figure 2.9: Potential Transformer

Undergraduate Internship



Bus-bar

In DESCO there are 3 types of bus- bar used in substation

- Single bus-bar
- Duplicate bus-bar
- Sectionalization of bus-bar

Circuit Breaker

A circuit breaker is a switching and current interrupting device in switchgear. The circuit breakers are used for switching during normal operation condition for the purpose of operation and maintains, switching during abnormal conditions such as short circuits and interrupting and fault currents.

Basically a circuit breaker comprises a set of fixed and movable contacts. The contacts can be separated by means of an operating mechanism. The separation of current carrying contact s produces an arc. The arc is extinguished by a suitable medium such as dielectric oil, air vacuum, and SF6 gas. A circuit breaker suitable for three phase system is called triple pole circuit breakers.

Operation:

When a fault occurs in the protected circuit, the relay connected to the CT and PT actuates and closes its contact .current flow from the battery in the trip circuit. As the tip coil of the circuit breaker is energized, the circuit breaker operating mechanism is actuated and it operates for the opening operation.

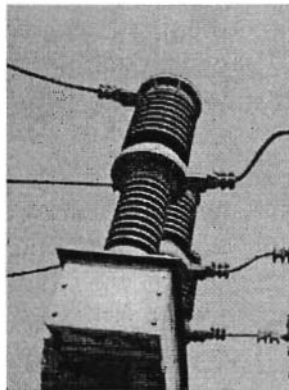


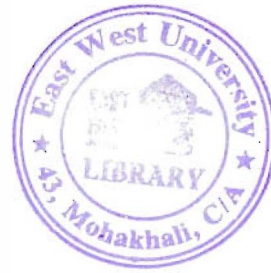
Figure 2.10: Circuit breaker

There are 3 Operating zone of circuit breaker:

- Sub-transient state
- Transient state
- Steady state

There are three type of circuit breaker

Undergraduate Internship



1. Oil filled circuit breaker
2. SF6 Gas filled circuit breaker
3. Vacuum circuit breaker

Protection and Switching Components

Protection and switches are installed at each voltage levels at every switching point for normal routine switching , control ,monitoring and automatic switching during abnormal and faulty operating condition such as short circuits, under voltage and overloads.

Protection and switching components which are commonly used in a substation:

- Light arrester
- Isolator
- Earth ground
- Circuit breaker
- Relay
- Switchgear board

Protection relays:

The fault current can damage the equipment and supply instruments, if allowed to flow for a longer duration. In order to avoid such damage every part of the power system is provided with a *protective relay system*. The *protective relay can automatically sense the fault and send instruction to the associated circuit breaker to open*.

Types of protection relay:

There are three types of relay used in DESCO sub-station.

Electromechanical relay

The electromechanical relays are based on the comparison between operating torque and restraining torque. Each relay unit can perform only one protection function.

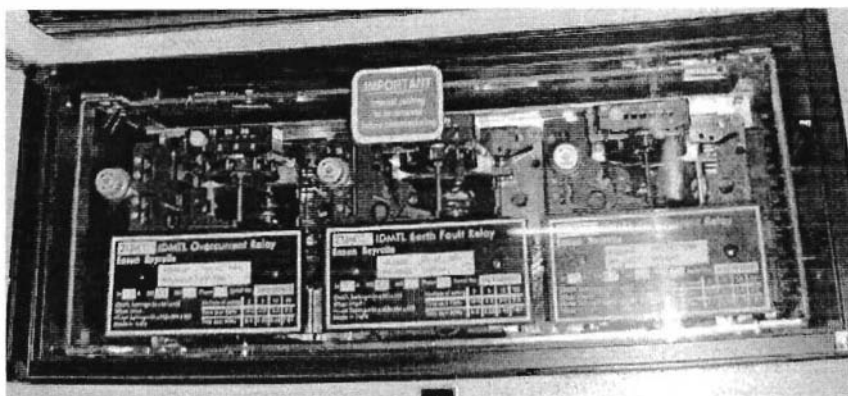


Figure 2.11: Electromechanical Relay

Undergraduate Internship

Static relay

In static relay the sensing, comparison and measurement are made by static circuit having no moving parts. A single relay can perform ten or more different protective functions thereby reducing the number of separate relays and increasing reliability.

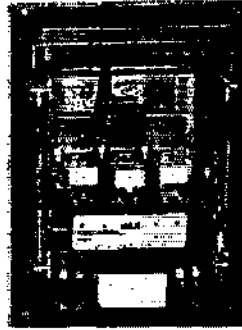


Figure 2.12: Static Relay

Microprocessor controlled relay

Now a day, all the new switching panels are using microprocessor controlled relay. In DESCO substation, new control panels are controlled by microprocessor based relay. There are many functions and protection systems are executed in microprocessor controlled relay.

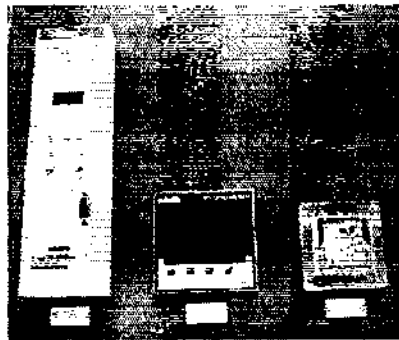


Figure 2.13: Microprocessor Based Control Panel

Different purpose of protection relay

- Earth fault relay
- Over current relay
- Transformer winding temperature alarm relay
- Transformer oil alarm relay
- Buchholz trip relay
- Transformer oil level relay
- Transformer pressure trip relay
- Transformer Tap changer control relay



Undergraduate Internship

- Oil temperature relay
- Trip circuit supervision relay
- Trip relay
- Circuit breaker spring charge fail relay
- Differential trip relay

Transformer

The important equipment of a substation is transformer. In a substation power transformer are used for step down the voltage. On load tap changing transformer are used in substation and off load tap changing transformer are used in distribution sub-station.

The different classes of power transformers are:

- o.n.: Oil immersed, natural cooling
- o.b.: Oil immersed, air blast cooling
- o.f.n.: Oil immersed, oil circulation forced
- o.f.b.: Oil immersed, oil circulation forced, air blast cooling

Mainly ONAN/ONAF cooling system transformers are used in DESCO power system.

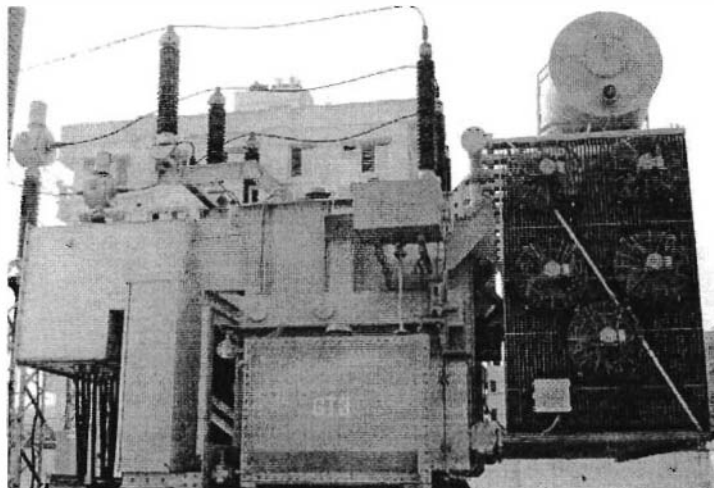


Figure 2.14: Power Transformer

Parts of transformer

Tap changer:

Tap changer are used for changing the tap of transformer. In substation, the voltage levels are controlled by tap changer.

Undergraduate Internship

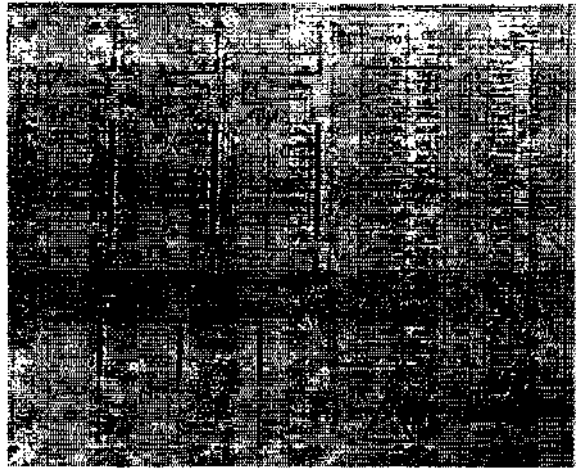


Figure 2.15: Tap Changing Instruction

Cooling system:

All transformers have two voltage rating, one is normal operation condition voltage and other is cooling system ON condition voltage. Cooling system are used for cooling the oil and winding of transformer.

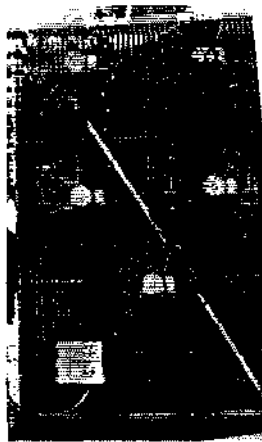


Figure 2.16: Cooling Fan

Conserver:

Conserver stores the cooling oil of transformer.

Silica gel:

Silica gels are used to suction the moister of tap changer and winding of the transformer.

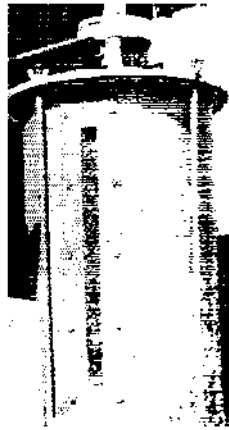


Figure 2.17: Silica Gel

Temperature meter:

Temperature meter indicate the winding and oil temperature of the transformer.

Switching panel

Switching panel is most important part of a substation. There are Energy meter, volt meter, ammeter, protection relay, circuit breaker, bus bar and fault indication light in a switch panel. Mainly incomer, distribution feeder and protection relay panel are used in DESCO sub-station.



Figure 2.18: Switching Panel

Undergraduate Internship



DC Source

DC Sources must be needed in a substation for operating the protection equipment and measurement equipment. In DESCO substation 48 V DC are used in communication system of SCADA and DAS and 110V DC are used in measurement and protection equipment. Every substation has a DC battery source. To convert the AC voltage to DC voltage, a converter is used in substation. Converter converts 415V AC to 110V DC and store in the battery.

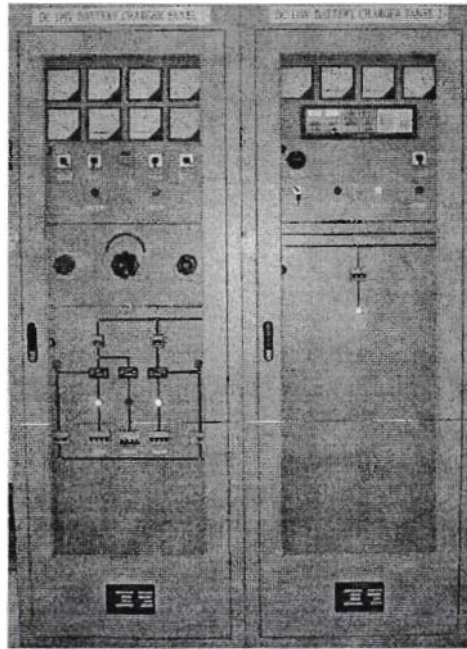


Figure 2.19: DC 110V Battery Charger Panel

Automation

The computer automation system is controlled by load control center to ensure the control of national grids and control of voltage, frequency power and wave form under prevailing and ever changing load conditions.

Fault and Abnormal Conditions

A fault in electrical equipment is defined as a defect in its electrical circuit due to which the current is diverted from the intended path. Faults are generally caused by breaking of conductors or failure of insulation. The other causes of failure include mechanical failure, accidents, and excessive internal and external stresses. The fault impedance is low and the fault current relatively high. It can damage the faulty equipment and the supply installation. During the fault, the voltages of the three phases became unbalanced.

Undergraduate Internship

There are many AC fault. A few of them are:

- Single line to ground fault
- Double line to ground fault
- Three phase fault
- Line to line fault
- Simultaneous fault
- Open circuit
- Voltage and current unbalance
- Under frequency
- Temperature
- Instability
- Over voltage
- Reversal of power
- Power swings

Operating zone:

The fault current varies with time. There are 3 zones.

Sub-transient state

This zone in which the current is high and decreases of is current very rapidly is called the Sub-transient state

Transient state

In this zone, the decreases of current are less rapid. This region of slow decreases in the short circuit current is called the transient state. The circuit breakers operate during the transient state.

Steady state

In this zone, the r.m.s value of the short circuit currents remains almost constant.

Communication

DESCO management uses those communication systems for communication.

- Power line carrier communication channel
- Pilot wire communication
- Microwave communication
- Fiber optics communication

Undergraduate Internship

Inter Connection Power System

In an interconnected zone network, the national load control centre determines the exchange between regional zones. During the low frequency, high load the region imports power from adjacent surplus region. During low load/high frequency, the region exports power. During the period of need, a region imports power from adjacent region and maintain stability and frequency.

The transient stability limit of each region is increased without increasing the installed capacity as the rotating reserve of adjacent region is used by inter connection.

LDC

A Load Dispatch Center (LDC) is designed to supervise a high voltage grid system. For smooth operation of power system network such as switching operation of the transmission lines, increase or decrease of generation, control of feeders for load shed, a central monitoring & controlling authority is essential who take the necessary measure /decision according to system condition. Central load dispatch (CLDC) coordinates between generation, transmission & distribution system in normal operation for safety, security, reliability and economic operation of power system. CLDC of PGCB performing the above mentioned activities successfully from the very beginning.



Figure 2.20: LDC

The LDC project has been established by the Bangladesh Power Development Board to monitor the the generation and X-mission systems in 1986, at siddhirgonj.



Undergraduate Internship

SCADA

A PC based SCADA (Supervisory control and data acquisition) system was installed at Biddut Bhavan to give the modern technical support for the system operation in 2001.

2.3.4 Maintenances of Substation

Mr. Istiaque also told us about the maintenances of substation. He told us, in DESCO, routine and schedule maintenances of substation are done by the maintains technical gang.

There are several step are followed in this maintains task

- Analyze the performance record of each equipment
- Cleaning and drying
- Check the oil of transformer or breaker by megger
- Check all the connection
- Check all the fuses
- Check earth connection
- Check transformer silica gel
- Check transformer's winding and cooler temperature
- Check the relay
- Check the indication light
- Check the pressure of SF6 circuit breaker
- Check the DFC fuse
- Check the jumper

2.4.1 Operation of Prepaid Meter

On 2, February 2010, we again visited Uttara S&D Division. In there, Engr. Mohammad Raihan Habib, DM (Prepaid Metering Pilot Project), told us about the operation of prepaid meter in DESCO area. We also went for a field visit to know about the consumer part of prepaid meter. In the field visit, we visited Uttara S&D Division vending station and visited a consumer's house. According to the information given by Mr. Habib, we found that their prepaid meter utilizes card technology that allows customers to put money on smart card which is then inserted and removed from the prepaid meter. The meter reads a chip in the card and ensures that only the amount of electricity that has been paid for be available to the customer. customers can recharge their smart cards by making payment at DESCO's vending station.

Undergraduate Internship

Mr. Habib told us that at that time, they were supplies electricity to sectors 4, 6, 8, 1, 3 and 7 of Uttara using prepaid meter and work to launch the prepaid meters in sectors 5, 13 and 14 of Uttara were in progress.

Advantage of prepaid meter

During the field visit, we knew about the advantage of prepaid meter. Those are,

- Customers receive hassle-free services.
- Are becoming aware about the misuse of power.
- DESCO can monitor the meter condition by reading the information of meter parameters in the smart card during the recharge.
- Customers also get a two per cent rebate in usage of the pre-paid meters.

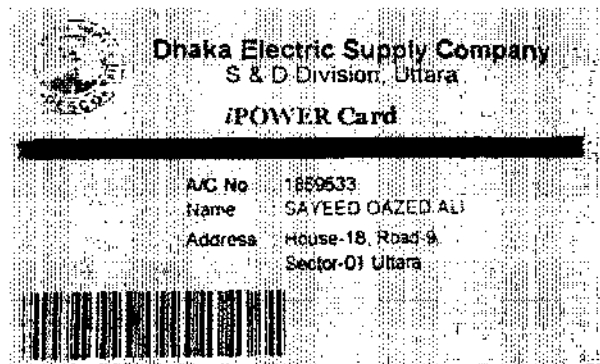


Figure 2.21: Prepaid Card

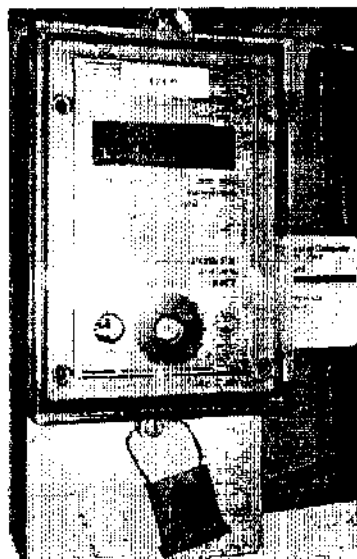


Figure 2.22: Prepaid Meter



Undergraduate Internship

2.5.1 E-Governance

On 3, February 2010, we visited CP&MIS Division, DESCO H/Q. In there, Mr. Mamunur Rashid, DM (CP&MIS), told us about the e – governance of DESCO and also showed different parts of their e – governing software. According to the given information by Mr. Rashid, IICT, BUET developed their e-governance software. Using that software DESCO is able to automate most of their works.

Important parts of the E-Governance process are:

1. Customer Management System.
2. Bill Generation and Collection System.
3. Local and Central Store Management System
4. Maintain the substation by DAS.
5. New Connection.
6. One Stop Service point.

2.5.2 Customer Management System

DESCO management working procedures are making faster by e-governance. Consumers don't need to go from table to table for service. They just drop complains or needs at one point service center. One point service center enters their problems in database and passes it to exact officer for process. In this e-governance there is no need of paper and extra man power to pass the consumer's paper. If officer needs any information about consumers, he or she can get it from e-governance.

2.5.3 Generation and Collection System

IT and revenue department are using e-governance for bill entry, bill print and revenue entry. There are several steps that are followed for this process. When meter readers submit their bill books, IT stuffs input all the meter readings to a database by the e-governance software. They maintain block and zone for inquiry. After entry of meter reading, it is checked again for accuracy. Then IT officer print the bill according to zone, and distribute it to contractor for bill distribution. Revenue department collect the bill from bank and make a several bundle for each bank, verify that the total amount collected from bank and the total amount of bill are same. Then submit it to IT for revenue entry. IT stuffs again input all the paid bills information to the database by the e-governance software and after that these all are checked by he IT officers to know that the total amount of the bundle and total amount of entry are same or not.

Undergraduate Internship

5.4 Local and Central Store Management System

DESCO is a large utility company in Bangladesh that provides electricity connection and sells electricity to the consumers. This company has nine Sales and Distribution offices and one head office. It is important to synchronize all the data. For that reasons DESCO maintain a central server and local server for data store. By E-governance, DESCO store all the data in local server and also in central server. It is easy for management officer to get any information about consumers. DESCO management also observes all activities of officer. E- Governance also store data about officer working activities.

5.5 Maintain the Sub-station by DAS

DAS (Data Acquisition System) is a SCADA type system which is implemented by DESCO.

5.6 New Connection

E-Governance software is being used for processing consumer's information, new connection documents, load sanction. First consumer applies for new connection in one stop service point. Officer of one stop service point store the consumer information and needs in e-governance software and pass it to new connection related officer for processing.

5.7 One Stop Service point

In one stop service point all complains of consumers are noted down in e- governance software and pass it to accurate officer to solve the problem.

6.1 Technical Activities, Major Projects and Future Plans

On 4, February 2010, we visited SE&D Division, DESCO H/Q, to meet Engr. MD. Shah Alam, GM (SE&D). In there, after the meeting, two officers briefed us about their technical activities, major projects and future plans. According to given information by them, to provide electricity to the consumer DESCO established distribution line from sub-station to consumer end. And to establish effective distribution line, consecutively DESCO is planning for new network and also upgrading the existing network.



of Planning

some steps which are following for distribution planning in DESCO.

Survey and Preparation of Topology Maps

step for planning a distribution line is to make a topology map of concerned area. and planning division of DESCO are using auto cad for digitization of the topology map.

atures indicated in a topology map, are
oads, lanes, by-lanes, pavements.

tries to permanent building from roads and pavements.

ghways, Railway tracks.

nbankments.

vers and canals.

ench marks.

esidential and commercial areas.

umber of overhead power lines pole and towers of 132/33KV.

/11KV Sub-stations.

/4KV Distribution Sub-station.

Existing Systems and Compilation on Maps

's demand of power is increasing day by day. Project and planning division of DESCO
vely upgrade their existing system. For upgrading an existing system, project and
division of DESCO survey the distribution line equipment, distribution substation and
substation of concerned area and compiled on topology maps.

Loads and Load Forecast

lways plans for providing best service to consumers. To assume a future demand of
DESCO uses the last 10 years of the sub-station log book to determine the present
11 KV substation, maximum load, and load forecast and load of all 11KV feeders.

recast, DESCO analyzes some important information:

vious 10 years and present load of 33/11KV sub-station and 11KV feeder.

vious 10 years data of consumer number, energy import and sales.

lication pending for new connection.

ected feeder's growth rates that are suggested by DESCO.

graduate Internship

Information of expected bulk loads.

Sample survey for estimating demand and collecting the future expected load demand data.

Two types of demand forecast that are made by DESCO:

For 5 years for distribution planning.

For 10 years for 33/11KV sub-station and 33KV sub-transmission lines.

Planning of 33/11KV Sub-station

Some criteria that are maintained for planning of 33/11KV sub-station:

Existing capacity and firm capacity of substation

Shifting of load from over loaded existing substation on adjacent substation.

Addition or replacement of transformer for increasing substation capacity.

Try to install substation in load center.

Modification or extension of control room building, equipment, foundation, and cable trenches etc.

Planning of 33 KV Sub-transmission Line

Design and planning division of DESCO maintain some criteria for planning 33KV sub-transmission lines:

Project and planning division of DESCO maintain some standard design parameter for maximum voltage drop, system loss, and conductors.

Forecast demand up to 10 years.

Reliable incoming source for new 33/11 KV sub-station.

Addition of 33KV feeder to the existing substation for sharing the load of over loaded feeder.

Increase reliability of the existing feeders.

Multiple feeding facilities from different source.

Co-ordination between the substations.

Easy maintenance of the feeder.

Planning of Distribution Network

Considerations for distribution planning are:

To cater load demand up to next 5 years.

To minimize interruption of power supply.

To create facilities for new consumers.

Undergraduate Internship

- To minimize technical losses to acceptable limits.
- To limit voltage drop to the following maximum figure at points farthest from supply point.

33KV system	1%
11KV system	3%
400/230 V System	4%
Service Drop	1%

- Analysis of load flow, voltage drop, system loss.

Preparation of Staking Sheet

Information of staking sheets:

- Feeder name.
- Substation name.
- Feeder section .
- Map reference and location.
- Pole numbers.
- Pole height and type.
- Pole top assembly, type and no.
- Transformer with KVA rating.
- Guy assembly, type and no.
- Span length, HV and LV conductor size and Length.
- Right of way.
- Other line equipment.

Preparation of Bill of Quantities (BOQ)

In this term DESCO project and planning division estimate the quantities of material to establish distribution network.

Estimate for Supply of Material and Workers

Estimation depends on bill of quantities (BOQ) and planning. Project and planning division of DESCO first estimate the present price of materials available in DESCO or other organizations and Latest rate for construction. Then make a price list.

Postgraduate Internship

Preparation of Tender Documents for Supply of Material and Workers

It is to maintain the rule of public procurement regulation 2003 for tender and for technical specification of material are maintained by BPDB or DESCO.

Preparation of Engineering Report

After processing all previous steps, Project and planning division of DESCO submit the engineering report.

Contents of engineering report:

Full details of the existing 33/11KV sub-station.

33KV sub-transmission lines.

11KV and 11.4 KV distribution network including the description of the latest condition of loading.

Numerical description of physical facilities, physical condition of substation and line and immediate requirement of replacement or repair.

Planning and design criteria based on approved guideline.

Loss reduction criteria to be proposed for acceptance by DESCO

Planned system to meet the future load.

Bill of quantities of planned system in summarized form.

Cost estimate.

Implementation Schedule

There are several stages in implementation schedule:

Invitation of tender for supply of materials.

Tender evaluation and award of contract for supply of material.

Delivery of material to the site.

Invitation of tender for construction works.

Tender evaluation and award of contract for construction work.

Execution of construction work

Testing and commissioning.

On-going Project

The on-going project of DESCO are:

Installation and upgrading of 33/11KV Sub-station

- Strengthening electric distribution network of DESCO
 - ❖ New sub-station
 - Baunia 2*20/28MVA
 - DOHS, Mirpur 2*20/28MVA
 - ❖ Upgrading capacity
 - Mirpur Old 1*10/14MVA
 - Kafrul 1*10/14 MVA

- Upgrading and expanding distribution system in Gulshan Circle
 - ❖ New
 - Aftabnagar 2*20/28MVA
 - Bashundhara 2*20/28MVA+1*10/14MVA
 - CAAB 2*20/28MVA
 - DOHS Mohakhali 2*20/28MVA
 - ❖ Rehabilitation
 - Uttara 2*20/28MVA+1*10/14 MVA
 - ADA 2*20/28MVA

33KV network planning for 33/11 KV Sub-station

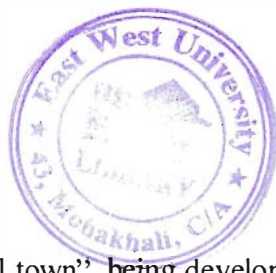
Every substation has at least two main sources, one from grid and one standby source from another grid. There are also interconnections between two substations through overhead or underground cable which is used as an alternative source for substation. Now, DESCO is planning to replace all overhead line by underground line and making a ring network between substations.

11KV underground line planning for feeder and switching station

DESCO is planning for 11 KV underground feeder lines for switching station and HT consumers.

Future Project

Plan for Extension of DESCO area:



Purbachal Model Town Project

A new area named “Purbachal model town”, being developed by RAJUK in north east of DESCO area on eastern bank of Balu River under Narayanganj District, has been decided to include in DESCO’s jurisdiction. The electrical network development for this area will be taken up by DESCO. The load demand of Purbachal model town is expected to be about 500MW in the year 2020. To keep pace with load growth and consumer strength, DESCO will create adequate facilities in Phases by taking up new projects.

Uttara 3rd Phase Project

A new area named “Uttara 3rd Phase” being developed by RAJUK in DESCO’s geographical area. The electrical network development for this area is under planning stage. The load demand of “Uttara 3rd Phase” is expected to be about 140MW in the year 2030.

Future Sub-station

Banana new	2*10/14 MVA
Niketon	2*10/14 MVA
Mirpur(section-6)	2*10/14 MVA
Kazipara	2*10/14 MVA
Purbachal	2*10/14 MVA

Future Infrastructures

Line (33 KV)	350KM
Transmission line (11 KV)	3652 KM
Sub-station (33/11 KV)	31
Installed capacity	1240/1736MVA
Load demand	830 MW
Substation transformer	6047
11 KV grid Sub-station	10
Household consumers	692500
Line loss	8.5%
Advanced metering	210000 Consumers
Substation and distribution division	17

Prepaid Meter Production Unit

February 2010, we also visited the Prepaid Meter Production Unit at 2 pm. according to changed schedule. In there, on be half of Engr. Md. Akharul Islam, Manager (Prepaid Meter Production Unit), one of his officers described the prepaid meter and its construction with power slides and also showed us their Prepaid Meter Production Unit. He told us that in order to maintain the continuous supply of prepaid meter in future, DESCO has set up their “Prepaid Meter Production Unit” at Mirpur with the technical assistance of IICT, BUET.

Structure of Prepaid Meter

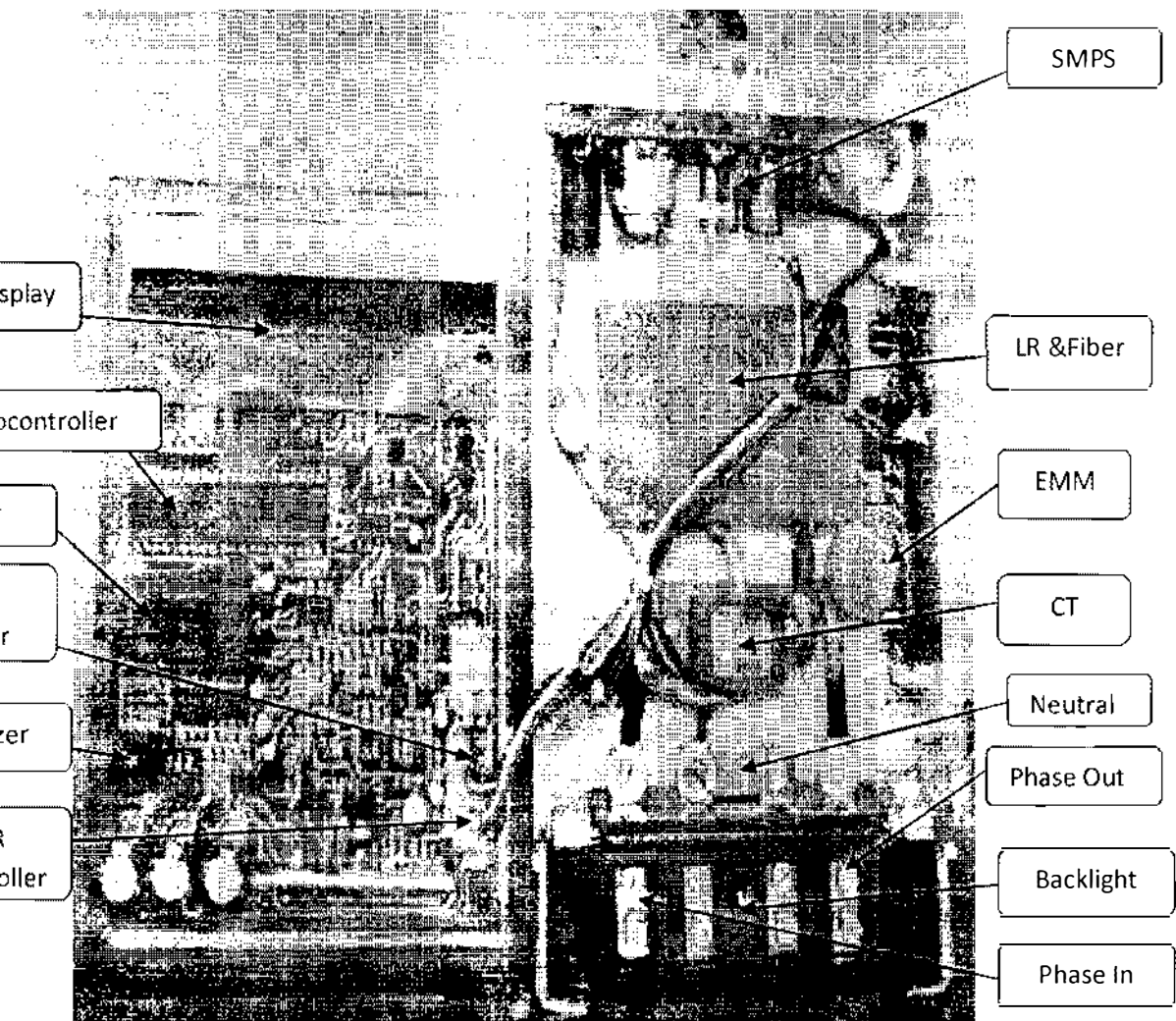


Figure 2.23: Internal Structure of a Prepaid Meter



Undergraduate Internship

SMPS:

It's used as a DC power supply. It converts from 230V AC to 12V DC for running meter operations.

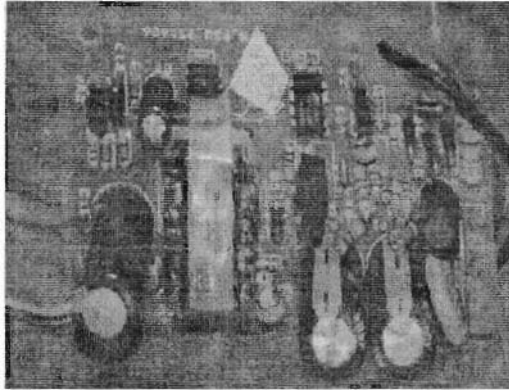


Figure 2.24: SMPS

Current Transformer (CT):

In prepaid meter CT is using to decrease the current level for measurement purpose.



Figure 2.25: Current Transformer (CT)

Smart Card Reader:

Smart card reader is used in prepaid meter for read or writes the data in prepaid card chip from microcontroller.



Figure 2.26: Smart Card Reader

Switch relay:

Switch relay are using in prepaid meter for disconnect the current supply. It's working as a circuit breaker.

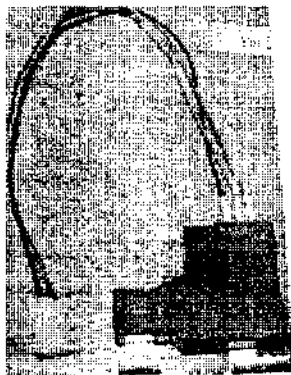


Figure 2.27: Latch Relay

LED display:

LED display is used in the prepaid meter for watching the information like unit, Ampere, Voltage, Power factor, maximum demand.

Microcontroller:

Microcontroller are using in the prepaid for countdown the unit, calculation and meter operation.

ime chip (RTC):

s used in prepaid meter for countdown and also for calendar.

:

is used to convert the CT output from analog to digital pulse.

r:

r is using for giving warning to consumer for recharge the card.

Sealing

Maximum demand seal

Body seal

Terminal cover seal

TT cover seal

Testing of Energy meter

O S&D divisions have energy meter testing lab.

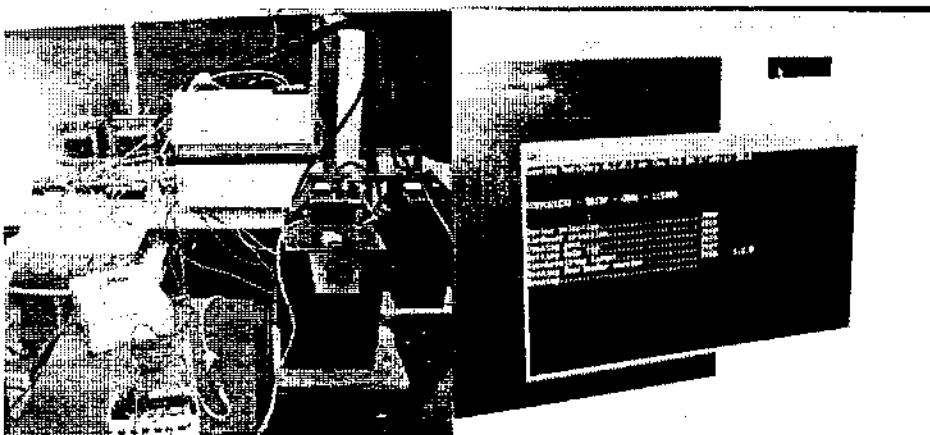


Figure 2.28: Energy Meter Testing Lab

Operation of Bashundhara Grid Station

On 07, February 2010, we went to the Bashundhara Grid Substation of DESCO to know about the operation of Bashundhara Grid Substation. In there, Engr. Golam Mowla, AM (Grid and Protection), showed us the Bashundhara Grid Substation and explained its operation. Grid substation takes power from grid line and distributes it to 33/11KV substation. He told us in Bangladesh three voltage levels (230KV, 132KV and 66KV) are considered as grid voltage. Bangladesh Electricity Distribution Company in Dhaka takes power from 230KV and 132KV grid line. Now DESCO has two grid substations in Uttara and Bashundhara. Other sub-stations of DESCO are connected with other grid sub-station.

The grid sub-station takes power from grid line at rated voltage 132KV or 230KV and steps it down to 33KV by power transformer. Then it distributes the power by overhead or underground cable. Grid substation sometimes controls 33/11 KV substation for grid protection.

Sales and Distribution

On 08, February 2010, we went to the Tangi (West) S&D Division of DESCO to know about sales and distribution operation. In there, Engr. Mirza Abu Nasher, DM, Tangi (West) S&D Division, explained us about their sales and distribution operation. He told us that there are nine sales and distribution offices in the DESCO area. Sales and distribution division mainly controls the commercial operation and technical operations. Most of the activities of sales and distribution are done by outsourcing.

There are two types of operation in sales and distribution division

- Commercial operations

- Technical operations

Commercial Operations

Commercial operations are done by both DESCO officers and outsourcing.

The processing for temporary connection, new connection, load sanction, load retention, complaints attend, printing out bill, revenue collection and load management are completed by DESCO officer. Reading collection, bill distributions are done by outsourcings.

Technical Operations

Management, controlling the control room, power factor monitoring are done by DESCO officer. Substation and line maintains, new connection, equipment setup, servicing are done by outsourcing.

Postgraduate Internship

Temporary and New Connection

February 2010, we went to the Tangi (West) S&D Division to know about temporary and new connection. In there, Engr. Md. Golam Faruk, AM (System Operation), Tangi (West) S&D Division, explained us about the topics. As Tangi is an industrial area, he mostly told us about temporary and new connection of industries (e.g. HT Connection) and showed us different kinds of official documents of the HT consumer related to new connection. According to the explanation of Mr. Faruk we found that the processes of temporary and new connection of industries are all most same to the temporary and new connection covered in chapter 2.2.5 and chapter 2.2.7. Some extra papers and requirements need to be fulfilled for HT connection. These

1. Demand load is equal or above 50KW

2. Design paper of substation of the connection place.

3. Single line diagram

4. Meter box room

5. All the test report of the equipment of the installed substation

6. Industrial Connection

7. The approval notice from environment office.

8. The approval notice from fire service.

Load Sanction and Load Retention

February 2010, we went to the Tangi (West) S&D Division to know about the load sanction and load retention from Mr. Faruk. He showed us different kinds of official documents of HT consumer related to load sanction and load retention and told us about the topics. What about load sanction and load retention has been covered in chapter 2.2.6 and chapter 2.2.7.

Load Management

February 2010, we went to the Tangi (West) S&D Division to know about the load management and control room activities from Mr. Faruk. According to him in Bangladesh, the demand energy is higher than generation energy. To fill up this energy gap, load management is necessary. Every day the S&D officer make a schedule of load shedding for load maintenance and control room. Holyday shifting is another type load management. In this kinds of load management holyday of different commercial area is shifted to different day to maintain load.



Control Room Activities

On that day, Mr. Faruk also told us about the control room activities. He told us that the control room controls the load shedding and feeder. All the technical gangs must be requested to control for shutting down any feeder for maintenance or service. The control room also controls the substation.

In the SCO, there are four control rooms

- Mirpur control room
- Gulshan control room
- Uttara control room
- Tongi control room

Line Maintenance

In February 2010, we went for a field visit in the Tangi area with Mr. Faruk to observe their line maintenance work.

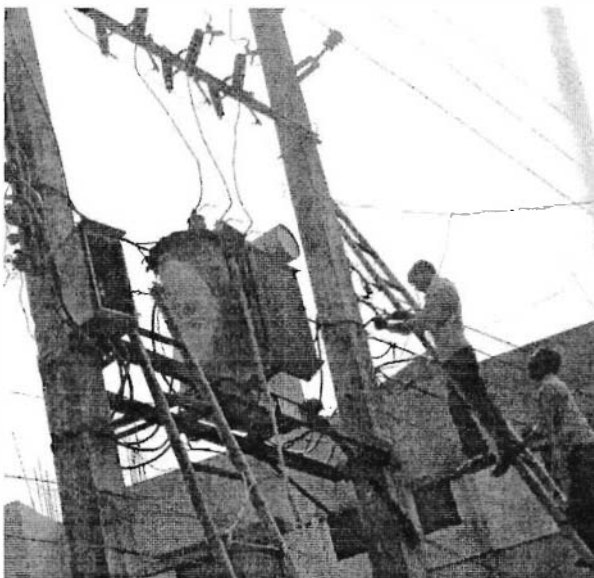


Figure 2.29: Line Maintenance

Power Factor Monitoring and Upgrading

In February 2010, we went to the Tangi (West) S&D Division to know about the power factor monitoring and upgrading from Mr. Faruk. According to him, because of the HT consumer's load type the approximately unity power factor of DESCO is hampered. That is why,

consumers are charged for their bad power factor and requested to build PFI units. Mr. Faruk showed different kinds of official documents related to the PFI units.

1 New Control Panel

On 16, February 2010, we visited a substation beside Tangi (West) S&D Division with Mr. Faruk to observe a newly coming uninstalled control panel.



Figure 2.30: Switching Panel

of switching panel:

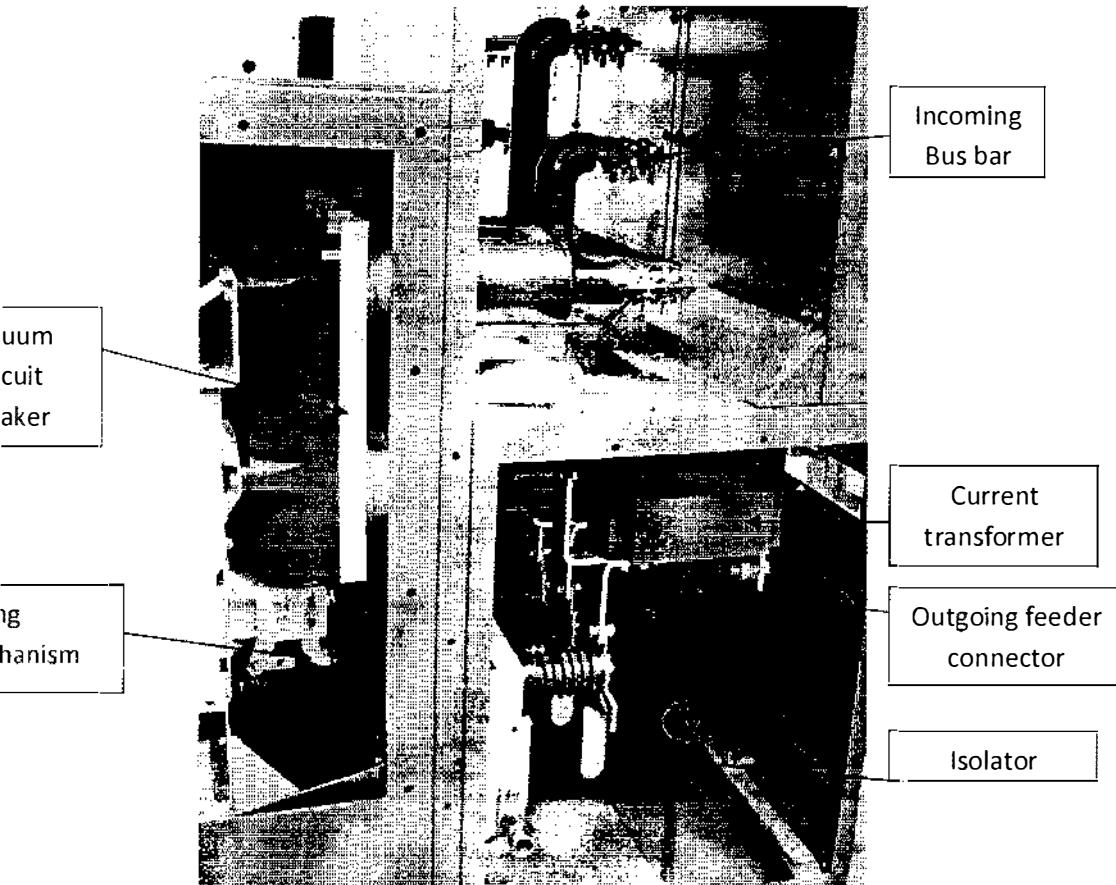


Figure 2.31: Inside of Switching Panel

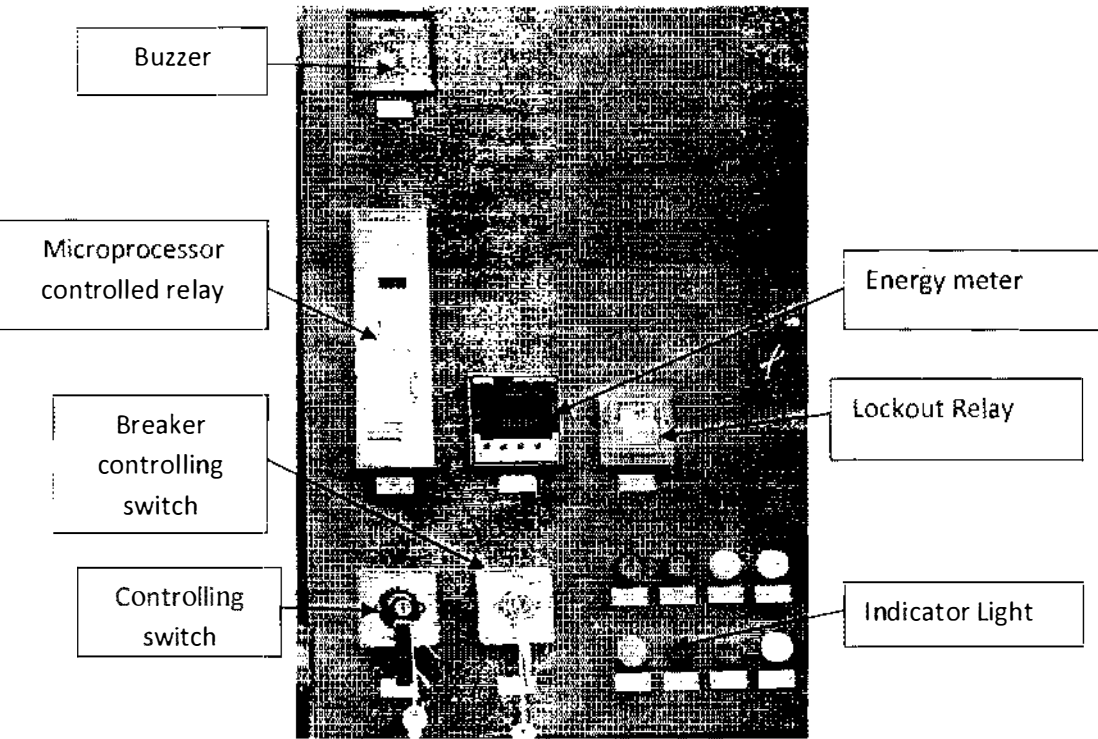


Figure 2.32: Front View of Control Panel

2.1 Substation Maintenance

On 17, February 2010, we visited one substation in Tangi area with Mr. Faruk to observe their substation maintenance work. In there, we observe oil changing process of a oil circuit breaker also observe how to measure dielectric strength of the transformer oil with migger.

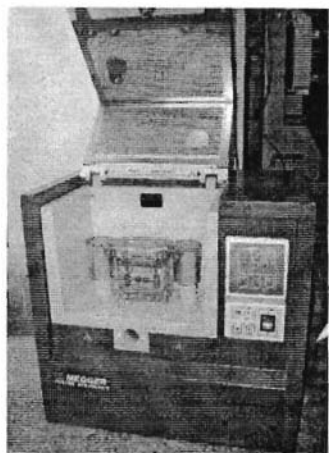


Figure 2.33: Migger



Figure 2.34: Oil Centrifugal Machine

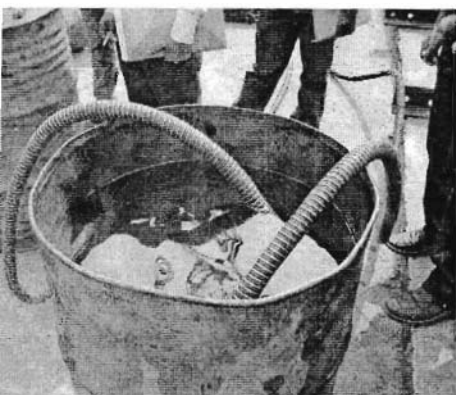


Figure 2.35: Oil Centrifuging

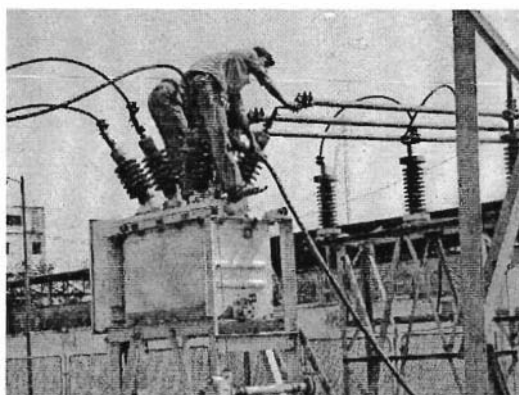


Figure 2.36: Changing of Breaker's Oil

Wireless and Telecommunication Unit and DAS

February 2010, we visited same substation beside Tangi (West) S&D Division with Mr. [Name] to observe their wireless and telecommunication unit and DAS. According to him DESCO [Name] their communication by using land phone, wireless and fiber optics telephone with the [Name] control rooms and LDC etc. He also told us that in some of their substations, [Name] stations and grid substations has SCADA unit. But, in every substations and grid [Name] stations, they have their own Data Accusation System (DAS). He told us that the power [Name] and maximum demand of the electricity network needs a strong monitoring and [Name]

Graduate Internship

power management. That is why; DESCO has implemented a data Acquisition System which helps to monitor real time load status of the network and helps to implement load shading. Data acquisition system is integrated with remote terminal unit for data and computer server network. The technical assistance along with the software is provided by Bangladesh University of Engineering Technology (BUET).

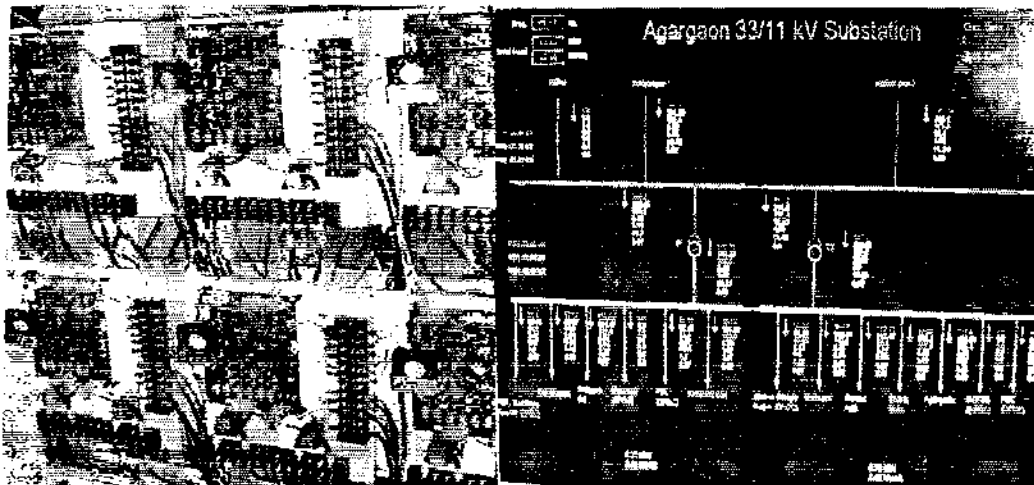


Figure 2.37: DAS

Report Submission and Certificate Collection

In February 2010, we submitted our internship reports to the HRM&D Division, Head Office, DESCO, and collected our certificates.

3. Conclusion

Conclusion

DESCO is one of the most stable power distribution companies of Bangladesh which has minimum amount of system loss. As a result it collects maximum revenue among all other power distribution companies of Bangladesh. After taking training from this company we get a brief idea about its successful operation. In our internship we knew about DESCO's commercial operations, technical operations, maintenance work, major projects and future plans. During the training we got the chance to observe some maintenance work, such as circuit breaker maintenance work, line maintenance work and also got the chance to visit DESCO's Prepaid Production Unit. Although the DESCO officers and staffs were very helpful we got little chance to operate substation machineries due to the real time nature of substations.

From this training we will gain the advantage on our career in power sector. We have also become interested to work in a power distribution company like DESCO. In Bangladesh, the production of energy is less than consumer demand. Along with the Bangladesh government companies of power sector are trying to recover this energy gap. Recently "day light saving" project has been completed to consume less energy. Now the management of power sector is trying to improve the power factor and reduce the transmission loss. We think, to reduce energy consumption, DESCO should increase awareness of electrical device using among consumers in the consumer's level.



References

- 1] www.desco.org.bd
- 2] DESCO Annual Report-08
- 3] <http://www.bpdb.gov.bd/>
- 4] <http://www.pgcb.org.bd/>
- 5] <http://www.banglapedia.org/httpdocs/english/index.htm>
- 6] http://en.wikipedia.org/wiki/Electrical_substation
- 7] By field inspection data during internship period.
- 8] Power system Analysis 2nd Edition by Arthur R. Bergen & Vijay Vittal
- 9] Modern Power System Analysis 3rd edition By I.J. Nagrath & D.P. Kothari.