Study on Pallabi Supply & Distribution Division (DESCO)

Internship is submitted in partial fulfillment of the requirements for the Award of Degree of

Bachelor of Science in Electrical and Electronic Engineering

Submitted By

Md. Mehedi Pervez

ID: 141-33-1741

&

Utshob Sarkar

ID: 141-33-1862

Supervised By

Professor Dr. M. Shamsul Alam
Dean

Faculty of Engineering

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

OCTOBER 2018

DECLARATION

This is to certify that this project and thesis entitled "**Pallabi Supply & Distribution Division (DESCO)**" is done by the following students under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering. The presentation of the work was held on 15 May 2018.

Signature of the candidates

_____

Name: MD. Mehedi Pervez

ID #: 141-33-1741

_____

Name: Utshob Sarkar

ID #: 141-33-1862

Countersigned

_____

Dr. M. Shamsul Alam
Professor and Dean
Department of Electrical and Electronic Engineering
Faculty of Engineering
Daffodil International University.

We hereby declare that this report on **“ Pallabi Supply & Distribution Division (DESCO),”** submitted by **Name: Md. Mehedi Pervez**, ID No: 141-33-1741 and Utshob Sarkar, ID: 141-33-1862, Session: Spring 2014 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of **Bachelor of Science in Electrical and Electronic Engineering**

BOARD OF EXAMINERS

_____

Dr. Engr. … Chairman
Professor
Department of EEE, DIU

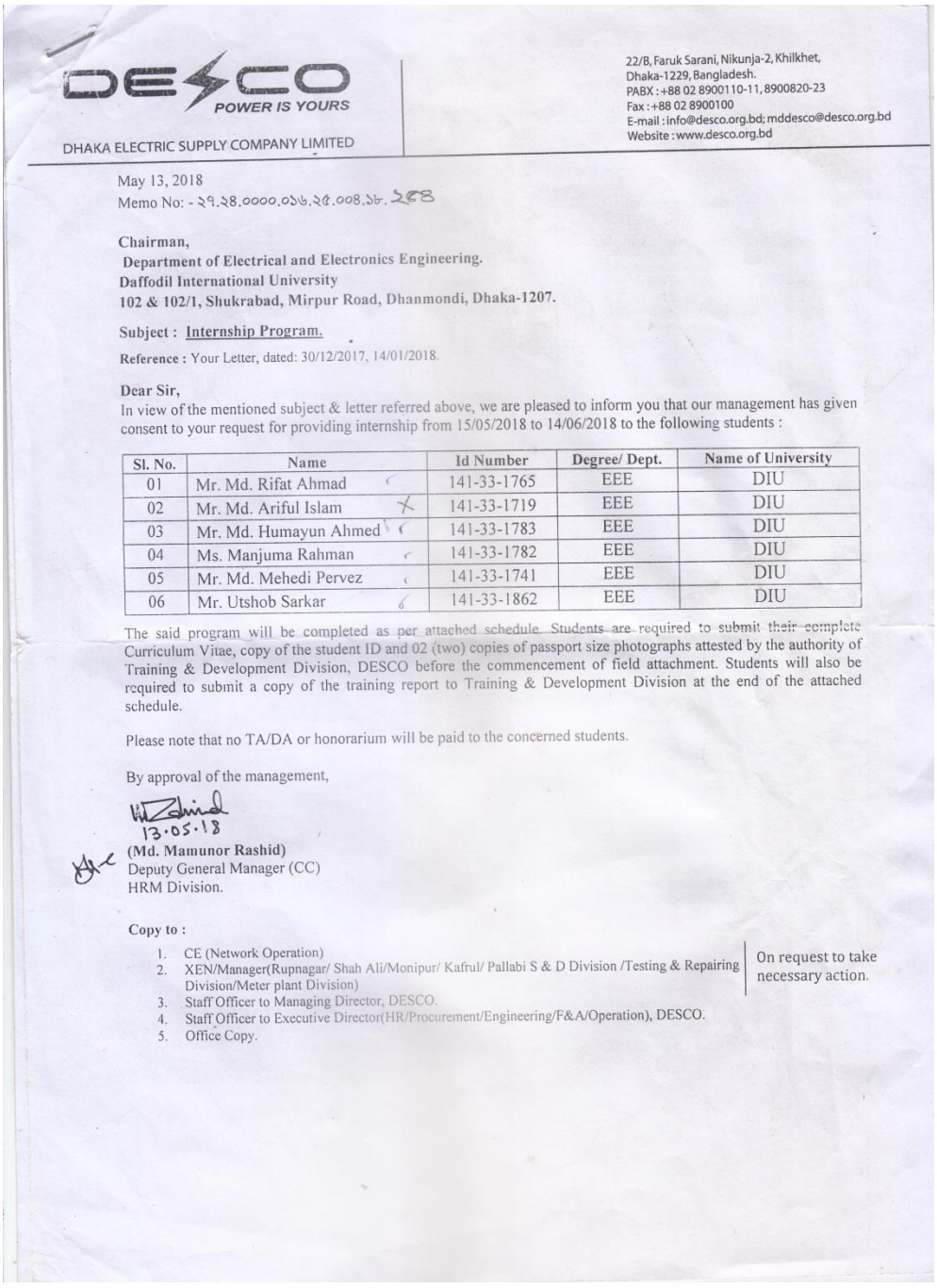
_____

Dr. Engr. --- Internal Member
Professor
Department of EEE, DIU

_____

Dr. Engr. --- Internal Member
Professor
Department of EEE, DIU

APPROVED LETTER



DESCO
POWER IS YOURS

DHAKA ELECTRIC SUPPLY COMPANY LIMITED

22/B, Faruk Sarani, Nikunja-2, Khilkhet,
Dhaka-1229, Bangladesh.
PABX : +88 02 8900110-11, 8900820-23
Fax : +88 02 8900100
E-mail : info@desco.org.bd; mddesco@desco.org.bd
Website : www.desco.org.bd

May 13, 2018
Memo No: - ২৯.২৪.০০০০.০১৬.২৫.০০৪.১৮.২৪৪

Chairman,
Department of Electrical and Electronics Engineering.
Daffodil International University
102 & 102/1, Shukrabad, Mirpur Road, Dhanmondi, Dhaka-1207.

Subject : Internship Program.

Reference : Your Letter, dated: 30/12/2017, 14/01/2018.

Dear Sir,
In view of the mentioned subject & letter referred above, we are pleased to inform you that our management has given consent to your request for providing internship from 15/05/2018 to 14/06/2018 to the following students :

Sl. No.	Name	Id Number	Degree/ Dept.	Name of University
01	Mr. Md. Rifat Ahmad	141-33-1765	EEE	DIU
02	Mr. Md. Ariful Islam	141-33-1719	EEE	DIU
03	Mr. Md. Humayun Ahmed	141-33-1783	EEE	DIU
04	Ms. Manjuma Rahman	141-33-1782	EEE	DIU
05	Mr. Md. Mehedi Pervez	141-33-1741	EEE	DIU
06	Mr. Utshob Sarkar	141-33-1862	EEE	DIU

The said program will be completed as per attached schedule. Students are required to submit their complete Curriculum Vitae, copy of the student ID and 02 (two) copies of passport size photographs attested by the authority of Training & Development Division, DESCO before the commencement of field attachment. Students will also be required to submit a copy of the training report to Training & Development Division at the end of the attached schedule.

Please note that no TA/DA or honorarium will be paid to the concerned students.

By approval of the management,

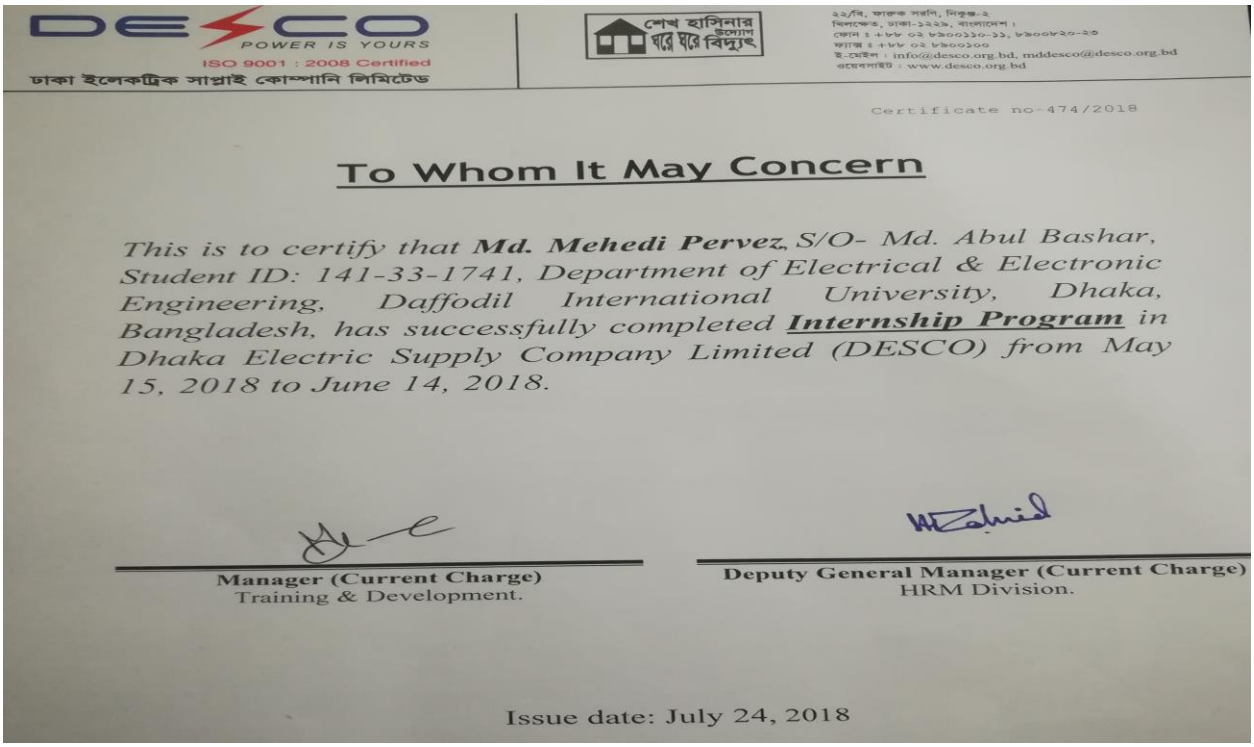
13.05.18
(Md. Mamunor Rashid)
Deputy General Manager (CC)
HRM Division.

Copy to :

1. CE (Network Operation)
2. XEN/Manager(Rupnagar/ Shah Ali/Monipur/ Kafrul/ Pallabi S & D Division /Testing & Repairing Division/Meter plant Division)
3. Staff Officer to Managing Director, DESCO.
4. Staff Officer to Executive Director(HR/Procurement/Engineering/F&A/Operation), DESCO.
5. Office Copy.

On request to take necessary action.

CERTIFICATE



DESCO
POWER IS YOURS
ISO 9001 : 2008 Certified
ঢাকা ইলেকট্রিক সাপ্লাই কোম্পানি লিমিটেড

শেখ হাসিনার উদ্যোগ ঘরে ঘরে বিদ্যুৎ

২২/বি, ফারুক সরণি, মিরপুর-২
বিশেষক্ষেত্র, ঢাকা-১২২৯, বাংলাদেশ।
ফোন : +৮৮ ০২ ৮৯০০১৯০-১১, ৮৯০০৮২০-২৫
ফ্যাক্স : +৮৮ ০২ ৮৯০০১০০
ই-মেইল : info@desco.org.bd, mddesco@desco.org.bd
ওয়েবসাইট : www.desco.org.bd

Certificate no-474/2018

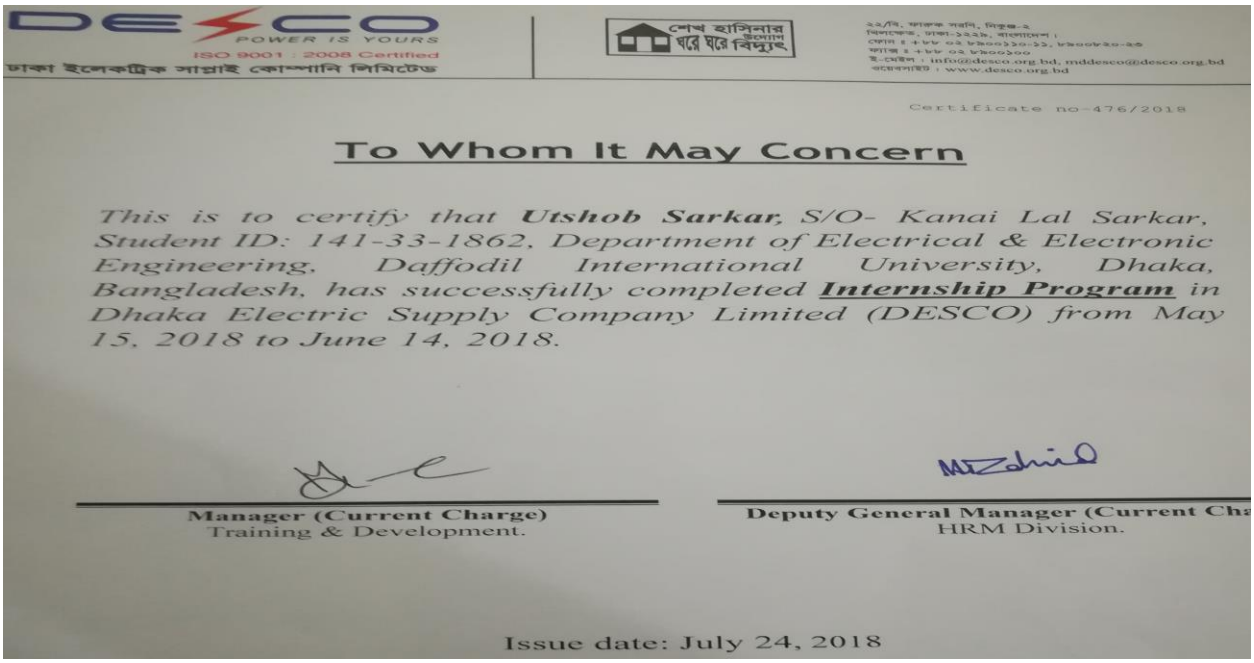
To Whom It May Concern

*This is to certify that **Md. Mehedi Pervez**, S/O- Md. Abul Bashar, Student ID: 141-33-1741, Department of Electrical & Electronic Engineering, Daffodil International University, Dhaka, Bangladesh, has successfully completed **Internship Program** in Dhaka Electric Supply Company Limited (DESCO) from May 15, 2018 to June 14, 2018.*

Manager (Current Charge)
Training & Development.

Deputy General Manager (Current Charge)
HRM Division.

Issue date: July 24, 2018



DESCO
POWER IS YOURS
ISO 9001 : 2008 Certified
ঢাকা ইলেকট্রিক সাপ্লাই কোম্পানি লিমিটেড

শেখ হাসিনার উদ্যোগ ঘরে ঘরে বিদ্যুৎ

২২/বি, ফারুক সরণি, মিরপুর-২
বিশেষক্ষেত্র, ঢাকা-১২২৯, বাংলাদেশ।
ফোন : +৮৮ ০২ ৮৯০০১৯০-১১, ৮৯০০৮২০-২৫
ফ্যাক্স : +৮৮ ০২ ৮৯০০১০০
ই-মেইল : info@desco.org.bd, mddesco@desco.org.bd
ওয়েবসাইট : www.desco.org.bd

CertiEicate no-476/2018

To Whom It May Concern

*This is to certify that **Utshob Sarkar**, S/O- Kanai Lal Sarkar, Student ID: 141-33-1862, Department of Electrical & Electronic Engineering, Daffodil International University, Dhaka, Bangladesh, has successfully completed **Internship Program** in Dhaka Electric Supply Company Limited (DESCO) from May 15, 2018 to June 14, 2018.*

Manager (Current Charge)
Training & Development.

Deputy General Manager (Current Cha
HRM Division.

Issue date: July 24, 2018

ACKNOWLEDGEMENT

At first I would like to express my gratitude to Almighty Allah who has given me opportunity to go through the total process of internship and to write a report in this regard.

I would like to thank my department **Professor and Dean Dr. M. Shamsul Alom**, and I am very gracefull to honorable faculty **Israt Jahan** for supervising me in the internship period for one months. Thanks go to all the faculties of DIU who taught me for the last four years of my study. Also I want to thank all the Registry staffs, Administration officers and employees working for DIU— Daffodil International University.

I also express my deep gratefulness **to Engr. Md. Monjurul Hoque (Chief Engr., Network Operation Division, DESCO)**. I am also grateful to the technicians of DESCO who always showed their respect and helped a lot during my internship.

Finally, I would like to thank Daffodil International University because of giving me such a prospect to be involved into real-life engineering project, which will help me to increase my knowledge and also it will be very helpful for my future career.

ABSTRACT

The power sector of Bangladesh have faced numerous problems characterized by lack of supply capacity, frequent power cuts, unacceptable quality of supply and poor financial and operational performance of the sector entities. There have been a number of reforms in the power sector in Bangladesh since the independence. But most of these reforms failed to bring the desired outcome in the power sector. Among the three main components of the power system, recent reform activities were centered on generation and transmission. The most pressing problems in the power sector have been with the distribution system, which is characterized by heavy system loss and poor collection performance. However, the distribution system seldom gets the priority in the reform initiatives. To solve these problems, Government of Bangladesh has taken an initiative to unbundle the power sector in the form of The Private Limited Companies. This report is based on my internship activities which the author has done at DESCO (Dhaka Electric Supply Company Limited). This report focuses on the operation of DESCO, their vision, supply capacity, financial condition, distribution of electricity and future planning. The Dhaka electric supply company was created as a distribution company in 1996 under the companies act 1994 as a public limited company with an authorized capital of TK. 5 million. At present, DESCO is one of the main power distribution companies in Bangladesh. In total 75% shares of DESCO are owned by Bangladesh Government and rests of the 25% shares are owned by Chairman of DESCO and other shareholders. Internship is such an opportunity to learn those activities that are related to our real engineering world. During my internship period, the author has been able to gather some knowledge on grid-substation, transformer and their maintenance and the power factor improvement which are closely related to my study materials. The author has also observed their administrative activities of control room; complain room operation, and one point operation which will surely help me to visualize the effectiveness in my practical life.

CONTENTS

LIST OF TABLE

LIST OF FIGURE

LIST OF ABBREVIATIONS

MSS	Maintenance of Sub-Station
LEM	Line & Equipment Maintenance
SO	System Operation
CO	Comercial Operation
HT, LT, LTI	High Tension, Low Tension, Low Tension Industry
MW, KV, MVA	Mega Watt, Kilo Volte, Mega Volte Amper
DESCO	Dhaka Electricity Supply Company Limited
DPDC	Dhaka power Distibution Company
BPDB	Bangladesh Power Development Board
PGCB	Power Grid Company of Bangladesh
DESA	Dhaka Electricity Supply Authority
MD	Managing Director
S & D	Sales and Distibution
MWH,KEH	Mega Watt Hours, Kilo Watt Hours
AC,DC,L.A	Alternative Current,Direct Current, Lighting Arrester
CT,PT,CB	Currrnt Transformer, Protential Transformer, Irecuit Breaker
OLTC	On Load Tap Changer
UG,OHL	Under Ground, Over Head Line

LIST OF SYMBOLS

SF_6	sulfur hexafluorid
Ω	ohm
Θ	Theta

CHAPTER-01

INTRODUCTION

1.1 Introduction of the Report

It was a great opportunity of internship in DESCO. DESCO is a Dhaka electricity Supply company. DESCO imports electricity from BPDB. During this internship there were some chances to visited sells & distribution divisions. DESCO has thirty sells & distribution division in Dhaka city and I visited only 2 (Pallabi,DOHS) sells & distribution division in DESCO. During my internship I worked in various divisions such as- substation operation and maintenance, electricity distribution, Load Management, Control Room Activate, line maintenance Power Factor Monitoring and upgrading and commercial operation of DESCO.

1.2 History of Bangladesh Power Sector

Electricity utilization in this region (Bangladesh) started in 1901 when a private generator was installed at the residence of the then Nawab of Dhaka. Mr. Bolton, British citizen, switched on the first electricity in Ahsan Monjil on 7 December 1901. Samit Group is a First Electricity Supply Company in Dhaka. Electricity distribution system under private ownership was begum by DEVCO, a subsidiary of Octttavian Steel Company in the 1930s and Dhanmondi power house was setup for commercial distribution of power.[16]

In the year 1947, power generation and distribution of this part of the country were in the hands of some private companies. The power supply to then 17 provincial districts was within the township in a limited way. The generation voltage was 400 volts. Power used to be supplied to most of the districts during night time only. Only exception was Dhaka City where power used to be supplied by two 1500 kW generators and the generation voltage was 6.6 kV and this was the highest supply voltage. There were no long distance transmission lines. In aggregate the generation capacity of the country was 21 MW. In 1957, the government of East Pakistan took over all private power

generation houses and distribution lines and established Power Development Board (BPDB) in 1959 as an associate of the East Pakistan Water and Power Development Authority (EWPDA). It became an independent body in 1972 and it's headquarter was in Dhaka.

Its responsibility was to control power plants and distribution network throughout Bangladesh.

At first BPDB used to generate transmit and distribute power. BPDB started generating power; transmission responsibility was given to PGCB. BPDB used to distribute power to mainly the urban areas except the metropolitan city of Dhaka. The responsibility of distributing power in Dhaka was given to Dhaka Electric Supply Authority (DESA). Later, DESA went through lots of controversies and corruption. Then Bangladesh government formulated National Energy Policy in 1996 and segregated power generation, transmission, and distribution functions in to separate services. Government created a new subsidiary named Dhaka Electric Supply Company Ltd. (DESCO) and provided the responsibility of electricity distribution in Mirpur, Gulshan, Baridhara and Uttara area of Dhaka. In 2005, Dhaka Power Distribution Company Limited (DPDC) was born.

1.2.1 Present Structure of power in Bangladesh

Power Division is responsible for formulating policy relating to power and supervise, Control and monitor the developmental activities in the puissance sector of the country. To implement its mandate the Power Division is fortified by a number of organizations, cognate with generation, transmission and distribution. The organizational linkage is as follows:

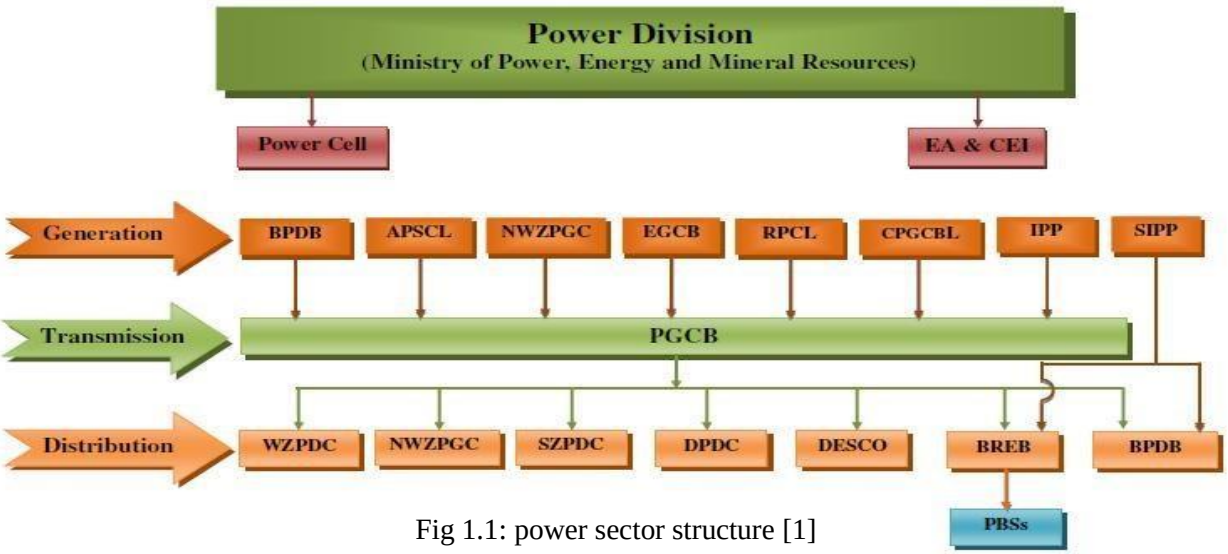


Fig 1.1: power sector structure [1]

1.2.2 Bulk Electricity Sales by BPDB

BPDB has been functioning as a single buyer in the power market of Bangladesh. BPDB purcheses electricity from the public and private generation entities and sales bulk electricity to all the distribution utilities including it's six distribution zones.Distribution entities purcheses electricity from BPDB are as follow:

- Dhaka Power Distribution Company (DPDC)
- Dhaka Electric Supply Company (DESCO)
- West Zone Power Distribution Company Limited (WZPDCL)
- Rural Electrification Board (REB)
- BPDB's six Distribution zone

In FY 2015 bulk electricity sales to the distribution utilities increased ti 42,616 MkWh which is 8.56% higher than the previous year. Total revenue collection also increased to 1,93,013 to 1,74,740 MTk which is 10.47% higher than the previous year.

Utility Wise Billing & Collection Statistics of BPDB

Name Of Utility	Billed Amount (Million TK)		Collected Amount (Million TK)		Accounts Receivable (Million TK)		% increase over the previous year	Collection/Bill Ratio (%)	
	2015-16	16-17	2015-16	16-17	2015-16	16-17		2013-14	14-15
BPDB's Dest Zones(in/c PS &GK)	69379	65791	66531	65218	18696	13999	-25.13	95.90	99.13
WZPDCL	13132	14030	12865	15215	2528	1361	-46.14	97.97	108.45
DPDC	47236	49996	30499	54900	60063	56881	-5.30	64.46	109.81
DESCO	27665	29138	26792	31821	6650	6253	-5.97	96.84	109.21
REB/PBS's	88333	101434	85746	98954	17672	20078	13.62	97.07	97.56
TOTAL	245744	260389	222382	266109	105609	98573	-3.95	90.49	104.832

Table 1.2: Billing and collection statistices of BPDB

CHAPTER-02

Overview on DESCO

2.1 History of DESCO

You know that DESCO, a power distribution company, was founded as a public limited company on November 03, 1996 under the Companies Act 1994. It was a demand of time to establish the company as part of an ongoing Power Sector Reforms to increase efficiency in the area of power generation, transmission and distribution. It started with the Authorized Capital of Tk 5.00 billion. However, the company started its field-level operational activities on September 24, 1998 as it took over the electric distribution system of Mirpur area from erstwhile Dhaka Electric Supply Authority (DESA) with the consumer strength of 71,161 and a load demand of 90 MW. In the subsequent years of successful operation and performance, the operational area of DESCO was expanded through inclusion of Gulshan Circle on April 9, 2003 and Tongi Area on March 4, 2007. The total consumer strength stands at 7,05,234 while the load demand reached its peak at 845 MW on 20th June, 2017.[2]

2.2 Structure of the DESCO

DESCO incorporated under the Companies Act 1994 with its own Memorandum and Articles of Association. The company as a whole owned by Government of Bangladesh and DESA representing government by acquiring 100% shares. DESCO managed by a part time Board of Directors appointed by its shareholders, they are responsible for policy decisions. The Board of Directors appointed managing Director and two full time Directors and they were also members of the Board Directors after appointment. The organizational of the company is as follows. [3]
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.

2.3 Start upto The DESCO

DESCO was constituted to provide uninterrupted & stable power supply, better consumer service, improve system loss & C.I. ratio and accordingly DESCO starting its operational activity since September 24, 1998 by taking over of Mirpur area from DESA. Following are the initial activity of DESCO which includes [3]

- Operation & Maint0enance of Sub-Stations & Lines;
- Commercial functions i.e. billing, consumer accounting, disconnection & re-connection of consumers, testing & installation of consumer meters etc.; and
- Planning, Design and installation of Sub-stations & lines etc.

2.4 Project Financing of DESCO

It is suggested that DESCO initially be financed on a debt equity ratio of 50:50. This conservative leveraging has been suggested since DESCO being a new organization handling a fairly complex project in a not-so-successful area in the power sector. Hence investor confidence is likely to be low. However, as DESCO demonstrates its capabilities in project execution and operations, this confidence level will increase and then the leveraging of capital may be made less conservative. The Government provided the first infusion of equity of DESA in DESCO from its Annual Development Budget 1996-97. [8]

Out of the total Project cost of Taka 126.06 Cores, the foreign exchange portion amounts to Taka 80.60 Cores (65%) and the local cost portion Taka 45.45 Cores (35%). The Asian Development Bank financed under the Loan No. 1505-BAN (SF): Ninth Power Project (DESCO Component for Mirpur area) in first phase and under the Loan No. 1731-BAN (OCR) they were again financed for Dhaka Power System Upgrade Project: Tenth Power Project Loan for Gulshan area. Local costs, which would constitute about 30% (thirty percent) of the total project cost will be met from

the equity part of DESCQ's finances. Arrangement will be made for arranging funding for remaining part of the project from other donor.

2.5 Organization and Services area of DESCO

The company is run by a small management team headed by the Managing Director under the guidance of a Board of Directors and 16 numbers of sales and distribution (S & D) division and above two numbers of grid-substations. DESCO always visualizes running the system efficiently and economically keeping minimum overhead cost with minimum number of skilled manpower. The area is about 250 square kilometers comprises the areas bounded by the Mirpure Road, Agargang Road, RokayaSaroni, ProgatiSaroni, New Airport Road, Mymenshing Road, Mohakhalijheel, RampuraJheel connected with Balu River in the south , Balu River in the east and Turag River in the west and areas under Tongi Pourashava in the north. It may be mentioned that "Purbachal Model Town" a Rajuk project, situated on the east side of Balu River, adjacent to Dakkhinkhan area, has been decided to be included under DESCO.

2.6 Objective

- Broad Objective
- Specific Objective

2.6.1 Broad Objective

The main objective of the report has been done to show the total working procedure of power transmission, distribution, substation operation, controlling and various protection systems.

2.6.2 Speifice Objective

- **The specific objective of this report includes:**
  - To study operation of 132/33/11KV substation
  - To study the process of power transmission and distribution
  - To make an analysis of total power consumption, various losses
  - To specify the fault and their protection systems

2.7 Methodology

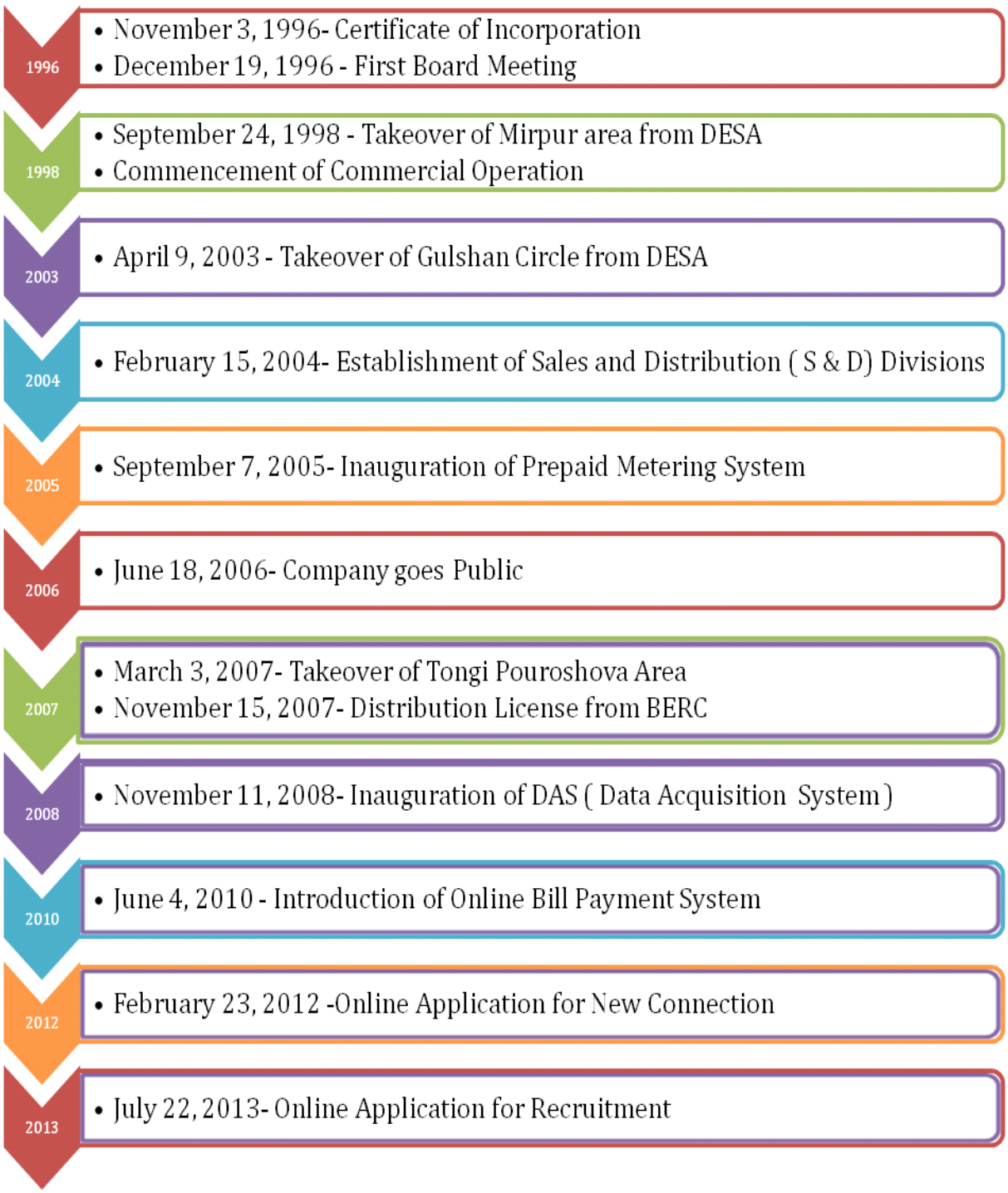
The research of this paper has been done with the help of the different sources. During the preparation of the paper several times it was cheeked by the authorized person of the DESCO. The data was chosen accurately throughout the entire period of the session. Although there were several sources but here some are mentioned as for the proper references. The information of this report has been collected from the following sources:

- Management Manual
- Operation Manual
- Maintenance Manual
- Product Brochure and catalog
- Quality management Manual
- Environment, Health and Safety Manual

2.7DHAKA ELECTRIC SUPPLY COMPANY LIMITED (DESCO)

	To be an enabler of economic development and social progress by providing safe, reliable and sustainable electricity [4].
	Bringing comfort to customers, supporting business and commerce and building strong communities. Achieving and maintaining the highest degree of efficiency, reliability and responsiveness for variety of customers [4].
	We will Achieve our vision through our core corporate principle [4]. **Safety:** Placing the safety of our communities, customers and employees first; **Customer Focus:** Providing superior service to help customers more effectively manage their use of electricity; **Operational Excellence:** Incorporating continuous improvement to deliver safe and dependable electricity at affordable prices; **Performance Driven Culture:** Fostering a strong values and performance based culture designed to attract, develop and retain best talents.

2.7.1 Milestnes of DESCO



2014

- July - Nationwide 3G Launch
- August - 4G launched in 3 major centres - Nadi, Suva and Lautoka

2014

- Digicel Cup Grand Final-September-Lae (Violence-Free and dubbed by rugby league fraternity as the Best grand final in the 25 years of PNGNRL matches in PNG)

2015

- Digicel Cup-5th consecutive year in sponsorship (3rd term-2011-2015)
- Inclusion of 11th Franchise into the Digicel Cup

1.10 ORGANOGRAM

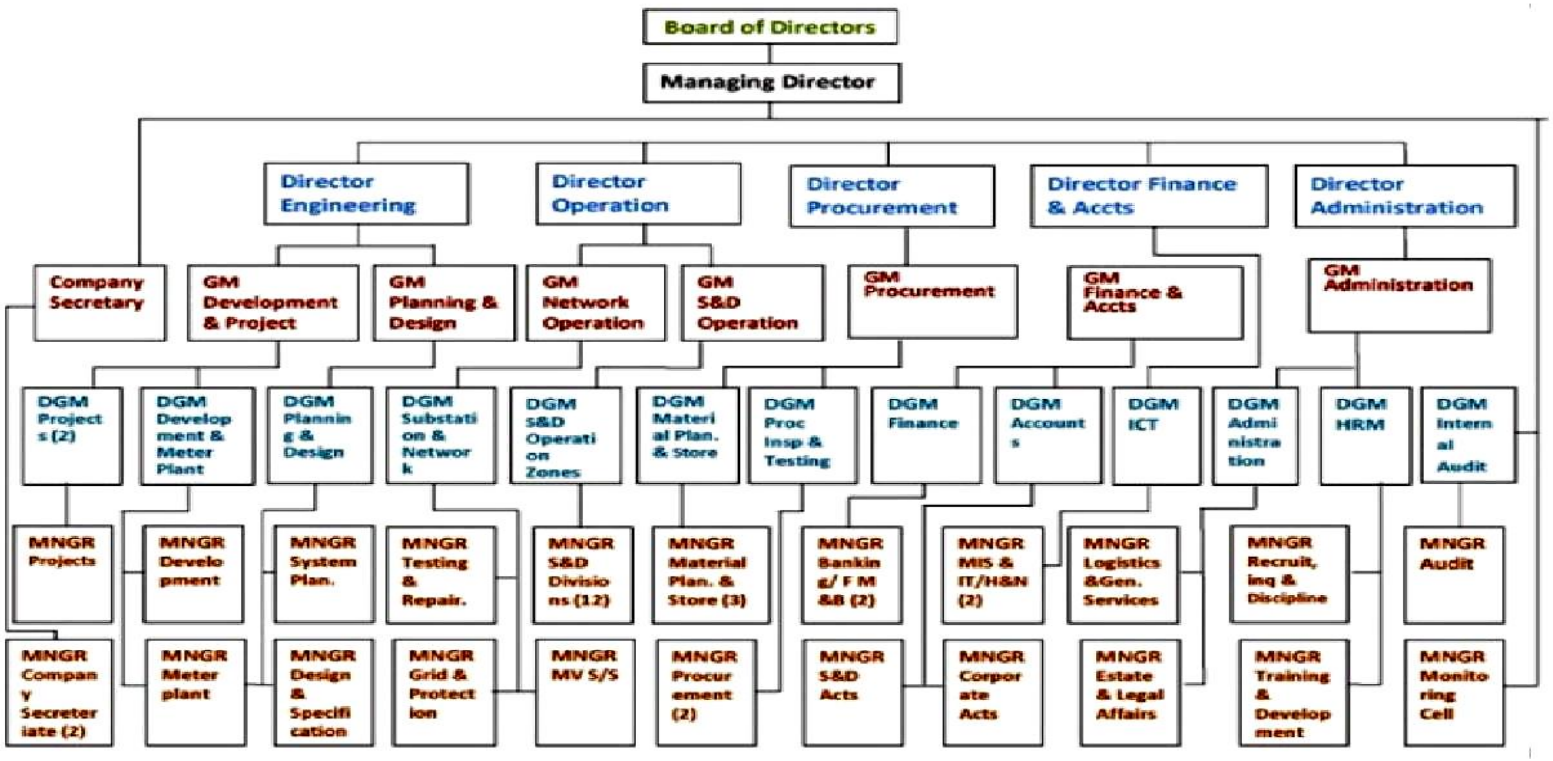
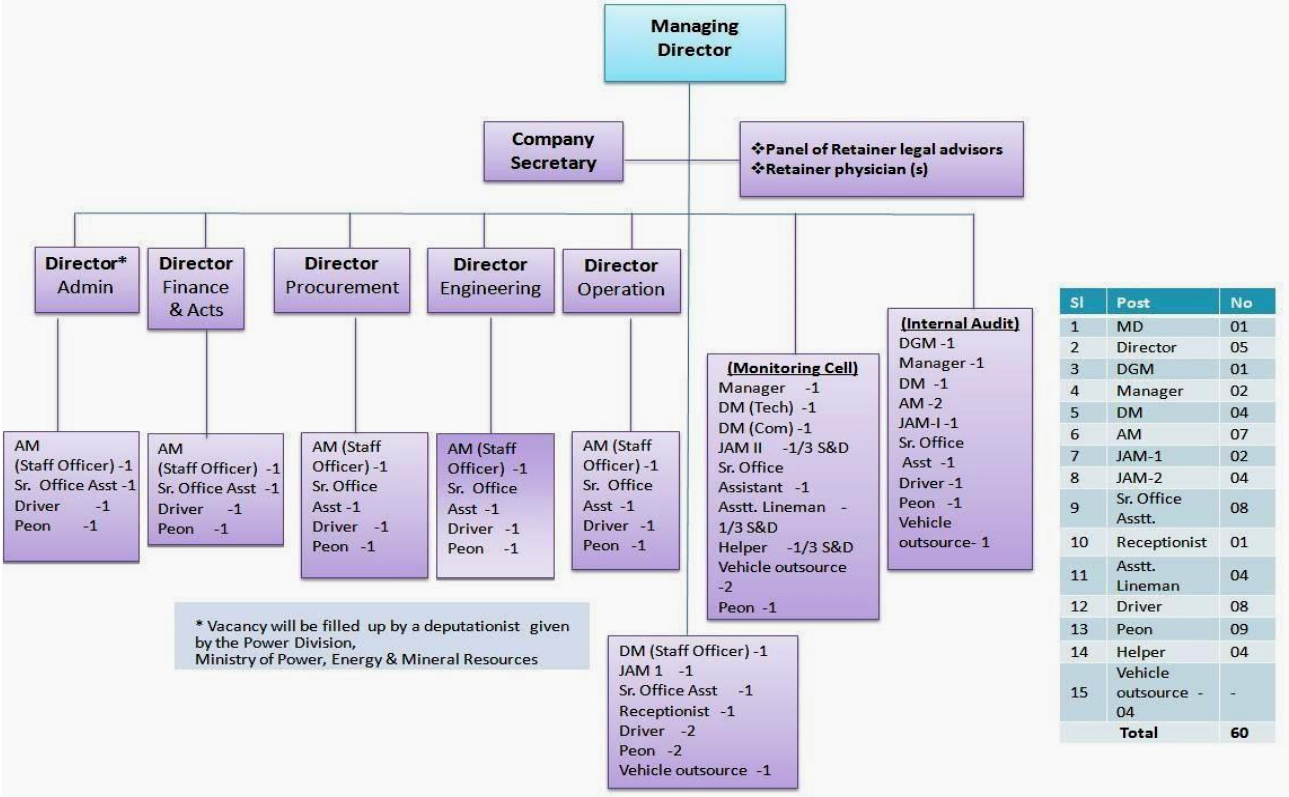


Fig 2.2: Organogram of DESCO [5]

2.10 DESCO HQ TOUR

DESCO is divided into five departments- **Administration, Engineering, Finance and Accounts, Procurement and Operations.** From the HQ, all paperwork to run this large company is done.

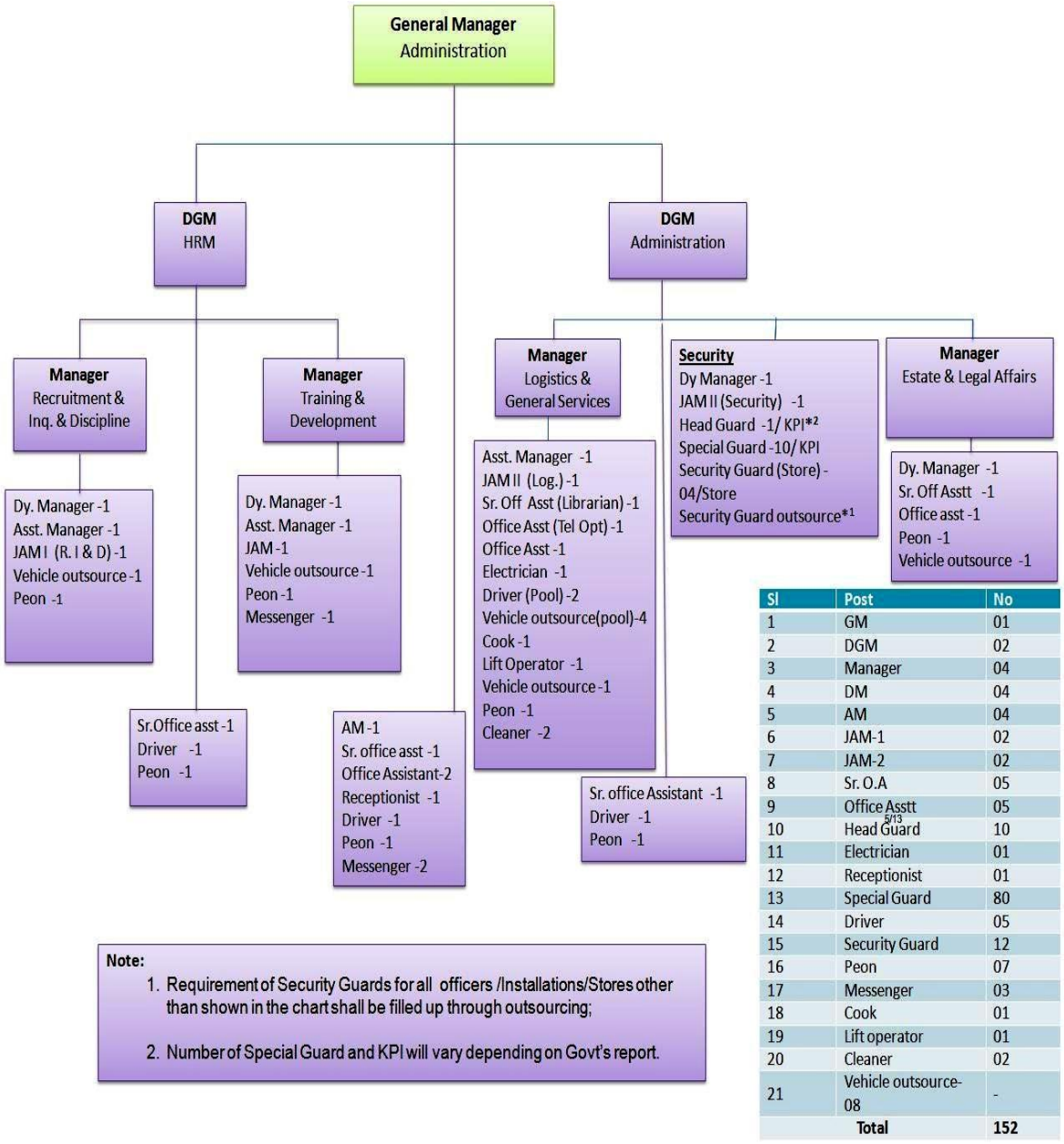


Sl	Post	No
1	MD	01
2	Director	05
3	DGM	01
4	Manager	02
5	DM	04
6	AM	07
7	JAM-1	02
8	JAM-2	04
9	Sr. Office Asstt.	08
10	Receptionist	01
11	Asstt. Lineman	04
12	Driver	08
13	Peon	09
14	Helper	04
15	Vehicle outsource - 04	-
	Total	**60**

Table2.3: Partial Hierarchy of DESCO (MD to Managers.[6]

2.10.1 Administration Department

Administration and Training both falls under the Administration Department. Training and Development Division: The author got a brief overview about DESCO at its Training Center in the beginning of the technical attachment. The procedure, rules and regulations of the internship were told to the author. Administration Division: The author was briefly informed about the Administrative procedures to run.



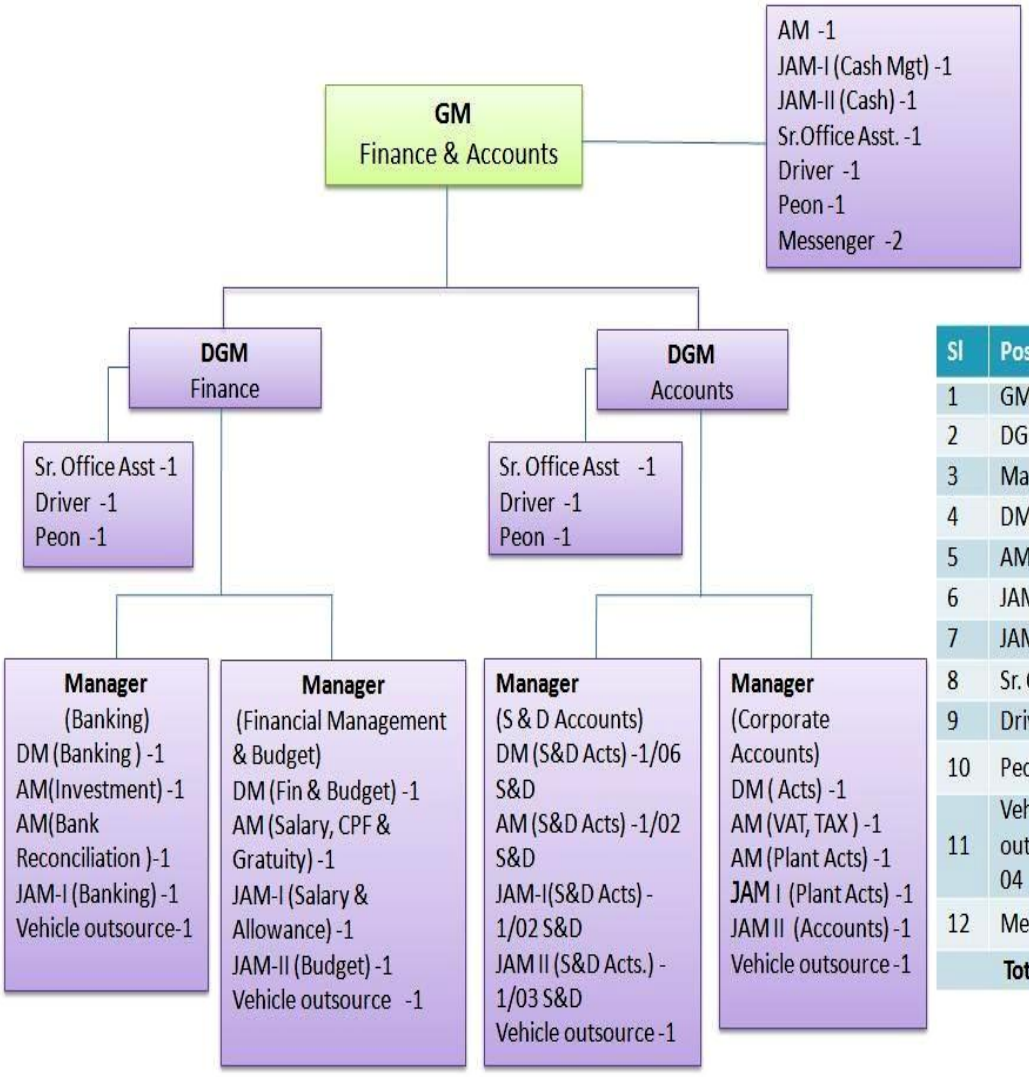
Sl	Post	No
1	GM	01
2	DGM	02
3	Manager	04
4	DM	04
5	AM	04
6	JAM-1	02
7	JAM-2	02
8	Sr. O.A	05
9	Office Asstt	05
10	Head Guard	10
11	Electrician	01
12	Receptionist	01
13	Special Guard	80
14	Driver	05
15	Security Guard	12
16	Peon	07
17	Messenger	03
18	Cook	01
19	Lift operator	01
20	Cleaner	02
21	Vehicle outsource-08	-
	Total	152

Table 2.4: Hierarchy of DESCO Administration Division.[7]

2.10.2 Finance and Accounts Division

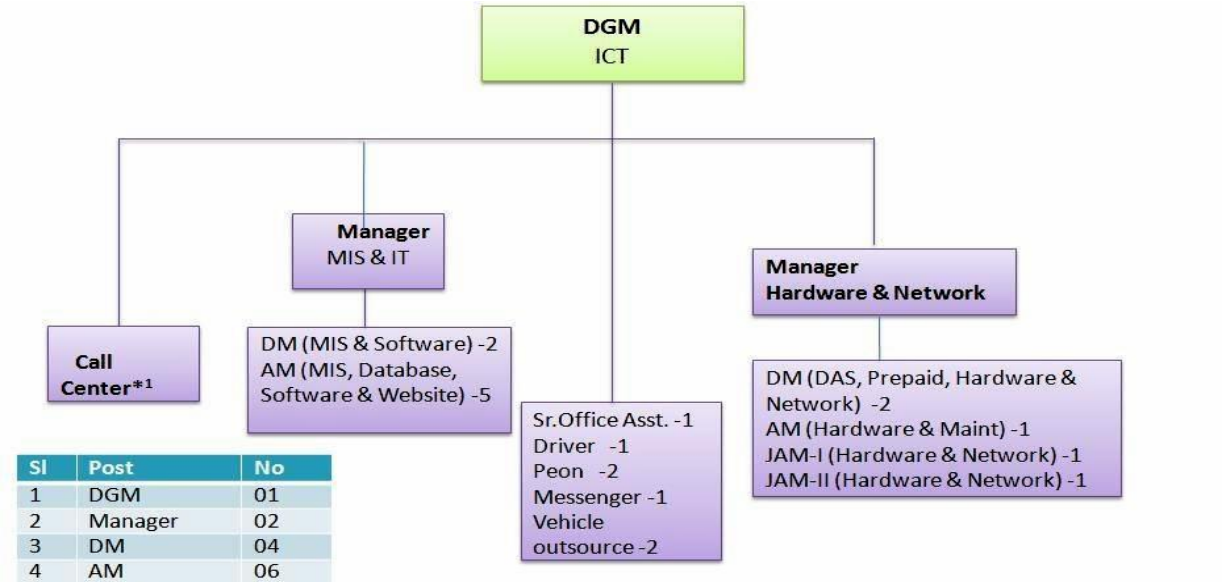
Finance and Accounts Division both works together to manage the Economical activities of DESCO. Under Finance and Accounts Division there is also ICT department making and managing consumer bills. The workings of these two divisions can be summarized as follows.

- Preparing Consumer Bills based on monthly operational data (done by ICT).
- Collecting billing money from the Banks and accumulating it in the Central Account.
- Managing the fund.
- Budget preparation.
- Expense allocation on Various Sectors of DESCO, including employees' salary.



Sl	Post	No
1	GM	01
2	DGM	02
3	Manager	04
4	DM	05
5	AM	12
6	JAM-1	10
7	JAM-2	07
8	Sr. O.A	03
9	Driver	03
10	Peon	03
11	Vehicle outsource-04	-
12	Messenger	02
	Total	**52**

Table 2.5: Hierarchy of DESCO Finance and Accounts Division.[8]



Sl	Post	No
1	DGM	01
2	Manager	02
3	DM	04
4	AM	06
5	JAM-1	01
6	JAM-2	01
7	Sr. Office Asstt.	01
8	Driver	01
9	Peon	02
10	Messenger	01
11	Vehicle outsource-02	-
	Total	**20**

Table2.6: Hierarchy of DESCO ICT Department under Finance and Accounts Division [9].

2.11 Tariff Rate at DESCO of Consummer

This is for information of all concerned that in accordance with the BERC Order a new tariff rates with respect to retail sales of electricity of Dhaka Electric Supply Company Ltd. (DESCO) has been made effective Tariff rate. Dated: 30December 2017. From bill month September 2015 as the followings:

SL	Customer Category		Per Unit Rate (Tk.)	Minimum Charge	Demand Charge	Service Charge 1ph	Service Charge 3ph
1	Category Residentialsdg						
		Life Line : From 1 to 50 units	3.5				
	a.	First Step : From 1 to 75 units	4.00				
	b.	Second Step : From 76 to 200 units	5.45				
	c.	Third Step : From 201 to 300 units	5.70	**100**	25.00	**10**	**30**
	d.	Fourth Step: From 301 to 400 units	6.02				
	e.	Fifth Step: From 401 to 600 units	9.30				
	f.	Sixth Step: Above 600 units	10.70				
2	Category-B : Agricultural pumping		4.00	**125**	15.00		**40**
7	Category-C : Small Industries						
	a.	Flat Rate	8.20				
	b.	Off-Peak Time	7.38	-	25		**70**
	c.	Peak Time	9.84				
4	Category-D : Non-Residential (Light & Power)		7.70	**100**	40	**10**	**30**
5	Category-E :Commercial And Office						
	a	Flat Rate	10.30				
	b	Off-Peak Time	9.27	**125**	30	**10**	**30**
	c	Peak Time	12.36				
6	Category-F :Medium Voltage, General Purpose (11 KV)						
	a	Flat Rate	8.05				
	b	Off-Peak Time	7.25	**8000**	50.00		**400**
	c	Peak Time	10.06				
7	Category-H : High Voltage, General Purpose (33 KV)						
	a	Flat Rate	8.00				
	b	Off-Peak Time	7.20	**80**	40.00		**450**
	c	Peak Time	10.00				
8	Category-J : Street Light and Water Pump		7.70	**100**	40.00	**10**	**30**

*****If uses go beyond 50 units then life line slab will not be applicable.

>>> Net Bill = Energy Charge + Demand Charge + Service Charge

>>> VAT = 5% Of Net Bill>>> Late Payment Charge (LPC) = 5% of Total Amount

CHAPTER – 03
SALES AND DISTRIBUTION (S & D) DIVISION

3.1 OPERATIONAL ZONE AND SALES & DISTRIBUTION (S&D) DIVISION

The Superintending Engineer is in-charge of a zone who supervises the Executive Engineers, the key responsible person of each S&D Division. Each Executive Engineer accomplishes his duties by two Sub-divisional Engineers, one for system related activities and another for commercial related activities. Two Assistant Engineers act as assisting body under each Sub-divisional Engineer**.** System related activities include scheduled maintenance, troubleshooting and breakdown maintenance of substation and switching stations, troubleshooting of customer complaints, line & equipment maintenance etc. Commercial related activities include meter reading, distribution of monthly electricity bills, service disconnection of the defaulter consumer, customers' house wiring inspection, new electric connection, meter installation, change of old or unserviceable meter etc.

3.2 NAME OF ZONES AND S&D DIVISIONS

Name of zone	**Name of S&D division**
Gulshan	Badda, Baridhara, Joarshahara, Gulshan
Mirpur	Agargaon, Kafrul, Monipur, Pallabi, Rupnagar, Shah Ali
Uttara	Dakshinkhan, Tongi (East), Tongi (West), Uttara (East), Uttara (West), Uttarkhan

3.3 SUBSTATION SALES & DISTRIBUTION (S&D) DIVISION

- **It consists of two functions:**
  - Commercial operation.
  - Systems Operation.

3.3.1 Commercial Operation:

- Disconnection / Reconnection – Metering
- One point service center
- Billing /collection

3.3.2 System Operation:

- New connection
- Load sanction & load retention
- Load management
- Control room activity
- Power factor monitoring &upgrading
- Substation operation & maintenance
- Line maintenance
- Wireless & telecommunication
- DAS maintenance etc.

3.4 FY WISE OPERATIONAL DATA

Particulars	2012-13	2013-14	2014-15	2015-16	2016-17
Energy Import (MKWh)	3,726.31	4,064.19	4,320.98	4,795.12	4,980.05
Energy Sales (MKWh)	3,411.91	3,722.23	3,959.46	4,410.203	4,619.28
Energy Import (MTk)	20,393.48	22,898.05	24,344.81	28,956.565	30,523.25
Energy Sales (MTk.)	21,951.48	24,431.03	27,358.15	31,478.24	33,277.57
System Loss (%)	8.44	8.41	8.37	8.03	7.24
Collection Ratio (%)	100.93	100.53	101.48	101.34	100.62
C.I. Ratio (%)	92.40	92.07	92.99	93.21	93.33
Consumer Nos.	573,356	641,933	705,234	7,60,844	8,18,156
Receivable/Sales (%)	14.49	13.60	12.79	12.79	12.72

Table 3.2: FY wise operational data [10]

3.5 Fiscal Year Wise System Loss (%)

Fiscal Year	System Loss (%)
1999-2000	32.47%
2000-2001	29.86%
2000-2001	29.86%
2002-2003	21.06%
2003-2004	19.24%
2004-2005	16.64%
2005-2006	16.2%
2006-2007	13.44%
2007-2008	10.91%
2008-2009	9.79%
2009-2010	8.86%
2010-2011	8.79%
2011-2012	8.86%
2012-2013	8.44%
2013-2014	8.41%
2014-2015	8.37%
2015-2016	8.03%
2016-2017	7.24%

Table 3.3: System loss. [10]

3.6 Year wise Maximum Demand

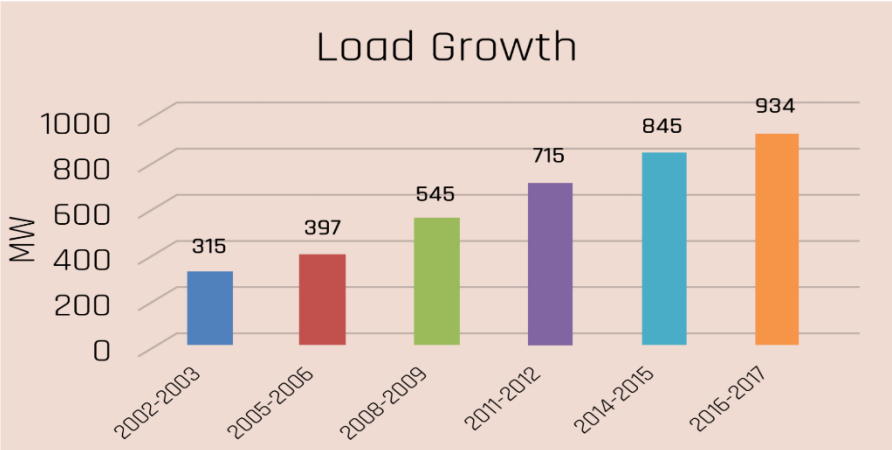


Table 3.4: S&D Division Wise Year Operational Data

3.7 S&D wise information for the month August 2016

In August 2016 DESCO import 29.378 MKWH and Sales 24.304 MKWH to their consumers. Here have given a table to show the monthly operational data on DESCO.

Dhaka Electric Supply Company Ltd. (DESCO)

Commercial Operation Summary Statistics

Date:02/08/2016

Ref. No. DESCO/ICT/IT-G(4)/MOD/80/2016/

S & D Divisions	Month	No. of Consumer	Import (MKWH)	Sales (MKWH)	System Loss (%)		Bill Amount (MTk)	Collection (MTk)	Coll / Bill (%)	CI Ratio (%)
					Target	Achieve				
Agargaon	Current Month	44398	19.899	17.320		12.96	115.261	124.371	107.90	93.92
	Previous Month	44107	19.258	16.997		11.74	118.000	116.995	99.15	87.51
	This Month Last Year	41560	19.429	17.147		11.75	115.619	149.518	129.32	114.13
	Year to date Last Year		187.379	170.180	9.20	9.18	1093.165	1166.521	106.71	96.92
	Year to date		200.862	183.378	8.75	8.70	1205.956	1227.554	101.79	92.93
Monipur	Current Month	51556	24.647	22.869		7.21	153.275	154.881	101.05	93.76
	Previous Month	51344	21.763	19.579		10.03	137.355	150.813	109.80	98.78
	This Month Last Year	47966	21.482	19.213		10.56	132.970	153.231	115.24	103.07
	Year to date Last Year		210.174	192.995	8.20	8.17	1264.213	1297.979	102.67	94.28
	Year to date		232.146	213.589	8.10	7.99	1447.732	1471.021	101.61	93.49
Shahali	Current Month	40739	22.101	18.485		16.36	122.000	136.164	111.61	93.35
	Previous Month	40451	19.731	17.481		11.41	125.438	135.722	108.20	95.86
	This Month Last Year	38114	19.795	16.072		18.81	116.213	121.203	104.29	84.68
	Year to date Last Year		195.921	168.338	14.10	14.08	1127.382	1137.867	100.93	86.72
	Year to date		212.761	187.508	12.00	11.87	1275.993	1296.591	101.61	89.55
Rupnagar	Current Month	54413	35.134	32.384		7.83	202.505	255.489	126.16	116.29
	Previous Month	54018	32.096	29.178		9.09	210.990	195.724	92.76	84.33
	This Month Last Year	50124	31.655	28.414		10.24	199.510	215.254	107.89	96.84
	Year to date Last Year		311.927	284.041	8.95	8.94	1895.584	1901.781	100.33	91.36
	Year to date		340.416	311.301	8.65	8.55	2131.767	2150.425	100.88	92.25
Pallabi	Current Month	55645	29.378	24.304		17.27	153.575	389.874	253.87	210.02
	Previous Month	55290	26.462	23.089		12.75	109.835	127.458	116.05	101.25
	This Month Last Year	50935	24.864	19.935		19.82	141.058	109.688	77.76	62.35
	Year to date Last Year		245.357	208.606	15.00	14.98	1385.038	1262.376	91.14	77.49
	Year to date		277.155	241.261	13.00	12.95	1430.437	1622.112	113.40	98.71
Kafrul	Current Month	58742	28.799	26.577		7.72	172.930	190.801	110.33	101.82
	Previous Month	58399	26.768	23.922		10.63	171.205	183.018	106.90	95.53
	This Month Last Year	55623	27.501	24.426		11.18	164.708	174.425	105.90	94.06
	Year to date Last Year		270.741	245.057	9.50	9.49	1624.746	1640.855	100.99	91.41
	Year to date		291.728	265.895	9.00	8.86	1817.294	1828.619	100.62	91.71
Mirpur Zone	Current Month	305493	159.959	141.939		11.27	919.546	1251.581	136.11	120.78
	Previous Month	303609	146.079	130.247		10.84	872.823	909.730	104.23	92.93
	This Month Last Year	284322	144.727	125.208		13.49	870.078	923.319	106.12	91.81
	Year to date Last Year		1421.498	1269.217	10.73	10.71	8390.127	8407.378	100.21	89.47
	Year to date		1555.067	1402.931	9.88	9.78	9309.178	9596.322	103.08	93.00

Table 3.5: S&D Division Wise Monthly Operational Data

Dhaka Electric Supply Company Ltd.

Billing Rate per KWH in each Tariff Category in Taka

Page - 7

Billing Month : June 2016

Month & Year	Billing Rate in Tariff Category											
	A	B	C	D	E	F	G	H	I	J	2E	Average
FY 14-15	5.91	2.60	7.50	5.06	9.77	7.35		7.69	5.63	7.36	20.05	6.96
Jul - 15	6.25	2.70	7.73	4.94	10.20	7.65	0.00	7.65	5.63	7.26	20.90	7.26
Aug - 15	6.01	2.70	7.43	5.11	9.71	7.37	0.00	9.38	5.63	7.36	20.09	7.01
Sep - 15	6.03	3.46	7.62	5.27	9.79	7.54	0.00	8.01	6.13	7.67	20.01	7.08
Oct - 15	6.21	3.69	7.53	5.36	9.91	7.58	0.00	8.09	6.13	7.65	20.31	7.16
Nov - 15	6.16	3.85	7.88	5.35	10.30	7.87	0.00	8.39	6.13	7.65	21.00	7.34
Dec - 15	5.91	3.06	7.95	5.44	10.44	7.81	0.00	8.41	6.13	7.69	21.18	7.33
Jan - 16	5.57	3.88	7.75	5.39	10.09	7.63	0.00	280.17	6.13	8.09	20.30	7.14
Feb - 16	5.57	3.95	7.71	-2.31	10.10	7.63	0.00	8.38	6.13	7.84	20.34	7.03
Mar - 16	5.84	3.92	7.73	-4.08	9.94	7.56	0.00	8.22	6.13	6.65	20.14	6.97
Apr - 16	6.01	3.94	7.93	-4.49	9.78	7.47	0.00	8.22	6.13	7.50	19.93	6.96
May - 16	6.58	3.66	8.07	-3.21	10.48	8.00	0.00	8.12	6.13	7.58	21.26	7.47
Jun - 16	5.78	4.02	7.68	5.34	9.93	7.60	0.00	8.17	6.13	7.71	20.13	6.97

Table3.6: :- Billing Rate in Tariff Category TK

CHAPTER-4

Pallabi Substation and Sales & Distribution (S&D) Division

4.1 What is Substation

Substations are a familiar sight alongside highways and in cities. Substation take high to lower voltage. They distribute electricity to consumers and supervise and protect the distribution network to keep it working safety and efficiently, for example by using circuit breakers to cut power in case of problem

4.2 Operation of Substion

Substation is an internated network for delivering electricity from suppliers to consumers. The DESCO has no power plant. But it have Two Grid Subsation and therty Two Distibution Subststion. Therefore, they purchase power that is transmitted from Bangladesh Power Development Board (BPDB) via Transmistion Operation by Power Grid Company of Bangladesh (PGCB) at different places of Dhaka city. A Substation transforms voltages from high to low by using Power Transformers. A Substation that has a step-down distribution Transformer decreases the voltage while increasing the current for domestic and commercial uses of electricity. During my internship period, I have visited following:

4.2.1 Substation:

- Pallabi Substation (33KV/11KV).

4.3 Pallabi S&D AT A GLANCE

August , Date 02/08/2017

Consumers	55645
Import (KWh)	29378000
Sales (KWh)	24304000
Import (Tk)	134093962
Vat (Tk)	6962241
Billing Amount (Tk)	153575000
Collection Amount (Tk)	389874000
Selling Rate (Tk)	7.1377
System Loss (%)	17.27
Collection Ratio (%)	253.87
C.I Ratio	210.02

Table 4.1: Pallabi S&D at a Glance[16]

This information has been taken for one month from August 2016

At Pallabi Substation, there are two incoming sources from Degun and Damalpur Grid 33kV bus-1, 33kV bus-2, bus PT-1 (potential transformer), bus PT-2 (potential transformer), 33kV bus coupler and the insulator of Pallabi Substation are shown in figure 1.

4.4 Power Tranaformer-1(33kV/11kV)

Fig 4.1: Power Transformer at Paralall pallabi Substation

HT Bushing, potential transformer (PT), lighting arrester (L.A), current transformer (CT) and 33kV incoming source from Grid Pallabi substation are shown in figure 2.

Fig 4.2: 33kV incoming source from Dagun and Damel CT, L.A, PT, HT Bushing

Actually single line diagram is the basic configuration to understand the basic operation of substation. It has been shown that how 33kV incoming sources are connected to the Pallabi substation and then how it transforms from 33kV to 11kV. Initially 33kV incoming sources from Grid is connected to Pallabi substation via UG/OHL (UG means underground and OHL means overhead line), then safety equipment L.A. (Lighting Arrester), potential transformer (PT), HT Bushing, Isolator, current transformer (CT) are connected to 33KV bus-1. Then 33KV bus coupling is used to run or to keep active both 33kV bus-1 and 33kV bus-2. Then again PT, Isolator, CT, L.A. and Power transformer- T1 & T2 which are transformed the voltages from 33kV to 11kV. Subsequently 11KV is also connected with 11kV bus via VCB (Vacuum circuit breaker). Here also 11kV bus coupling is used to run both 11kV bus-1 and 11kV bus-2.

4.5 Equipments of Subststion

4.5.1 There is various equipment at substation such as:

- Power transformer,
- Circuit breaker (Air blast, Vacuum CB),
- Buchholz Relay
- Preser Relay Devices(PRD)
- Instrument transformer (CT & PT),
- Isolator,
- Earth switch,
- Lightening arrester,
- Auxiliary transformer,

- Bus bar (main bus bar and reserve bus bar),
- Battery and battery charger,
- Control relay panel,
- Ac & dc distribution panels and
- Voltage regulator etc.

4.6 POWER TRANSFORMER

Transformer is a device which transforms electric power from one circuit to another circuit without changing in frequency. The electric power of transformer is created by electromagnetic induction between the windings or circuits. Depending upon the size of the windings, values of voltage and current are changed from primary (source) to secondary (load) with constant frequency. At DESCO, I have observed power transformer to transform power from 33KV to 11KV. Where 132 KV is supplied by PGCB. Most of the power transformers are made by Energy Pace and maintained by them as well. At **Pallabi** substation, there are three power transformers indicated as T1, T2 & T3 connect to the Parallal connection. At **Pallabi** substation three transformers transform voltages from 33KV to 11KV which is indicated by TR1, TR2 & T3 (20/28 MVA Ratio transformers are used).Power Transformer.

Fig 4.3: Power Transformer

4.7 Insulators

The insulators serve two purposes. They support the conductors or bus bars and confine the current to the conductors. The most commonly used material for insulators is porcelain. There are several types of insulators and their use depends upon the service requirement.

4.8 Isolators

In substations, it is often desired to disconnect a part of the system for general maintenance or repairs. This is accomplished by an isolating switch or isolator. An isolator is essentially a knife switch and is essentially designed to open a circuit under no load. Figure 4.6 is an example of isolators in Pallabi Substation.

Figure 4.5.: Isolators in Pallabi Substation

4.9 Winding

In figure (2.6), the primary winding is 33kV and secondary winding is 11kV. In this case it is step-down transformer and that is why primary winding is Δ (delta) connected and secondary winding is Y (wye) connected. The ac source is known as primary winding. The load which is taken from the source is called secondary winding. The transformer consists of soft iron core or the silicon steel core. Also two windings attached to it, they are primary winding and the secondary winding. The windings are insulated from one another. The conducting material (a conductor is a material which contains movable electric charges) used for the windings, depends upon the application. But in all cases, each turns must be electrically insulated from each other to ensure that the current travels throughout every turn.[11]

4.10 Main Tank

Main tank is such type of protective element for the primary winding and secondary winding. The end edge of the primary winding is connected from one side of the main tank. And the starting edge of the secondary winding is connected from opposite site of the main tank. Main tank is filled up with oil. And oil is used to provide insulation between the main tank and the windings. The image of main tank along with primary and secondary winding is given in figure (2.6)

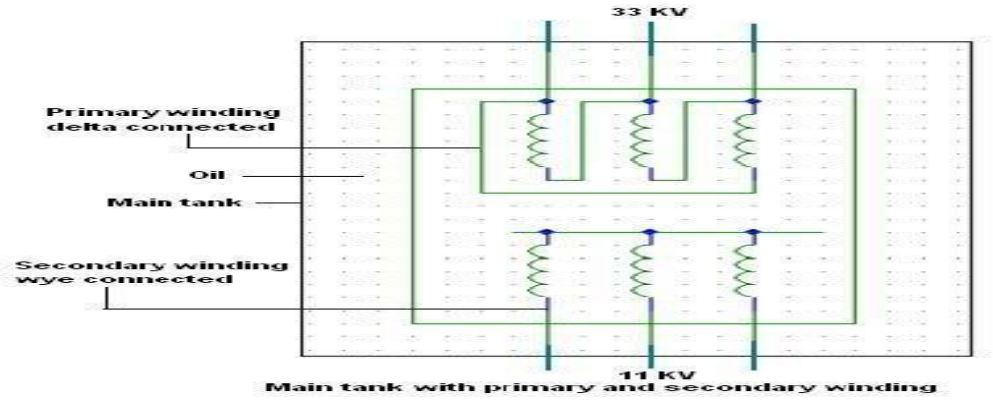


Fig 4.6: Main tank with primary & secondary winding.

4.11 Conservator Tank

During the expansion of oil due to internal fault of transformer or when load increases, windings (both primary and secondary winding) produce more heat. As a result oil volume can expand. And expansion of oil volume can enter from main to conservator tank via buchholz relay. Actually the tank is designed as an expansion reservoir which allows the expansion of the oil during operation. The image of conservator tank is given in figure (2.7).

Fig 4.7: Conservator tank

4.12 Buchholz relay

Buchholz relay is a protective element of transformer. It is installed at the middle position of the transformer tank and the conservator tank. When gas is produced in the main tank due to a minor fault, oil volume expands and can enter to conservator tank via buchholz relay. If oil's motion is very rapid, then at 1st, it gives the signal to the control room. If the fault is very big then it trips the transformer [12].

The image action of buchholz relay is given in figure.[2.8]

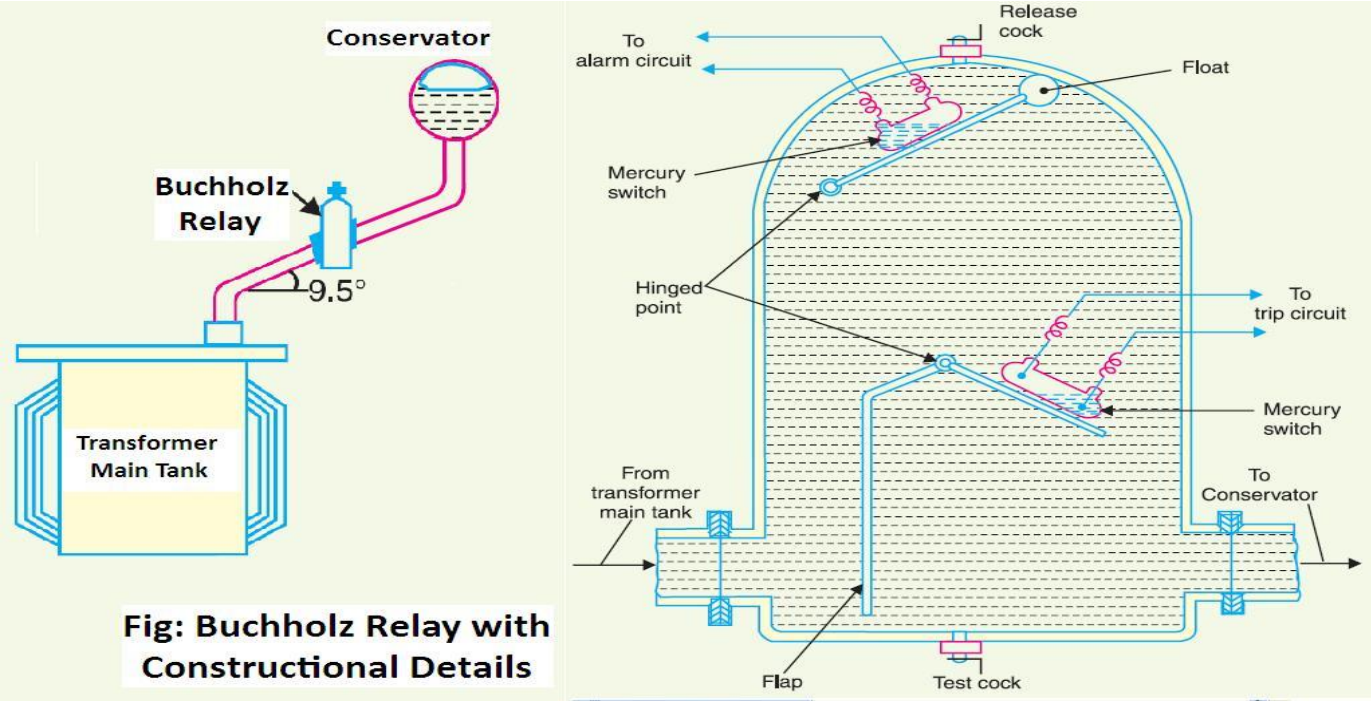


Fig 4.8: Action of buchholz relay

4.13 The cooling equipment

The cooling equipment such as radiator collects the hot oil from the top of the main tank and returns cooled oil lower down on the side of the main tank.

4.14 Winding temperature and Oil temperature Indicator

Winding temperature indicator (meter) indicates the appropriate temperature of winding (The normal position of winding temperature is 75 (degree centigrade). Oil temperature indicator

(meter) indicates the appropriate temperature of oil (The normal position of oil temperature is 65 degree centigrade). The image of oil temperature and winding temperature indicator is given in figure.[2.9]

Fig 4.9: Winding temperature and oil temperature indicator.

4.15 On load tap changer

On load tap changing is a mechanism that usually used in case of any disturbance of primary winding or in case of any fault of actual incoming voltages to the primary winding. In figure (2.10), the primary winding is 33KV and secondary winding is 11KV. If 33KV is reduced at 28KV then on load tap changer is used to increase from 28K to 33KV. The image of on load tap changing mechanism is given in figure.[2.10]

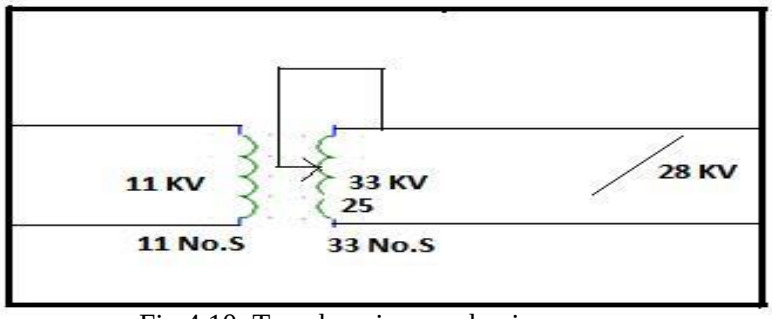


Fig 4.10: Tap changing mechanism.

4.16 Transformer oil

Transformer oil is used to provide insulation between the transformer main tank and the windings (both primary windings and secondary windings) and for keeping cool the transformer. The transformer oil also provides high dielectric strength to the coils and core which are submerged. This allow transformer to be more compact and cost efficient.

4.17 Breathing System

Transformer breathing system is controlled by silica gel. It is used to absorb moisture. During the injection of oil into transformer tank some air can enter or exit in the conservator tank depending on expansion and extraction of the oil of main tank and silica gel is used to absorb the moisture from that air. The image of silica gel is given in figure (2.11).

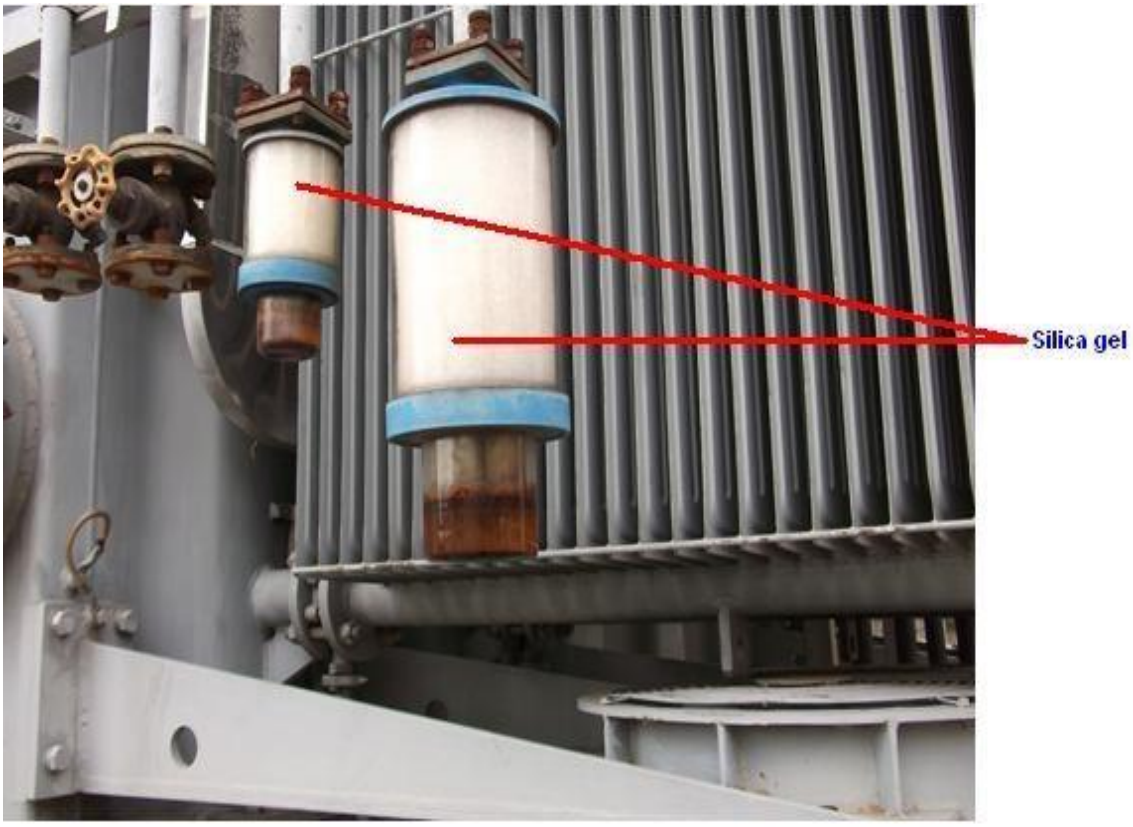


Fig 4.11: Transformer breathing system (silica gel) used at DESCO.

4.18 Losses in transformer

Iron Losses: In actual iron cores, in-spite of lamination, some heat is still produced by the eddy currents.

Copper Losses: In actual practice, coils of the transformer possess some resistance. So a part of energy is lost due to heat produced by the resistance of the coils.

4.19 Hysteresis Losses:

The alternating current in the coils repeatedly takes the iron core through complete cycle of magnetization. So energy is lost due to hysteresis.

4.20 Protection System for transformer

The principal relays and systems used for transformer protection at DESCO's grid-substation are described below.

- Buchholz devices providing protection against all kind of incipient fault i.e. slow – developing faults such as insulation failure of windings, core heating, fall of oil level due to leaky joints etc.
- Earth-fault relays providing against earth-faults only.
- Over current relays providing protection mainly phase-to-phase faults and overloading.
- Differential system (or circulating current system) providing protection against both earth and phase fault.

4.21 Auxilary Tranaformer

The Grid Substation has a maintaences of control room it,So the power supply at that household is provident bthrough power Transformer**.**It Provides the supply to the auxiliary service which includes lighting, low voltage power supplies and ventilation. The auxiliary service may be three-phase 415V or single phase 230V (Typical voltage rating 33KV/0.415KV). The image of auxiliary transformer at Uttara grid-substation is given in figure.[2.12]

Fig 4.12: Auxiliary transformer at Pallabi-substation.

4.22 Circuit Breaker

A circuit breaker is equipment which can open or close a circuit under normal as well as fault conditions. It is so designed that it can be operated manually or by remote controller under normal conditions and automatically under fault conditions. For the latter use, a relay circuit is used with a circuit breaker. DESCO use SF6 circuit breaker and Vacuum circuit breaker

4.23. SF_6 Circuit Breaker

A circuit breaker in which the current carrying contacts operate in sulpher hexafluoride or SF_6 gas is known as an **SF_6 circuit breaker**. SF_6 has excellent insulating property. SF_6 has high electro-negativity. That means it has high affinity of absorbing free electron. Whenever a free electron collides with the SF_6 gas molecule, it is absorbed by that gas molecule and forms a negative ion. The attachment of electron with SF_6 gas molecules may occur in two different ways,

1) $SF_6 + e = SF_6^-$
2) $SF_6 + e = SF_5^- + F$

These negative ions obviously much heavier than a free electron and therefore over all mobility of the charged particle in the SF_6 gas is much less as compared other common gases. We know that mobility of charged particle is majorly responsible for conducting current through a gas.

Fig: 4.13 SF6 circuit breaker

4.24 Bus Bar

When a number of lines operating at the same voltage have to be directly connected electrically, bus-bars are used as the common electrical component. Bus bars are copper or aluminum bars and operate at constant voltage. The incoming and outgoing lines in a substation are connected to the bus bars. Figure 4.1 shows a single line diagram of Pallabi sub-station 132/33/11 KV Grid substation, indicating two duplicate bus bar systems. Here, both 33 KV buses are sectionalized.

CHAPTER-5

Maintenance and Protection of Substation

5.1 Maintenance and Inspection of Substation

During my internship period at DESCO, I have got ideas about substation's equipment maintenance and practically observed maintenance period of Pallabi substation. Basically there are many inspections of substations, but DESCO implements inspection of substation's equipment on monthly and half-yearly basis.

Single line diagram of Pallabi substation is shown in figure .At Pallabi substation, there are three (3) 33 KV incoming sources and Fifteen (15) 11KV outgoing feeders. In figure (5.1), some transformers directly transform voltages from 33KV to 440V and some transformer transform voltage from 33KV to 11KV.Pallibi substation only eight mumber of 11KV outgoing feeders are Active seven mumber of 11KV outgoing feeders are spare or in off position and three mumber of 11KV outgoing feerers are for switching.

5.2 Singal line Diagram Pallabi Substation(33KV/11KV)

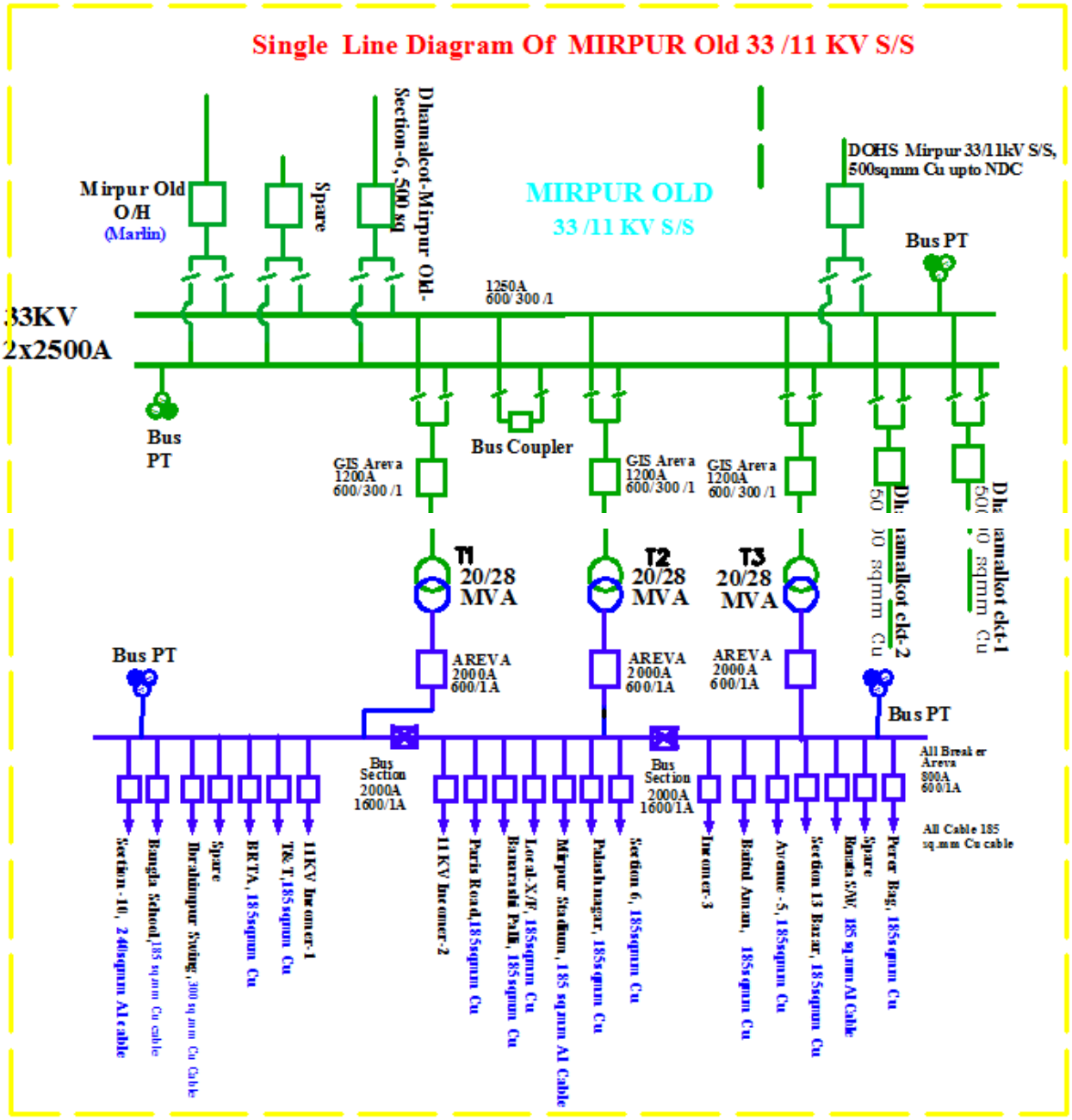


Fig 5.1: Single line diagram of Pallabi (Mirpur) 33/11 KV substation

5.3 Transformer maintenances

Transformer maintenances at Pallabi substation are given below. :

- Overall cleaning or washing of transformers.
- Check insulation resistance between each winding and ground.
- Check the control system and driving mechanism of OLTC.
- Change the oil of OLTC (OLTC means On Load Tap Changer).
- Check toughness of low terminal and high terminal.
- Check the performance of oil temperature & winding temperature meter.

5.4 Transformer Fault Detection and Repairing

The common faults of transformer which is given below:

- Transformer coil burn.
- Drop out fuse.
- Low dielectric strength in transformer oil.

5.5 Transformer Coil Burn

Coil burn process happens when distribution transformer runs under overload for long days. For detecting transformer fault, at first the 'insulation tester' is used. This insulation tester measures the resistance of transformer insulation. This tester has a prime mover, mega Ω meter and two probes. To test the transformer insulation, one probes is connected to high side and another one to low side. Then the prime mover is rotating by 120 rpm (rotating per minute) and produces very low current follow like 100V. If the meter shows the resistive value less than 5 MΩ, it means coil is burned, otherwise the tester shows more or equal to 30 MΩ. The image of distribution transformer is given in figure (5.2).

Figure 5.2: The 11/.440KV distribution transformer.

5.6 Drop Out Fuse

Drop off fuse is a protection to protect transformer from burning. It is used, when transformer's distribution or feeder lines falls in short circuit or ground fault.

5.7 Low Dielectric Strength

One kind of oil is used in transformer to isolate the coil-container and to keep cool the transformer. This oil is a dielectric material. If the oil dielectric value decreases, the core can be burned or a serious accident could be occurred. So, DESCO usually checks the oil dielectric strength in every two or three years ever since the transformer is installed.

5.8 Power Factor Monitoring & Upgrading

Power factor monitoring is one of the most important factors in power system. Because poor power factor impose low effects on power generation. At Pallabi substation I have seen the power factor was about 0.97≈0.98, but usually the average is about 0.96.

Inductive load is responsible to degrade the power factor. We know that power factor is defined as the ratio of KW to KVA. But we can see that the cause of low power factor is large KVAR. And we know that the magnitude of KVAR is proportional to inductive load. All big factories, industries and workshops are main sources of inductive loads. Inductive load includes: Transformer, Induction motor and Energy saving light. Reactive power increases the amount of apparent power. This increases the reactive power and as a result apparent power creates large angle (θ) between KW and KVA and larger angle produces poor power factor (pf=cosθ).

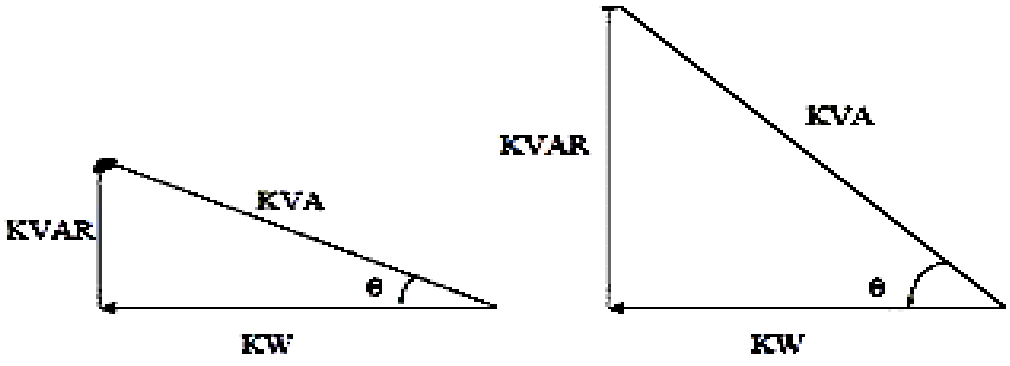


Figure 5.3: PF dependence on the amplitude of KVA

Based on the above figure (5.5), we can describe PF as follows:

- Power factor will remain as an approaching unity (if KVAR small).
- KW and KVA will be almost equal (if KVAR small).

5.9 Effect of Low Power Factor

Poor power factor affects the power distribution system, loss in distribution network and voltage drop in feeder line. Excessive voltage drop may cause over heating in distribution network. Poor power factor also affect the generation plant. The power generators act as an induction machine. The reactive power comes from these power generators. Poor power factor means more reactive power. More reactive power overloads the generate.

5.10 Control Room Activity

I have spent six and half (6.5) hours at Pallabi substation's control room. Actually control room is very important in power system. This control room is open for 7 days and 24 hours. All control room are maintenance three shift worker in power System.The basic operations of a control room are as follows:

- Communicates with other control rooms or grids.
- Communicates with line maintenance teams.
- Manage load shedding.
- Record data (Supply load, demand load, load shedding time). The image of control room at Pallabi substation is given in figure (5.4).

Control relay panels facilitate centralized control of the related controlled equipment in power stations, switching stations and industrial plant. The panels are bolted together to form a board. This approach permits replacements, extensions and rearrangement when necessary. The panel incorporates control switches and indicator lamps for remote control of controlled equipment. A "remote/ supervisory" selector switch is also provided for selection of supervisory control from remote control center.

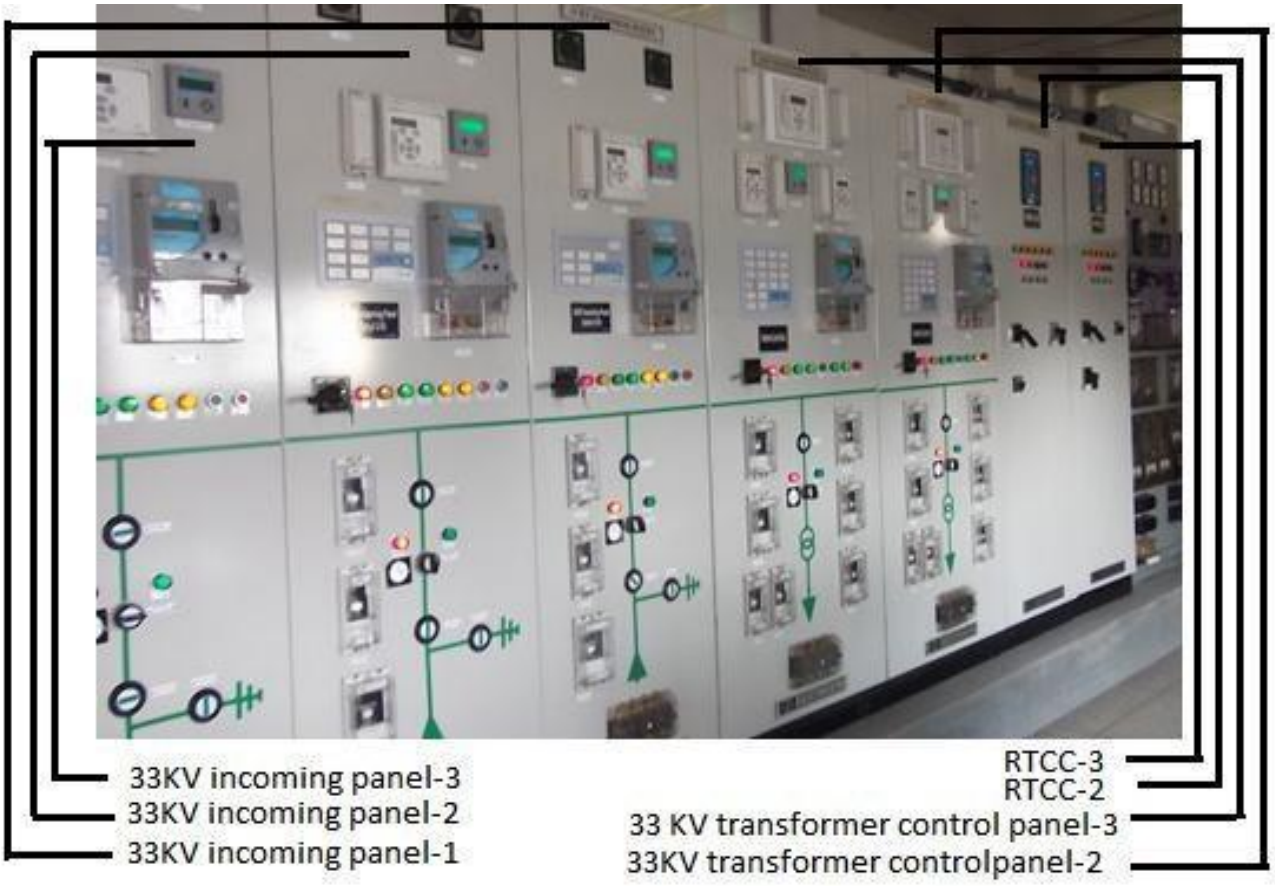


Fig 5.4: Control room at Pallabi substation (33/11KV).

5.11 Incoming Panels or Lines

At Pallabi substation there are three incoming lines. These are as follows:

- 33KV incoming panel-1 (Mirpur ,Pallabi U/G).
- 33KV incoming panel-2 (Pallabi ,U/G)
- 33KV incoming panel-3 (Pallabi ,O/H).

The equipment of 33KV incoming panels are trip circuit supervision relsy-1,trip circuit supervision relay-2,trip relay,bus isolator,ac alarm,dc alarm,on lamp, off lamp,line isolator, dir. O/C and E/F relay, multifunction meter,KWH meter and indicrator signal.The image of 33KV incoming panels with relay protection is given in figure(5.5)

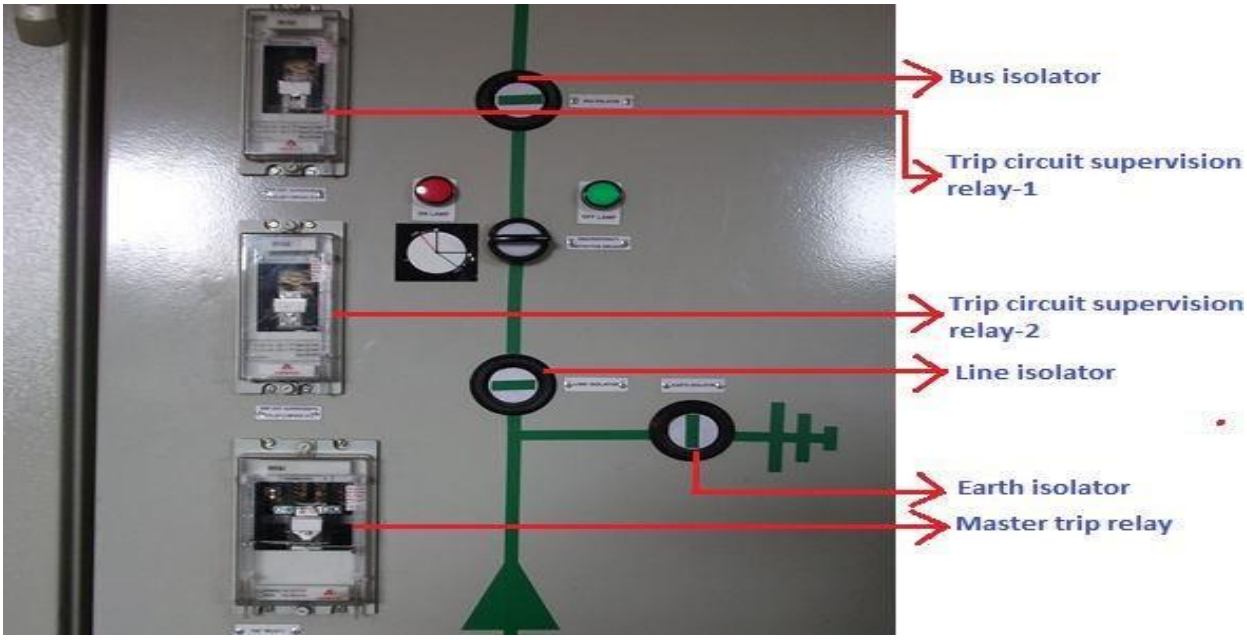


Fig 5.5: The relay protection on 33KV incoming line at Pallabi substation

5.12 Relay Protection on 33kV Incoming Line

At Pallabi substation's control room inside the 33KV incoming panel there are two trip circuit supervision relay, one trip relay, one bus isolator, one line isolator, and one earth isolator.Trip circuit supervision relay-1is the which supervises the trip circuit of the circuit breaker. It tests whether dc supply is under proper condition or not. It also provides alarm for loss of dc supply, faults in trip coil or cables, faults on the breaker auxiliary contacts and faults in the relay itself. Trip circuit supervision relay-2 is also used for same objective. Bus isolator is used to isolate the bus from incoming line due to the maintenance or service purposes of bus. Line isolator is used to isolate the incoming line due to the maintenance or service purpose of substation.

5.13 Earth Isolator

After closing the bus isolator and line isolator, some electric charge remains present in cables. Actually earth isolator is used to discharge the electric charge from the cables. Master trip relay is the main and backup for protection relay for trip circuit super vision relay [14].

5.14 The 33KV Transformer Control Panels

At Pallabi substation, these are transformer control panel-1, transformer control panel-2 and transformer control panel-3. The equipment at 33KV transformer control panel are differential relay, sensitive earth fault relay (p-120), O/C and E/F relay (p-120), multifunction meter, energy (KWH) meter, spring charge lamp, trip lamp, trip coil-1, healthy lamp, trip coil-2, healthy lamp, dc-1, dc-2, spare, trip relay-1, trip coil-1, healthy lamp, trip coil-2, healthy lamp, dc-1, dc-2, spare, trip relay-1, trip relay-1 (BZ main tank and PRD main tank), auxiliary relay-2 (WTT and OLT), auxiliary relay-3 (BZ OLTC and PRD OLTC). The image of digital relay protection is given in figure (5.6).

Fig 5.6: The digital relay protection on 33KV transformer panel.

Actually transformer differential relay is a relay that checks for current balance between the primary and the secondary side of a transformer. It also acts as a protective element to protect cables which finds the fault or the difference between the primary and secondary current. The sensitive earth fault relay of power transformer is a protective device that works by measuring the amount of lick curren Which discharges to the earth such as for any small lick at underground cables and some current are discharging to the ground of earth.

But it has a limitation. If it crosses the limit current, the sensitive earth fault relay trips the transformer. Multifunction meter is a meter which can display voltage, current, power factor, line to line voltage, phase to phase voltage and phase to neutral voltage. O/C means over current relay and E/F earth fault relay. O/C relay, if there is any imbalance in the 3 phase current then the over current relay trips the circuit. During storms, if the phase falls down to the earth, then the earth fault relay trips the circuit [15] [14] the image of relay protection on 33KV transformer panel is given in figure (5.7).

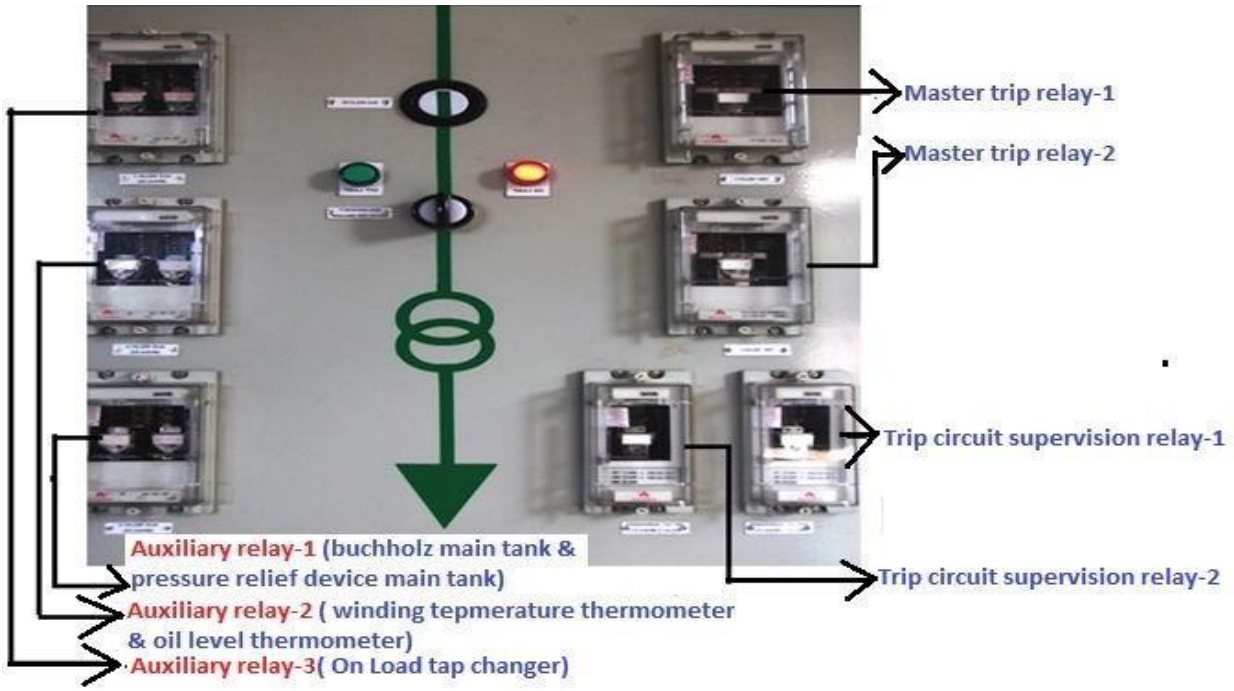


Fig 5.7: The relay protection on 33KV transformer panel at Pallabi substation. Relay Protection on

5.15 Outgoing Feeders

At Pallabi substation there are eighteen numbers of 11KV outgoing feeders. But seven numbers of 11KVoutgoing feeders are closed or spare for requirement of future generation and three numbers of 11KV outgoing feeders are for switching and only eight numbers of 11KV outgoing feeders are active for the distribution of electricity

CHAPTER -6

Conclusion & Discussion

6.1 Consolation

I have spent some remarkable days at DESCO during my internship program. DESCO is one of the best practical grounds for the Electrical and Electronic Engineers in our country. I must say the theories that I have learned at my university was practically observed by me at DESCO. I consider myself very much lucky to have my internship program with a reputed electricity distribution company like DESCO. It gave me an opportunity to implement my theoretical knowledge practically. My achievements from DESCO are as follows:

- Industrial training provided by DESCO has enriched my practical knowledge.
- It has enlarged my thinking capacity about practical operations of the different equipment.
- I have learned about the design, implementation, operation and maintenance of a grid substation.
- It has increased my confidence level for facing job interview in future.
- DESCO gave me a unique experience of understanding the equipment of substation.

The friendly environment in DESCO encouraged me to co-operate with others. I have learned a lot and obtained practical knowledge during my internship at DESCO which will help me in future life.

6.2 Discussion

The Switchgear, Protection and Network Automation are integral part of the Modern energy Management and national economy. The computer controlled Network Automation by Load control center, power station control rooms and substation control rooms and communication channels together ensures the control of national and regional grids and control of voltage, frequency, power Ltd.(DESCO) was assigned to manage power transmi9ssion system,

and power distribution system. During the training period there have learnt about power transmission system and distribution system, controlling and operating breakers, isolators, acknowledge of alarm observing the signal. It has also learnt about the various types of maintenance like transformer dielectric strength of oil test, insulation test of conductors etc.
Everyone thinks DESCO should continue such Internship opportunities. It will be a great help for students who are going to complete their degree of bachelor of engineering in EEE.

REFERENCES

[1]http://www.bpdb.gov.bd/bpdb/index.php?option=com_content&view=article&id=5&Itemid=6

[2]https//www.desco.org.bd/index.php?page=organogram

[3]https//en.wikipedia.org/wiki/

[4]photo taken by author from personal communication at DESCO

[5]www.google.com/

[6]http//www.desco.org.bd/

[7]Wiki answer, the Lighting Arresters(online). Available:
http:/en.wikipedia.org/wiki/Lightingarrester

[8]https//www.en.wikipedia.org/wiki/Dhaka_Electric_Supply_Company_Limited

[9]https//ww.electrical4u.com/electrical_transformer/working-principle-transformer.php.

[10]https//www.electricilnotes.com/

[11]https/www. electrical4u.com/differential-protection-of-transformer-differential-relay.

[12]Wiki answer, Bus Bars,(online).Available:
http://en.wikipedia.org/Wiki/Bus/Busbar

[13]Different relay, Air Circuit Breaker,SF6 Circuit Breaker [Online]. Available:
http://electrical4u.com

[14]History and Divisonal Data of Dhaka Electric Supply Company,
[Online]. Available : http://WWW.desco.org.bd/

[15] Principles of power system by- V.K. Mehta & Rohit Mehta

[16] A Textbook of Electrical Technology by-B.L Theraja

[17] Switchgear Protection and Power Systems - SunilS. RAO