INTERNSHIP REPORT

ON

Electricity Distribution, Operation, and Maintenance of Substation (Dhaka Electric Supply Company Limited)

By

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Submitted to the

Department of Electrical and Electronic Engineering
Faculty of Sciences and Engineering
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for the degree of
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Approved By

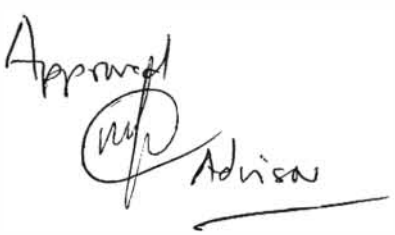
OCT 7 2010	7.10.2010	07.10.2010
Dr. Md. Ishfaqur Raza	Sharmin Rowshan Ara	Dr. Anisul Haque
Academic Advisor	Academic Advisor	Department Chairperson

Approval Letter

To whom it may concern

This is to certify that Saniul Islam, student ID 2006-3-80-004 and Imran Ahmed, student ID 2006-2-80-052 have successfully completed the project work that was assigned to them as part of the internship program. I, Engr. Md. Golam Rabbani, on behalf of Dhaka Electric Supply Company (DESCO) Ltd. am recommending this work as the fulfillment for the requirement of EEE 499 Industrial Training. I wish them success.

Engr. Md. Golam Rabbani



Acknowledgment

We had a remarkable time during our internship at DESCO. We very much acknowledge the encouragement and assistance given to us by the people at DESCO. We are very grateful to Dhaka Electric Supply Company Limited for giving us the opportunity to complete our internship in their organization. We want to specifically mention Md. Golam Rabbani, who is the manager of human resource management and development (HRM& D) of DESCO Ltd. for his support and guidance during the internship program at DESCO.

We are grateful to our honorable supervisor Dr Md. Ishfaqur Raza, Associate Professor, Department of Electrical & Electronic Engineering, East West University (EWU) and Sharmin Rowshan Ara, Senior lecturer Department of Electrical & Electronic Engineering, East West University (EWU) for providing me much needed assistance and diluting time constraints and also to encouraging me to prepare the internship report on "Dhaka Electric Supply Company Limited".

We would also like to mention the name of Dr. Anisul Haque, Chairperson& Professor of the Department of Electrical & Electronic Engineering, East West University (EWU) for being so kind during the period of my internship. Finally, We would like to thank some persons who had given us appointment from their precious time to collect related data of my report and also helped us to understand many related matters and gave their precious time to us more than once. they are Engr. Md. Akharul Islam, Manager(Prepaid meter production unit); Engr. Md. Mohammad Shafiqul Islam, DM (Pallobi S&D Divn.), DESCO; Engr. Md. Manjurul Hoque, Manager, System protection & Grid, DESCO; Engr. Md. Raihan Habib, DM(prepaid Metering pilot project),DESCO; Engr. Md. Zulfiquar Tahmid Manager (SE&D),DESCO; Engr. Md. Abdus Salam, Manager (CP&MIS),DESCO; Engr. Md. Golam Mowla, AM(Grid & Protection) ,DESCO; Engr. Md. Shawkat Ali, DM, Tongi(East)S&D Divn, DESCO.

Executive Summary

Electricity is a fundamental requirement, to upgrade the socio economic condition and to alleviate poverty. Proper and enough electricity supply have a great positive impact on our national economy as well as on GDP of the country, where GDP is one of the important measures of the economic condition for a developing country like Bangladesh. Adequate electricity supply will also help to attract foreign investment. But Bangladesh is going through a huge power crisis for a long time. Demand of power is very high but supply is not adequate. Only 47% population of Bangladesh has access to electricity which is very low compared to other developing countries. This power crisis is slowing down the economic growth of the country.

The power sector in Bangladesh has many problems; e.g. lack of supply capacity, frequent power cuts, unreliable quality of supply, and poor financial and operational performance of the sector entities. Among the three main components of the power system, recent reform activities were centered on generation and transmission. However the most pressing problem in the power sector has been with the distribution system.

To solve these problems, the Government of Bangladesh has taken an initiative to unbundle the Power Sector in the form of Public Limited Companies. As a result, aiming to provide better consumer service and to improve revenue collection Dhaka Electric Supply Company Ltd. (DESCO) was created in November 1996 under the Companies Act 1994 as a Public Limited Company, taking over some jurisdiction area of DESA. The operational activities of DESCO at the field level commenced later on September 24, 1998. The primary aim of creating DESCO was to provide better consumer service and to improve revenue collection.

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1. Overview of Internship

1.1. Objective of Internship

The internship has been undertaken as a part of my fulfillment of Undergraduate Degree. It is the Department of Electrical and Electronics Engineering, East West University, which develops students on the basis of practical knowledge with theoretical support. Assignment of such a intern to be conducted under the guidance of my advisor, Dr. Ishfaqur Raza, Associate Professor, Department of Electrical & Electronic Engineering, East West University, has set the stage to conduct the intern. Conducting such an intern has given me a rare opportunity to blend my theoretical knowledge with practical aspects of the distributions and operations in power sector. The purpose of this report is to explain in writing the learning from the internship program. The objective of internship was to gather practical knowledge and experiencing the implementation of theoretical study in real world. To this regard this report is contemplating the knowledge and experience accumulated from the internship program. With the set guidelines by the EEE Department of East West University and our internship Supervisor this report comprises of an organization part and a project part. The prime objective of the organization part is to present a background and introduction of DESCO Ltd.

1.2. Sources and Methods of Data Collection

The Methodology of the study is to collect data, processing the data in a very systemic form so that it can be possible to predict something about the company based on the analysis. Data can be collected both from primary level and secondary level. But this is true that primary data collection is much more difficult due to time constraints and the information is sometimes confidential to the company itself.

To conduct the project the following sources have been used.

- Primary Information: The primary source of information is based on the collecting reports of different S&D division of DESCO.
- Secondary Information: The secondary source of information is based on Internet Searching, Annual report of DESCO.

1.3. Benefit of study

The analysis in the project part is based on distribution, operation and maintenance of Substation. In a word this report will give a short scenario of how the distribution, operation and maintenance of substation work. We hope this report will be helpful for the students who have interest to work on power system.

1.4. Limitations

The thesis has certain limitations, which must be mentioned for the sake of reader's understandability and achieving transparency. As most of the data were taken from the web sites, though the cross check was conducted; still the depth of reliability varies as by the nature of web sites. For data, most of the data used in this paper are government published data, so the verification of this data was not possible. Lastly the limited knowledge of the analyst, who is conducting such report for the first time, has its effect on the paper.

1.5. The Internship Schedule

For Internship purpose we went to many sales and distribution (S&D) division of Dhaka Electric supply Limited (DESCO). We have gone to many sub-stations which are operated by DESCO. We went 132/33kv sub-station in Bashundhora which is operated by DESCO. We have also gone 33/11kv sub-station in Tongi S&D division, Mirur S&D division and Uttora S&D division. We also have visited control room of sub-station of the above S&D divisions. We also have visited Banani head office of DESCO to learn about their e-governance sector. In the head office we also learned about planning and development of DESCO's distribution system. We have also visited the prepaid meter production unit in Mirpur S&D division. Internship attachment schedule is given bellow:

Date & Time	Location	Topics	Coordinator/Instructor
11/05/10 9:00am to 2:00pm	Uttara Training Centre, Uttara S&D Division, DESCO.	Welcome speech & DESCO at a Glance	Engr. Golam Rabbani, manager (HRM& D) & Mr. Reazul Hossain Talukdar Assistant manager (HRM& D)
12/05/10 9:00am to 2:00pm	Prepaid meter production Unit, Mirpur	Prepaid Meter	Engr. Md. Akharul Islam, Manager(Prepaid meter production unit)
13/05/10 to 17/05/10 9:00am to 2:00pm	Pallabi S&D Division, DESCO.	Commercial operation: -Disconnection/Reconnection -Metering -One point service center -Billing collection -Complain center -New connection	Engr. Md. Mohammad Shafiqul Islam, DM (Pallobi S&D Division.)
18/05/10 9:00am to 2:00pm	Uttara 33/11Kv substation, Uttara S&D Division, DESCO.	Overview of substation, operation and maintenance of substation	Md. Manjarul Haque, Manager, System protection & Grid & Engr. Khondokar Ishtiaque Ahmed AM, (Grid and protection)
19/05/10 9:00am to 2:00pm	Uttara S&D Division, DESCO.	Operation of prepaid meter	Engr. Md. Raihan Habib, DM,prepaid Metering pilot project
20/05/10 9:00am to 2:00pm	CP & MIS Division, DESCO H/Q	E-governance	Engr. Md. Abdus Salam, Manager(CP&MIS) & Mr. Mamunor Rashid DM, (CP&MIS)
23/05/10 9:00am to 2:00pm	S&D Division, DESCO H/Q	Technical activities, Major project and future plan	Engr. Md. Zulfiquar Tahmid Manager,(SP&D)
24/05/10 9:00am to 2:00pm	Bashundhara grid substation	Operation of Bashundhara grid substation	Engr. Md. Golam Mowla, AM(Grid & Protection)
25/05/10 to 31/05/10 9:00am to 2:00pm	Tongi(East) S&D Division, DESCO.	S & D operation -Load section & load retention -Temporary & new connection -Load management -Control room activity -Power factor monitoring and upgrading -Substation maintenance and line maintenance -Wireless & telecommunication -DAS maintenance	Engr. Md. Shawkat Ali, DM, Tongi(East)S&D Divn.DESCO
01/06/10 11:00am	HRM & D Division, Head Office, DESCO.	Report submission and certificate distribution	

Table 1: Internship schedule.

2. DESCO LTD OVERVIEW

2.1. Introduction

Electricity is a vital ingredient, necessary to upgrade the socio-economic condition of the general population and alleviate overall poverty. The supply of electricity has a great impact on the national economy. Proper and enough reliable electricity supply have a great positive impact on our GDP and GDP is one of the key measures to understand the economy of a country. It is also fundamental for the growth of foreign investment in Bangladesh. This is because when the foreign investors want to invest in any country at first they observe the economic growth or the GDP growth rate of the country and for the developing country like Bangladesh, investment of foreign investors is very necessary to develop the country. Bangladesh is a densely populated country with 160 million (approximately) people. Population is increasing but generation of power is not increasing. Only 47 % of the country's population has access to electricity, which is very low compared to other developing countries of the world. And per capita generation is 182 kWh which is also lower compared to the neighboring countries. This current power crisis is slowing the pace of our GDP growth rate. To increase the GDP growth rate, available and reasonably priced electricity is a prerequisite. Because Bangladesh economy is depending upon educational, agricultural, industrial, commercial and other economic development and these development directly and indirectly depend upon fluent electricity supply. The main reason for the current power crisis is by lack of supply capacity, frequent power cuts, unreliable quality of supply, and poor financial and operational performance of the sector entities. Among the three main components of the power system, recent reform activities were centered on generation and transmission. The most pressing problem in the power sector has been with the distribution system.

In order to lay greater emphasis on distribution management of electricity in the metropolitan of Dhaka city, DESCO was formed on 3rd November 1996. It started its commercial operation on 24th September 1998 at Mirpur taking control over Dhaka Electric Supply Authority (DESA). The main objectives of DESCO are to enhance reliability of electricity supply, to improve customer service, to reduce system loss to a reasonable level, to augment revenue collection and above all to bring dynamism in the distribution system management and run it commercially in a viable way.

2.2. Background

Since the inception of Bangladesh, Power Development Board (PDB) was responsible for the electricity generation, transmission and distribution of the entire country. At that time the consumption of electricity of the Greater Dhaka region was about 62 percent of the total electricity sold in Bangladesh. Therefore, to provide quality service it was a necessity to establish a separate authority to distribute electricity in this core area. The result is Dhaka Electric Supply Authority (DESA). DESA was established in the year 1991 and within a few years it became a losing concern, due to huge corruption and poor performance with respect to system loss and account receivables. Workers' association was also a significant problem of DESA.

The poor revenue collection performance of DESA was also hurting the generation and transmission side of the Power Sector as cash inflows to the sector come only from distribution agencies. To solve these problems Government of Bangladesh took an initiative to unbundle the Power Sector in the form of Public Limited Companies. As a result, aiming to provide better consumer service and to improve revenue collection Dhaka Electric Supply Company Ltd. (DESCO) was created in November 1996 under the Companies Act 1994 as a Public Limited Company, taking over some jurisdiction area of DESA.

2.3. Organization Status of DESCO

The operational activities of DESCO at the field level commenced on September 24, 1998 starting from a consumer base of 71,161 and load demand of 90 MW in 1998, the Company has grown to cater to 415,842 consumers with a load demand of 545 MW as of June 2009, recording an increase of 484.00% and 506.00% respectively over the last ten years. During the same period, the Company's gross fixed assets, including capital works in progress, increased from Tk. 130 Core to Tk. 1017 Core with a growth of 682%, while the shareholders equity increased from Tk. 121 Core to Tk. 465 Core, recording a growth of 284%. DESCO has become a high profitable organization with earning per share of more than taka 120.

2.4. 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:

- 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.

2.5. Start up to the DESCO

DESCO was constituted to provide uninterrupted & stable power supply, better consumer service, improve system loss & CI 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:

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

The service territory of DESCO is as follows where the above services provided:

1st Phase:

Mirpur area bounded by Rokeya Sarani 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 low lying areas in the North. The proposed area is shown in the enclosed map. The area covered under the 1S1 phase was taken over by DESCO on September 24, 1998 from DESA.

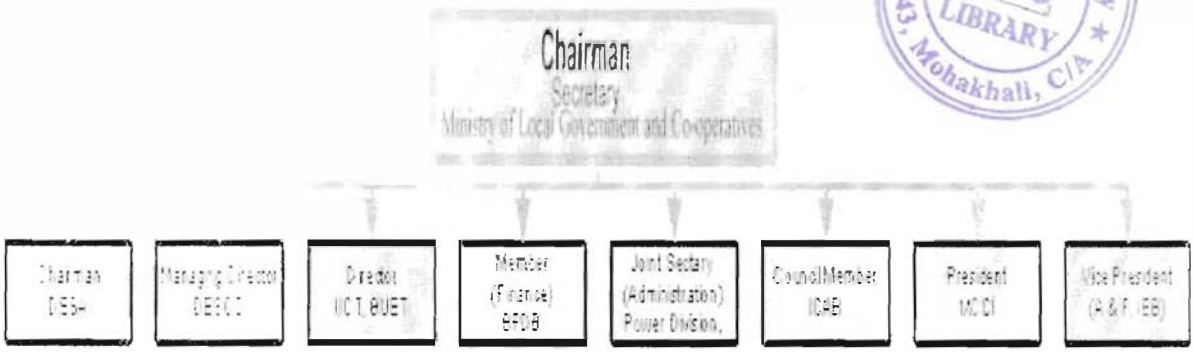
2nd Phase:

Gulshan Circle including Mirpur Area bounded by Balu River in the east, Turag River in the west and Turag and Balu River in the Nort and Mirpur Road, Agargaon Road, Rokeya Sarani,

Progoti Sarani, New Airport Road, Maymenshing Road, Mohakhali Jeel, Rampura Jheel connected with Balu River in the South (Map enclosed). The additional area covered under the 2nd phase was taken over by DESCO on April 09, 2003 from DESA.

2.6. Core Management of DESCO

The company is run by a small management team headed by the Managing Director under the guidance of a nine member Board of Directors. DESCO always envisages running the system efficiently and economically keeping minimum overhead cost with minimum number of skilled manpower. The Desk-top Jobs and supervisory activities are generally carried out by DESCO employees under its regular payroll while the field operations have been out sourced. Since its commencement, the field level functions of DESCO have been implemented through separate divisions of System Operation and Commercial Operation but with the expansion of operational area and fast increase in consumer strength and system load, DESCO took up appropriate steps and created six numbers of Sales and Distribution (S&D) Divisions having all such field activities been merged under the common umbrella of each S&D Division. This is a way forward towards providing prompter & better consumer service. Following figure shows the core management of DESCO:



CORE MANAGEMENT OF DESCO

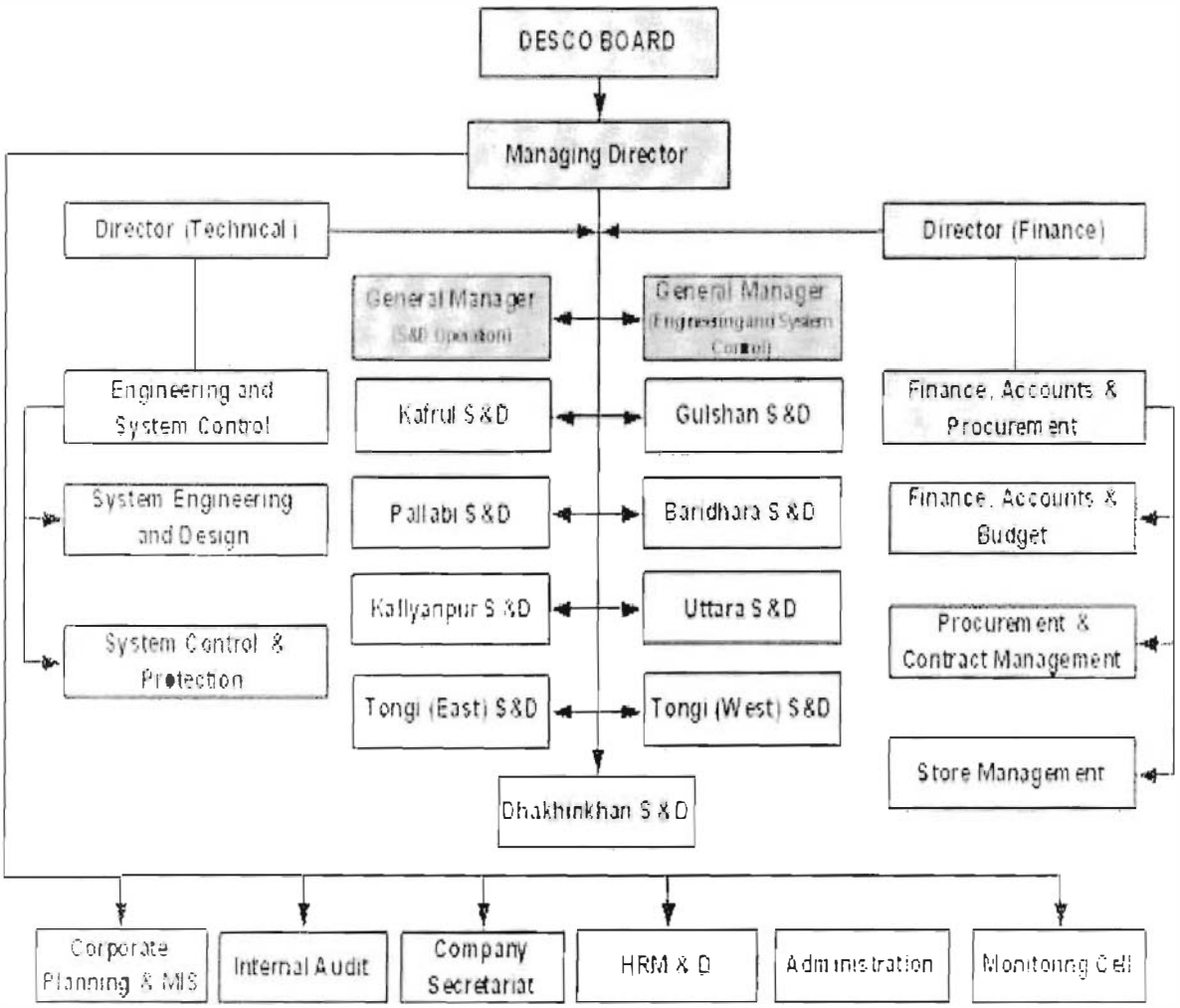


Figure 1: Core Management of DESCO.

2.7. Mission, vision and corporate philosophy. The Mission, vision and corporate philosophy are-

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

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.

Corporate Philosophy: Service excellence with integrity and corporate social responsibility.

2.8. Ethics of DESCO employees

The members of the DESCO, in recognition of the importance of their service in affecting the quality of life throughout the nation, and in accepting personal obligations to their responsibilities, do hereby commit ourselves to conduct of the highest ethical and professional manner and agree:

a) To accept responsibilities in making electricity distribution and sale of power decisions consistent with the safety, health, and welfares of the consumers, and to disclose promptly factors that might endanger the consumer or the environment;
b) To be honest and realistic in stating claims or estimates based on available data;
c) To reject bribery in all of its forms;
d) To improve understanding of technology, it's appropriate application, and potential consequences;
e) To seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contribution of consumers;
f) To treat fairly all persons regardless of such factors as race, religion, gender, disability, age or political support;
g) To avoid injuring others, their properties, reputation, or employment by false or malicious action;
h) leagues and co-workers in their professional developments and to support them in following this code of ethics.

2.9. Services and products

SERVICES: As an electricity distribution utility service organization, DESCO's services are to the utmost satisfaction of consumers through reliable and uninterrupted power supply and provide value of money by revenue generated and also provide customer-friendly environment for collection of payment by customers.

PRODUCTS: As an electricity distribution utility service organization, DESCO's products are:

a) Service drop (Power carrying conductor) for supply of electricity to consumers' premises.
b) If needed Power transformer for supply of electricity to consumers' premises.
c) Electricity consumption recording meter.
d) Pre-paid meter.

2.10. Responsibilities of DESCO

Every member of DESCO is dedicated to –

1) Provide dependable Power service to the customers,
2) With honest and sincerity,
3) Abide by the electricity act ;
4) Concern about future requirement of energy;
5) Work together with community and customers to conserve it,
6) Follow rule of saving by avoiding wastage and misuse.
7) With the Knowledge of the state-of- the-art technology to work in power distribution system;
8) Capable to work to ensure sustainable development for providing quality power and
9) Cause to feel the customer delighted.
10) Installing new lines, substations etc. in the newly developed area and existing area to fulfill the ever rising demand of electricity.

DESCO receives electricity from Bangladesh Power Development Board (BPDB), authority responsible to generate electricity. Electricity is transmitted from the Power Plants to DESCO's receiving sub-stations through the National Grid. Power Grid Company Bangladesh Limited (PGCB) is in-charge of the National Grid and they receive wheeling charge for transmission of electricity through the National Grid. DESCO distributes electricity to the consumers through its own distribution network and collets revenue against the electricity usage. Following figure shows the power supply chain to consumer:

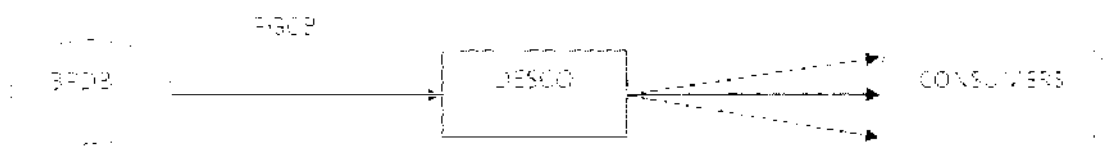


Figure 2: Power Supply chain to consumer.

2.12. Energy Purchase and Sales Rate

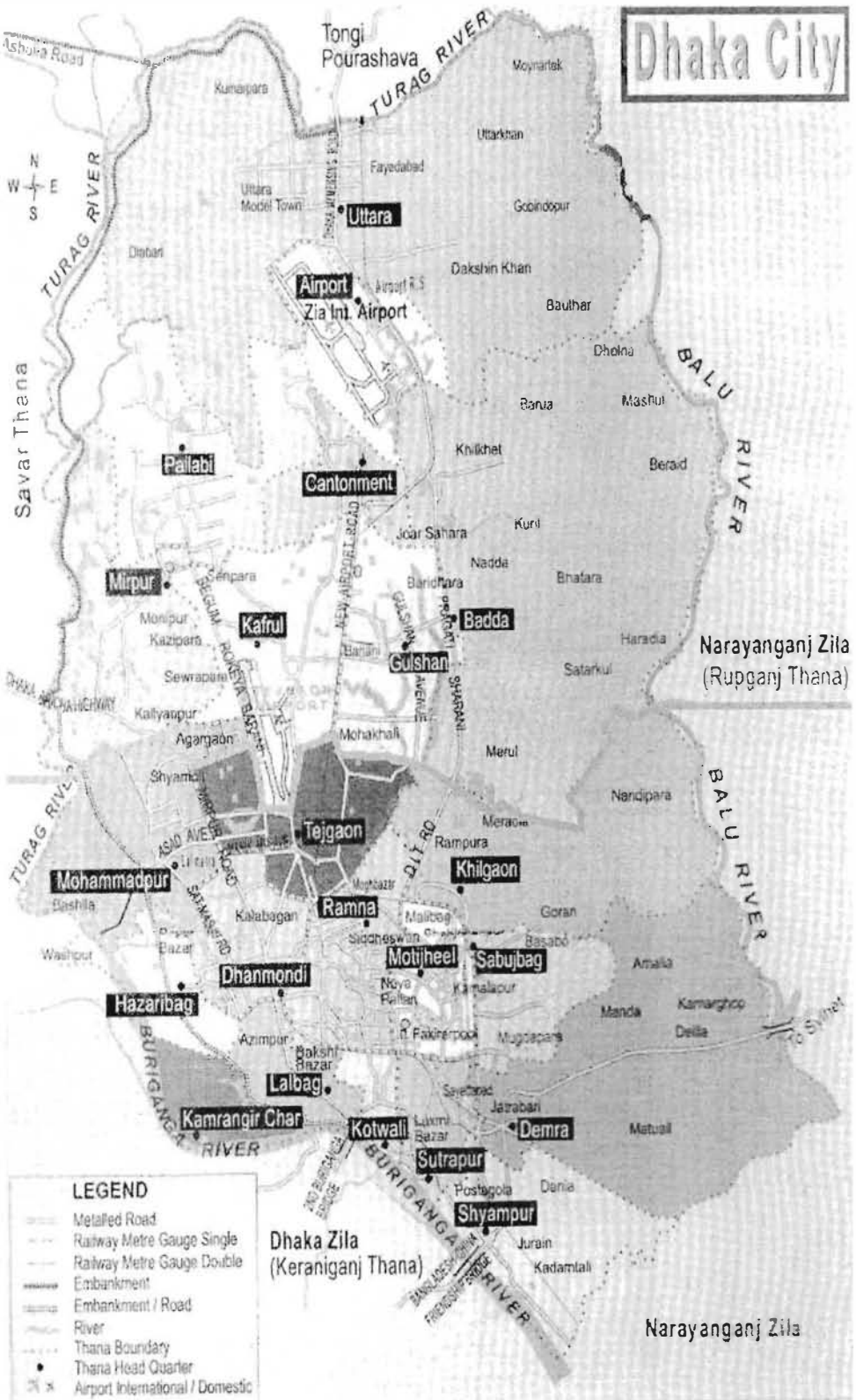
The energy Purchase Rate, Sales Rate and Wheeling Charges are fixed by the Bangladesh Energy Regulatory Commission (BERC).

Purchase Rate from PDB : 2.62 Taka/KWH
Wheeling Charge (to PGCB) : 0.05 Taka/KWH

The electric energy selling rate varies with types of consumers, timing of consumption (peak, off-peak) and amount of consumption. The energy selling rates are also fixed by the Bangladesh Energy Regulatory Commission (BERC).

2.13. Territory of DESCO

The service area of DESCO is mainly the Northern part of Dhaka City, Viz. Mirpur, Pallabi, Kafrul, Kallyanpur, Gulshan, Banani, Cantonment, Baridhara, Badda, Uttara, Dakhinkhan, Tongi Pourashava and Purbachal Model Town. The service area is about 220 square kilometers except Purbachal Model Town.



DESCO Area

DPDC Area

Figure 3: Territory of DESCO.

Sl	Particulars	Present status	Projected up to 2013
1	Source line (33 KV)	268 KM	350 KM
2	Distribution line (11 KV)	2.832 KM	3652 KM
3	No of substation (33/11 KV)	21 Nos	31 Nos
4	Installed capacity	760/1064 MVA	1240/1736 MVA
S	Max demand	545 MW	830 MW
6	Load factor	57.45%	
7	Distribution and transformer (11/0.4 kV)	4613 Nos	6047 Nos
8	No of feeder (IIKV)	212 Nos	310 Nos
9	132/33 KV Grid SS	07 Nos	10 Nos
10	No of consumers	4,28.098	6,92.500
11	System loss	9.79%	85%
12	Prepaid metering	9,780 Consumers	2.10,000 Consumers
13	Sales and Distribution Division	9	13

Table 2: Infrastructure

2.15. Consumer and Consumption

The following figures picture the total number of DESCO consumers from inception to June, 2009 and up to last 2008-2009 fiscal year its category type consumer mix and usage patterns.

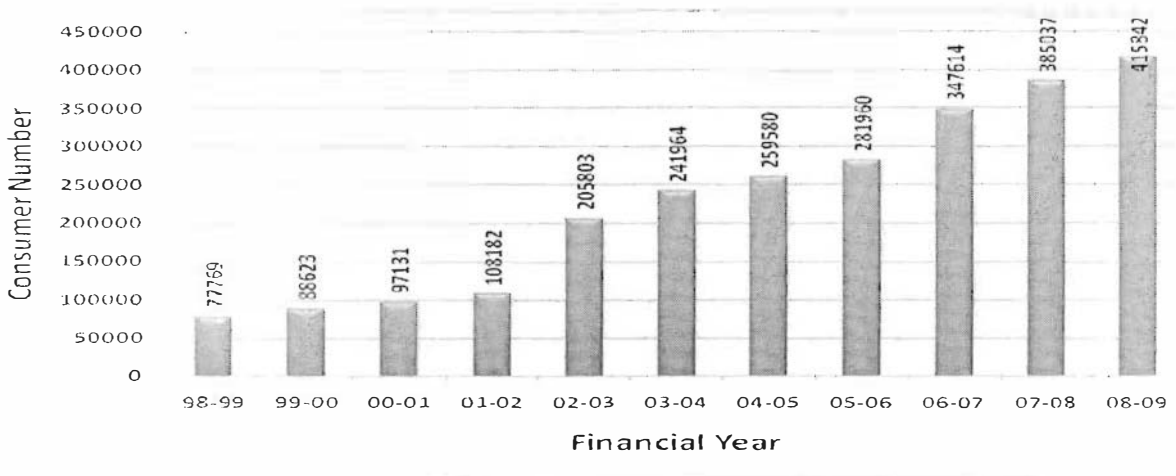


Figure 4: Consumer Growth of DESCO.

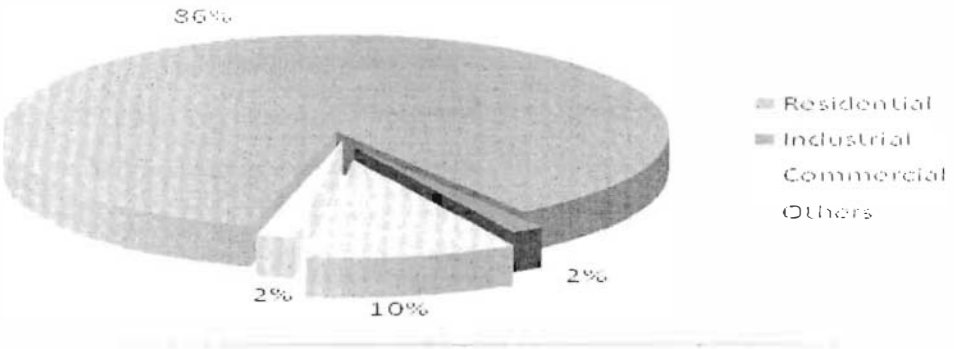


Figure 5: Consumer Mix of DESCO.

Consumption Pattern

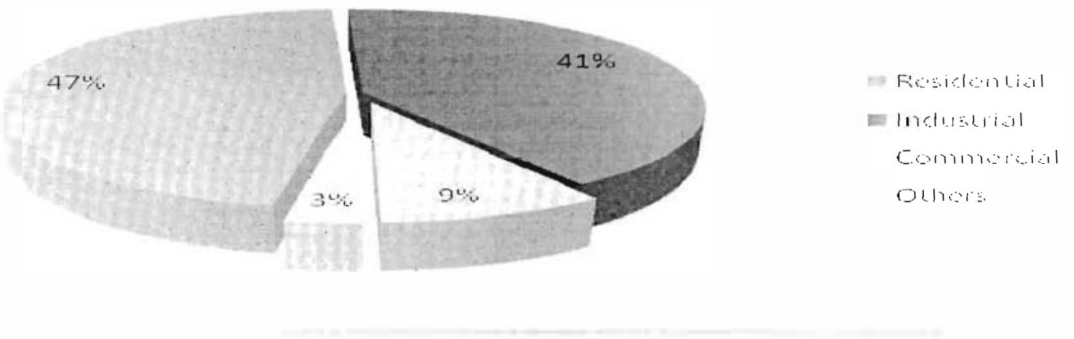


Figure 6: Consumption Pattern of DESCO's Consumers.

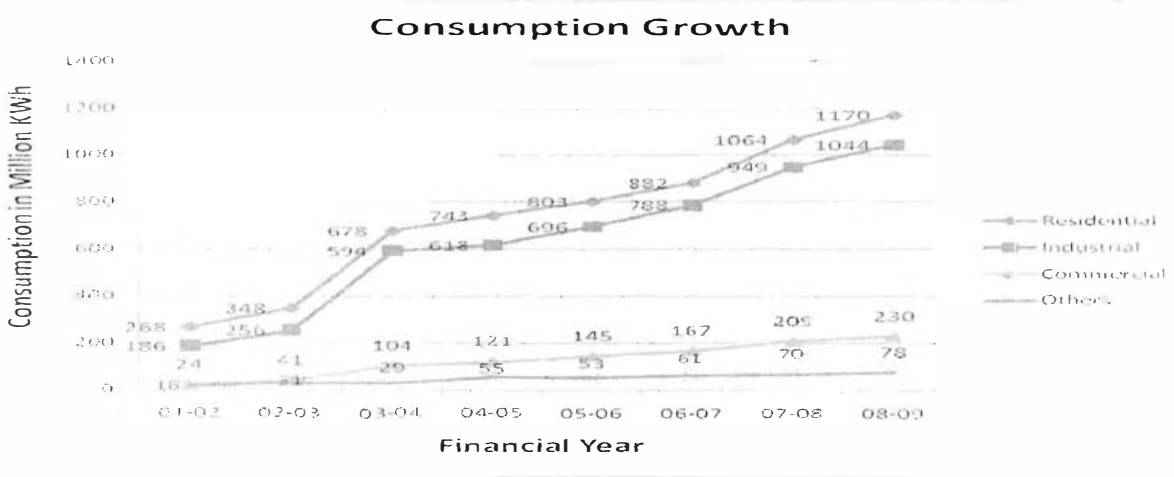


Figure 7: Usage Category wise Consumption Growth.

from the inception. DESCO is showing constant improvement in reducing system loss. At the beginning, in the year 1998-99 the system loss was 40.61%, where as in the year 2008-09 it is reduced to 9.79%, which is lowest among all the electricity distribution agencies of Bangladesh. Following figure shows how distribution system loss decreases year by year.

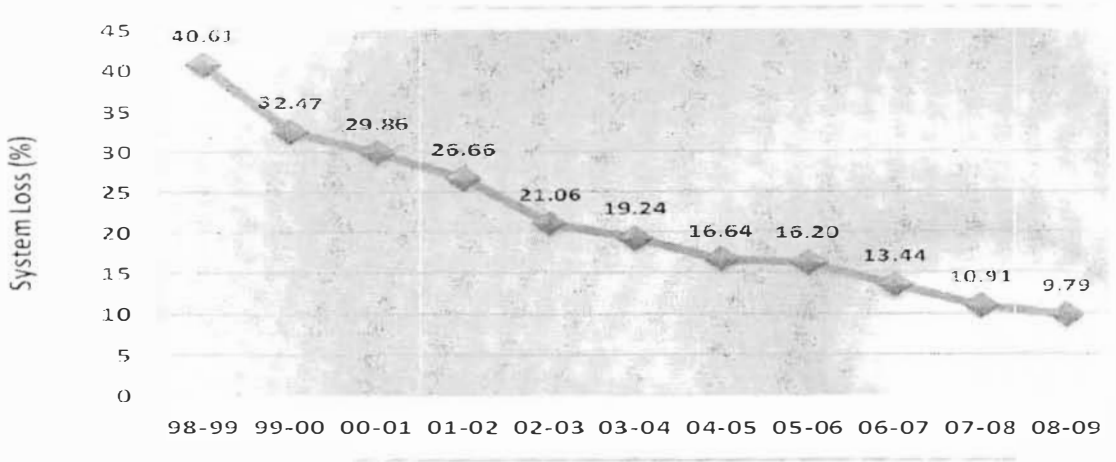
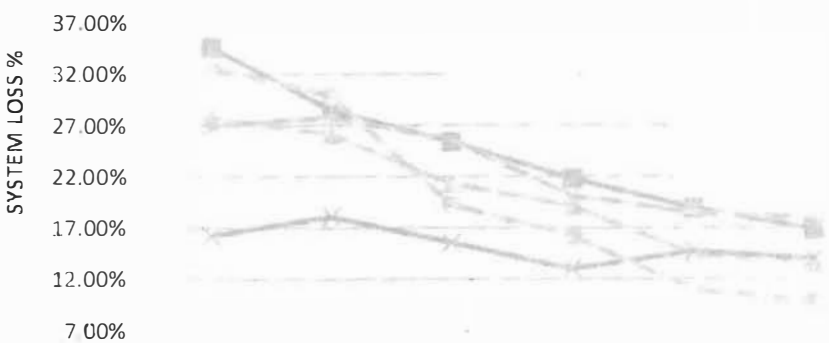


Figure 8: Year-wise Distribution System Loss of DESCO.



	1998	2000	2003	2005	2008	2009
BANGLADESH SYSTEM LOSS % OR THEFT	34.54%	28.43%	25.39%	21.80%	18.93%	16.84%
BPDB % THEFT	27.73%	26.11%	21.33%	19.06%	14.39%	13.58%
REB % THEFT	16.24%	18.08%	15.60%	12.98%	14.73%	13.97%
DPDC % THEFT	26.88%	27.77%	25.62%	20.13%	18.44%	17.88%
DESCO % THEFT	32.47%	29.86%	19.24%	16.20%	10.91%	9.79%

Figure 9: System Loss Reduction Progress Year by Year For all Distributors.

2.17. Net Profit before Tax

Starting its operations in the year 1998, DESCO managed to achieve its first profit in the year 2003. Since then, profit is increasing year by year. Following figure shows how profit increases year by year.

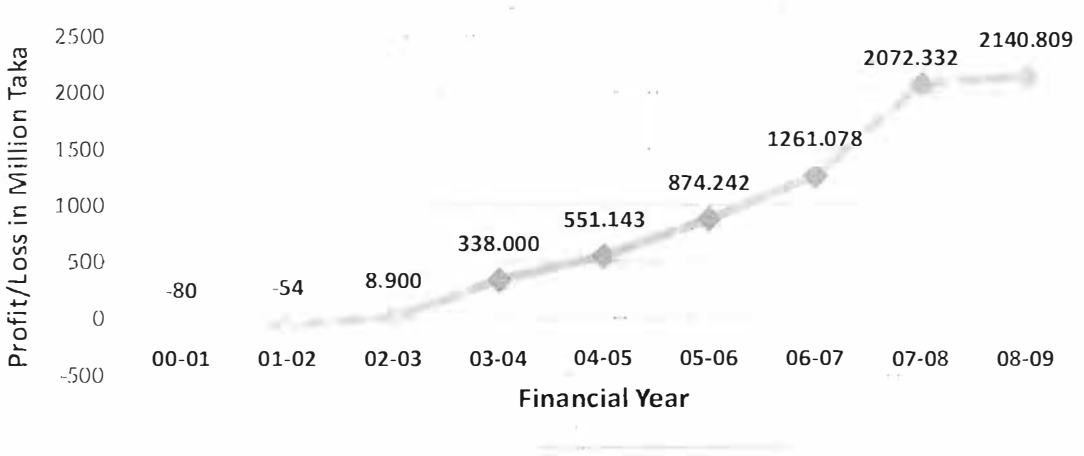


Figure 10: Year-wise Net-Profit before Tax.

2.18. Maximum Demand

In any event, sales data are poor measures of demand firstly because the full demand has not in practice been met and, secondly, because there are high levels of theft from the system that are not reflected in sales data. The unsatisfied demand on the power supply system has led to load shedding and the development of captive generation by major consumers. Load shedding grew in frequency and intensity during the early to mid 1990s. However, in the last 5 years or so there has been greater shortage of power due to lack of initiative to install new power plants, as Figure 11 shows.

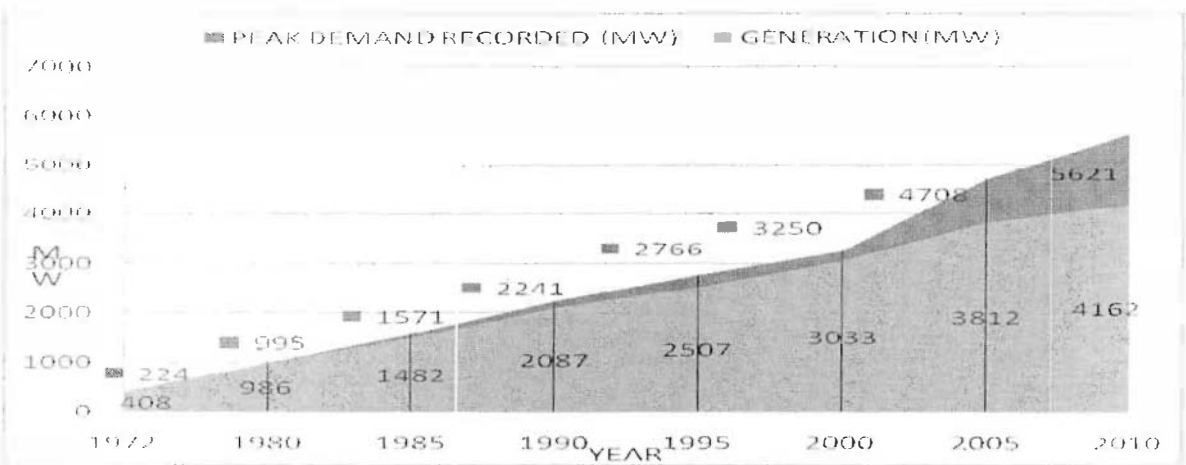


Figure 11: Peak demand served versus Generation.

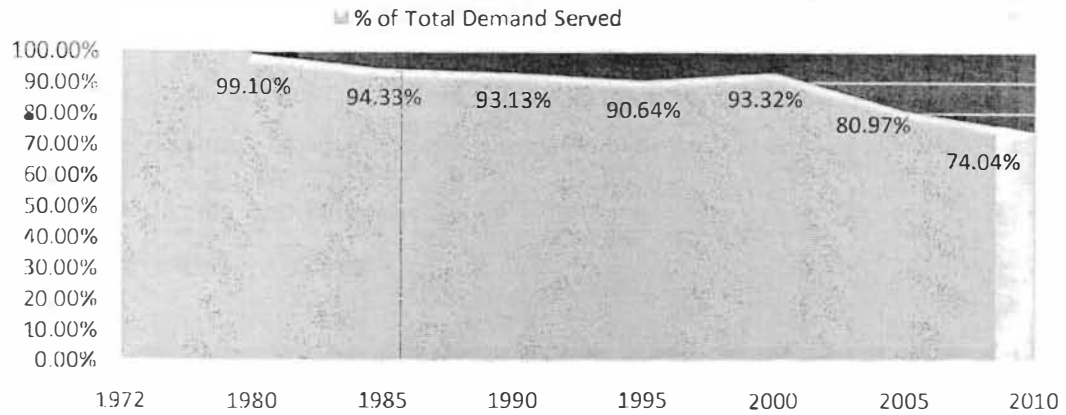


Figure 12: Percentage of Total demand served.

High levels of losses, as a result of both technical factors and the theft of power, have been a continuing issue in Bangladesh. Between 1998 and 2009 power system losses have ranged between 16.84% from 35.54%. Excessive losses appeared as a continuing theme in documents going back to the 1970s, when losses ranged between 34.6% and 42.5%. For the past 5 years, system losses have been on a downward trend and the provisional estimate of 16.84% for 2009, if confirmed, will be the lowest figure achieved since independence. Some of these losses arise from technical factors such as losses in stepping down power and in transmission and distribution. The Power System Master Plan suggested that 7.00% would be a reasonable level of technical losses on the Bangladesh power system. However, there are considerable technical problems with the Bangladesh transmission and distribution systems at the moment that cause it to run with excessive loads for much of the day. This tends to increase technical losses and thus the current level is probably in excess of 15%. However, even after allowing for these factors, the system loss of 16.84% incorporates high levels of non-technical loss, i.e., theft.

3.1. Introduction

Co-ordination & monitoring of all support system to perform or run the system smoothly is the main function of Commercial Operation. The main Activity of Commercial Operation –

1. Disconnection and Reconnection
2. One point service center
3. Outsourcing Operations
4. Data acquisition System
5. Billing and collection
6. New connection
7. E-governance
8. Metering

The above topics are the main activity of commercial operation. Here, we have learnt about the commercial activity of DESCO from Pallabi S&D Division. Engr. Md. Mohammad Shafiqul Islam, DM (Pallobi S&D Division) was our coordinator. From 13th May 2010 to 17th May 2010 we were in Pallabi S&D Division, DESCO. Our schedule time was 9:00am to 2:00pm, every day. We have visited one point service center of Kallyanpur S&D Division and have learnt how one point service center works. For metering purpose, we have also visited prepaid meter production unit, Mirpur. On the 12th May 2010, 9:00am to 2:00pm, we have visited prepaid meter production unit. On that day, Engr. Md. Akharul Islam, Manager (Prepaid meter production unit) was our coordinator. We have learnt about e-governance of DESCO from CP & MIS Division, DESCO H/Q. Engr. Md. Abdus Salam, Manager (CP&MIS) & Mr. Mamunor Rashid DM, (CP&MIS) was our coordinator. On the 20th May of 2010, 9:00am to 2:00pm we were in S&D Division, DESCO H/Q. Engr. Md. Zulfiquar Tahmid showed their Technical activities, Major project and future plan in a power point slide.

3.2. Types of Tariff

There are 10 different types of connection according to the consumers demand. Types of new connections are listed bellow –

- A -Residential
- B - Irrigation

- E - Commercial
- F - 11 KV
- G - 33/132 KV (DPDC)
- H - HT
- I (I-1, I-2 ,I-3, I-4, I-5, I-6) - Utility
- J - Street light

3.3. Disconnection/Reconnection

Disconnections of consumer's line are mainly based on four reasons. Those are -

- Disconnection for non-payment of electric bill.
- Disconnection for Illegal electricity used.
- Disconnection for electric safety/security.
- Disconnection for consumer demand –
  - Temporary Disconnection
  - Permanent Disconnection

For re-connections, after all dues are paid by consumer and complete all official formalities, DESCO will ensure reconnection within that day or as early as possible.

3.4. One Point Service Center

One point service center is the front face or the mirror of DESCO. All types of consumer first come to the one point service center and then apply or collect information as their demand. Main activities of one point service center are –

- Receive all types of consumer complaint or information with smiling face.
- Possible all service or information are provide to the consumer instantly.
- Communicate with the consumers for required further information.
- All types of consumer complain/information entry in register.
- Maintain consumer complain/information record.
- Give the proper guidance to the consumers.

3.3. Billing/Collection

Net-Revenue collection indicates the amount collected from the consumers against the consumed energy within a specific period usually one month or year. Net revenue collection does not include all other charges like VAT, surcharge, demand charge, service charge etc. DESCO achieved a tremendous success in increasing the revenue collection. In FY 1998-99, the collection of revenue was 337 million, where as in FY 2007-2008, the collection of revenue was reached to 9095 million which is playing a vital role in gaining the profit. In the 2008-09 financial year the net collection is 9708 million which is much higher than the last year's net collection of bills.

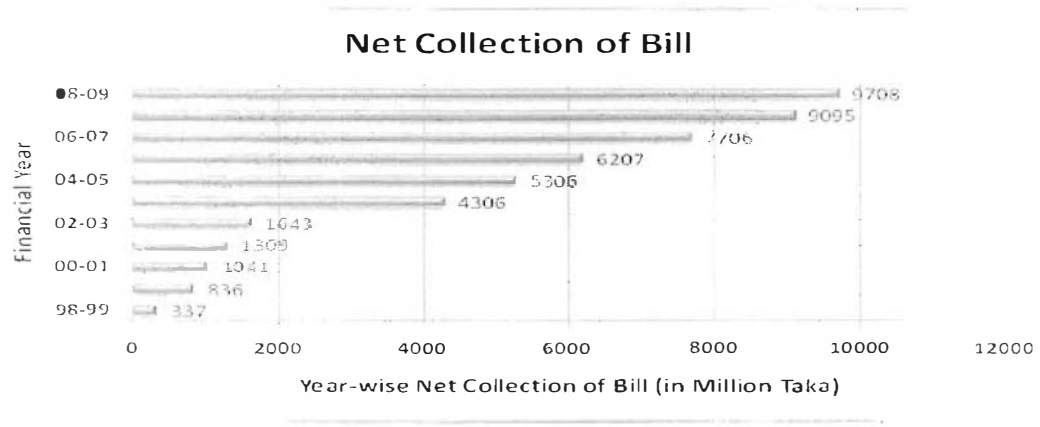


Figure 13: Year-wise Net collection of Bill/Revenue.

It is to be noted that, revenue collection jumped in the year 2003. This is due to the inclusion of Gulshan, Banani, Uttara and Cantonment area in the DESCO system which was previously under DESA. It is to be noted that, in the year 06-07 and 07-08 collection/bill (%) was more than 100. This was the result of crash program undertaken to collect the un-paid bills of the previous years.

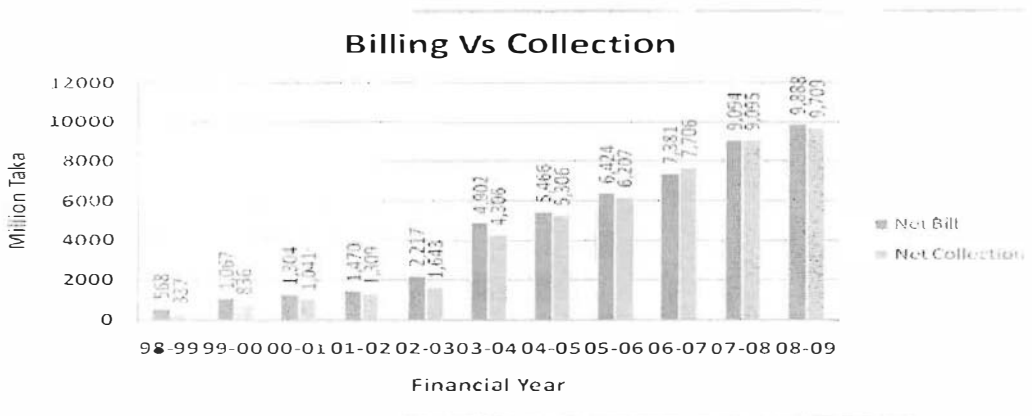


Figure 14: Year-wise Bill issue Vs Collection amount.

procedures of metering are listed bellow –

- Prepare reading schedule in every month. Monitoring & give them proper guidance of meter reader to take reading properly and correctly.
- Generate meter report by meter reader of faulty/defective meter. Then collect the meter report from meter reader & take necessary action to solve these defects.
- After reading taken submit the meter reading book in IT section to prepare bill. After complete the bill process, the printed bill are distribute to the consumer.
- Motivate the consumer to bill payment within due date. Disconnection activity continues for non-payment of bill.
- Ensure reconnection after bill and dues are payment of disconnected consumer.
- Change damage /defective/faulty meter or defective/joint/unsecured service drop.
- Installed meter & service drop in new consumer and disconnected Illegal connection.

3.6.1. Pre-paid meter production

Prepaid meter is most essential and modern metering system of the power system. Prepaid metering system helps reducing system loss and wastage of electricity. Customers also get benefit in two ways: by controlling their usage and getting discounts from DESCO. DESCO first installed 10,000 prepaid meters in Uttara residential area and take initiative to install another 10,000 prepaid meters in Uttara residential area.

Installing Prepaid meters to reduce harassment of customers and ensure smooth collection of bills. The prepaid metering system is customer-friendly as this removes hassle of paying bills at banks and fear of 'ghost bills.' This also puts an end to the disputes between house-owners and tenants over electricity bill. A customer will be able to control his consumption to keep it within his personal budget.

There three steps in prepaid metering. One is meter, 2nd one is vending station and the other one is SMS (system master station).Meter installed in the consumer end. In vending station consumer can recharge their master card.

There are 2 types of prepaid meter. They are:

1. Smart card based meter.
2. Keypad based meter.

DESCO use smart card based prepaid meter. Smart card based meter has a card reader to read the master card. Smart card based meter has a real clock timer and Keypad based meter has no

real clock timer. For meter power supply it requires 12 Volts. For this a transformer used which have 220 primary turns and 9 secondary turns. Connection disconnected using latching relay. If the power supply output is more than 13V then the relay does not work.

3.7. Outsourcing Operations

Most and major activities of commercial operation are operated by outsourcing. Outsourcing activities of commercial operation are -

1. Collect meter reading.
2. Bill distribution.
3. Disconnection & Reconnection activity.
4. New meter & service drop installation.
5. Defective/faulty meter & service drop change.
6. Notice & certificate distribution.
7. Major/huge meter or consumer related data collect.
8. Disconnection of Illegal connection.

3.8. Data Acquisition System (DAS)

The power generation and maximum demand of the electricity network needs strong monitoring and effective power management. DESCO has implemented a Data Acquisition System (DAS). Data Acquisition System is integrated remote terminal unit for data gathering and computer-server network which helps to monitor the real time load status of the network and to implement rational load shading. The technical assistance along with the software is developed by Bangladesh University of Engineering and Technology (BUET).

3.9. E-Governance

To keep pace with modern technological advancement in IT (Information Technology) sector and to make the utility management more user friendly, DESCO management to launch e-governance program with unified approach. The objective is to create a paperless office for quick and better management All of the nine S&D (Sales and Distribution Division)'s and all other units of DESCO will be interconnected under a single network Data to and from each administrative unit will be transmitted to HQ using the network. All decision on a file will be made electronically Institute of Information and Communication Technology of BUET is developing the system.

4. Operational performance of electricity distribution system

4.1. Introduction

The power sector in Bangladesh 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. The most pressing problem in the power sector has been with the distribution system, which is characterized by heavy system loss and poor collection performance; however, the distribution system seldom got the priority in reform initiatives. In this chapter, there are some important factor regarding distribution system are described. Most of the things are collected from the official website of DESCO and their annual report. We also have learnt about the following topics during our internship period.

4.2. Power Distribution and Maintenance

The power system includes every activity from electricity generation to reaching the electricity to the end users. Generally power system can be divided into three components, such as generation, transmission and distribution. Generation system includes all the activities of generating electricity using different energy sources. After generating electricity the electric energy is transmitted to the distribution system through the transmission system by PGCB (Power Grid Company of Bangladesh). The main task in the distribution system is to reach electricity to the consumers. Distribution system mainly comprises of huge distribution network of different voltage level varying from 33 KV to 440 Volt. DESCO is one of the power distributors of Bangladesh. The following illustrates the present structure of Bangladesh's power sector by indicating the key sector entities and their interrelationship.

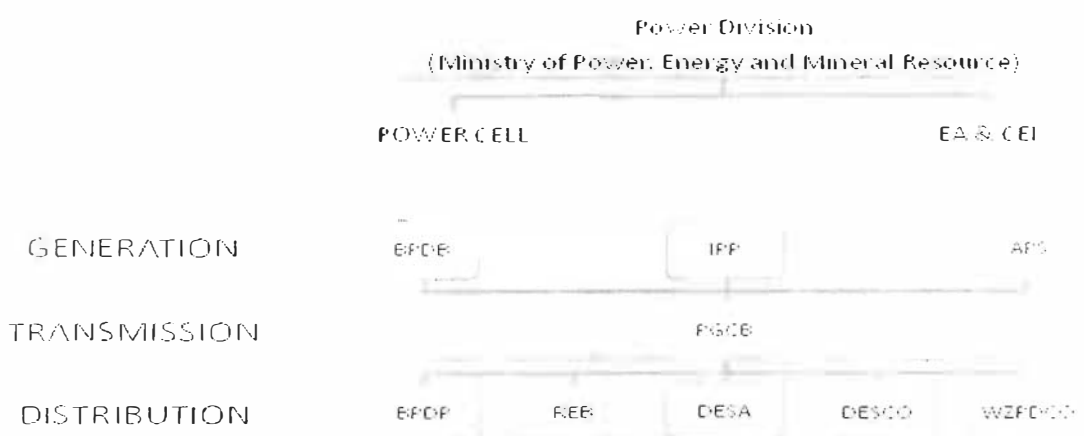


Figure 15: Present structure of Bangladesh power sector.

In case of distribution system, for a specific period of time-

$$\text{System loss (\%)} \quad \frac{(\text{Energy Import} - \text{Energy sales})}{\text{Energy Import}} \times 100$$

Every equipment, conductor and cable used in the power system has some loss in carrying electricity. This loss is due to the resistance property of material, electrical energy converts into heat, sound and light energy. The theoretical system loss of the entire system is found by the above formula.

But, in reality the pilferage of electricity by any means is also reflected in the system loss, as the pilfered electricity does not come under energy sales. Therefore, in case of distribution system-

$$\text{System Loss} = \text{Actual System Loss} + \text{Loss due to pilferage}$$

The actual system loss of the overhead distribution system should not be more than 7.00 %.

4.4. Net Revenue Collection

Net-Revenue collection indicates the amount collected from the consumers against the consumed energy within a specific period usually one month or year. Net revenue collection does not include all other charges like VAT, surcharge, demand charge, service charge etc.

4.5. Account Receivable

For specific period of time-

$$\text{Account Receivable} = \text{Net Billed Amount} - \text{Net Revenue Collection}$$

Account receivable includes only the energy prices not all other charges like VAT, surcharge, demand charge, service charge etc.

4.6. Account Receivable Equivalent Month

At an instant of time-

$$\text{Account Receivable Equivalent Month} = \frac{\text{Total Account Receivable}}{\text{Average monthly billed amount}}$$

This indicator indicates the equivalent monthly bill of account receivable. Usually electricity is sold using post paid billing system. At the end of a month meter reading is collected and based on the reading bill is prepared and distributed to the consumer. 15 days is required to conduct this operation. Again, one month time is given to the consumer to pay the bill. Therefore, Distribution Agency or Company receives the payment against their sales after a period of two months.

As a result, in the current system, the ideal Account Receivable Equivalent Month shall be near the value of 2.

4.7. Collection/Bill (%)

For a specific period of time-

$$\text{Collection/Bill (\%)} = \frac{\text{Net Revenue Collection}}{\text{Net Billed Amount}} 00$$

4.8. Collection Import (CI) Ratio

For a specific period of time-

$$\text{Collection Import (CI) Ratio} = \left|100 - \frac{\text{system loss \%}}{100}\right| \times \text{Collection \%} \times$$

This is the most appropriate indicator to evaluate the operational performance of an electricity distribution agency or company. It combines both the system operational and commercial operational indicators. Usually CI ratio over 90 is treated as very good performance.

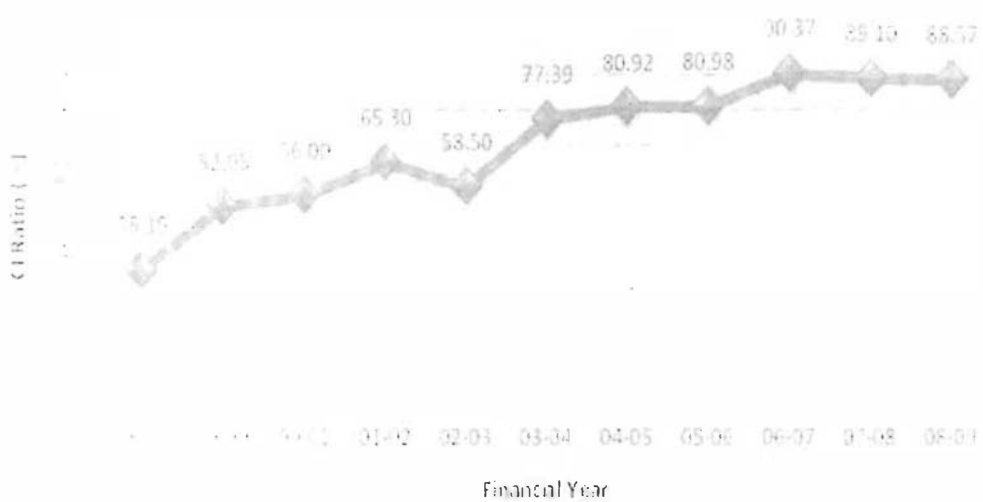


Figure 16: Year-wise Collection-Import Ratio (%)

5.1. Introduction

DESCO calculate their Net working capital, Current Ratio, Gross profit margin, Net profit margin, Operating ratio, Earning per share (EPS), Earning power which are related to financial performance. To calculate these DESCO can estimate their distribution losses financial performance. Most of the things are collected from the official website of DESCO and their annual report. We also have learnt about the following topics during our internship period.

5.2. Net working Capital

Net Working Capital (NWC) represents the excess of current assets over current liabilities. The term current assets refers to assets which in the normal course of business get converted into cash without diminution in value over a short period, usually not exceeding one year or length of operating/cash cycle whichever is more. Current liabilities are those liabilities which at the inception are required to be paid in short period, normally a year. The greater is the amount of NWC, the greater is the liquidity of the firm.

$$\text{Net Working Capital} = \text{Current Assets} - \text{Current Liabilities}$$

5.3. Current Ratio

The current ratio is the ratio of total current assets to total current liabilities. It is calculated by dividing current assets by current liabilities.

$$\text{Current Ratio} = \frac{\text{Current Assets}}{\text{Current Liabilities}}$$

The higher the Current Ratio, the larger is the amount of Taka available per Taka of Current Liability, the more is the firm's ability to meet current obligations and the greater is the safety of funds of short term creditors.

5.4. Gross Profit Margin

$$\text{Gross Profit Margin} = \frac{\text{Gross Profit}}{\text{Sales}} \times 100$$

This measures the relationship between net profits and sales of a firm.

$$\text{Net Profit Margin} = \frac{\text{Earning After Interest and Tax}}{\text{Sales}}$$

5.6. Operating Ratio

$$\text{Operating Ratio} = \frac{\text{Expenses for purchasing electric energy + Operating expenses}}{\text{Net Sales of electric energy}} \times 100$$

5.7. Earnings per Share (EPS)

It measures the profit available to the equity shareholders on a per share basis, that is, the amount that they can get on every share held. It is calculated by dividing the profits available to the shareholders by the number of the outstanding shares.

5.8. Earning Power

Earning Power or overall profitability is measured as follows-

$$\text{Earning Power} = \text{Net Profit Margin X Investment Turnover}$$

$$\text{Net Profit Margin} = \frac{\text{Net Profit after Taxes}}{\text{Sales}}$$

$$\text{Investment Turnover} = \frac{\text{Sales}}{\text{Total Assets}}$$

Therefore,

$$\text{Earning Power} = \frac{\text{Net Profit after Taxes}}{\text{Total Assets}}$$

6.1. Introduction

To distribute continuous power, a substation needs frequent maintenance. Lossless and error less distribution is the main purpose of power distribution. We have learnt about operation and maintenance of substation from Tongi(East) S&D Division, DESCO. Engr. Md. Shawkat Ali, DM, Tongi(East)S&D Divn, DESCO was our coordinator. From 25th May 2010 to 31st May 2010 we were present here. We have also visited our schedule time was 9:00am to 2:00pm every day. We have visited Tongi(West) S&D Division. We have also learnt load section & load retention, load management, control room activity, power factor monitoring and upgrading, substation maintenance, line maintenance and DAS maintenance. We have also visited Bashundhara grid substation at 24th May 2010. Engr. Md. Golam Mowla, AM(Grid & Protection) was our coordinator.

6.2. General Equipments of S/S

There are several equipments used in a sub-station. Following equipments are used in a sub-station:-

- Power transformer.
- Switchgear / Circuit Breaker.
- Current Transformer.
- Potential Transformer.
- Isolator/ Disconnector.
- Lightening Arrester / Surge Diverter.
- Auxiliary Transformer.
- Bus bar.
- Battery and Battery Charger.
- Control Relay Panel.
- Remote Terminal Unit for SCADA/ DAS.
- AC & DC Distribution Panels.

6.3. Line Construction

DESCO surveys of the site as per applicant demand by S&D division and Drawing, staking sheet and bill of quantities. SE&D division makes further survey and study the feasibility of the

line construction. Select Places for approval to the authority. After approval job is issued to contractors. SE&D division maintain and monitoring the work of the contractor coordinating with respective S&D division. Contractors draw material as per requirements. And apply for outage to do the work. Joint Inspection Is done after the work has been completed. Bill is required to pay as per contract with the contractor. Connection is given from respective S&D.

6.4. Maintenance & Inspection of S/S Equipments

Equipments of a sub-station required frequent maintenance and Inspection.

6.4.1. Maintenance of Substation Equipment

- Preventive and Schedule Maintenance.
- Emergency or Break-down maintenance.

6.4.1. Inspection of Substation Equipment

- Daily Inspection.
- Weekly Inspection.
- Monthly Inspection.
- Quarterly Inspection.
- Half-yearly Inspection.
- Annual Inspection.

6.5. Operation of Power Transformer

There are several operations in a power transformer. They are -

- Operation of Tap Changer.
- Operation of cooling control system.
- Operation of breaking system.

6.6. Maintenance of a Power Transformer

A power transformer also required frequent maintenance.

6.6.1. Test oil sample of transformer main tank & tap changer tank

- Check condition of oil gauges and oil level.
- Check for oil leakage & integrity of gasket joints.
- Check the tightness of nuts & bolts.

- Check that silica gel crystals are blue.
- Re-greasing of bearings.
- Check the performance of oil temperature & winding temperature meter.
- Change the oil of OLTC.
- Check the control system and driving mechanism of OLTC.
- Check insulation resistance between each winding and ground.
- Calculate the Dielectric Absorption Ratio-

$$DAR = (I.R. \text{ of } 60 \text{ sec})/(I.R. \text{ of } 15 \text{ sec})$$

6.6.1. Test of Insulating Oil

Test	Assumptions
Dielectric strength test	Min. 30kV at 2.5 mm gap (12.5mm sphere)
Acidity test	Acid value less than 0.02 mg KOH/g
Moisture content in oil	50-60 ppm
Neutralization number	0.03 mg KOH/gm
Viscosity at 20°C	40 cst
Pour point maximum	-10°c
Flash point	140°c
Dissipation factor or Power Factor	0.5% (at 90°c), 0.1% (at 20°c)
Volume resistivity	5.7×10^{14} Ω-cm
Interfacial tension at 27°C	minimum 0.04 N/m
Dielectric constant	2 to 2.5
Specific gravity	0.895 (at 20 °C)

Table 3: Test of Insulating Oil.

6.7. Operation and Maintenance of Breakers

- Timing and Insulation resistance test.
- Measurement of contact resistance.
- Check SF6 gas pressure and the Charging Mechanism.
- Check security of couplings and pipes.
- Measurement condensation temperature (Dew point) of gas.

- Check for oil leaks and low pressure oil tank oil level.

6.8. Transformer

6.8.1. Types of Transformer in a substation

There are two typed of transformer. They are-

1. Current X-former (in metering).
2. Potential X-former (for protection).

6.8.2. Use of Transformer in a substation

There are two typed of transformer that are widely used in substations. They are-

1. For Protection of the substation equipment.
2. For metering purpose.

6.8.3. Maintenance

There are many things which is checked in a transformer. Some kinds of checking are given bellow:

- Check of physical condition and the insulation resistance.
- Check tightness of primary side & secondary terminals.
- Check the ratio and justify the accuracy.
- Check for oil leakage for oil immerged CT and PT.
- Check the dielectric strength of oil.

6.8.4. Protection

- Buchholz relay.
- Differential relay.
- Pressure relief relay.
- Over fluctuation protection.
- Directional over current.
- High set over current.
- Earth fault protection: Stand by earth fault or restricted earth fault.
- Thermal over heating protection: Winding temperature and Oil temperature.

- Check security of nuts bolts and clamps securing drive parts.
- Clean and inspect porcelain insulators.
- Check split pins in clevis and oil all clevis pins.
- Clean and lubricate auxiliary switch contacts.

6.10. Operation and Maintenance of Lightening Arrester

- Wash Diverter housing.
- Check for damage to porcelain housing and for deformation of corona or stress rings.

6.11. Operation and Maintenance of Bus Bar

- Cleaning of insulators.
- Tightening or changing of clamps.
- Checking of insulation resistance.

6.12. Devices of Relay panel for 132KV & 33KV side

- Protective Relays.
- Annunciator.
- Control switches.
- Energy meters.
- Voltmeters, ammeters, power factor meter.
- Semaphore indicator.
- Heater.
- Auxiliary Relays.
- Terminal strip and Test terminal block.

6.13. Protection of power system

6.13.1. Requirement of protection:

- Normal operation.
- Prevention of electrical failure.
- Mitigation of the effects of electrical failure.

6.13.2. Protective device:

- Switchgear.
- Fuse.

- Sensitivity, Selectivity and Speed.
- Reliability.

6.14. Relay operation

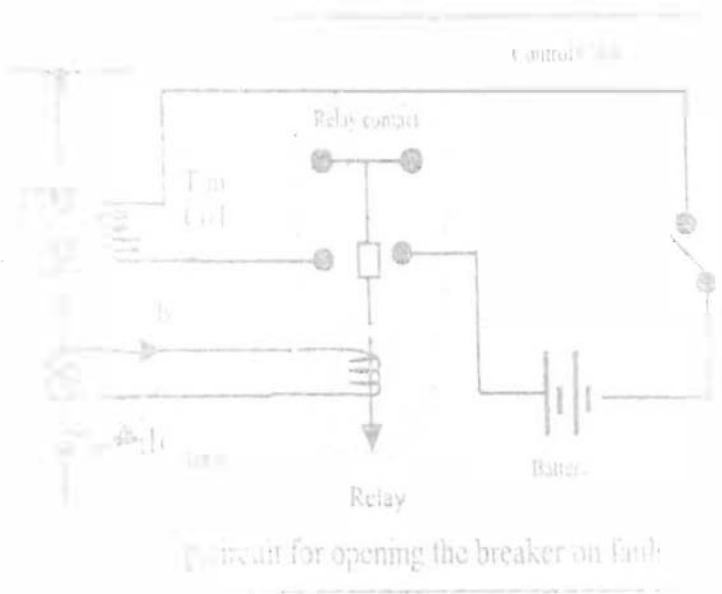


Figure 17: Relay Operation.

6.14.1. Types of relay

-Electro-mechanical.

-Static relay.

-Digital or Numerical.

6.14.2. Operation & maintenance of Control relay panel

-General cleaning of both inside and outside.

-Check for looseness of connections.

-Checking of heater.

-Check operation and accuracy of instruments.

-Carry out insulation tests between wiring and earth, and between circuits.

-Check operation of all alarms and control functions.

-Carry out secondary injection tests of relays.

6.15. Faults of power system

Power system has many faults-

-Short Circuit fault.

-Three phase fault (with or without earth).

-Two phase fault (with or without earth).

-Single line to ground fault.

-Open circuit fault.

-Simultaneous fault.

6.16. Feeder protection

There are many way to protect feeder. Non directional over current and Earth fault protection, directional over current and Earth fault protection, under frequency protection, Distance or Impedance relay for 132kV and above transmission line & feeder and Pilot wire protection or line differential protection.

6.16.1. Character of relays

-IDMT type.

-Instantaneous relay (without time delay).

-Definite time relay.

6.17. Bus bar Protection

- Bus protection by differential protection.
- Bus protection by over current relay.
- Frame leakage earth protection.

6.17.1. Back-up protection of bus

- By distance protection from remote end.
- By over current protection from far end.

6.18. Different testing instruments and equipments of Grid Substation

Meggar and Capsule vacuum gauge 0-50mbar.

- AVO Meter and Low Ohm Meter.
- Digital Transformer oil testing set and secondary injection set.
- Oil centrifuging machine.

- Mili ampere measuring clip on ammeter.
- Clip on ammeter. Gas burner.
- Tan delta test set, Turn ratio test set and Moisture test set for transformer oil.
- Testing board with necessary cables legs.
- CT V_k testing set (knee point voltage test).

7.1. Introduction

We have learnt about planning and development of DESCO from S&D Division. DESCO H/Q. Engr. Md. Zulfiquar Tahmid Manager, (SE&D) was our coordinator. 23rd May 2010, 9:00am to 2:00pm, we were in S&D Division, DESCO H/Q. Engr. Md. Zulfiquar Tahmid showed us their technical activities, major project and future plan in a power point slide. He gave us brief idea on distribution planning, line construction and relevant issues.

7.2. Steps for planning

DESCO has many steps for their distribution network planning. Following steps are mainly implemented:

-Topographical survey and preparation of topographic maps.
-Survey of existing systems and compilation on maps.
-Survey of loads and load forecast.
-Planning of 33/11kv sub-stations & 33kv sub-transmission lines.
-Detailed planning of distribution network.
-Preparation of staking sheets.
-Preparation of bill of quantities.
-Cost estimate.
-Preparation of tender document for supply of materials/works including technical specifications.
-Preparation of engineering report including implementation schedule.

7.2.1. Topographical survey and preparation of topographic maps

DESCO Collect geographic map of concerned area. Demark of area on geographic map. They do topographic survey using standard method. Production of maps in digitized form using latest version of AutoCAD.

7.2.2. Survey of existing systems and compilation on maps

-Distribution Line Equipment Survey.
-Survey of Distribution Sub-stations.
-Survey of 33/11 KV Sub-stations.
-Compilation on Maps.

Survey loads are determination of the present load of 33/11kV sub-stations and maximum demands for the last 10 years from the sub-stations log book, Load (data) of all 11kV feeders. Future demand of bulk loads/ establishments.

Historical (Previous 10 years) and present load of 33/11KV sub-station and 11 kv feeders - Historical (Previous 10 years) data of consumer number, energy import and Sale. Expected feeder wise load growth rates suggested by DESCO. Information of expected future bulk loads. Street by street sample survey for estimating demand and collecting the future expected toad demand data from different government/semi' government and other private organizations. Demand forecast for the project area.

- For 5 years for distribution planning
- For 10 years for 33/11 kV sub-stations/ 33KV sub-transmission lines.

7.2.4. Planning of 33/11kv substations and 33kv transmission lines

Criteria for planning of 33/11kv s/s;

-Existing capacity and firm capacity of Sub-stations.

-Shifting of load from over loaded existing Sub-station on adjacent existing / proposed Sub-station.

-Addition or replacement of transformer for increasing S/S capacity.

-Depending on Load forecast up to next 10 years. Location of proposed new S/S. if required, considering load centre, available 33 KV source.

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

Criteria for planning of 33kv sub-tr. Lines:

-Standard design parameters of DESCO, e.g. maximum allowable voltage drop, System Loss, use of standard conductors etc.

-Forecast demand up to 10 years.

-Reliable incoming source for new 33/11 KV Sub-stations.

-Addition of3 3 KV feeders to the existing Sub-stations for sharing the load of over loaded feeders.

-Increase reliability of the existing feeders.

-Dual feeding facilities from different sources.

-Easy maintenance of the feeder.

7.2.5. Detailed planning of distribution network

Main Considerations for Distribution Planning:

Main consideration 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, to minimize technical loss to acceptable limits, to limit voltage drop to the following maximum figures at points farthest from the supply point:

- 33 KV System 1%
- 11 KV System 3%
- 400/230 Volt System 4%
- Service Drop 1%

7.2.6. Preparation of staking sheets

Main Information/Items of Staking sheet are feeder name, sub-station name, feeder section, map reference and location, pole numbers (old and new), pole height and type, pole top assembly type and no, transformer with KVA rating, guy assembly, type and no, span length, HV & LV conductor size & length, right of way, other line equipment and any other Information required.

7.2.7. Preparation of bill quantities

Main Considerations of the preparation of bill quantities are-

-Detailed planning of distribution network.

-Technical specifications of materials.

-BOQ are prepared Feeder-wise.

-Materials category-wise such as. Poles. Conductors, Cables. Insulator, Pole Top Assembly, Guy Assembly etc.

7.2.8. Cost estimate

Basis for Cost Estimate:

-Bill of Quantities (BOQ) based on detailed planning.

-Present Price of materials available with DESCO/ any other organizations.

-Uniform Rate Schedule/DESCO Price list.

-Policy Guideline on Deposit scheme.

7.2.9. Preparation of tender documents

Tender documents for supply of materials/ works are prepared in accordance with:

-Public Procurement Regulations 2003(PPR 2003)/ User Guide on Procurement of Goods & Related Service and Works & Physical Service.

-Technical Specifications of materials are Derived from the standard specifications Adopted by BPDB / DESCO.

7.2.10. Preparation of engineering report including implementation schedule

Contents of engineering report :

-Full details of the existing, 33/11 KV S/S. 33 KV Sub-Transmission lines and 11 KV & 11/0.4 KV Distribution Network Including the description of the latest condition of loading, numerical description of physical facilities, physical condition of sub-station and lines and Immediate requirement of replacement/ repair etc.

-Planning and Design criteria based on approved guidelines and or International Norm.

-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.

Implementation stages:

-Invitation of Tender for supply of materials.

-Tender evaluation and award of contract for supply of materials.

-Delivery of materials to the site.

-Invitation of Tender for construction/rehabilitation works.

-Tender evaluation and award of contract for construction/rehabilitation works.

-Execution of Construction/rehabilitation works.

-Testing & commissioning.

-Roads: names, by lanes, pavements.

-Entries to permanent building from roads and pavements.

-Highways, railway tracks.

-Embankments.

-Rivers and canals.

-Bench marks.

-Residential and commercial areas.

-Overhead power line poles and towers.

-Identity number of overhead power lines poles and towers 132/33 KV. 33/11 KV Sub-stations and 11/0.4 KV distribution sub-stations.

7.4. On Going Planning

There are some ongoing planning DESCO has developed. They are-

-Installation/rehabilitation of 33/11 KV substations.

-33 KV network planning for 33/11 KV substations.

-11 KV underground line planning for feeders and switching stations.

-Purbachal new town project.

-Uttara 3rd phase project Etc.

7.5. Ongoing Projects

There are many project was approved by DESCO. One is strengthening DESCO's electric distribution network. Another is upgrading and expanding distribution system in Gulshan circle in order to meet the growing demands of the system.

7.6. Future Plan

A new area named "Purbachal Model Town" is being developed by RAJUK in north east of DESCO area. The load demand of Purbachal Model Town is expected to be about 500MW in the year 2025. To keep pace with the load growth and customer strength, DESCO will create adequate facilities in phases by taking up new project. Another new area named "Uttara 3rd phase" is being developed by RAJUK within DESCO's territory. The electrical network development for this area is under planning stage. The load demand of "Uttara 3rd phase" is expected to be about 230MW in the year 2030.

From the discussion of the paper it is very much clear that power sector of Bangladesh has to go for a long way in future. Developing country even the neighboring countries' position is far better than us. Development of power sector is the first requirement for the development of a country. With this end in view Government has taken some goals to improve the power sector of the country which is briefly discussed in below:

- To ensure electricity for all by the year 2020.
- To commercialize the power sector utilities in order to make them financially viable
- To establish an independent Energy Regulatory Commission.

For achieving the target government has taken some initiatives to increase the generation of electricity. As power sector is a capital-intensive industry, huge investment will be required for addition generation capacity. Public sector is not in a position to secure this huge investment for power generation. Recognizing these trends, GOB amended its industrial policy to enable private investment in the power sector and Private Sector Power Generation Policy was framed in 1996 for promoting private sector participation in the generation of electricity.

The most important problem of power sector was shortage of fund. BPDB generates and also purchases electricity for IPP, sales them to the distribution organization and some consumers directly. But they could not sale of standard amount due to high system loss and not to collect sale revenue which they could sale because of poor management.

Providing electricity to all the citizens is a Constitutional obligation for the Government of Bangladesh. By managing its operations in efficient and effective manner, incorporating new ideas in providing better consumer service, DESCO has become the role model for all the electricity utility service providers of Bangladesh. But the service quality is far behind the world standard. A change in the Management's view, employee mindset, MIS structure etc. is required to become a world class company.

Reference

[1] www.desco.org.bd

[2] Annual Report 2008-09, Dhaka Electric Supply Company Ltd.

[3] Annual Report 2007-08, Dhaka Electric Supply Company Ltd.

[4] Annual Report 2006-07, Dhaka Electric Supply Company Ltd.

[5] Annual Report 2008-09, Dhaka Power Distribution Company.

[6] Yearly Financial Progress report of DESCO to Asian Development Bank.

[7] Greater Dhaka Development Program Plan of DESCO to ADB

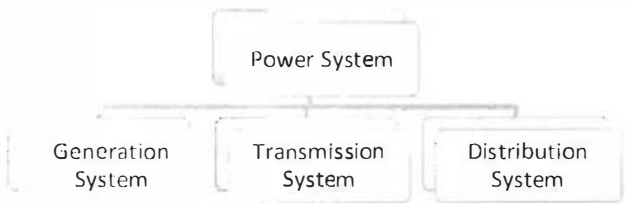
[8] www.bpdb.gov.bd.org

[9] www.powercell.gov.org.bd

Important terms regarding electricity system

Power system

The power system includes every activity from electricity generation to reaching the electricity to the end users. Generally power system can be divided into three components. They are generation, transmission and distribution.



Generation system

Generation system includes all the activities of generating electricity using different energy sources.

Transmission system

After generating electricity the electric energy is transmitted to the distribution system through the transmission system. Usually power plants are situated near the energy sources. The transmission system connects these power plants with the distribution hubs. Usually electricity is generated at 15.6 KV and 11 KV Voltage level. To reduce energy loss in the long distance transmission, the Voltage level is raised up to 230 KV in the transmission phase using step up transformer. Near the distribution hubs the voltage level is further lowered to 132 KV and 33 KV Using step down transformer.

Distribution system

The main task in the distribution system is to reach electricity to the consumers. Distribution system mainly comprises of huge distribution network of different voltage level varying from 33 KV to 440 Volt. The revenue or the price of the consumed electric energy is collected from the consumers.

Electricity consumer

In electricity system, an electricity consumer indicates one electricity connection not just a person using that connection. Consumers can be of different types i.e. domestic, commercial,

industrial, bulk. In the distribution system, a multistoried shopping complex or office can be treated as a single consumer if metering is done through one electric energy measuring meter. Whereas electricity distribution agency or company is a consumer to the electricity generation authority or company from where they purchase electricity.

Demand load

Demand load indicates the aggregate demand of electricity of all the consumers at an instant time. Usually electricity demand is denoted by the unit "Watt".

Installed capacity

In the electricity system every equipment and line has its maximum load handling capacity. Capacity (power) is usually denoted by Volt-Ampere (VA) which is also convertible into Watt by multiplying power factor with the VA. Therefore, the installed capacity of an electricity system indicates the maximum VA or Watt it can handle. In case of electricity generation, it is the summation of capacities of all the power plants within the system. In case of electricity distribution system, usually it is the summation of the capacities of the sub-stations where high voltage is converted into low voltage. The capacity of electric line and cable is also considered in deriving the capacity of distribution system.

Electric energy measuring unit

Usually electric energy consumption is measured by Unit. One Unit of electric energy consumption means consuming one Kilo Watt of energy in one hour.

1 Unit of electric energy = 1 Kilo Watt hour (KWh)

Electric energy meter is used to measure the electricity consumption.

Energy Import

Usually distribution authorities and companies purchase electricity from Bangladesh Power Development Board (BPDB). Now a day a number of private power plants are also selling electricity directly to the distribution authorities and companies. The total amount of electric energy imported by a distribution agency or company within a time period is called energy import. It is usually denoted by Million Kilo Watt hour (MKWh) and also in Million Taka (the purchasing cost of energy).

Energy purchase rate

electricity from BPDB or any private power plant. The energy purchase rate is fixed by the Bangladesh Energy Regulatory Commission (BERC).

Energy selling rate

The electric energy selling rate varies with types of consumers, timing of consumption (peak, off-peak) and amount of consumption. The energy selling rates are also fixed by the Bangladesh Energy Regulatory Commission (BERC).

Peak Off-peak hour

In electricity distribution system 05:00 P.M. to 11:00 P.M. is called Peak Hour and the rest of the time in a day is called Off-peak Hour.

Acronyms

ADB	Asian Development Bank
BPDB	Bangladesh Power Development Board
DESA	Dhaka Electric Supply Authority
DPDC	Dhaka Power Distribution Company
DESCO	Dhaka Electric Supply Company Ltd.
GDP	Gross Domestic Product
GOB	Government of Bangladesh
GWh	Giga Watt hour
IPP	Independent Power Producer
KWh	Kilo-Watt-Hour
KV	Kilo-Volt
MKWh	Million Kilo-Watt-Hours
MTk.	Million Taka
MW	Mega Watt
PBS	Polli Biddut Samity
PDB	Power Development Board
REB	Rural Electrification Board
PGCB	Power Grid Company Bangladesh
EA	Electrical Advisor
IPP	Independent Power Producer

DESCO
POWER IS YOURS

Dhaka Electric Supply Company Limited (DESCO)

Certificate

Awarded to **Saniul Islam**

Student Id: 2006-3-80-004

Department Of Electrical & Electronic Engineering

of East West University

For successful completion of the Internship in DESCO

Held from 11 May, 2010 to 31 May, 2010.

Engr. Md. Golam Rabbani
Manager, HRM&D

A. H. M. Nurul Huda
Company Secretary

Issue date: 01 June, 2010

DESCO
POWER IS YOURS

Dhaka Electric Supply Company Limited (DESCO)

Certificate

Awarded to **Imran Ahmed**

Student Id: 2006-2-80-052

Department Of Electrical & Electronic Engineering

of East West University

For successful completion of the Internship in DESCO

Held from 11 May, 2010 to 31 May, 2010.

Engr. Md. Golam Rabbani
Manager, HRM&D

A. H. M. Nurul Huda
Company Secretary

Issue date: 01 June, 2010