TARIFF AND ENERGY AUDIT OF DPDC (DHAKA POWER DISTRIBUTION COMPANY LIMITED)

An internship submitted in partial fulfillment of the requirements for the Award of Degree of

Bachelor of Science in Electrical and Electronic Engineering

Submitted By

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&

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DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

JANUARY -2020

LETTER OF TRANSMITTAL

23rd September, 2019

Engr. Bikash Dewan

Managing Director.

DPDC Ltd

Sub: Submission of the Internship Report.

Dear Sir,

It is a great pleasure to submit my report prepared by me during my internship in Dhaka Power Distribution Company Limited (DPDC).

The internship provided me great opportunity to experience the real life development environment, modern technology and techniques. I hope that it will ensure positive role in the development of my future career. In this report, I tried to summarize what I have done and experienced during my internship period in DPDC Ltd.

I am really lucky to have the chance to take part in this internship program. I express my sincere gratitude and thankfulness to my co-supervisor **Nazmus Saqib** for guiding me continuously for the successful completion of the internship report.

Thank You.

Yours sincerely,

Abdur Rouf

ID: 163-33-3605

Md. Zakaria Shagor

ID: 163-33-3672

Department of Electrical and Electronic Engineering, Faculty of Engineering.

Approval letter

ঢাকা পাওয়ার ডিস্ট্রিবিউশন কোম্পানি লিমিটেড
DHAKA POWER DISTRIBUTION COMPANY LIMITED
(An Enterprise of the Government of the People's Republic of Bangladesh)
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স্মারক নম্বর: ৮৭.৪০৪.৪০৮.০১.০৭.০১৯.২০১৫. ১৩৫৮

তারিখ: ০৫ কার্তিক, ১৪২৬ বঙ্গাব্দ
২১অক্টোবর, ২০১৯ খ্রিস্টাব্দ

সহযোগী প্রধান
ইলেক্ট্রিক্যাল এন্ড ইলেক্ট্রনিক ইঞ্জিনিয়ারিং ডিপার্টমেন্ট
ড্যাফোডিল ইন্টারন্যাশনাল ইউনিভার্সিটি

বিষয়: Electrical & Electronic Engineering Department-এর শিক্ষার্থীকে ঢাকা পাওয়ার ডিস্ট্রিবিউশন কোম্পানি লিমিটেড (ডিপিডিসি)'তে ইন্টার্নশিপ- এর অনুমতি প্রদান।

সূত্র: আপনার ২৩ সেপ্টেম্বর, ২০১৯ খ্রি. তারিখের পত্র।

উপর্যুক্ত বিষয় ও সূত্রের মাধ্যমে প্রেরিত পত্রের প্রেক্ষিতে সদয় অবগতির জন্য জানানো যাচ্ছে যে, নিম্নবর্ণিত ছকে উল্লিখিত আপনার বিশ্ববিদ্যালয়ের **Electrical & Electronic Engineering Department** এর ১১ জন শিক্ষার্থীকে সুপারিনটেন্ডিং ইঞ্জিনিয়ার, ট্যারিফ এন্ড এনার্জি অডিট, ডিপিডিসি- এর তত্ত্বাবধানে ০২ মাসের জন্য ইন্টার্নশিপ সম্পন্ন করার নিমিত্ত নিম্নবর্ণিত শর্ত সাপেক্ষে অনুমতি প্রদান করা হলো:

Sl. No.	Name of the Student	Student ID	Remarks
1	2	3	4
1.	Mr. Abu Sufian	141-33-1748	
2	Mr. Md Maruf Ahmed	163-33-3601	
3	Mr. Abdur Rouf	163-33-3605	
4	Mr. Imran Hossen	163-33-3633	
5	Mr. Md. Zahid Hasan	163-33-3658	
6	Mr. Md Yasin Arafat	163-33-3659	
7	Mr. Md Zakaria Shagor	163-33-3672	
8	Mr. Yeasin Chowdhury	163-33-3697	
9	Mr. Md Imranul Hoq Chowdhury	163-33-3698	
10	Mr. Md Nuralam	163-33-3699	
11	Mr. Md Sajjad Hossan Rony	163-33-3632	

শর্তাবলী:

ক. ডিপিডিসি- তে ইন্টার্নশিপ সম্পন্ন করার জন্য কোন রকম ভাতা প্রদান করা হবে না;
খ. উক্ত ইন্টার্নশিপ সম্পন্ন করার সকল ব্যয়ভার সংশ্লিষ্ট শিক্ষার্থী কর্তৃক বহন করতে হবে অর্থাৎ এতে ডিপিডিসি'র কোন রকম আর্থিক সংশ্লিষ্টতা থাকবে না;
গ. ডিপিডিসি সংক্রান্ত যে কোন তথ্য শিক্ষা কার্যক্রম ব্যতীত অন্য কোন ক্ষেত্রে ব্যবহার করা যাবে না;
ঘ. ইন্টার্নশিপ চলাকালীন ডিপিডিসিতে অবস্থানকালে শিক্ষার্থী-কে বিদ্যুৎ স্থাপনার অভ্যন্তরে ব্যক্তিগত নিরাপত্তার বিষয়ে সচেষ্ট ও সচেতন থাকতে হবে;
ঙ. ডিপিডিসি'র সংরক্ষিত/ কেপিআই/ গুরুত্বপূর্ণ এলাকার নিরাপত্তা বিঘ্নিত হয় এমন কোন কাজ করা যাবে না।

কর্তৃপক্ষের অনুমোদনক্রমে,

22/10/19

মোঃা: মনিরুজ্জামান
ডিজিএম, এমপ্লয়ি ম্যানেজমেন্ট (আডমিনিসট্রেইশন)
হিউম্যান রিসোর্সেস, ডিপিডিসি।

বিতরণ:

০১. এক্সিকিউটিভ ডিরেক্টর (আডমিনিসট্রেইশন এন্ড এইচ.আর/ ইঞ্জিনিয়ারিং/ অপারেশনস/ ফিন্যান্স), ডিপিডিসি।
০২. জেনারেল ম্যানেজার (এইচ.আর/ আইসিটি এনার্জি এন্ড মিটারিং)/ কোম্পানি সচিব, ডিপিডিসি।
০৩. সিসিও টু ম্যানেজিং ডিরেক্টর/ সুপারিনটেন্ডিং ইঞ্জিনিয়ার, ট্যারিফ এন্ড এনার্জি অডিট, ডিপিডিসি।
০৪. জনাব....., ডিপিডিসি।
০৫. অফিস কপি/ মাস্টার ফাইল।

Certification

This is to certify that this internship entitled **"Study on Tariff and Energy Audit of DPDC"** is done by the following students under my direct supervision and this work has been carried out by 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 December - 2019.

Signature of the candidates

Abdur Rouf
163-33-3605

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163-33-3672

Countersigned

Nazmus Saqib
Lecturer
Department of Electrical and Electronic Engineering
Faculty of Engineering
Daffodil International University

DECLARATION

The internship entitled **"Study on Tariff and Energy Audit of DPDC"** submitted by Name: **Abdur Rouf, Id No: 163-33-3605** and Name: **Md. Zakaria Shagor Id No: 163-33-3672**, Session: Fall-2019 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering on 2019.

BOARD OF EXAMINERS

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Dedicated to

Our PARENTS

Internship Program Schedule

Date	Types of work	Address
24.10.2019 - 04.11.2019	Tariff & Billing System	SCADA Bhaban, DPDC, Katabon
5.11.2019 - 14.11.2019	Energy Audit of 36 NOCS (Network Operation & Customer Service)	SCADA Bhaban, DPDC, Katabon
17.11.2019 -27.11.2019	Digitalization and Automation of Substation Metering System (DASMS) **PILOT PROJECT 1**	SCADA Bhaban, DPDC, Katabon
28.11.2019 - 09.12.2019	Supervisory Control And Data Acquisation (SCADA) **PILOT PROJECT 2**	SCADA Bhaban, DPDC, Katabon
10.12.2019 – 26.12.2019	Energy Balance Sheet (App) & Metering System	SCADA Bhaban, DPDC, Katabon

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DIGITALIZATION AND AUTOMATION OF SUB STATION METERING SYSTEM (DASMS)

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ABB SCADA (SUPERVISORY CONTROL AND DATA ACQUISITION)

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LIST OF ABBREVIATION

ABB	ASEA Brown Boveri
SCADA	Supervisory Control And Data Acquisition
DASMS	Digitalization and Automation of Substation Metering System
RTU	Remote Terminal Unit
IP	Internet Protocol
AC	Alternating Current
BPDB	Bangladesh Power Development Board
CB	Circuit Breaker
CT	Current Transformer
DC	Direct Current
DESA	Dhaka Electric Supply Authority
DPDC	Dhaka power distribution Company LTD.
KV	Kilo Volt
KVA	Kilo Volt Ampere
LV	Low Voltage
EHT	Extra High Tension
MCB	Miniature Circuit Breaker
MV	Medium Voltage
PFI	Power Factor Improvement
REB	Rural Electrification Board
SF6	Sulphur Hexafluoride Circuit Breaker
AIS	Air insulated switchgear
GIS	Gas insulated switchgear
HRC	High Rupturing Capacity Fuse
PT	Potential Transformer
VCB	Vacuum Circuit Breaker
SAS	Substation Automation System

ACKNOWLEDGEMENTS

We give thanks to Allah first of all, for the successful completion of this Internship and fulfillment of our dream into reality. However, thanks and gratitude are also due to the following persons for their continuous support in completing this thesis and in preparing this report.

First of all, thanks to our dissertation advisor, **Dr. M. Shamsul Alam**, Dean, Department of the EEE Faculty of Engineering (FE), Daffodil International University, we would like to express our sincere appreciation and gratitude, Bangladesh for his invaluable instructions, continuous guidance, constructive criticisms and thoughtful advice during pursuing this thesis and preparation of this report.

We also want to thankfulness to our thesis co-supervisor **Nazmus Saqib**, Lecturer, Department of EEE, for his help, support and constant encouragement.
Special thanks are extended to our fellow classmates of the Department of Electrical and Electronic Engineering, Daffodil International University, Bangladesh for their helping hand, continuous support and cooperation during this internship.

Finally, we are proud to recognize the great sacrifices, good wishes, moral support, fruitful advice, inspiration and encouragement from our family members, relatives and friends that help us to successfully complete the thesis.

EXECUTIVE SUMMARY

Dhaka Power Distribution Company Limited (DPDC) is one of the biggest Power circulation organizations in Bangladesh. Dhaka Power Distribution Company Limited (DPDC) had been incorporated on 25th October, 2005 under the Companies Act 1994 with an approved offer capital of Tk. 10,000 (ten thousand) crore isolated into 100 (one hundred) crore common portion of Tk. 100 each.

Our internship is on **"TARIFF & ENERGY AUDIT OF DPDC"** The tariff structure would consist of two parts. In the solicited bids, the bidders shall offer bulk power tariff based on the capacity payment and energy payment and also provide the equivalent levelized tariff. The capacity payment will be made in Bangladeshi currency (Taka), but denominated in both Dollars and local currency. This will cover debt service, return on equity, fixed operation and maintenance cost, insurance and other fixed cost. The energy payment will be denominated in local currency to the extent to which the variable costs are in local currency. This will cover the variable costs of operation and maintenance, including fuel. Interconnection of IPP to transmission system: The power will be purchased from the IPP at a specified voltage and frequency at the outgoing terminal of the substation of the power plant.

The cost of interconnecting facilities up to outgoing terminals of the private power project will be borne by the private power producers. Severe power crisis compelled the Government to enter into contractual agreements for high-cost temporary solution, such as rental power and small IPPs, on an emergency basis.

CHAPTER 1

INTRODUCTION

1.1 Broad Objective

The Broad Objective of this research are mainly to understand of this each and every equipment of distribution substation.

1.2 Specified Objective

To achieve the specific goals, I need to find out from the following goals. It's the following:

- Substation research

- Test and check the equipment of Substation
- Identify different types of equipment for this substation
- Learning probable solution of the different problems.

1.3 Company Profile

Bangladesh The historical backdrop of intensity age and dissemination in Dhaka city is significant. Legend goes that in 1901, when he installed a small generator in his living arrangement Ahsan Manzil, the Nawab of Dhaka presented control in Dhaka. The era of power for public use started in 1930 when an exclusive organization M / S DEVCO developed a

system for power dispersion. Privately owned businesses oversaw control age and circulation framework in Dhaka until the finish of British guideline in 1947. In 1957 Pakistan's government took charge of the private owned organizations in Dhaka and in 1959 they were set up under the recently settled East Pakistan Water and Power Development Authority (EPWAPDA). Bangladesh Power after Bangladesh's Independence.Development Board (BPDB) supplanted EPWAPDA's Power wing in 1972. [8]

The power age and dispersion arrangement of Dhaka was overseen by BPDB until 1991. An independent association named Dhaka Electric Supply Authority (DESA) was made by a law

proclaimed by the President in March 1990 to enhance administrations to the buyers and to improve income accumulation by decreasing the overarching high framework misfortune. DESA assumed control over the power dissemination framework in and around Dhaka city in October 1991, yet the locale of intensity age stayed with BPDB. Later in 1998, an auxiliary organization Dhaka Electric Supply Company Limited (DESCO) was framed to assume control over a couple of territories of the Dhaka city from DESA. Furthermore, in 2008, DESA was canceled and supplanted by DPDC. At it's of initiation, DPDC territory was around 7473 square kilometer in and around the capital city. Therefore, according to government choice,

subsequent to giving over the city peripherals to Rural Electrification Board (REB) and a few sections of the Metropolitan zone to Dhaka Electric Supply Company Ltd (DESCO), DPDC region is diminished to just around 350 square kilometer, extended in the southern piece of the capital city of Dhaka and abutting townships of Narayangonj.

DESA, the predecessor of DPDC was built up as a major aspect of a change procedure to guarantee better administrations to the power shoppers, build up the power dispersion framework and decrease framework misfortune. Before the setting up of DESA, the power advancement board endured a framework loss of 45%.

DESA has figured out how to cut it down to around 26%. Nevertheless, as it has also become a losing concern for various reasons, DPDC has been introduced as a major aspect of the reform procedure to replace DESA. DPDC has figured out how to chop down the framework misfortune to single digit as of late.

1.4 Profile of DPDC

SL. NO	Description	Quantity
1	Incorporation	25 October, 2005
2	Commercial Operation	1 July, 2008
3	Total area covered	350 sq. km.
4	Total electricity line (Up to February, 2014)	4282 km.
5	132 KV Transmission Line (Up to February, 2014)	224 km.
6	33 KV Transmission Line (Up to February, 2014)	320 km.
7	11/.4 KV Line (Up to February, 2014)	3708 km.
8	Total number of substation (Up to February, 2014)	54 Nos.
	132/33 KV Substation	11 Nos.
	132/11 KV Substation	1 No.
	33/11 KV Substation	42 Nos.
9	11/.4 KV Distribution Transformer (Up to February, 2014)	11125Nos.
10	Installed capacity	1456 MW/1820MVA.
11	Max. Demand (August 2013)	1280 MW.
12	Max. Received Load (July 2013)	1140 MW.
13	Max. Load Shedding (April 2013)	301 MW.
14	Load Factor	82.8%
15	Annual Load Growth	8.8%
16	Annual Customer Growth	6%
17	Total Billed Amount (Up to February, 2014)	Tk. 26010.682 Million
18	Total Collection (Up to February, 2014)	Tk. 25619.611 Million
19	System Loss Target (FY 2012-13)	9.60%
20	System Loss Achieved (FY 2012-13)	9.07%
21	System Loss Target (FY 2013 - 14)	9.0%
22	System Loss Achieved (Up to February, 2014) in 33 KV Level	8.21%

Table 1.1

1.5 Methodology

The work of this paper has been carried out with the help of different sources. In planning, the paper was cheeked by the approved men of the SCADA Bhaban, DPDC. The data was collected correctly throughout the session. While there have been several sources, some of them are mentioned here as references. Data from the study has been obtained from the following sources:

- Tariff and Energy Audit Department
- General Service Department.
- Engineering Department.

1.6 Summary

Dhaka Power Distribution Company Limited (DPDC) is one of the biggest Power circulation organizations in Bangladesh. Dhaka Power Distribution Company Limited (DPDC) had been incorporated on 25th October, 2005 under the Companies Act 1994 with an approved offer capital of Tk. 10,000 (ten thousand) crore isolated into 100 (one hundred) crore common portion of Tk. 100 each.

The organization was allowed consent to initiate business from 25th October, 2005 and began its capacity from fourteenth May 2007. Organization began its business activity on first July of 2008 by assuming control over all benefits and liabilities from the then DESA. While the organization began its activity the quantity of clients was 6,55,908, presently we have around 12,98,125 (on August, 2019).

CHAPTER 2

TARIFF

2.1 Introduction [1]

The electrical energy created by a power plant is conveyed to huge Customers. The Customers can be convinced to utilize electrical energy on the off chance that it is sold at sensible rates. The tariff rate at which electrical energy is sold normally becomes consideration welcoming for electric stock organization. The stock organization needs to guarantee that the tax is with the end goal that it not just recoups the all out expense of delivering electrical energy yet additionally gains benefit on the capital venture. In any case, the benefit must be minor especially for a nation like Bangladesh where electric inventory organizations go under Government sector and are constantly dependent upon criticism.

> ***The Tariff is known as the rate of electrical energy which is provided by supplier to a consumer.***

2.2 Objective of Tariff

(i) Saving of cost of generating electrical energy at the power plant.

(ii) Saving cost on the assets investment in transmission and distribution sector.

(iii) Recovery of cost of activity and maintenance of supply of electrical energy e.g., metering apparatus, charging and billing.

(iv) An appropriate benefit on the capital venture.

2.3 Desirable Characteristics of a Tariff [1]

A tariff should have the following desirable characteristics:

2.3.1 Proper return

The tariff should be with the end goal that it guarantees the best possible come back from every customer. At the end of the day, the complete receipts from the customers must be equivalent to the expense of generating and providing electrical energy in addition to reasonable benefit.

2.3.2 Fairness

The tariff must be reasonable so various types of customers are happy with the rate of charge of electrical energy. In this way a large customer should be charged at a lower rate than a little customer. It is on the grounds that expanded energy utilization spreads the fixed charges over a large number of units, along these lines decreasing the general expense of delivering electrical energy.

2.3.3 Simplicity

The tariff ought to be basic with the goal that a conventional customer can simply get it.

2.3.4 Reasonable profit

The benefit component in the tariff should be sensible. An electric stock organization is an open service organization and for the most part appreciates the advantages of imposing business model.

2.3.5 Attractive

The tariff ought to be attractive with the goal that huge number of customers are inspired to utilize electrical energy. Efforts ought to be made to fix the tariff in this way, that customers can pay effectively.

2.4 Types of Tariff [1]

There are four types of tariff, described below:

2.4.1 Simple tariff

When there is a constant rate per unit of energy consumed, it is known as simple tariff.

2.4.2 Flat rate tariff

When various kinds of customers are charged at various uniform per unit rates, it is known as flat rate tariff.

2.4.3 Block rate tariff

At the point when a given block of energy is charged at a identified rate and the succeeding blocks of energy are charged at logically reduced rates, it is known as a block rate tariff.

2.4.5 Two-part tariff

At the point when the rate of electrical energy is charged based on most extreme demand of the customer and the units consumed, it is known as two-part tariff.

2.5 Tariff rate [2]

(Retail Electricity Rate)

2.5.1 Low Voltage (LT) 230/400 Volt

Electricity Supply: Low Voltage AC Single Phase 230 Volt and Three Phase 400 Volt

Approved Demand: Single Phase 0-7.5 KW and Three Phase 0-50 KW

SL	Customer Category and Slab	New Tariff Per Unit Rate (Tk.) Effective from Bill month 1st December, 2017	Demand Charge (Tk./KW/Month)
1	LT- a: Residential		
	Life Line: 1-50 Units	3.50	25.00
	First Step: From 00 to 75 units	4.00	
	Second Step: From 76 to 200 units	5.45	
	Third Step: From 201 to 300 units	5.70	
	Fourth Step: From 301 to 400 units	6.02	
	Fifth Step: From 401 to 600 units	9.30	
	Sixth Step: From 601 to above	10.70	
2	LT- b: Agricultural pumping	4.00	15.00

3	**LT- c 1: Small Industries**		
	Flat Rate	8.20	15.00 (Applicable for approved demand upto 25 KW) 25.00 (Applicable for approved demand more than 25 KW)
	Off-Peak Time	7.38	
	Peak Time	9.84	
4	**LT- c 2: Construction**	12.00	80.00
5	**LT- d 1: Education, religious and charitable organizations and hospitals**	5.73	25.00
6	**LT- d 2: Street lamp, water pump and battery charging station**	7.70	40.00
7	**LT- e: Commercial & Office**		
	Flat Rate	10.30	30.00
	Off-Peak Time	9.27	
	Peak Time	12.36	
8	**LT- t: Temporary**	16.00	100.00

2.5.2 Medium Voltage (MT):11 KV

Electricity Supply: Medium Voltage AC 11 KV

Approved Demand: 50KW to maximum 5MW

SL	Customer Category and Slab	New Tariff Per Unit Rate (Tk.) Effective from Bill month 1st December, 2017	Demand Charge (Tk./KW/Month)
1	MT-1: Residential		
	Flat Rate	8.00	50.00
	Off-Peak Time	7.20	
	Peak Time	10.00	
2	MT-2: Commercial & Office		
	Flat Rate	8.40	50.00
	Off-Peak Time	7.56	
	Peak Time	10.50	
3	MT-3: Industries		
	Flat Rate	8.15	50.00
	Off-Peak Time	7.34	
	Peak Time	10.19	
4	MT-4: Construction		
	Flate Rate	11.00	80.00
	Off-Peak Time	9.90	
	Peak Time	13.75	

5	**MT-5: General Purpose***		
	Flat Rate	8.05	50.00
	Off-Peak Time	7.25	
	Peak Time	10.06	
6	**MT- 6: Temporary**	15.00	100.00

2.5.3 High Voltage (HT):33 KV

Electricity Supply: High Voltage AC 33 KV

Approved Demand: 5MW to maximum 30MW (Must be Double circuit for above 20MW)

SL	Customer Category and Slab	New Tariff Per Unit Rate (Tk.) Effective from Bill month 1st December, 2017	Demand Charge (Tk./KW/Month)
1	HT-1: General Purpose		
	Flat Rate	8.00	40.00
	Off-Peak Time	7.20	
	Peak Time	10.00	
2	HT-2: Commercial & Office		
	Flat Rate	8.30	40.00
	Off-Peak Time	7.47	
	Peak Time	10.38	
3	HT-3: Industries		
	Flat Rate	8.05	40.00
	Off-Peak Time	7.25	
	Peak Time	10.06	
4	HT-4: Construction		
	Flat Rate	10.00	40.00
	Off-Peak Time	9.00	
	Peak Time	12.50	

2.5.4 Extra High Voltage (EHT): 132 KV and 230 KV

Electricity Supply: Extra High Voltage AC 132 KV and 230 KV

Approved Demand: EHT-1: 20MW to maximum 140 MW (Single or double circuits in technical consideration) ; EHT-2: Above than 140 MW

SL	Customer Category and Slab	New Tariff Per Unit Rate (Tk.) Effective from Bill month 1st December, 2017	Demand Charge (Tk./KW/Month)
	EHT-1: General Purpose		
1	Flat Rate	7.95	40.00
	Off-Peak Time	7.16	
	Peak Time	9.94	
	EHT-2: General Purpose		
2	Flat Rate	7.90	40.00
	Off-Peak Time	7.11	
	Peak Time	9.88	

CHAPTER 3
ENERGY AUDIT

3.1 Introduction

An energy audit is an inspection survey and an analysis of energy streams for energy preservation in a structure. It may include a procedure or system to decrease the amount of energy contribution to the system without negatively influencing the output.

3.2 Importance of energy audit

An energy audit is typically a procedure of analysis of a flexibility that can help decrease the energy utilization of a residential or commercial site and save energy expenses to a huge extent. These types of energy audits assist to determine the energy-saving deficiencies in homes and business spaces, which thus assists with countering those issues, successfully. At present times, there are many energy preservation organizations, which provide highly suitable services to the consumer for decreasing the energy consumption of the living spaces and control energy expenses. These organizations use advanced audit strategies to reduce the utilization of energy and save expenses.

3.3 Benefits of energy audit

- It helps decrease energy expenses in your facility.
- This helps reduce the reliance on outside energy sources.
- It decreases natural harm and contamination
- It can rise the protection of your energy supply.
- It can decrease the utilization of natural resources.
- It helps us to increase the life span of the accessories in your facility.

3.4 Energy audit process

An energy audit is a four-step procedure that includes the periods of planning, investigating, implementing, and sustaining. Exhaustive planning and cautious increase the chances of a fruitful energy audit with a greatest return on investment.

Fig 3.1: Energy audit process

3.5 Substations list of DPDC

	NORTH			SOUTH	
Sl. No.	Name of S/S		Sl. No.	Name of S/S	
29	Asad Gate 33/11 KV S/S		1	Banqabhaban 132/11KV S/S	
24	Azimpur 33/11 KV,		30	Biddyut Bhaban 33/11 KV	
31	Banasree 33/11 SS		17	Char Syedpur 33/11KV S/S	
22	Banshal 33/11KV S/S		32	Dapa 33/11 kV	
35	BSMMU 33/11KV S/S		20	Demra 33/11KV S/S	
6	Dhanmondi 132/33/11KV S/S		13	Fatullah 33/11KV S/S	
7	Dhanmondi 33/11KV S/S		27	IG Gate GIS 33/11 kV	
33	DMC		8	Kazla 33/11KV S/S	
14	Goran 33/11KV S/S		22	Khanpur 33/11KV S/S	
3	Green Road 33/11KV S/S		4	Kumertuly 33/11KV S/S	
34	Green Road Dormatory 33/11 SS		33	Laxmi Narayan Cotton Mill 33/11 kV	
23	Japan Garden 33/11 KV,		6	Madarteck 132/33KV S/S	
17	Jigatola 33/11KV S/S		7	Madarteck 33/11KV S/S	
12	Kakrail 33/11KV S/S		5	Maniknagar 132/33/11KV S/S	
18	Kallyanpur & Agargaon 33/11KV S/S		26	Maniknagar 33/11KV S/S	
19	Kamrangirchar 132/33/11KV S/S		24	Matuail 132/33 KV S/S	
20	Kamrangirchar 33/11KV S/S		23	Matuail 33/11KV S/S	
8	Kawranbazar 33/11KV S/S		29	Mitford 33/11 kV	
13	Khillgaon 33/11KV S/S		21	Mondalpara 33/11KV S/S	
27	LALBAGH 132/33 KV S/S		28	Motijheel 33/11 kV	
28	LALBAGH 33/11 KV S/S		31	Nandalalpur 33/11 kV	
21	Lalbagh 33/11KV S/S		16	Narayangonj (west) BSCIC33/11KV S/S	
4	Lalmatia 33/11KV S/S		2	Narinda 132/33KV S/S	
1	Moghbazar 132/33/11KV S/S		3	Narinda 33/11KV S/S	
2	Moghbazar 33/11KV S/S		12	Postogola 33/11KV S/S	
32	Mugdhapara Hospital		25	Sarulia 33/11KV S/S	
9	New Ramna 33/11KV S/S		9	Shyampur 132/33KV S/S	
16	Satmasjid 33/11KV S/S		10	Shyampur 33/11KV S/S	
30	Shatmasjid 132/33 KV S/S		11	Shyampur BISIC 33/11KV S/S	
26	SHERE BANGLA NAGAR 33/11 KV S/S		19	Siddhirganj 33/11KV S/S	
25	T&T 33/11 KV,		18	Siddhirganj 132/33/11KV S/S	
15	Taltola 33/11KV S/S		14	Sitalakhya 132/33KV S/S	
5	Tejgoan 33/11KV S/S		15	Sitalakhya 33/11KV S/S	
10	Ullon 132/33/11KV S/S				
11	Ullon local 33/11KV S/S				

Fig 3.2: Substation List

3.5.1 Mogbazar 33/11KV, 4 x 10/14 MVA Substation

Substation wise Energy Balance Statement

Sl	Name of S/S. (Voltage level)	Meter		METER	Meter Reading		Diff.	OMF
No.	Name of Feeders.	Number	CF	Make	1/9/2019	1/9/2019		
	Maghbazar (33 KV Side)							
1	33/11 KV Transformer No.1.	6604465	1	L&T	5824.31	5865.39	41.08	180000
2	33/11 KV Transformer No.2.	202006985	1	0	22916765528	23300942740	384177212	3
3	33/11 KV Transformer No.3.	6604338	1	L&T	5897.94	5939.83	41.89	180000
	33/11 KV Transformer No.4	0	1	0	132.608	161.638	29.03	180000
	Maghbazar (11 kV Side)							**Total**
A	Incomer from T-1.	**D1025646**	1.0		328814.2	336011.6	7197.400	1000
1	11 kV Doctor's Lane	D1025648	1.0		32388.2	33284.0	895.800	1000
2	11 kV T&T O/H Feeder (TEJ)	D1025680	1.0		47401.2	48490.9	1089.700	1000
3	11 KV Acre Ice Feeder.	D1025642	1.0		86748.8	88817.0	2068.200	1000
4	11. KV Tejgaon 11 KV S/S.No.1.	D1025685	1.0		83340.9	85290.8	1949.900	1000
5	11kv Ambagan feeder	D1025650	1.0		72574.6	73931.5	1356.900	1000
B	Incomer from T-2.	**D1025641**	1.0		357735.2	365071.6	7336.400	1000
6	11KV Modhubagh O/H Feedr.	D1025658	1.0		83215.4	83215.4	0.000	1000
		DHKD9107	1.0		2089.1	3728.2	1639.100	1000
7	11KV Bangla Motor Feeder.	D1025682	1.0		69653.0	71300.5	1647.500	1000
8	11 KV Maghbazar Nearest Feeder.	D1025647	1.0		86951.0	89147.2	2196.200	1000
9	11 KV MP Suit Feeder.	D1025653	1.0		4895.8	4940.0	44.200	1000
10	11 KV Kunipara Feeder	D1025640	1.0		94589.3	96655.2	2065.900	1000
C	Incomer from T-3.	**D1025638**	1.0		371570.9	378911.1	7340.200	1000
11	11 KV BGEMA Feeder.	D1025683	1.0		6798.2	6798.2	0.000	1000
12	11 KV Nayatola O/H. Feeder.	D1025639	1.0		69225.3	70797.4	1572.100	1000
13	11 KV Garden Fdr. via Holy Famly	D1025652	1.0		76388.8	77591.2	1202.400	1000
14	11 KV BSRS U/G. Feeder.	D1025679	1.0		25647.2	26221.0	573.800	1000
15	11 KV Eskaton O/H.(New Meter)	D1025654	1.0		75760.4	77652.2	1891.800	1000
16	11 KV Isphani Feeder.	D1025649	1.0		56054.3	56995.0	940.700	1000
	11 KV Maghbazar (Old) S/S-2	D1025686	1.0		19346.7	19346.7	0.000	1000
	11 KV Incomer from Old building							1000
17	11 kV Tejturibazar	D1025644	1.0		88455.6	90665.6	2210.000	1000
18	11KV Sonargaon	D1025645	1.0		22943.9	22997.7	53.800	1000
D	Incomer from T-4		1.0		87000.8	87000.8	0.000	1000
19	11 kV TCB Feeder	D1025684	1.0		20599.4	20997.7	398.300	1000
20	Spare	D1025637	1.0		571.3	571.3	0.000	1000
21	11 kV Tejgaon ss-2	8576965	1.0		82768.0	85305.7	2537.700	1000
22	11 KV Sangsad Bhaban	D1025681	1.0		309.4	310.5	1.100	1000
23	11KV Holy Day Inn		1.0		28111.1	28111.1	0.000	1000
24	11KV Polly Bhabon		1.0		18260.3	18261.7	1.400	1000
25	AT -1	6603338	1.0	INDIA	1466249	1466249	0.000	0.75
26	AT -2	6603849	1.0	INDIA	969318	969318	0.000	0.75

Table 3.1

3.5.2 Dhanmondi 33/11 KV 2x 20/28 MVA Substation. (North)

Substation wise Energy Balance Statement

Sl	Name of S/S. (Voltage level)	Meter		METER	Meter Reading			Diff.	OMF
No.	Name of Feeders.	Number	CF	Make	1/9/2019	1/9/2019			
	Dhanmondi (33 KV Side)								
1	33/11 KV Transformer No.1.	6604456	1	L&T	820.74	820.74		33.57	240000
2	33/11 KV Transformer No.2.	6604432	1	L&T	875.81	875.81		35.16	240000
	Dhanmondi (11 kV Side)								Total
A	Incomer from Transformer-1.	DHK-60976	1.0		95831.30	140524.10		44692.80	180
1	11 KV Azimpur U/G-.2.	DHK-61109	1.0		0.0	0.0		0.00	60
2	11 KV Museum U/G	DHK-61107	1.0		291718.6	308147.2		16428.60	60
3	11 KV BIRDEM U/G	DHK-61108	1.0		174017.1	188367.3		14350.20	60
4	11 KV New Elephant O/H	DHK-60981	1.0		472658.6	488754.3		16095.70	60
5	11 KV DPH U/G-.1	DHK-60978	1.0		189182.7	206219.8		17037.10	60
B	Incomer from Transformer-2.	8838009	1.0	GEC	191711.9	238542.9		46831.00	180
1	11 kV TSC Feeder	DHK60873	1.0		677120.5	677120.5		0.00	60
2	11 kV University O/H Feeder	DHK60882	1.0		963954.3	971374.0		7419.70	60
3	11 kV Azimpur-1 Feeder	DHK60872	1.0		885671.6	885671.6		0.00	60
4	11 kV P G Hospital Feeder	DHK60889	1.0		116751.2	135066.5		18315.30	60
5	11KV Dhanmondi O/H Feeder	DHK61110	1.0		533241.4	556754.7		23513.30	60
6	11 kV Surjasen Hall Feeder	DHK60880	1.0		355479.6	358753.4		3273.80	60
7	11 KV DPH-2	DHK60871	1.0		330240.4	393464.4		63224.0	60
8	11KV sonargaon feeder	DHK61115	1.0		287615.9	316656.1		29040.20	60
9	11kV Scada		1.0		17833.00	18258.50		425.50	60
10	11KV Balaka Feeder		1.0		74089395.00	74921450.00		832055.00	1
11	11KV Shanta property		1.0		210523.60	214111.90		3588.30	60
12	11KV Abdul Mone Ltd.		1.0		441.80	448.54		6.74	60000
13	Panthopath O/H		1.0		21173883.00	22259862.00		1085979.00	1
13	11KV Mogbazar		1.0		42176572.00	43574075.00		1397503.00	1

Table 3.2

3.5.3 Bangabhaban 132/11 KV, 2X28/35 MVA Substation. (South 2)

Substation wise Energy Balance Statement

Sl	Name of S/S. (Voltage level)	Meter		METER	Meter Reading		Diff.	OMF
No.	Name of Feeders	Number	CF	Make	1/9/2019	1/9/2019		
	Maniknagar (132 kV Side)							
1	132 kV Bangabhaban Feeder-1.	06604332	1.00	L&T	1443.74	1453.46	9.72	720000
2	132 kV Bangabhaban Feeder-2.	06604430	1.00	L&T	1343.66	1353.51	9.85	720000
	Bangabhaban Converted to 33 KV)				.	.		
1	33 kV Bangabhaban Feeder-1.							
2	33 kV Bangabhaban Feeder-2.							
	Bangabhaban (11 kV Side)				Total 132 kv level=>	**Total 132 kv level=>**		
	-							
	-							
A	**Incomer from Transformer-1(GT-1).**	**4150744**	**1**	**IME**	1328303.30	1335350.30	**7047.00**	**1000**
1	11 kV Navana O/H Feeder	4150752	1.00	IME	204000.36	204870.91	870.55	1000
2	11 kV Motijheel-1Feeder	4150748	1.00	IME	18851.51	18851.51	0.00	1000
3	11 kV Sugar Bhaban Feeder.	4150753	1.00	IME	12892.43	13015.99	123.56	1000
4	11 kV Kamlapur(Madhumita via avisar)	4150741	1.00	IME	49009.3	49009.3	0.00	1000
5	11 kV Osmani Feeder		1.00	IME	33482.28	33482.28	0.00	1000
6	11 kV P & T S/S. Feeder	4150751	1.00	IME	345228.52	347692.50	2463.98	1000
7	11 kV Bangladesh Bank RMU.	4150738	1.00	IME	64271.26	64673.93	402.67	1000
8	11 kV Saidabad Water Treatment	4150749	1.00	IME	84547.36	85766.28	1218.92	1000
9	11 kV B.Bhabon DIT gate RMU.	4150743	1.00	IME	21518.24	21575.32	57.08	1000
10	11 kV DIT S/S Feeder	4150750	1.00	IME	173552.77	173552.77	0.0	1000
							0	
B	**Incomer from Transformer-2(GT-2).**	**4150742**	1.00	**IME**	1268875.00	1275946.70	**7071.70**	**1000**
1	11 kV BCIC Feeder	4150756	1.00	IME	170515.35	170515.35	0.00	1000
2	11 kV Sena Kalyan Feeder.	4150745	1.00	IME	60217.00	60881.36	664.36	1000

3	11 kV DIT RMU Fdr	4150740	1.00	IME	236821.24	238074.76	1253.52	1000
4	11 kV Janata Bank Feeder	4150755	1.00	IME	113101.57	113653.60	552.03	1000
5	11 kV Sonali Bank Feeder.	4150746	1.00	IME	65965.40	66469.18	503.78	1000
6	11 kV B.B.Hospital zone Feeder	4150739	1.00	IME	18373.93	18442.20	68.27	1000
7	11 kV PDB Design Feeder	4150747	1.00	IME	122494.80	123788.48	1293.68	1000
8	11 kV WAPDA Feeder	4150736	1.00	IME	92234.64	92343.88	109.24	1000
9	11 kV Gopibagh O/H Feeder	4150735	1.00	IME	194814.27	194814.27	0.00	1000
10	11 kV B.Bhabon Staff Quarter Fdr.	4150737	1.00	IME	6942.20	7131.78	189.58	1000
11	AT -1	63412931	1.00	L&G	31521.80	31521.80	0.00	1
12	AT -2	63403117	1.00	L&G	53249.60	58428.00	5178.40	1

Table 3.3

3.5.4 Asadgate 33/11 KV, 2X28/35 MVA Substation (North 2)

Substation wise Energy Balance Statement

Sl	Name of S/S. (Voltage level)	Meter		METER	Meter Reading		Diff.	OMF
No.	Name of Feeders.	Number	CF	Make	1/9/2019	1/9/2019		
	Satmosjid (33 KV Side)							
1	33 kV Shatmasjid-1 Feeder	DHKC9350	1.0		532031.000	556769.000	24738.00	270
2	33 kV Shatmasjid-2 Feeder	DHKC9354	1.0		505773.000	530874.000	25101.00	270
	Asadgate side (33 KV Side)							Total
	33 KV X-Fside							Total
1	33/11 kV Transfomer-1 (T1)	DHKC9353	1.0		779705	822570	42865.00	180
2	33/11 kV Transfomer-2 (T2)	DHKC9305	1.0		803111	835100	31989.00	180.00
	Asadgate (11 kV Side)							Total
A	33/11 kV Transfomer-1	DHKC9371	1.0		769877	812348	42471	180
1	Gonobhaban	DHKC9332	1.0		45982	49259	3277.00	60.00
2	11 kV Rapa Plaza Feeder	DHKC9339	1.0		338329	361753	23424.00	60.00
3	11 kV Shukrabad O/H Feeder	DHKC9324	1.0		302348	324073	21725.00	60.00
4	11KV Wasa O/H	DHKC9333	1.0		274622	290326	15704.00	60.00
5	11KV Bangabandhu Memorial Museum	DHKC9334	1.0		7847	8256	409.00	60.00
6	11KV Iqbal Road O/H	DHKC9330	1.0		345315	367166	21851.00	60.00
7	11KV Town Hall	DHKC9351	1.0		714623	748064	33441.00	60.00
6	11KV Post office		1.0		55534	62613	7079.00	60
B	33/11 kV Transfomer-2	DHKC9337	1.0		794371	826042	31671.00	180
1	11KV Shanshad Bhaban	DHKC9370	1.0		46742	47687	945.00	60
2	11 kV Jakir Hossain Road	DHKC9373	1.0		350079	371638	21559.00	60.00
3	11 kV New Colony O/H Feeder	DHKC9369	1.0		420505	440038	19533.00	60.00
4	11 kV Aurangzeb Feeder	DHKC9321	1.0		615717	634776	19059.00	60.00
5	11 kV Asadgate Local Feeder	DHKC9338	1.0		251374	260799	9425.00	60
7	11KV Humayun road		1.0		362741	381190	18449.00	60
8	11KV Sonar Bangla road		1.0		150019	152482	2463.00	60
9	11KV NHA		1.0		21936	24993	3057.00	60
10	Auxiliary Transformer		1.0		315650	338861	23211.00	1

Table 3.4

3.5.5 Dhaka Medical College Hospital 33/11 kV, 2*28/35 MVA GIS Substation (North 1)

Substation wise Energy Balance Statement

Sl	Name of S/S. (Voltage level)	Meter		METER	Meter Reading		Diff.	OMF
No.	Name of Feeders.	Number	CF	Make	1/9/2019	1/9/2019		
	Dhanmondi (33 KV Side)							
1	33 kV DU Incoming Circuit-1	00000072	1.0		68.34	96.08	27.74	240000
2	33 kV DU Incoming Circuit-2	00000081	1.0					
	DMC (33 KV Side)							**Total**
1	33/11 kV, 28/35 MVA T-1 (HV)	00000069	1.0		8236800.00	11582420.00	3345620.00	1
2	33/11 kV, 28/35 MVA T-2 (HV)	00000088	1.0		5738800.00	11480400.00	5741600.00	1
								Total
	T&T (11 kV Side)							
A	Nurshing Institute Feeder	00000126	1.0				0	1
1	Jagannath Hall	00000002	1.0				0.00	1
2	Samsun Nahar Hall	00000024	1.0		1369516	1708835	339319.00	1
3	Spare, 4L	00000184	1.0				0.00	1
4	Board Office O/H, (5L)	00000023	1.0		412119	805918	393799.00	1
5	Spare, 6L	00000167	1.0				0.00	1
6	Alia Madrasa O/H, (7L)	00000148	1.0		134159	216879	82720.00	1
7	Majed Sordar Road	00000164	1.0		2495894	3612471	1116577.00	1
8	33/11 kV, 28/35 MVA T-1 Incoming	00000056	1.0		8109604	11426406	3316802.00	1
9	33/11 kV, 28/35 MVA T-2 Incoming	00000034	1.0		8073004	11371206	3298202.00	1
10	Cankharpool, 9L	00000001	1.0		2210394	3424351	1213957.00	1
11	Shahidullah College, 10L	00000003	1.0		500758	818638	317880.00	1
12	Ananda Bazar	00000111	1.0		3587791	4738188	1150397.00	1
13	Hosseni Dalan, 12L	00000165	1.0		1224747	2047875	823128.00	1
14	Badrun nessa College	00000006	1.0		2578473	3021992	443519.00	1
15	Dhaka Medical Unit-II	00000125	1.0		1268796	1598676	329880.00	1
16	Spare, 15L	00000163	1.0				0.00	1
17	Sheikh Hasina National Burn Institute	00000127	1.0		373919	560238	186319.00	1
18	Aux. Transformer, AT-1	DHKF-7804	1.0		272.23	400.97	128.74	1
19	Aux. Transformer, AT-2	DHKF-7802	1.0		0.1	0.1	0.00	1

Table 3.5

3.5.6 Kawranbazar 33/11KV, 2x 20/28 MVA Substation (North 1)

Substation wise Energy Balance Statement

Sl	Name of S/S. (Voltage level)	Meter		METER	Meter Reading		Diff.	OMF
No.	Name of Feeders.	Number	CF	Make	1/9/2019	1/9/2019		
	Dhanmondi (33 KV Side)							
1	33 KV Kawranbazar Feeder No.1.	6604397	1		1139.50	1184.73	45.23	240000
2	33 KV Kawranbazar Feeder No.2.	6604345	1		461.03	461.50	0.47	240000
	Mogbazar (33 KV Side)							
1	33 kV Moghbazar	DHK 61038	1		961.81	1008.14	46.33	180000
	-							
	Kawranbazar (11 kV Side)	CF	1.00					
A	Incomer from Transformer-1.	DHK00182	1.0	secure	97165.2	98232.6	1067.40	10000
1	11 KV Titas Gas U/G. Feeder.	DHK-00190	1.10		37646.30	38211.30	565.00	444.44
2	11 KV Panthapath FDR	8536184	1.10	secure	99751.7	100790.6	1038.90	1000
3	11 KV Hotel Sonargaon Feeder.	8536190	1.10	secure	51744.1	51744.1	0.00	1000
4	11 KV Monipuripara Sw/S No-1	DHK00183	1.10	secure	78250.4	80552.1	2301.70	444.44
5	11 KV Green Road North Feeder.	8536193	1.10	secure	20965.2	22867.3	1902.10	1000
6	11 KV Airport Road West Feeder.	8536182	1.10	secure	65298.0	66581.3	1283.30	1000
7	11 KV Russel squre Fdr.	8536178	1.10	secure	365236.0	406838.0	41602.00	44.00
8	11 KV Rajabazar Feeder.	9119840	1.10	secure	9556.0	9556.0	0.00	1000
B	Incomer from Transformer-2.	DHK000184	1.0	secure	71512.3	72340.5	828.20	10000
1	11KV BERC	202007001	1.0	EDMI	62211606.0	63600406.0	1388800	1
2	11 KV UTC		1.0		8269451.0	8510599.0	241148.0	1
3	11 KV BCIFCC Feeder.	WBB01295	1.0		90245.0	90245.0	0.00	1
4	11 KV Green Road South Feeder.	8536192	1.0	secure	43886.8	45274.3	1387.50	1000
5	11 KV National Parlament Feeder.	8536194	1.0	secure	53644.0	53876.5	232.50	1000
3	11 KV Kawranbazar North	8536189	1.0	secure	63303.3	64915.4	1612.10	1000
7	11 KV PM's Secretariate. (ICC)	8536191	1.0	secure	87978.3	87980.1	1.80	1000
8	11 KV Kalabagan feeder.	DHK00080	1.0	secure	51851.7	56033.7	4182.00	444.44
9	11 KV WASA Bhavan Feeder.	8536188	1.0	secure	97881.7	98109.9	228.20	1000
10	11 KV Satota Feeder	8536195	1.0	secure	95188.2	96854.3	1666.10	444.44
11	AT-1	85-12906	1.0	secure	75551.0	75551.0	0.00	10
12	AT-2	85-12909	1.0	secure	57819.0	57863.0	44.00	10

Table 3.6

3.5.7 Siddhirganj 33/11 KV 2x 10/14 MVA Substation (SOUTH)

Substation wise Energy Balance Statement

Sl	Name of S/S. (Voltage level)	Meter		METER	Meter Reading		Diff.	OMF
No	Name of Feeders.	Number	CF	Make	1/9/2019	1/9/2019		
33 kv side								
7	33/11 KV Transformer No.1.	07389555	1.0	elster	4343.980	4377.480	33.500	240000
10	33/11 KV Transformer No.2.	07389487	1.0	elster	4570.780	4596.570	25.790	240000
11 kv Side			-	-	-	-	-	total=>
1	11 kV EPZ Feeder + DCM	XA587377	1.0	secure	111559.500	114496.200	2936.70	1000
2	11 kV SPS Local & Staff Qtr Feeder (F-2)	XA587359	1.0		10358.400	10527.100	168.70	1000
3	11 kV Narayangonj Direct Feeder (F-3)	XA587358	1.0		27197.7	29205.9	2008.200	1000
4	11 kV Akata Steel Feeder (F-4)	XA587376	1.0	secure	55005.800	57774.500	2768.70	1000
5	11 kV Sailo +Titas	XA575929	1.0		2796.500	2886.700	90.20	1000
		XA587353	1.0				0.00	1000
6	33/11 kV Transformer-1 Incoming	XA587379	1.0	secure	369298.000	377286.900	7988.90	1000
7	33/11 kV Transformer-2 Incoming	XA587354	1.12	secure	394841.800	394841.800	0.00	1000
8	11 kV DCM Feeder (F-6)	XA587363	1.00	Conzerv	22135.200	22135.200	0.00	1000
		XA587369	1.00		20774.100	20774.100	0.000	1000
9	11 kV IRA Steel Feeder (F-7)	XA587355	1.10	secure	24024.500	24067.700	43.200	1000
		N07-19282	1.10	Conzerv			0.00	1000
10	11 KV Monowar	XA575919	1.10		23469.500	24241.100	771.60	1000
11	11 kV Sailo+Bengal Feeder (F-8)	N07-19317	1.10	Conzerv	1385.386	1385.386	0.00	1000
		XA587381	1.10		363.600	363.600	0.00	1000
12	11 kV Mizmizi Feeder (F-9)	XA587357	1.10	secure	126941.600	129264.900	2323.30	1000
		N07-18992	1.10	Conzerv			0.00	1000
13	11 kV EGCB 335 MW (F-13)	XA587383	1.10	secure	2907.400	2930.900	23.50	1000
		HA021100505-02	1.10				0.00	1
14	11 kV Admjee EPZ-2 Feeder (F-11)	XA586384	1.10	secure	14340.200	14340.200	0.000	1000
15	11 KV Seven Horse Feeder	XA587373	1.10		72782.600	74014.400	1231.800	1000
16	11 KV Shanti Nagar	XA587371	1.10		72841.600	73815.100	973.50	1000
17	AT -1 = AT -2	101003	1.10		560470.000	560470.000	0.00	1

Table 3.7

3.5.8 Green Road 33/11KV, 2x 20/28 MVA Substation (North 2)

Substation wise Energy Balance Statement

Sl	Name of S/S. (Voltage level)	Meter		METER	Meter Reading		Diff.	OMF
No.	Name of Feeders.	Number	CF	Make	1/9/2019	1/9/2019		
	Moghbazar (33 KV Side)							
1	33 KV Green Road Feeder.1.	76026305	1.0	L&G	6697.53	6730.25	32.72	180000
2	33 KV Green Road Feeder.2.	76026322	1.0	L&G	3713.15	3713.15	0.00	180000
	33KV Dhanmondi 1				459.15	459.15	13.52	240000
	33KV Dhanmondi 2				182.00	182.00	38.29	240000.00
	Green Road (33 KV Side)							**Total**
1	33 KV Mogbazar Feeder - 1	8058156	1.0		42856.00	42856.00	0.00	3000
2	33 KV Mogbazar Feeder- 2	8058157	1.0		0.00	0.00	0.00	3000
	Green Road (33 KV X-FSide)							**Total**
1	33/11 KV Transformer No.1.	7173371	1.0		51025.70	51025.70	0.00	3000
2	33/11 KV Transformer No.2.	7173377	1.0		94339.40	94339.40	0.00	3000
	Green Road (11 kV Side)							**Total**
A	Incomer from Transformer-1.	DHK-00138	1.0		91694.6	92609.8	915.2	10000
1	11 KV Lab Aid feeder.	3C65883	1.0		836674	842549	5875.00	300
2	11 KV Green View Feeder.	DHK-00151	1.0		53052.7	53680.9	628.20	3333.33
3	11 KV Central Road Feeder.	65943	1.0		814664	820260	5596.00	300
4	11 KV New market. Feeder	DHK-00194	1.0		32351.1	32707.0	355.90	3333.33
5	11 KV DPH S/S. Feeder.	21100459	1.0		37542	37639	96.60	1
6	11 KV Kathal Bagan Feeder.	6604464	1.0		3748.60	3784.47	35.87	60000
								Total
B	Incomer from Transformer-2.	HA-021101496	1.0		2225.0	3005.1	780.1	180000
1	11 KV Green Road (East) Feeder.	21101050	1.0		53272010	54859050	1587040	1
2	11 KV North Road Feeder.	21100854	1.0		17853840	19504950	1651110	1
3	11 KV Green Road SS Feeder	DHK00134	1.0		70306710.0	71983058.0	1676348	1
		DHK00135	1.0		35370.3	35370.3	0	1
4	11 KV Plane Mosjid Feeder.	21100962	1.0		37093785	38459956	1366171	1
5	11kv Malancha	211009	1.0		3357380	4113185	755805.00	2
6	AT -1	5404440	1.0		22891	22891	0.00	1

Table 3.8

3.5.9 Khilgaon 33/11KV, 2x 20/28 MVA Substation

Substation wise Energy Balance Statement

Sl	Name of S/S. (Voltage level)	Meter		METER	Meter Reading		Diff.	OMF
No.	Name of Feeders.	Number	CF	Make	1/9/2019	1/9/2019		
	Ullon (33 KV Side)							
1	33 KV Khilgaon Feeder.	DHK00065	1.0		**747.71**	**774.38**	26.67	2000
	Taltola (33 KV Side)						**Total**	
	33 KV khilgaon Feeder.	9319673	1.0		443537.00	443537.00	0.00	1000
	33 KV khilgaon Feeder.	9319674	1.0		93293.00	93293.00	0.00	1000
	Maniknagor (33 KV Side)							
	33kV Khilgaon(Gulbag) Feeder	ABB03915	1.0		163539	163539	0	2000
	Khilgaon 33/11 KV 33KV side)						**Total**	
1	33 kV Ullon Incoming	DHK60984	1.0		486468	510311	23843.00	270
2	33 kV Maniknagor Incoming	DHK 61123	1.1		881918	910302	28384.00	180
3	**33 kV Taltala Incoming**	**DHK60983**	**1.0**					
4	33/11 kV Transformer - 1 (T1)	DHK60982	1.0		949276	982197	32921.00	180
5	33/11 kV Transformer - 2 (T2)	DHK60947	1.0		582701	613963	31262.00	180
	Khilgaon (11 kV Side)	ALL CF	1.00				**Total**	
A	Incomer from Transformer-1.	DHK60927	1.00		950237	982912	32675.00	180
1	11 KV Gulbagh O/H. Feeder.	DHK-60934	1.0		241305	268880	27575.00	60
2	11 kV Maghbazar T&T	DHK60931	1.0					60
3	**11 KV Santinagar S/S.-1. Fdr.**	**DHK60933**	1.0		561252	610319	49067.00	60
4	111KV Police Line Fdr.	DHK60930	1.0				0.00	60
		DHK60931	1.0		141369	148870	7501.00	60
B	Incomer from Transformer-2.	DHK60928	1.0		770646	801731	31085.00	180
1	11 KV Sajanpur Feeder.	DHK61017	1.0		748250	773429	25179.00	60
2	11 KV East Malibagh Feeder.	DHK60929	1.0		790663	810674	20011.00	60
3	11 KV Rampura TV Feeder.	DHK60933	1.0		11477	11481	4.00	60
4	11 KV Benjir Bagan Feeder.	DHK60985	1.0		660925	682313	21388.00	60
5	**11 kV Shantinagar S/S-2 Fdr**	**DHK60935**	1.0				0.00	60
			1.0		205151	230449	25298.00	60
6	11 kV West Shantibag Feeder	DHK60926	1.0		987557	1001188	13631.00	60
7	AT - 1	ELIB7374	1.0		7487.23	7631.11	143.88	60

Table 3.9

3.6 Calculation

- **Meter Consumption = Reading difference * OMF * CF**

- **CF** = Correction Factor

- **Overall Multiplication Factor (OMF) =** $\frac{Line\ CT\ ratio * Line\ PT\ ratio}{Meter\ CT\ ratio * Meter\ PT\ ratio}$ *** DMF**

- **DMF** = Dial Multiplication Factor

3.7 DPDC Area Map

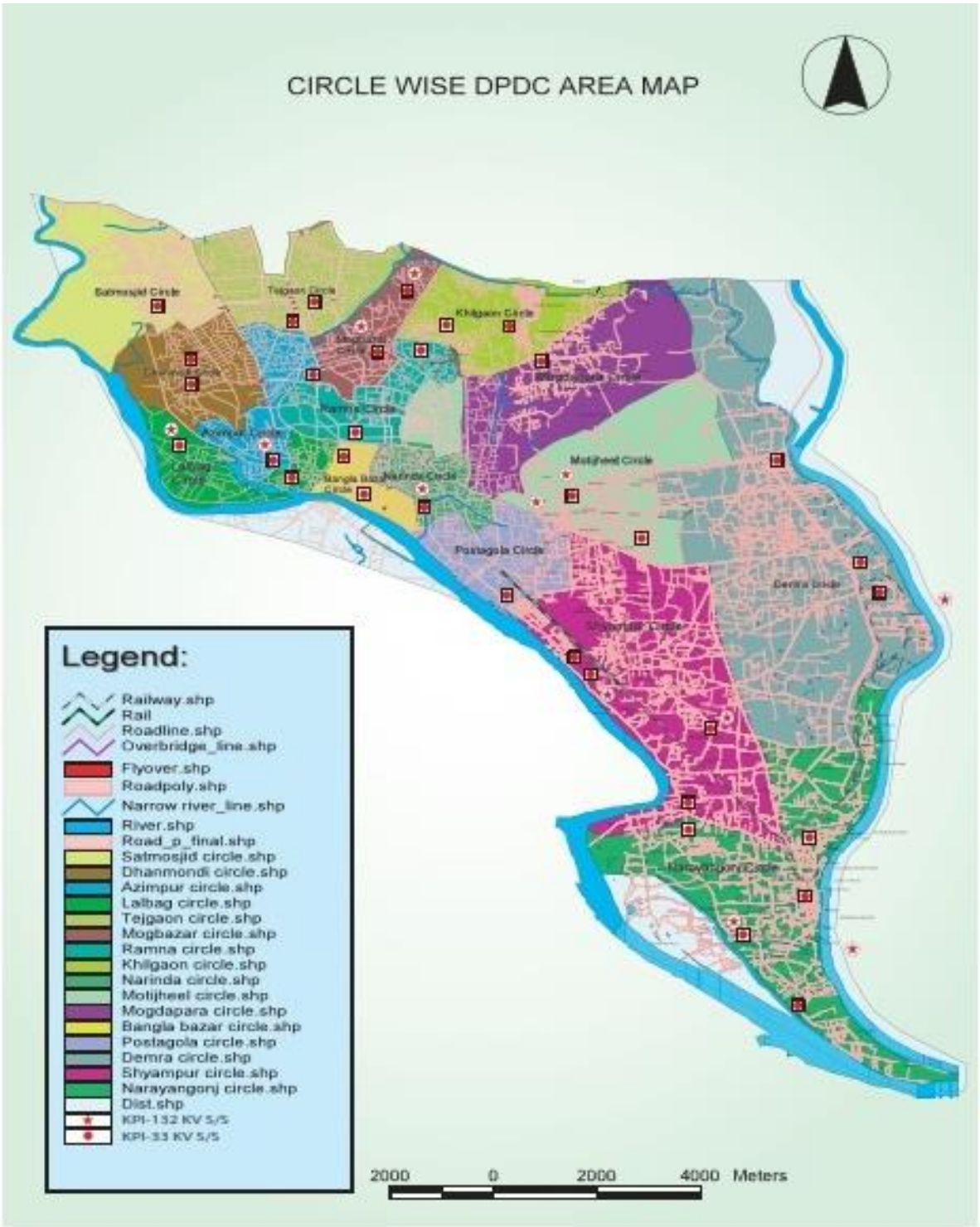

Fig 3.3: DPDC Area Map

CHAPTER 4

DIGITALIZATION AND AUTOMATION OF SUB STATION METERING SYSTEM (DASMS)

4.1 Digitalization and Automation of Sub Station Metering System (DASMS)

Digitalization means computerization of systems and jobs for better ease and accessibility.

Automation means the use of largely automatic equipment in a system of manufacturing or other production process.

DASMS means Digitalization and Automation of Sub-Station Metering System, it's a complete automatic system which is used substation.

4.2 Purposes of Digitalization and Automation of Sub Station Metering System

In the near past, we used analog meter in substations. Now a days everything is depends on science & technologies. So therefore, we are using digital equipment in substation system.

Before Digitalization and Automation of Sub Station Metering System (DASMS) we were collect meter reading manually to go through substation. After using DASMS we can collect data completely computer based by the through of a server. We do not need to go substation to collect data.

4.3 DPDC controls all the substations from one point

- Old meter replacement

- Every smart meter have IP address
- Ethernet (104)
- Router (local station)
- Intranet Network system
- Control room

4.4 Digitalization and Automation of Sub Station Metering System (DASMS)

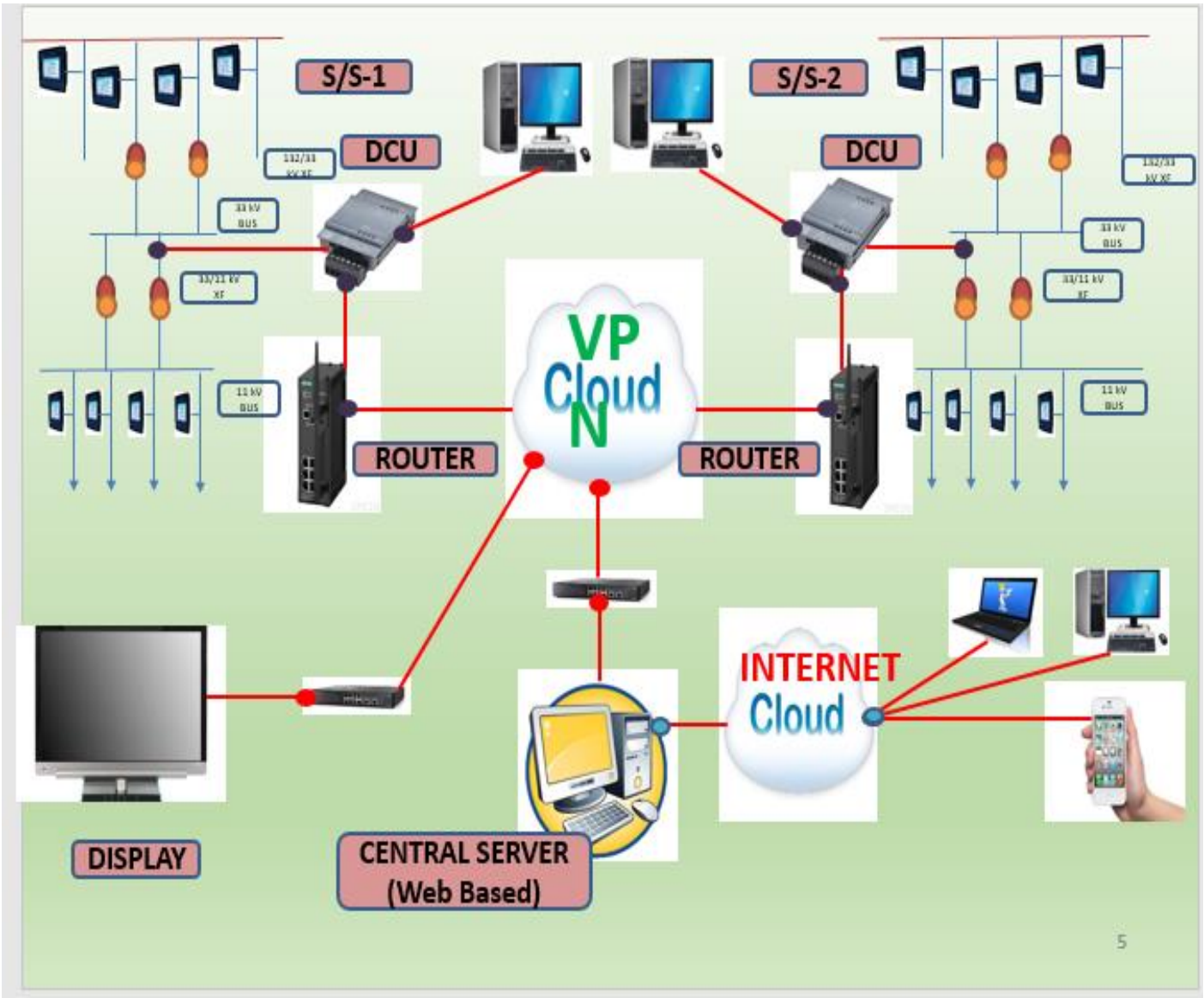

Fig 4.1: Digitalization and Automation system

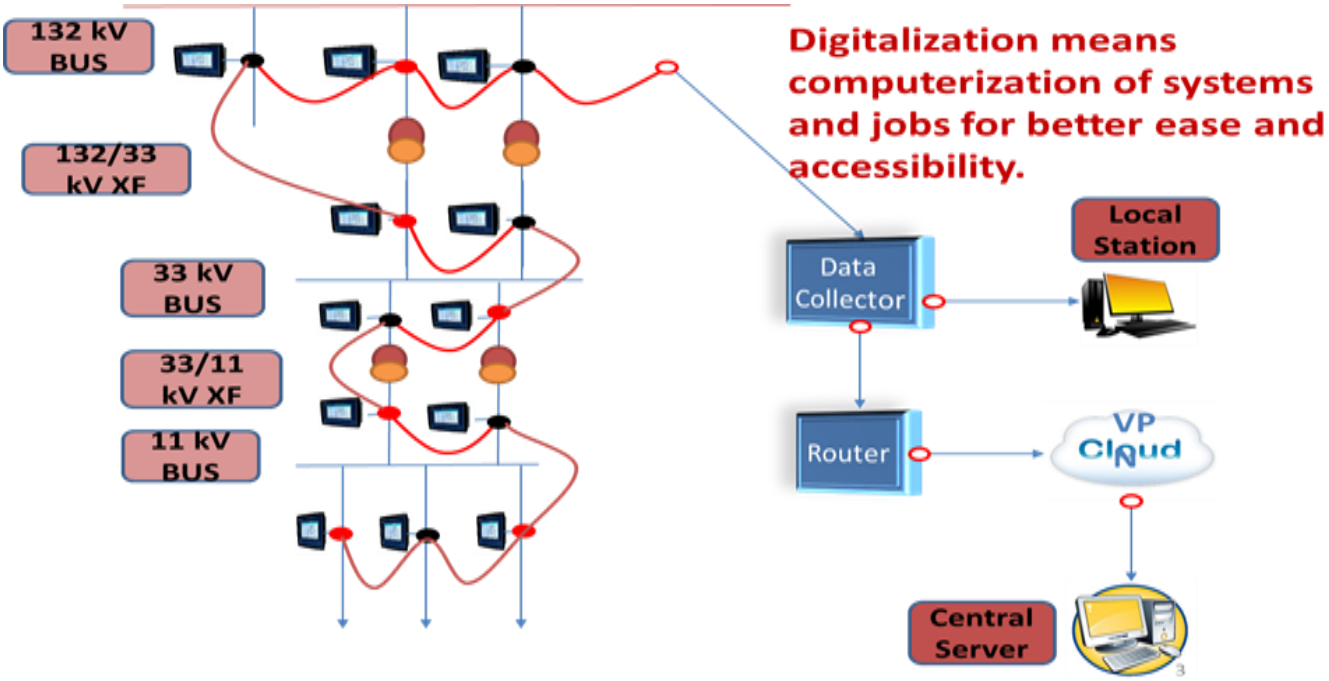

Fig 4.2: Digitalization and Automation system

4.5 OPERATION OF DASMS

Every transformer connected with a four quadrant energy meter. Every meter connected to each other by the through of Data Collector Unit. Data collector unit connected with local station server & a router. Now the router is connected with Virtual private network cloud (VPN). Cloud VPN is a kind of VPN that uses a cloud-based system foundation to convey VPN administrations. It gives all around available VPN access to end clients and endorsers through a cloud stage over open Internet. Cloud VPN is also known as hosted VPN or virtual private network as a service. All the sub stations connected with a central server (web based).Now central server connected with VPN cloud and internet cloud connected with central server. Therefore every user can connected with internet cloud. Above all every user can see the update data of the sub substation.

4.6 Scope of DASMS

- Energy auditing add different voltage level
- Automatic energy balancing

- Energy accounting
- Energy conservation
- System Management
- Duration of load shedding from breaker status
- Checking the consumption of tariff meters receiving point
- Facility of automatic collection and store data such as (voltage, current, power factor, KWH, KVAR, KVA) hourly, daily, monthly, yearly basis.

4.7 Comparison of DASMS, GIS & SCADA

Subject	DASMS	GIS	SCADA
Energy Reading	YES	NO	NO
Sub-Station Energy Balancing	AUTOMATIC	NO	NO
Cumulative Load Profile	YES	NO	NO
Global Position	NO	YES	NO
Fault Information	NO	NO	YES
Supervisory Control	NO	NO	YES
Data Source	ENERGY METER	GPS	COUPLING RELAY
Data Accessibility	OPEN FOR ALL AUTHENTIC PERSONS	LIMITED	RESTRICTED

Table 4.1

4.8 Convenience of Digitalization and Automation of Sub Station Metering System (DASMS)

- It will be possible to receive energy readings at 00.00 hrs as per PDB.
- Monthly bills of PDB and PGCB can be accurately deducted.
- SMS Alert for VIP Feeders.
- Server based DATA Archive
- Disputed PFC bill passed by PDB can be amended.
- The power factor of DPDC network can be improved by establishing customer and feeder based capacitor bank.
- Various tasks can be done including load flow, load management, planning-design.
- Energy balance of all sub-stations can be completed quickly and accurately.
- In the interest of accurate energy accounting, information about the CT-PT shutdown of a feeder, change of source, change of phase sequence, etc. will be obtained correctly.
- Import units can be accurately transmitted to 36 NOCs in the fastest time.
- All energy accounting information can be stored and paperless on the server.
- It will be possible to calculate the amount of loss in different sections of the line and sub-station.
- Acquisition of API targets will be accelerated.
- Accuracy and mobility will come in the work of DPDC.

4.9 Challenges of this project

CHALLENGES

Space for Central Control Center

Manpower

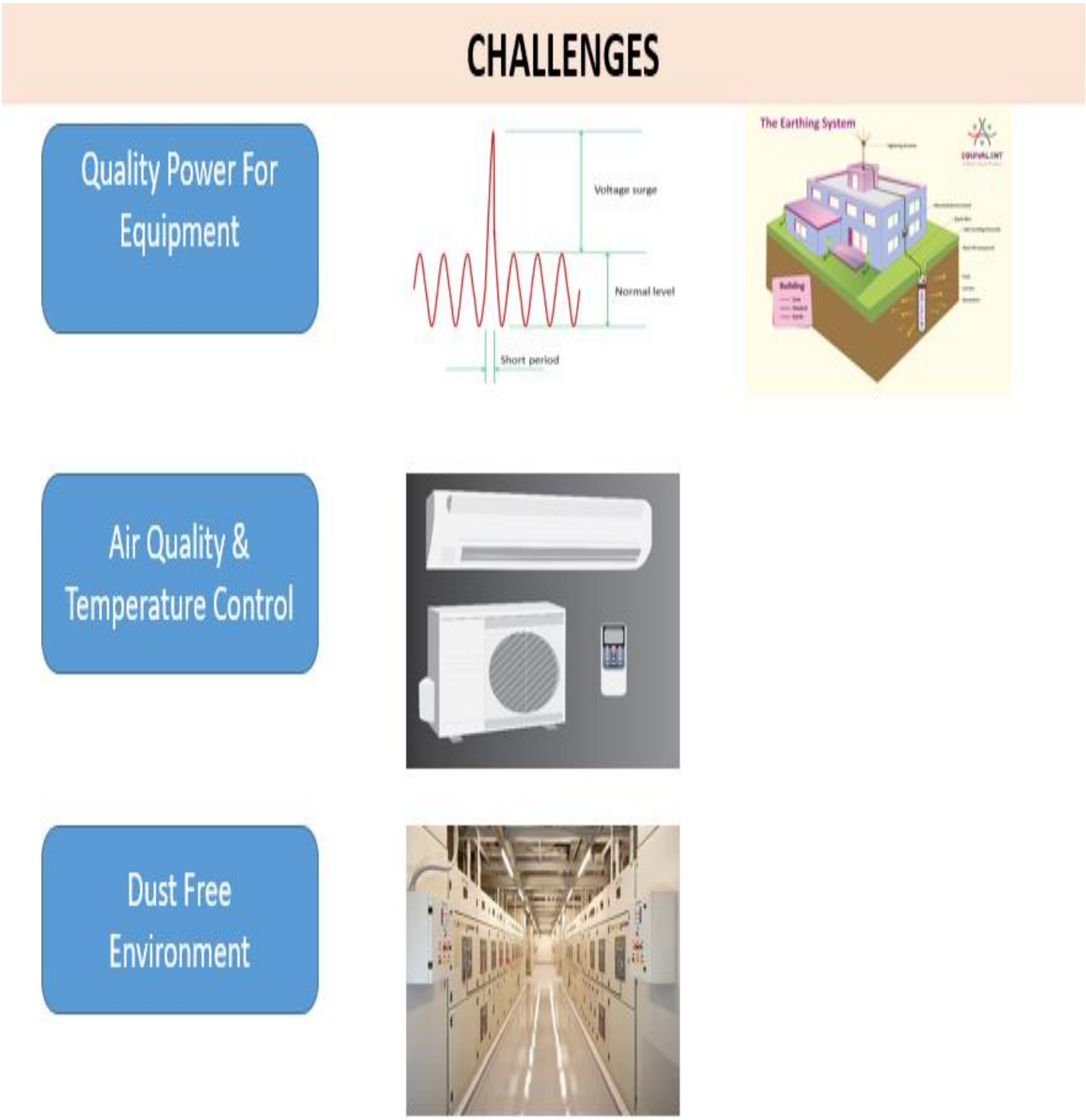

Fig 4.3: Challenges

CHAPTER 5

ABB SCADA

(SUPERVISORY CONTROL AND DATA ACQUISITION)

5.1 SCADA

Supervisory control and data acquisition (SCADA) is an arrangement of programming and equipment components that permits modern associations

5.2 Purposes of SCADA

SCADA systems are critical for modern associations since they help to maintain proficiency, process information for smarter decisions, and convey system issues to help moderate vacation.

- Control industrial procedures locally or at remote areas
- Monitor, accumulate, and process real time information
- Directly connect with gadgets, for example, sensors, valves, Pumps, engines, and increasingly through human-machine interface (HMI) programming
- Record events into a log document

5.3 Scope of SCADA:

- Distribution Outage Management and Restoration
- Distribution Operation Management
- Demand side Management
- System Control and Protection (Integration with SAS)
- Reactive Power and Voltage Management
- Distribution Planning (Integration with GIS)

5.4 Demand Side Management

- Peak Load Forecasting
- Execution of Load control strategies
- Demand Balancing according to Supply
- Intelligent demand forecasting based on previous power flow data

5.5 Distribution Planning (Integration with GIS)

- Data analysis for decision making
    - Real-time and historical data plotting of graphs, charts, trends, etc.
- Future Distribution network expansion
- Planning of Future Grid, Substation & Feeder
- Manageable network
- Reporting

5.6 Central Control Room

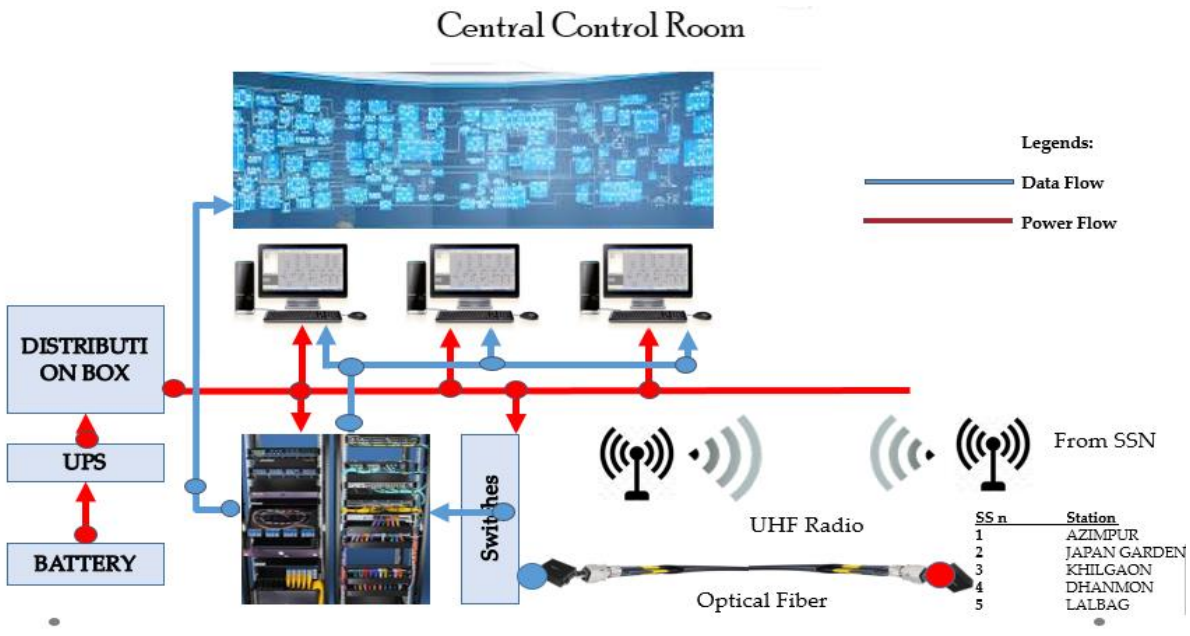

Fig 5.1: Central Control Room

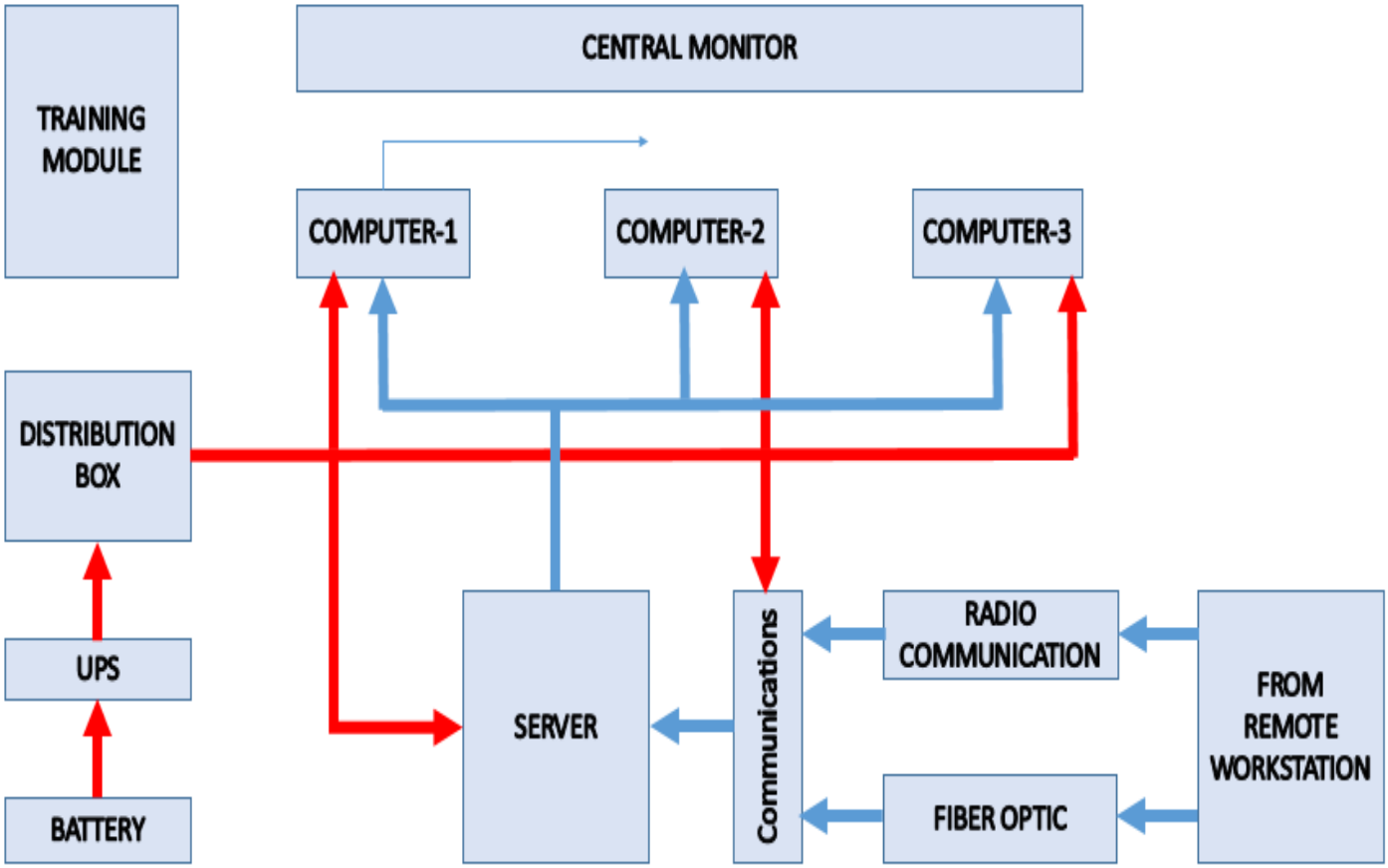

Fig 5.2: Central Control Room

5.7 Summary of Equipments

- Servers
- Workstations
- Network Equipment
- Firewalls
- Firewall For ABB Support
- Other Devices
- Software
- Operating System
- Office
- Database

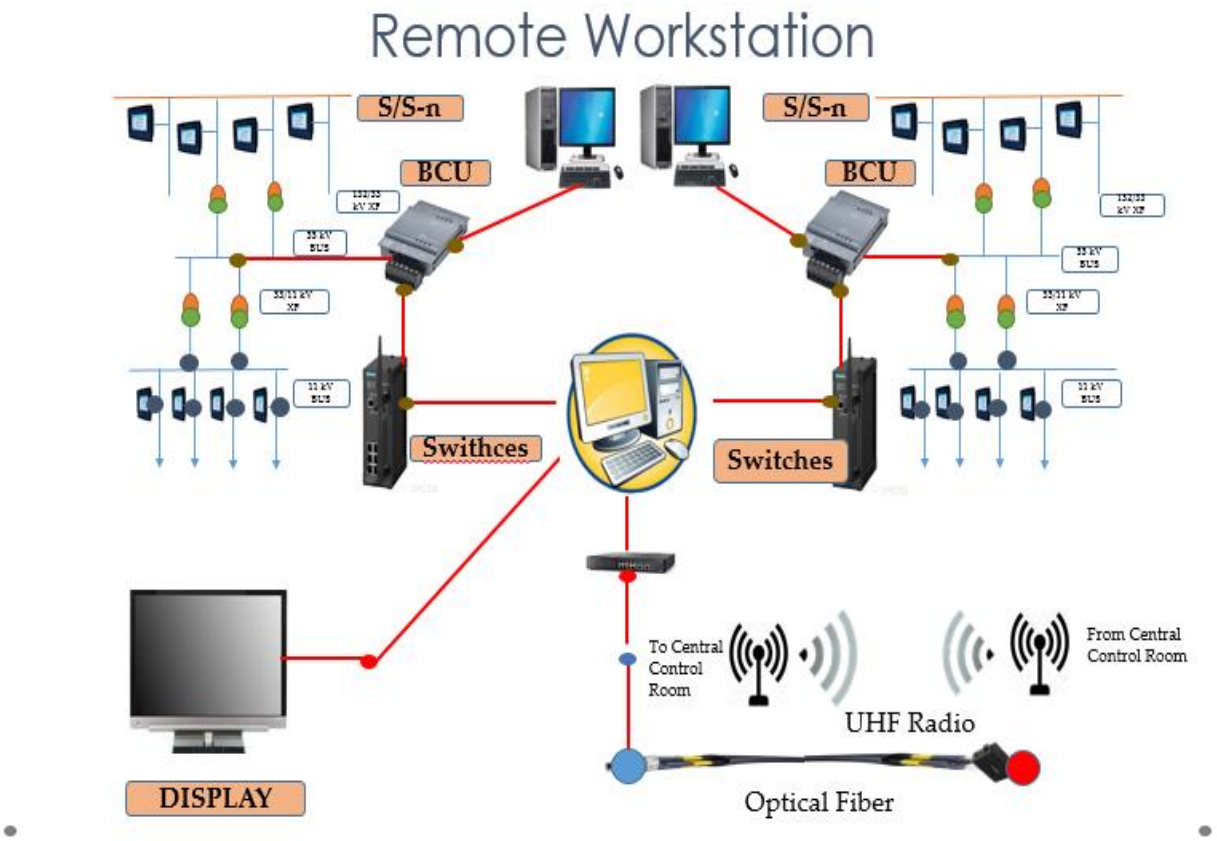

Fig 5.3: Remote Workstation

5.8 Remote Workstations

- ❑ Industrial gateway SYS600C Workstations
- ❑ Cubicle
- ❑ Managed Industrial Ethernet switch
- ❑ GPS Clock
- ❑ MCBs and other
- ❑ LAN-cables
- ❑ F/O cables
- ❑ Laser color printer
- ❑ Monitor
- ❑ keyboard and mouse
- ❑ 33KV relay for Line, Feeder and Transformer BCU

- ❑ Relay for 11kV Feeder BCU
- ❑ Installation accessories (11KV)
- ❑ UHF Radio Equipment
- ❑ Antenna System
- ❑ Fiber optic connection
- ❑ Coaxial Cable
- ❑ Installation Kit
- ❑ Feed line cable
- ❑ Coaxial overvoltage protection
- ❑ SFP Module
- ❑ Installation accessories (33KV)

5.9 Proposed Control Room Design

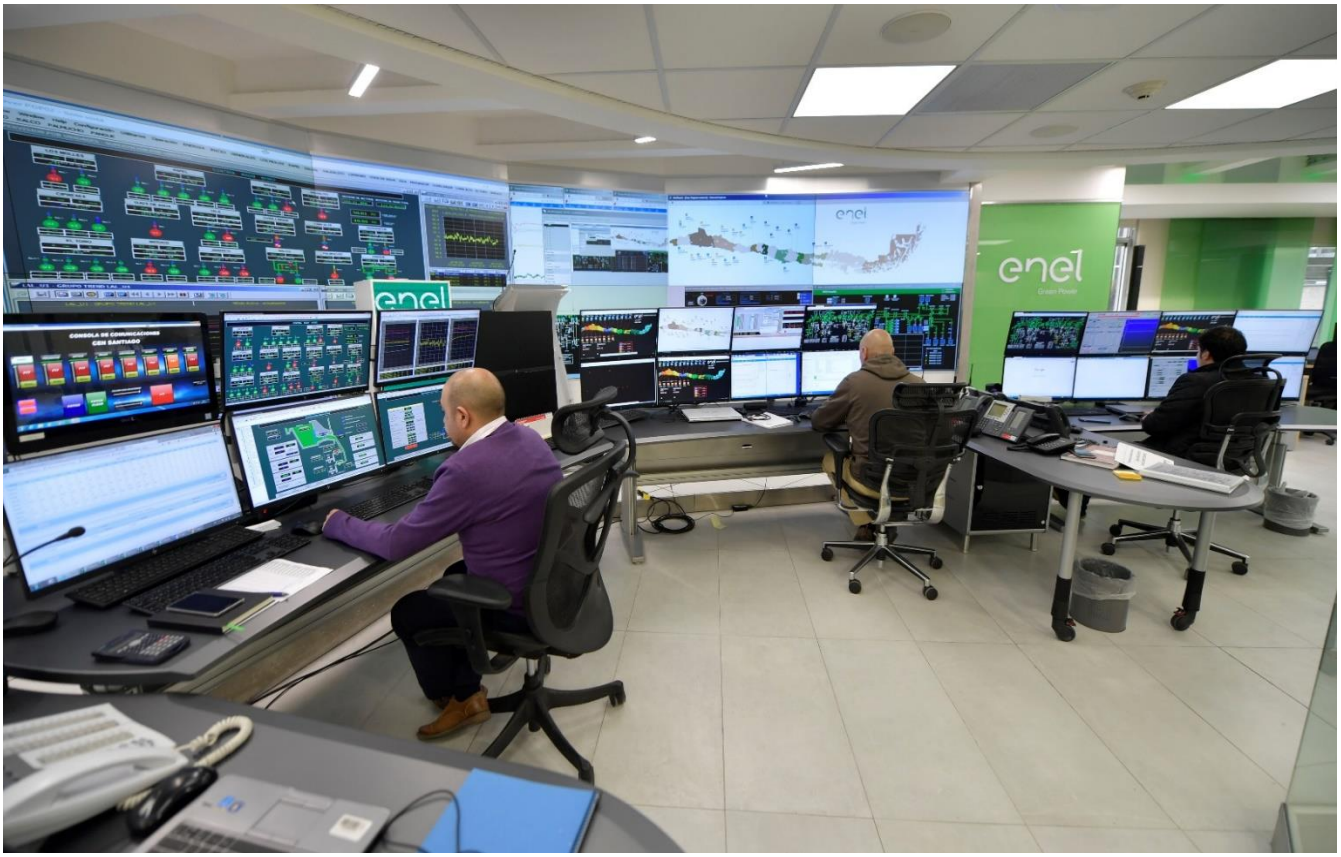

Fig 5.4: SCADA Control Room

5.10 SCADA Pilot Project in 5 Sub-Stations

SL	Sub-Station Name	Comments
1	Mogbazar 132/33/11KV	VPN connectivity is available though Leased Fiber Optic connection.
2	Lalbagh 132/33/11 KV	
3	Japan Garden 33/11KV	
4	Azimpur 33/11 KV	
5	Khilgaon 33/11KV	

Table 5.1

5.11 ABB SCADA System Control and Protection (Integration with SAS)

- Remote Operation & Control
- Identify Fault Location
- Relay configuration
- Ensure Protection of Equipment Remotely
- Integration with DPDC'S SAS
- Advanced fault detection
- Events, Alarm summery & Alarm history

- Logging and Archiving

5.12 Reactive Power and Voltage Management

- Monitor real data (Frequency and Power Factor)
- Take immediate step to stable the power system keeping voltage & frequency within the limits
- Using the data for planning and implementation to compensate reactive power lose.
- Controlling the capacitor banks and voltage regulators to provide a good voltage at the real time.
- Reducing energy losses by minimizing reactive power flows
- Overall increased grid stability and efficiency

5.13 Distribution Operation Management

- Load Forecasting, load flow and Short circuit calculation
- Re-allocated load and optimization of Distribution network and Substation
- Identify strength and weakness of distribution network
- Measure the effectiveness of maintenance team
- Assist management for planning

5.14 Summary of Revised Price Proposal

Sl No	Station Name	SCOPE	Total Price (CIF)	% with Equipment	Total Price
1	**Azimpur 33/11 KV SS (33KV Breaker-7 11KV Breaker-16 Total=> 23)**	-New Realy Installation -Local SAS -Fiber & Radio Communicaiton -GPS -Workstation etc	**294,233**		**398,174**
		Design and Project Management SAS	**28,385**	**10**	
		Telecom installation	**14,021**	**25.68**	
		Installation and Implementation for SA	**61,535**		
2	**Japan Garden 33/11 KV SS (33KV Breaker-6 11KV Breaker-15 Total=> 21)**	-New Realy Installation -Local SAS -Fiber & Radio Communicaiton -GPS -Workstation etc	**256,896**		**329,689**
		Design and Project Management SAS	**28,385**	**11**	
		Telecom installation	**14,021**	**17.29**	
		Installation and Implementation for SA	**30,387**		
3	**Khilgaon 33/11 KV SS (33KV Breaker-7 11KV Breaker-13 Total=> 20)**	-New Realy Installation -Local SAS -Fiber & Radio Communicaiton -GPS -Workstation etc	**268,427**		**341,220**
		Design and Project Management SAS	**28,385**	**11**	
		Telecom installation	**14,021**	**16.54**	
		Installation and Implementation for SA	**30,387**		

4	**Dhanmondi 33/11 KV SS (33KV Breaker-19 11KV Breaker-23 Total=> 42)**	33/11KV -New Realy Installation -Local SAS -Fiber & Radio Communicaiton -GPS -Workstation etc	**343,259**		**385,665**
		Design and Project Management SAS	**28385.4**	**8**	
		Telecom installation	**14,021**		
		Installation and Implementation for SA			
5	**Lalbag 33/11 KV SS (33KV Breaker-0 11KV Breaker-17 Total=> 17)**	33/11KV -New Realy Installation -Local SAS -Fiber & Radio Communicaiton -GPS -Workstation etc	**266,960**		**309,366**
		Design and Project Management SAS	**28,385**	**11**	
		Telecom installation	**14,021**		
		Installation and Implementation for SA			

Table 5.2

5.15 Satellite View of 5 Substation (Point-to-Multipoint)

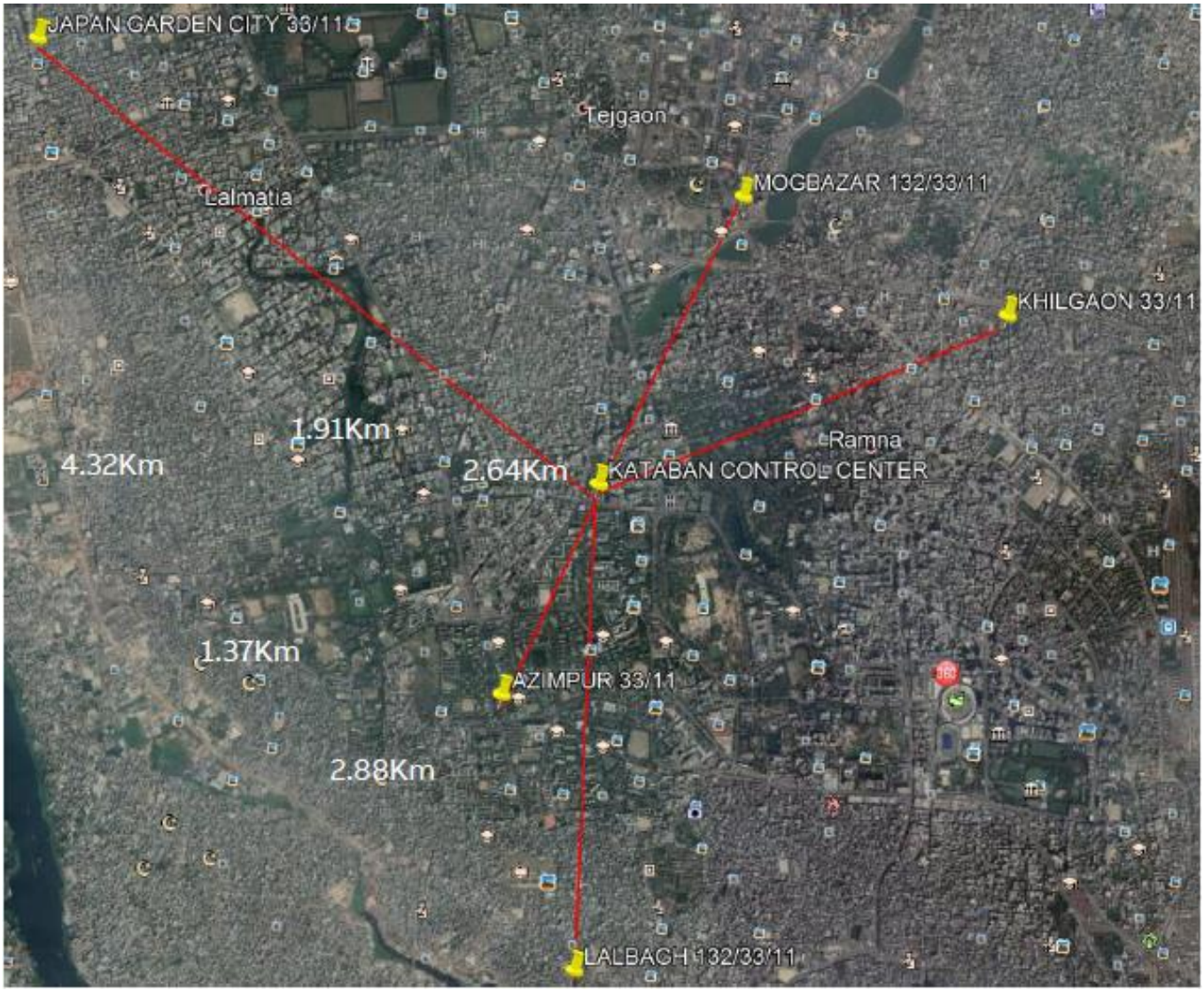

Fig 5.5: Point-to-Multipoint Radio Simulation

5.16 Azimpur (33/11 kV)

Japan Garden

Khilgaon

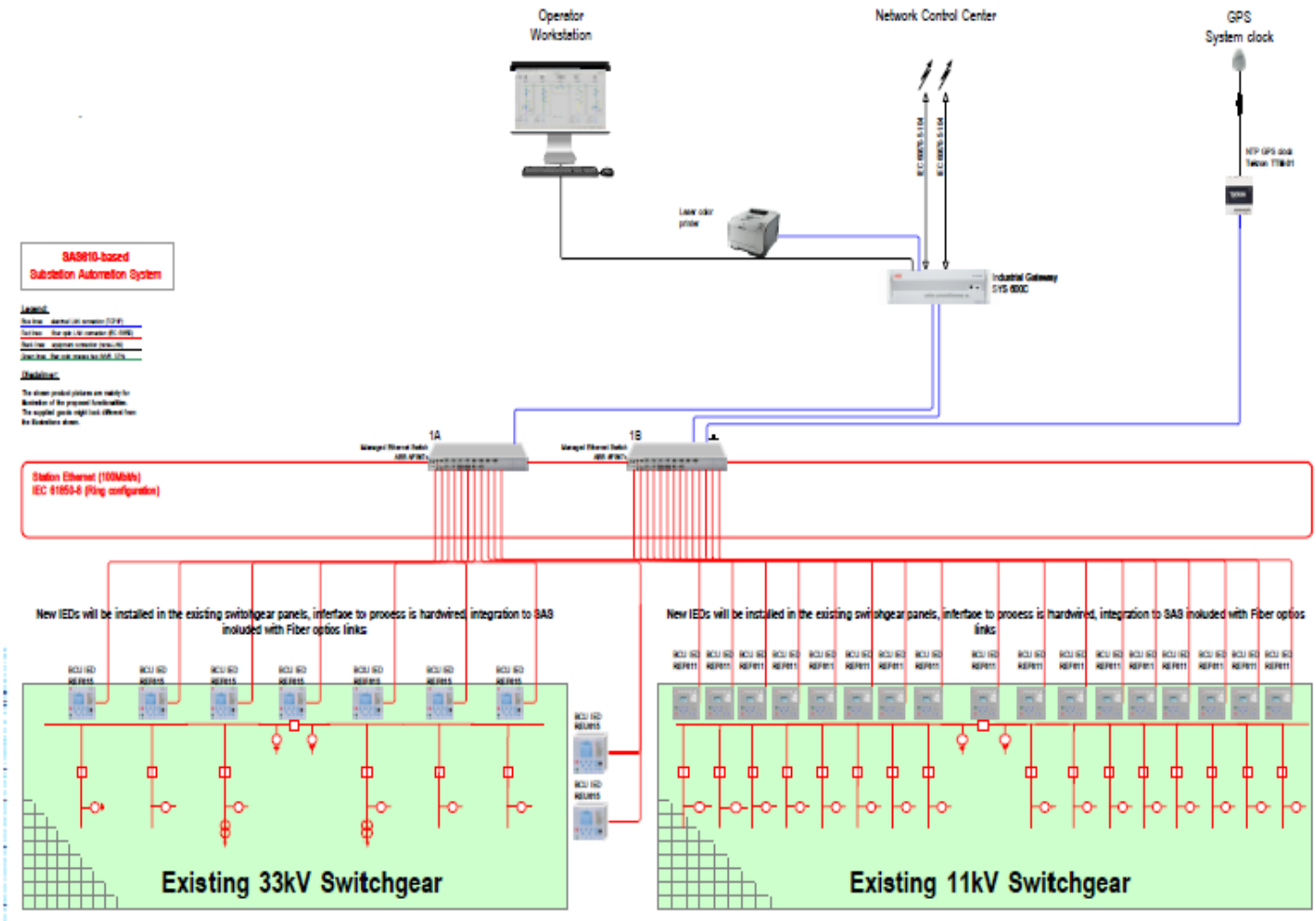

Fig 5.6: Azimpur/Japan Garden/Khilgaon (33/11 KV)

5.17 SCADA for DPDC (Implementation)

5.17.1 Upgraded SCADA system in 2 steps

1. SCADA project delivery

– New SCADA system with 5 substations

– 100% SCADA functionality where signals are available for HV and MV

– DMS functionality and GIS import

– Extensive training for operators and maintenance personnel

2. Separate project

– Full deployment with all substations and larger communication network

– DMS applications for the entire MV/LV network

Fig 5.7: SCADA for DPDC

5.18 Benefits from Pilot and beyond (MV/LV control and visualization)

Pilot Project

The delivery project for 5 substations includes the following project items:

• Distribution Management support;

• Leverage existing network data investments by GIS import

• Main Pilot project delivery in 12-18 months, training & extensive support to utility personnel Substations

Fig 5.8: Visualization of 5 Delivery Project

Next Steps

• Create a single, common network asset registry and network presentation in geographical and schematic maps, for overhead and underground network (in the future) that will be used in the complete Organization.

• Build a network model that is a foundation for all network analytical applications. With the help of these applications it is then easier to improve network planning process, optimize network configuration and improve outage restoration process.

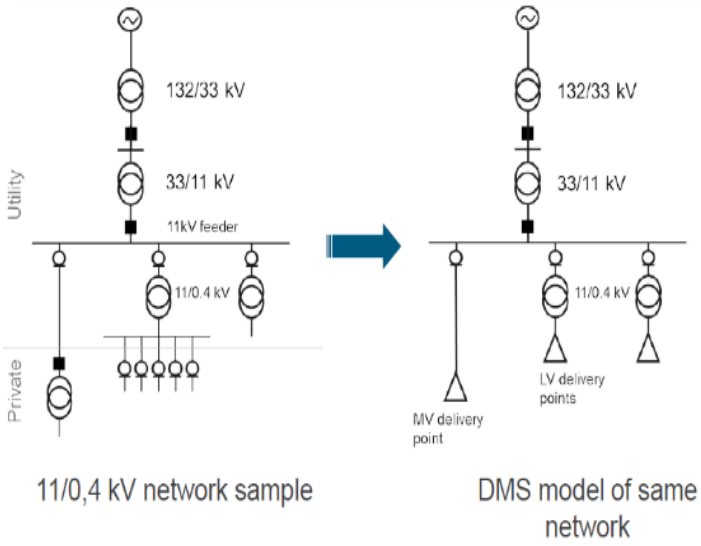

Fig 5.9: Transformation of Substation

• Expand SCADA DMS into all the Utility regions.

5.19 Intranet Connection

Leased Line & Radio

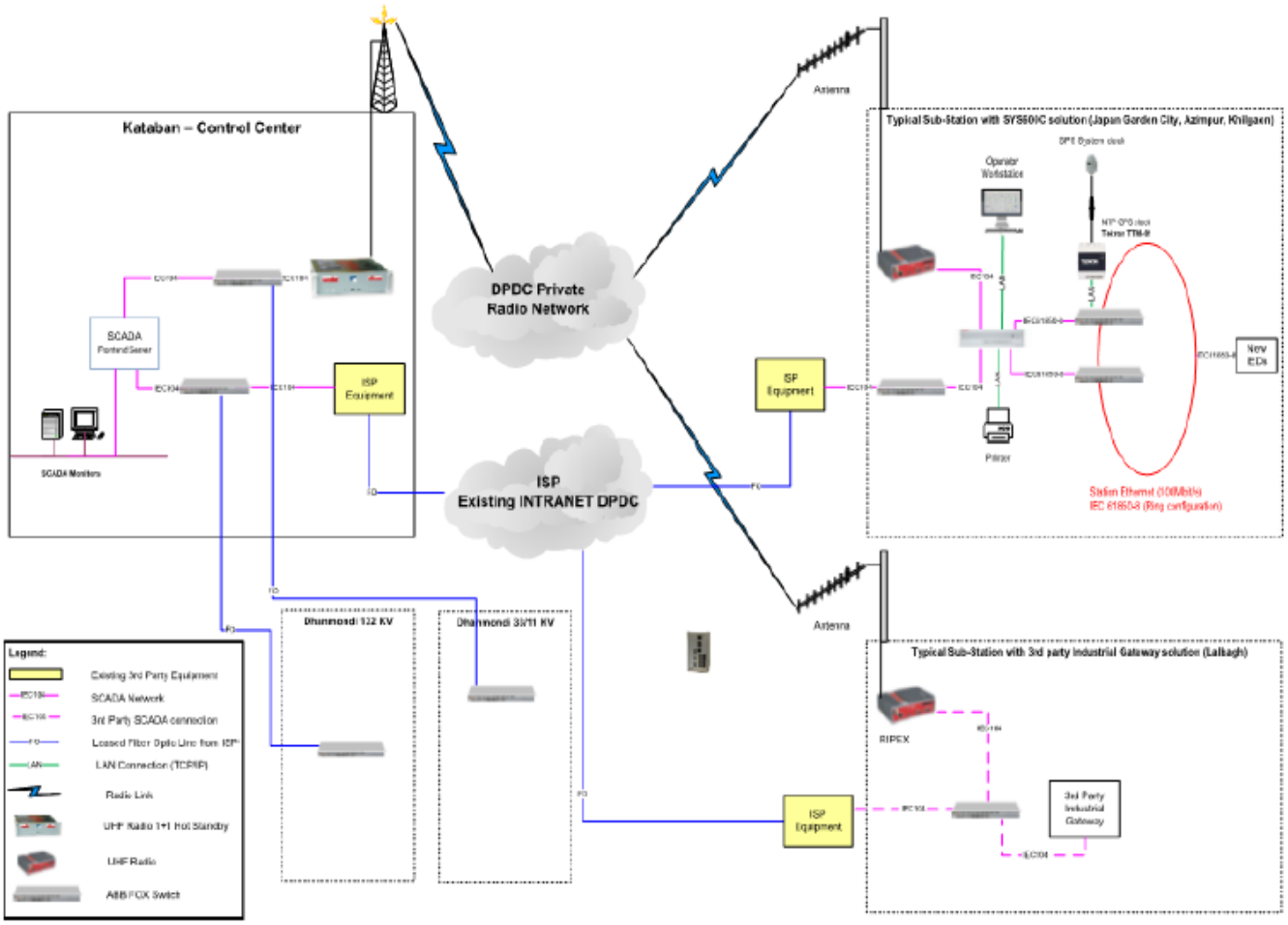

Fig 5.10: DPDC Private Network (Intranet Connection)

CHAPTER 6
METERING SYSTEM

6.1 Metering System [3]

A Metering System is comprised of things of Metering Equipment; voltage transformers, current transformers, Meters and Outstations, the wires and connections between everything and connections required to move metered information to the outside world (for example modems and correspondence lines).

6.2 Energy Meter [4]

An electric meter, or energy meter, is a device that estimates the measure of electric energy consumed by a structure, occupant space, or electrically powered equipment.

6.3 Importance of Energy Meter [6]

Accurate energy bills are a significant factor for dealing with the household finances, particularly in these difficult times. Without normal meter readings all energy companies can do is to estimate utilization. In the event that more has been utilized, more than evaluated, at that point this can be a shock for the consumer meter reading is one of the most important parts of energy supply. Readings must be dependable and exact so your bills can be as well.

6.3.1 Visibility [5]

The significance of smart meters for the visibility of data for purchasers lies in the way that with current conventional meters it is simple for householders to utilize more energy than they really need. However, smart meters qualify consumers to see precisely how much energy they are utilizing and when they are utilizing it

6.3.2 Savings [5]

These Characteristics qualify smart meters to help customers save money on electric bills. At present, householders receive estimated charges after the energy has been utilized. This makes challenges in that it is often very difficult to compare expenses with usage. Sometimes, energy suppliers will provide online equipments for customers who install smart

meters in their homes or businesses. These online equipments are planned at helping consumers to deal with their energy usage more proficiently.

6.3.3 Accuracy [5]

Smart meters send precise data through to the power organization, taking out the need to make estimates. They are thoroughly tried even before they leave the manufacturing company, so there is no confusion about this. However, energy providers will likewise offer to test smart meters in the home when required to guarantee the meter is doing what it should and giving exact data.

6.4 Types of Energy Meter

There are two types of energy meter. Such as,

- Substation Meter or Grid Meter
    - ❑ Four Quadrant Meter
- Consumer Meter
    - ❑ Analog Meter
    - ❑ Digital Meter
    - ❑ Prepaid Meter

6.5 Substation Meter or Grid Meter

6.5.1 Four Quadrant Meter

Power is generated by producing stations and transmitted to load centers from where it is distributed to end purchasers. These load focuses are constrained by distribution utilities, and there is a between change of energy between various utilities associated with the grid.

The trading of power is complex in such circumstances, and four quadrant energy estimations are expected to precisely measure the active and reactive energy under various export/import conditions for both active & reactive energy.

Fig 6.1: Four Quadrant Energy Meter

6.5.2 Application

EQM is four quadrant power meter intended for direct and transformer estimations in 3 and 4 wire power organize. On account of EQM' s complex expanded usefulness and high exactness, the meter is expected to be utilized in high voltage estimating frameworks of power plants, utilities and industry estimating frameworks.

Fig 6.2: Rating of Four Quadrant Energy Meter

6.5.3 Active Energy

The loads are included of a combination of inductive load, resistive load and capacitive load. The present vector can be maximum 90 away from the voltage vector when the load is either inductive or capacitive. It is in-phase with voltage when load is resistive.

At the point when the edge between the voltage and active segment of current is 0 degrees, the

power stream is considered as " active import". All energy recorded by the energy meter for this sort of intensity stream is recorded as "import energy". The current vector lies in either quadrant 1 or 2, active energy is being expended.. The quadrants characterized in IEC for active energy import are 1 & 4.

At the point when the angle between the voltage and active component of current is 180 degrees, the power stream is considered as "active export". All energy recorded by the energy meter for

this sort of intensity stream is recorded as “active export energy”. The current vector lies in either quadrant 3 or 4 active energy is being generated. The quadrants characterized in IEC for active energy send out are 2 & 3.

6.5.4 Reactive Energy

When the angle between the voltage and reactive component of current is π/2 degrees, the power stream is supposed as “ reactive import”. All power recorded by the vitality meter for this kind of power stream is filed as “import of reactive energy”. When the load is capacitive, the voltage vector lags the current vector. The current vector Hence stays in Quadrant 2 or 3 depending on whether the capacitive load is import or export, and the quadrature component of the load current is either at a π/2 angle or 270 as for the voltage vector. This reactive energy is called Reactive energy capacitive. At the point when the angle between the voltage and reactive component of current is 270 degrees, the power stream is supposed as “reactive export”. All energy filed by the energy meter for this kind of power stream is filed as “active export energy”.

Two types of reactive power, Such as

(a) capacitive power and

(b) inductive power.

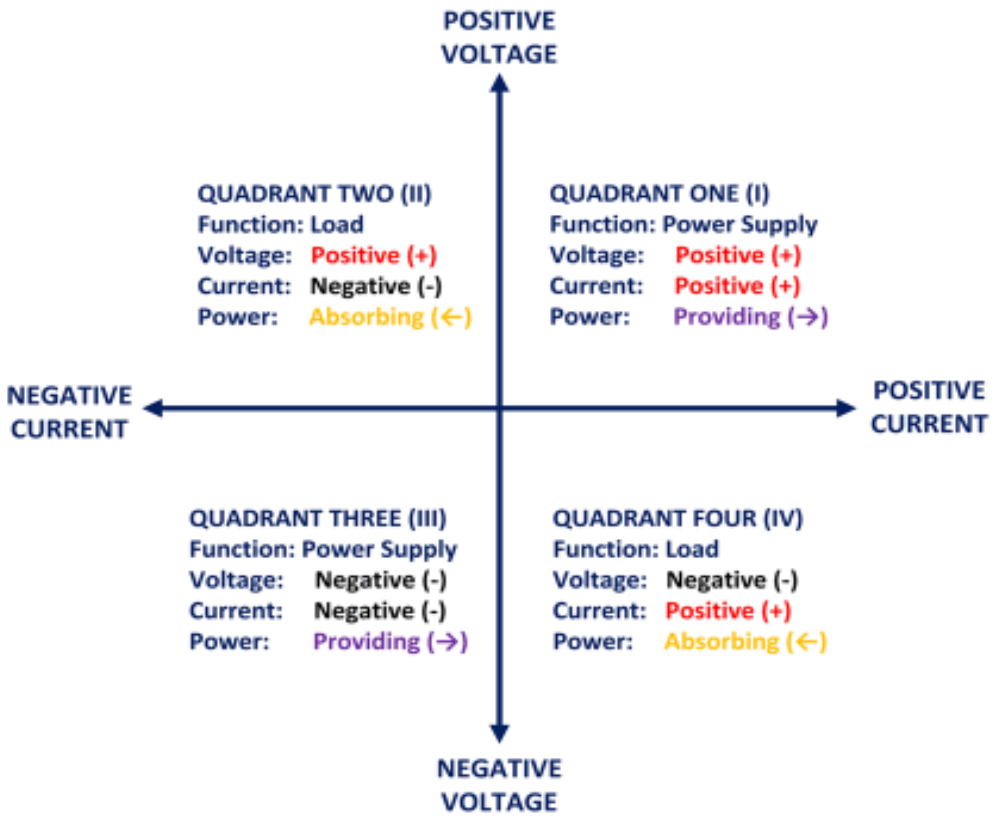

Fig 6.3: Four Quadrant Energy Cycle

6.5.5 Working Principle:

In Quadrant 1: Dynamic energy is considered as "import", reactive energy as well considered as "import". This is called reactive while dynamic import. The power factor of this sort of burden is a lagging power factor.

In Quadrant 2: Dynamic energy is discussed as "import", however reactive energy is considered as "export". This is called reactive while Active import The power factor of this kind of driving is a power factor.

In Quadrant 3: Dynamic energy is considered as "export", reactive energy is moreover considered as "convey". This is called reactive while Dynamic export since this is a perfect representation of inductive import (of quadrant 1). The power factor of this sort of burden is a slacking power factor.

In Quadrant 4: Dynamic energy is considered as "convey", yet receptive energy is considered as "import". This is called reactive while active export since this is a perfect representation of reactive import of quadrant 2. The power factor of this kind of weight is a main power factor.

6.5.6 Communication interfaces

EQM meter is furnished with interfaces: optical CLO or RS485. The meter might be also furnished with communication module: GTqm (for GSM transmission), RS485, CLO, RS232.Access to the communication module is secured via fixed terminal box cover.

6.5.7 Metering information

Every one of the information enrolled by the meter is customer friendly exhibited on the LCD applying OBIS standard. All information screens might be seen physically utilizing joystick that is accessible on the front board of the meter. Extraordinarily structured, graphical LCD of the meter permits introduction of numerous information on a similar screen. There are four essential LCD menus:

• Current information – access to current estimating information,
• Archives information – access to authentic estimating information,
• Momentary qualities - access to transitory current estimations,

• Preset – meters setup and presets. LCD screen is furnished with outer attractive field pointer.

6.6 Consumer Meter [7]

An electric energy meter is a device that calculate the electric energy consumed by consumers powered apparatus

6.6.1 Analog Energy Meter

Analog energy meters are those gadget which are utilized to compute the pre-owned wattage or unit of power. Analog meters takes a shot at magnetic gadget which continues moving a roundabout ring. That ring when complete one circle implies one unit of power is utilized.

Fig 6.4: Analog Energy Meter

6.6.2 Digital Energy Meter

Digital energy meter is a device that calculate the consumers used electricity. Digital energy meter count the electricity by blinking a LED light 1600 times to calculate an Unit (kilo-watt-hour). It has a LCD display which demonstrate the consuming energy of a consumer.

Fig 6.5: Digital Energy Meter

6.6.3 Prepaid Energy Meter

- Prepayment meters usually accept tokens or cards that can be bought or topped up respectively.
- Customer stops paying for electricity, the electricity supply will be cut off by a relay fitted into the meter.

- The advantage of this kind of meter is that you can budget for how much electricity you use by paying for it before you use it.

Fig 6.6: Prepaid Energy Meter

CHAPTER 7

CONCLUSION

7.1 Discussion

At DPDC, we've put some great days in our entry level job plan. For the electrical and electronic engineers in our country, DPDC is outstanding among other things. We should state the speculations that we have learned at our University was for all intents and purposes seen by us at DPDC. It allowed us a chance to actualize our hypothetical information in for all intents and purposes. Our accomplishments from DPDC are as per the following:

• Industrial preparing given by DPDC has improved our handy information.
• It has augmented our reasoning limit about down to earth activities of the distinctive gear.
• It has expanded our certainty level for confronting prospective employee meet-up in future.
• DPDC gave us a special affair of watching the hardware of substation.

The well-disposed condition in DPDC energized us to co-work with one another. We have taken in a great deal and got reasonable learning amid our temporary position at DPDC which will help us in future life.

7.2 Problems

We have officially assembled some learning about DPDC's down to earth activities. Yet, inside the constrained time it was extremely troublesome undertaking to assemble the entire learning about everything. Because of some security issue we couldn't get enough pictures and enough gets to each place. Because of some technical fault, visiting and collecting some details about three of our exhorted substation was extremely disturbing.

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