

Field Study
On
Operation of Grid-Substation of
Dhaka Power Distribution Company Limited
(DPDC)

**A Field study submitted in partial fulfillment of the
requirement for the Award of Degree of
Bachelor of Science in Electrical and Electronics Engineering**

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DAFFODIL INTERNATIONAL UNIVERSITY

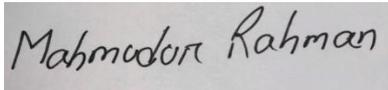
September 2021

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CERTIFICATION OF APPROVAL

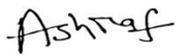
This is to certify that this field study report “**Operation of Grid-Substation of Dhaka Power Distribution Company**” is done by the following students under our direct supervision and this work has been carried out by them in the Dhaka Power Distribution Company for partial fulfillment of the degree of B.Sc. in Electrical and Electronics Engineering. The report has not been submitted to any other institution or university. The presentation of the work was held on September 2021.

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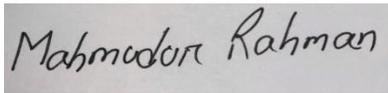
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DECLARATION

The Field study entitled “**Operation of Grid-Substation of Dhaka Power Distribution Company**” submitted by Mahmudur Rahman. ID No:161-33-3200.Session: Spring 2016 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of **Bachelor of Science in Electrical and Electronic Engineering** on September 2021.

We here by declare that, this report has been done by us under the supervision Md.Ashraful Haque,Assistant Professor,Department of EEE,Daffodil International University.

We would too like to pronounce that this report is submitted to Daffodil International university for halfway fulfillment of the prerequisite of the degree of Bachelor of Science in Electrical & Electronic Engineering. It has not been submitted to any other college or university for the grant of any degree already.



.....
Mahmudur Rahman

Id: 161-33-3200

Department of Electrical & Electronic Engineering (EEE)

Faculty of Engineering

Daffodil International University

Dedicated to

Our Parents

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Approval Letter



ঢাকা পাওয়ার ডিস্ট্রিবিউশন কোম্পানি লিমিটেড
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০৭ অক্টোবর, ২০১৬ খ্রিস্টাব্দ

সহযোগী প্রদান
ইলেক্ট্রিক্যাল এন্ড ইলেক্ট্রনিক ইঞ্জিনিয়ারিং ডিপার্টমেন্ট
অ্যাফিলিটেড ইন্টারন্যাশনাল ইউনিভার্সিটি

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

পূর্ব: স্মারক নং ০৬ ডিসেম্বর, ২০১৬ খ্রি. তারিখের পত্র:

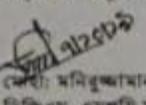
উপর্যুক্ত বিষয় ও সূত্রের মাধ্যমে প্রেরিত পত্রের প্রেক্ষিতে সনদ অবশ্যিকর জন্য জানানো যাচ্ছে যে, নিম্নবর্ণিত ছকে উল্লিখিত আশনার বিশ্ববিদ্যালয়ের **Electrical & Electronic Engineering Department** এর ০৬ জন শিক্ষার্থীকে সুশারিনটেজিং ইঞ্জিনিয়ার, রিনিউবেল এনার্জি এন্ড রিসার্চ, ডিপিডিসি-এর তত্ত্বাবধানে ০১ মাসের জন্য ইন্টার্নশিপ সম্পন্ন করার মিমিত নিম্নবর্ণিত শর্ত সাপেক্ষে অনুমতি প্রদান করা হলো:

Sl No.	Name of the Student	Student ID	Remarks
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2.	Mr. Md. Yeasin Reza	161-33-3234	
3.	Mr. Mahmudur Rahman	161-33-3200	
4.	Mr. Tarek Islam Chowdhury	161-33-3188	
5.	Mr. Zamil Hasan Shourov	161-33-3224	
6.	Mr. M. M. Alif Hossain	161-33-3131	

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 কথা শিক্ষা কার্যক্রম বাতীক অন্য কোন ক্ষেত্রে ব্যবহার করা যাবে না;
- ঘ. ইন্টার্নশিপ চলাকালীন ডিপিডিসিতে অবস্থানকালে শিক্ষার্থী-কে বিদ্যুৎ স্থাপনার ক্ষয়ক্ষতির ব্যক্তিগত নিরাপত্তার বিষয়ে সচেতন ও সতর্কতন থাকতে হবে;
- ঙ. ডিপিডিসি'র সংরক্ষিত/কেপিআই/পুরুবপূর্ণ এলাকার নিরাপত্তা বিধিত হয় এমন কোন কাজ করা যাবে না।

কর্তৃপক্ষের অনুমোদনক্রমে,


ডিকিএম, এমগ্রাফি ম্যানেজমেন্ট (স্বাভিমিনিস্ট্রেশন)
হিউমান রিসোর্সেস, ডিপিডিসি।

বিতরণ:

০১. এক্সিকিউটিভ ডিরেক্টর (স্বাভিমিনিস্ট্রেশন এন্ড এইচ.আর/ ইঞ্জিনিয়ারিং/ অপারেশনস/ ডিনাফস), ডিপিডিসি।
০২. জেনারেল ম্যানেজার (এইচ.আর)/ কোম্পানি সচিব, ডিপিডিসি।
০৩. সিসিও টু ম্যানেজিং ডিরেক্টর/ সুশারিনটেজিং ইঞ্জিনিয়ার, রিনিউবেল এনার্জি এন্ড রিসার্চ, ডিপিডিসি।
০৪. জনাব/মিক ডিপিডিসি।
০৫. অফিস কপি/ মাস্টার ফাইল।

Internship Program Schedule



গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
বিদ্যুৎ জ্বালানি ও খনিজ সম্পদ মন্ত্রণালয়
ঢাকা পাওয়ার ডিস্ট্রিবিউশন কোম্পানি লিমিটেড (ডিপিডিসি)
রিনিউবল এনার্জি এন্ড রিসার্চ শাখা
www.dpdc.org.bd
বিদ্যুৎ ভবন, ১ আব্দুল গনি রোড, ঢাকা- ১০০০

সীমিত

স্মারক নম্বর: ২৭.৮৭.০০০০.১০৭.৯৯.০০৩.১৯.১৭২

তারিখ: ১ কার্তিক ১৪২৬

১৬ অক্টোবর ২০১৯

বিষয়: ড্যাফোডিল ইন্টারন্যাশনাল ইউনিভার্সিটি-র ০৬ (ছয়) জন শিক্ষার্থীর ঢাকা পাওয়ার ডিস্ট্রিবিউশন কোম্পানি লিমিটেড (ডিপিডিসি)-তে ইন্টার্নশীপ সম্পন্নকরন সম্পর্কে।

সূত্র: ৮৭.৪০৪.৪০৮.০১.০৭.০১৯.২০১৫.১২৭৬, তারিখঃ ০৭/১০/২০১৯ খ্রিঃ।

উপর্যুক্ত বিষয় ও সূত্র মোতাবেক নিম্ন বর্ণিত ০৬ (ছয়) জন ছাত্রকে ডিপিডিসি-র তত্ত্বাবধায়ক প্রকৌশলী, রিনিউবল এনার্জি এন্ড রিসার্চ-এর তত্ত্বাবধানে ইন্টার্নশীপ সম্পন্ন করার জন্য ডিপিডিসি কর্তৃপক্ষ অনুমোদন দিয়েছে (কপি সংযুক্ত)। এমতাবস্থায়, নিম্নোক্ত শিডিউল অনুযায়ী শিক্ষার্থীদেরকে আপনার আওতাধীন দপ্তর সমূহের বিভিন্ন কার্যক্রম সম্পর্কিত ইন্টার্নশীপ সম্পন্ন করতে প্রয়োজনীয় সহযোগিতা প্রদান করার জন্য অনুরোধ করা হলো।

Student Name & ID	Name of Office	Date		Comments
		To	From	
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Mr. Mahmudur Rahman 161 33 3200	SE, System Services Dhanmondi Power House, Hatipool, Paribag, Dhaka	27-10-2019	31-10-2019	
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Mr. M M Alif Hossain 161 33 3131	SE, Tariff and Energy Audit 3 Sonargao Road, Katabon, Dhaka	17-11-2019	21-11-2019	
	SE, NOCS Motijheel 148 Motijheel C/A, Dhaka	24-11-2019	28-11-2019	
	DGM, ICT Revenue H 42, R 135, Gulshan, Dhaka	01-12-2019	05-12-2019	

১৭-১০-১৯

আবদুর রউফ খান

X

Certification of DPDC



ঢাকা পাওয়ার ডিস্ট্রিবিউশন কোম্পানি লিমিটেড
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Memo No. 87.404.408.01.07.019.2019.1920

Date: 13/02/2020

TO WHOM IT MAY CONCERN

This is to certify that **Mr. Mahmudur Rahman** (ID: 161-33-3200), a student of Electrical and Electronic Engineering Department, Daffodil International University has successfully completed 02 (Two) months internship program from **07 October 2019 to 07 December 2019** at the office of Superintending Engineer, Renewable Energy & Research, DPDC Vide Memo No: 87.404.408.01.07.019.2015.1276, Date: 07 October 2019. He was released from the responsibilities with effect from 05 December 2019.

We wish all the best in his future endeavors.


Md. Moniruzzaman
DGM, Employee Management (Administration)
Human Resources, DPDC.
Phone: +880-2-9550295

Distribution:

01. Superintending Engineer, Renewable Energy & Research, DPDC.
02. Office Copy/ Master File.

ACKNOWLEDGMENT

First of all, we articulate our heartiest thanks and gratefulness to almighty Allah for his divine blessing makes us possible to complete the final year field study successfully. We are grateful and wish our profound indebtedness to **Md. Ashraful Haque, Assistant Professor**, Department of EEE, Daffodil International University, Dhaka.

We would like to express our heartiest gratitude to **Dr.M.Shamsul Alam, Professor and Dean, Department of EEE**, for his kind help to finish our field study and also to other faculty member and the staff of EEE department of Daffodil International University.

We would like to thank our entire course mate in Daffodil International University, Who took part in this discuss while completing the field study.

Apart from that, we would like to thank our entire friends for sharing knowledge, information and helping us to make this project successfully. Also thanks for lending us some tools and equipment.

To our beloved family, we want to give them our deepest love and gratitude for being very supportive and also for their inspiration and encouragement during our studies in this University.

Chapter 1

Introduction

1.1 Introduction of the Report

It was an extraordinary chance of entry level position in DPDC. DPDC represents dhaka power dispersion organization. It is one of the biggest force dissemination organization in Bangladesh. During my entry level position I worked in different division, for example, – substation activity and support , power and dissemination, load the executives, control room actuate, link division, sunlight based energy and NOCS.

1.2 Background of DPDC

Dhaka power dissemination organization restricted was set up in 2005 under the organization demonstration of 1994. Beforehand this organization was known as DESA. All the resources and liabilities of DESA were moved to DPDC through an understanding endorsed on September 2008. DESA endured a framework deficiency of 26%,as it additionally became a losing worry because of different reasons, DPDC was presented as a feature of the change cycle to supplant DESA.

In 1959, East Pakistan Water and Power Development Authority (EPWAPDA) was developed to see after time, transmission, movement and arrangement of intensity all through the domain of the East Pakistan. After the self-governance of Bangladesh in 1972, Bangladesh Power Development Board (BPDB) was made to see after the same work.

To advance organization to the purchasers and to overhaul pay assortment by diminishing the triumphant tall system adversity, Dhaka Electric Supply authority (DESA) was made by the President of the Peoples Republic of Bangladesh in 1990. ACT no. 36 of 1990 for foundation of Dhaka Electric Flexibly Authority was given 23rd June 1990. Furthermore, hardly any quite a while thereafter due to the cash related and structure mishap DESA was divided into DPDC also, DESCO.

DPDC is isolated into 36 NOCS (Network activity client assistance). The vision of DPDC is to give power all through Dhaka city and Narayengonj.

1.3 Rational of the examination

The entry level position program and the report have following reason:

- To have detail information about force area.
- To comprehend the genuine business world.
- To apply the erudite information on reality.

To turn out to be important for a task which will assist with understanding the calling in future.

1.4 Methodology

Essential and auxiliary information sources had been utilized in this report.

1. **Essential Source:** Primary information has been gathered through vis-à-vis transformation with the SE (Superintended Engineer).
2. **Auxiliary source:** Secondary information has been gathered from various Division of DPDC .Books of various writers and furthermore the web sources are useful for composing the examination point.

1.5 Limitations

The snags , which are experienced in setting up this report , are as per the following:

- Due to pool of time, it was unrealistic to increase inside and out information on the point.
 - Absence of dependable reports on force framework. Because of certain ties we were unable to taste the genuine work.
- 1.3 Rational of the examination The temporary job program and the report have following reason:
- To have detail information about force area.
 - To comprehend the genuine business world.
 - To apply the scholarly information on reality. To turn out to be essential for a venture which will assist with understanding the calling in future.

Chapter 2

Literature Review

2.1 Generation System

Force is the significant wellspring of control for the majority of the countries monetary activities. Bangladesh is introduced power creation limit was 15351 megawatts as of January 2017 and 20000 megawatts in 2018. The development as far as limit has been striking—expanding from 5% to 28% from 2012 to 2018 as per the World Bank and the Bangladesh Power Development Board. Starting at 2011, 79 petroleum gas wells were available in the 23 furnished which create more than 2000 million cubic feet of gas every day. In truth, more than seventy five percent of the countries business imperativeness demand is being met by trademark gas .

2.2 Transmission System

The organization that communicate and conveys power from the makers to the shopper is known as the transmission framework. Electrical transmission is the technique for passing on delivered power generally speaking over long divisions to the spread network discovered populated areas. The electrical transmission structure is used in blend with power plant, circulation framework, and sub-station to make what is known as the electrical structure.

2.3 Distribution System

Electrical Distribution framework are a key bit of the electrical force system. To move electrical force from source to where it will be used, some sort of scattering mastermind must be utilized. Progressively incredible force flow structure are used, to move electrical ability to organizations, homes, and business structures. All things considered, the movement structure is the electrical system between the substation supported by the transmission system and the customer end.

2.4 Transformer

A Transformer is a static electrical machine which move AC electrical force starting with one circuit then onto the next circuit at the reliable repeat, yet the voltage level can be changed that infers voltage level can be extended or reduced by the essential. It deals with the guideline of faradays Law of Electromagnetic Induction which states "the extent of voltage is straightforwardly relative to the pace of progress of transition."

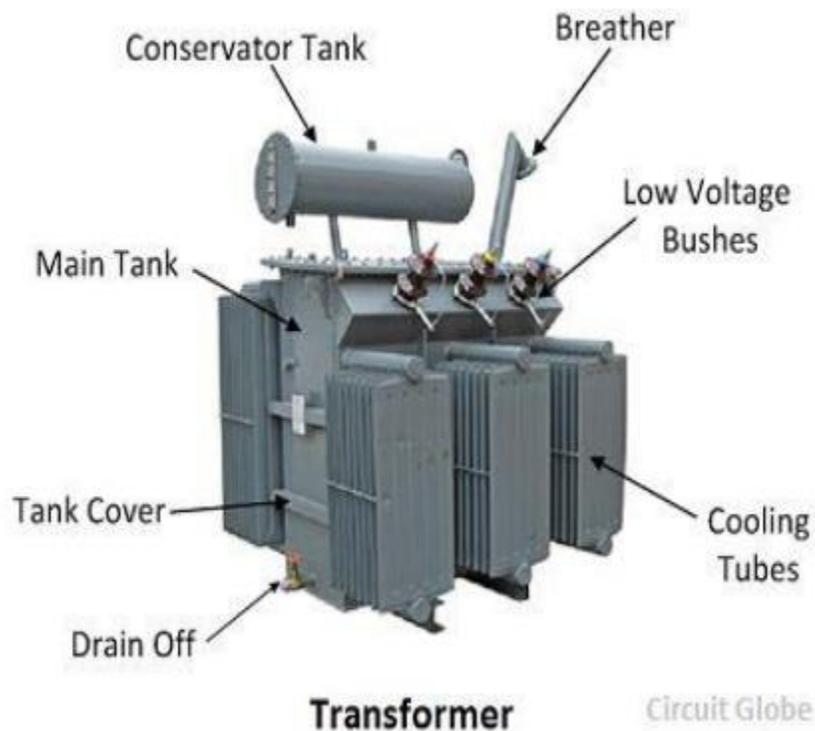


Figure 2.1: Transformer

2.4.1 Necessity of a Transformer

For the most part ,electrical force is created at 11kv.For moderate reasons AC control is sent at high voltages state 220 kv or 440 kv over long partitions. In like manner a phase up transformer is applied at the making stations. What's more, thereafter for prosperity reasons the voltage is wandered down to different levels by venture down transformer at various substation.

2.4.2 Construction of a Transformer

It primarily comprise of

1. Attractive circuit (comprising of center, appendages, burden and damping structure).
2. Electrical circuit (comprising of essential and optional windings)
3. Dielectric circuit (comprising of protection in various structures and utilized at various places)
4. Tanks and adornments (conservator, breather, bushing, cooling tube, and so forth)

2.4.3 Accessories of transformer: Core and Windings:

It could be of different shape i.e.core,shell .It is made of cold-moved grain-arranged Siliconsteel of stain protection on the overlay.

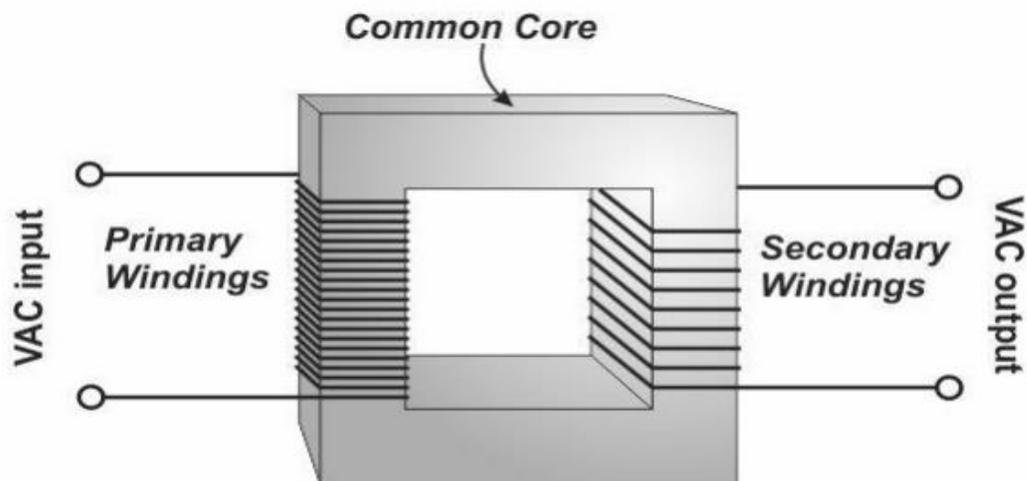


Figure 2.2: Core and winding

Mainly there are two types of transformer :

1. Core type transformer
2. Shell type transformer

In center sort, we wrap the essential, and the auxiliary twisting outwardly appendages what's more, in shell type we place the essential and optional windings on the internal appendages. Windings are layered sort and uses rectangular round conductor. Furthermore, round and hollow windings are low voltage windings utilized something like 6.6 KV for KVA up to 600-750, and current rating between 10 to 600 A. We likewise utilize helical windings low voltage, high limit transformers, where current is higher, simultaneously windings turns are lesser.

2.4.4 Transformer Oil

Generally, the oil we use for the electrical force transformer insurance and cooling explanation behind existing is known as the transformer oil or securing oil. This oil used to assemble through the midway refining of harsh oil. By and by there are two major clarifications behind using this insurance oil control transformer.

1. Transformer Oil is responsible for guaranteeing the transformer major focus what's more, the winding. Transformer Oil in like manner goes about as security so it could shield bending from direct contact with the oxygen and stop such an oxidation reaction.
2. There is another central issue to use transformer oil in a force transformer. It ingests the excess proportion of warmth when the transformer is operational what's more, keeps the transformer cool from inside.

2.4.5 Conservator

The Conservator tank is a tank fitted over the level of top front of Oil Filled transformer to contemplate augmentation and weight of the Oil. The guideline limit of conservator tank of transformer is to give adequate space to expansion of oil inside the transformer. Conservator is the most crucial piece of the transformer, considering the way that the Conservator tank takes up the

advancement and pressure of oil during running action.

2.4.6 Breather

The capacity of breather in transformer is to sift through the dampness from air. Breather comprise of silica gel which ingest the moister from air. So air is have to go through the silica gel breather, which will assimilate the dampness noticeable all around as it were dry air can enter in to the transformer

2.4.7 Bushing

A transformer bushing is the end highlight make electrical associations. Bushing are typically related voltages over 100 volts. In electric force, a bushing is an ensured device that empowers an electrical course to go safely through a grounded driving obstacle, for instance, the occasion of a transformer or on the other hand electrical switch.



Figure 2.3: Bushing of Transformer

2.4.8 Tap Changing

Tapping is the way toward choosing just particular number of goes and to change the turns proportion. Essentially, a tap transformer resembles a slider on a potentiometer, which can either be utilized for steady voltage guideline or various voltage esteems.

2.5 Substation

A substation is a piece of an electrical age, transmission, and appropriation framework. The Substation are basically used to change over AC (substituting current) to DC (direct current). The electrical substation in which the voltage is changed from high to low or low to high for transmission, appropriation. They are additionally prepared with circuit breakers to ensure the appropriation framework, and can be utilized to control the progression of current.



Figure 2.4: Electrical substation

2.6 Components

Substations generally have switching, protection and control equipment, and transformers. The main components of a substation are

- Busbars
- Surge or lightning Arresters
- Isolator
- Circuit Breaker
- Power Transformer
- Current Transformer
- Potential Transformer

2.7 Types

Substation can be classified by their different capacities and jobs. Step-up substation: A phase up transmission substation gets electric force from a close by delivering office and uses a gigantic force transformer to assemble the voltage for transmission to far away territory. In making end 11KV is conveyed and venture up transformer convert it into 230 or 130 KV for transmission. Step-down substation: These substation cut down the voltage from 130/33 KV, which is used for current purposes. Something different, the yield is at that point composed to a scattering substation. Circulation substation: These substation further lower the voltage from 33KV to 11KV and afterward it is provided to the most mechanical, business, and private needs. These offices are in some cases found underground.

2.8 Power Factor

Force factor is a statement of energy proficiency. It is typically communicated as rate. Force factor is the proportion of genuine force in a circuit to the obvious power conveyed to the circuit. The force factor equation can be communicated in other ways:

$$PF = (\text{True force})/(\text{Apparent force})$$

Helpless force factor suggests that using power inefficiently and it can damage to security and circuit portions. Finally, power factor extends the overall cost of conveyance framework.

2.9 Electricity Consumer

Force is the huge wellspring of power for most of the country and for financial activities. Bangladesh has one public cross section with a presented breaking point of 21,419 MW as of September 2019. The total presented limit is 20,000MW. Starting late Bangladesh started advancement of the 2.4GW Nuclear Force Plant. Issues in the Bangladesh electric force zone recollect pollutions for association, high system setbacks, power blackouts, etc. By and large, the nation can't fulfill framework need over the previous decade.

Chapter 3

Grid & Substation Operation

3.1 Introduction

Network substation are the basic spots from which power supplies to the client in better places. Indeed super network substation voltage level is about 230/132/33KV, network substation voltage level is around 132/33/11KV, and substation voltage level is 33/11KV. Be that as it may, matrix substation is an interconnected network for conveying power from providers to purchaser.

3.1 Introduction Network substation are the basic spots from which power supplies to the client in better places. Indeed super network substation voltage level is about 230/132/33KV, network substation voltage level is around 132/33/11KV, and substation voltage level is 33/11KV. Be that as it may, matrix substation is an interconnected network for conveying power from providers to purchaser.

3.2 Grid-Substation

There are numerous framework substation of DPDC yet at KAMRANGICHAR it changes 132/33KV to the diverse substation. Truth be told SND (single line graph) is the essential design to comprehend the fundamental activity of lattice substation.

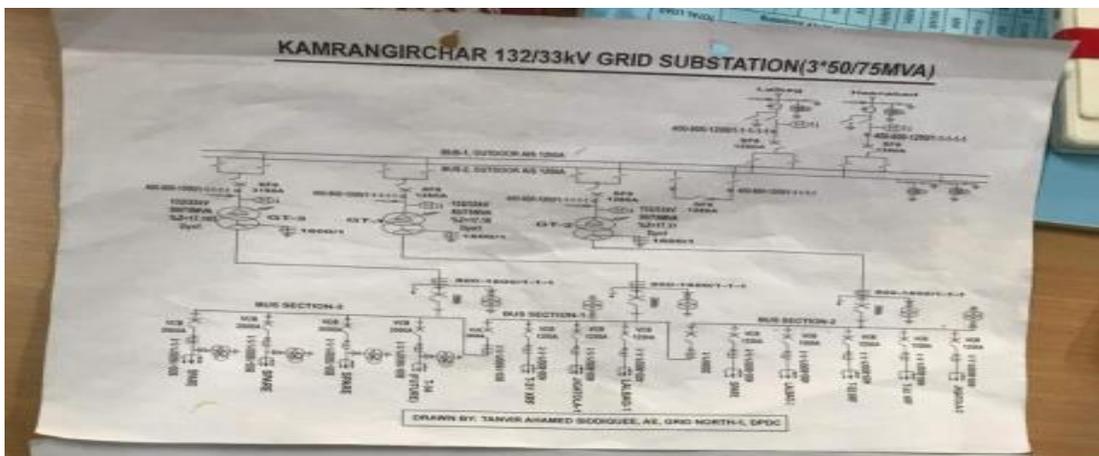


Figure 3.1 : Single line diagram of Kamrangichar 132/33KV grid –substation

In the figure above it is demonstrated that Kamrangichar is getting 132KV from Lalbag also, Hasnabad and from their it goes to the GT1,GT2 and GT3 and from their it is separated into three area and each segment is associated with each other by buscoupler . After that it is dispersed to numerous feeders for the customer.



Figure 3.2: Kamrangichar grid-substation 132/33KV

As should be obvious from the figure that in this lattice substation there are transport bar,encasing, current transformer, likely transformer, transport coupler and circuit breaker and so on These component and assurance framework runs in 132KV. There are numerous defensive component are prepared to secure the transport bar.

Consequently 33KV is likewise associated 33KV transport by means of SF6 electrical switch. These gear and component are likewise run in 33KV.

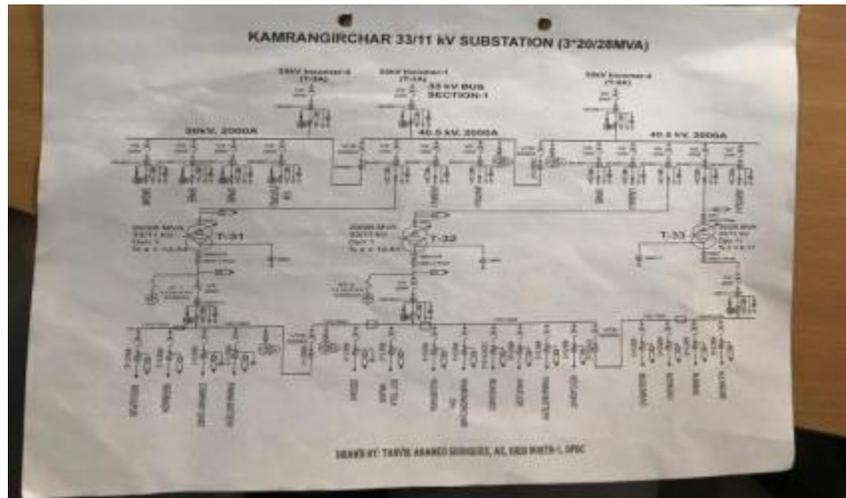


Figure 3.3: Single line diagram of 33/11KV of DPDC

In this part 33KV is changed into 11KV for dispersion reason . Here we too need to utilize a similar assurance framework and this framework is outside framework.

3.3 General Equipment

There are numerous hardware at network substation, for example, power transformer, transfer, electrical switch, oil electrical switch, SF6 electrical switch, vacuum electrical switch, current transformer, possible transformer, isolator, lightning arrester, assistant transformer, transport bar and battery and so on.

3.4 Operational Equipment

Power Transformer:

During my entry level position at DPDC I had the occasion to visit network substation and there I have accumulated some data about transformer. The force transformer is a one sort of transformer, that is utilized to move electrical energy in any piece of the electrical or electronic circuit between the generator and the appropriation essential circuit. I have noticed force transformer to change power from 132KV to 33KV and 33KV to 11KV where 132KV is provided by PGCB and most of the force transformers are made by Energy Pack and kept up by them. The following is given a picture of intensity transformer or GT-3



Figure 3.4: 132/33KV Power transformer (GT-3) in grid-substationFigure

3.5 Protection System for transformer

Buchholz devices giving affirmation against such an early blemish for instance moderate making defects, for instance, an assurance dissatisfaction of windings, focus warming, fall of oil level due to faulty joints, etc. Earth-insufficiency moves giving against earth-deficiency just . Over current exchanges giving protection against stage to organize defect and over-troubling.

3.6 Auxiliary Transformer

Helper transformer are utilized in force framework. For the most part an assistant transformer is a more modest transformer than the principle flexibly transformer. They are essentially used to give gracefully to the force hardware they don't venture up or step down the transmission voltage. It changes over 33/415KV .



Figure 3.5: Auxiliary transformer AT-1 (33/415) & AT-2(33/415)

Helper transformer is utilized to gracefully low voltage for AC power framework inside substation, for example, lightning, forced air system and other AC gracefully framework and DC .power framework, for example, assurance transfers, batteries, SCADA and so forth.

3.7 Circuit Breaker

An electrical switch is an exchanging gadget that intrudes on the anomalous or issue flow. It is likewise a programmed gadget for halting progression of flow in an electric circuit as a security measure. Electrical switch comprises of fixed and moving contacts. These contacts are contacting one another and conveying the current under ordinary condition at the point when the electrical switch is shut.

Working principle of circuit breaker:

An electrical switch basically comprises of fixed and moving curl, called cathode. These contacts remain shut and won't open therefore until the system gets defective. The contacts can be opened genuinely or by controller. At the point at the point when an issue occurs on any bit of the structure, the trip twists of the electrical switch get energised and the moving contacts are pulled isolated by some framework, in this way opening the circuit.

Types of Circuit Breaker:

- **SF6 Gas circuit breaker**
- **Vacuum circuit breaker**
- **Air circuit breaker**

3.7.1 SF6 Gas circuit breaker

Sulfur hexafluoride (SF₆) gas is used as the twist quenching medium. SF₆ is an electro-negative gas and has a strong affinity to hold free electrons. It includes fixed and moving contacts encased in a chamber containing SF₆ gas furthermore, the chamber is related with SF₆ gas gracefully. Right when the contacts of breaker are opened, the valve segment permits a high weight SF₆ gas from the store to stream towards the round section bend impedance chamber.

Impediments:

1. SF₆ breaker are extreme due to the critical cost of SF₆
2. Gas must be reconditioned after every movement of the breaker

3.7.2 Vacuum Circuit Breaker

Vacuum electrical switch is used as the round section quenching medium, since vacuum offers the Vacuum most significant ensuring quality. When the round section is made in vacuum, it is quickly smothered due to the speedy movement of recovery of dielectric quality.

Vacuum circuit breakers are being used for outdoors application stretching out from 22KV to 66KV. To be sure, even with limited rating of express 66 to 100 MVA they are sensible for a larger piece of uses in provincial zones.

Preferences:

- Vacuum electrical switch are minimized, dependable and have a more extended life
- There are no fire perils
- There is no age of gas during and after activity
- Require little upkeep
- Low curve energy
- They have low inactivity and subsequently requires more modest force for control instrument

3.7.3 Air Circuit Breaker

In air electrical switch the contacts are opened in a progression of air-shoot set up by the launch of impact valve and afterward air impact cools the bend and ranges away the arcing items to the climate. The arcing item are completely annihilated by the impact .

Focal points:

- The peril of fire is emptied
- The intensification of dielectric quality rushes so much that last contact opening needed for round section annihilation is nearly nothing.
- Because of lesser twist imperativeness, air-sway circuit breakers are appropriate for conditions where redundant action is required.
- The current accommodated bend destruction is obtained from high weight air also, is self-administering of the current to be impeded.

Weaknesses:

- The air has nearly mediocre curve dousing properties.
- The air-impact circuit breakers are exceptionally receptive to the varieties in the pace of ascent of restriking voltage.
- If the electromagnetic field are week, for example, at low current, the breaker turns out to be less efficient. Disadvantages.

- The air has similarly substandard circular segment stifling properties.
- The air-impact circuit breakers are exceptionally receptive to the varieties in the pace of ascent of restriking voltage.
- If the electromagnetic field are weak, for example, at low current, the breaker turns out to be less proficient.

3.8 Potential Transformer

Potential transformer is utilized in less productivity improvement voltage transformer. For the most part it is utilized in 11KV advance down transformer just as mind the voltmeter ,watt meter. The reach in volt meter is 110V to 150V. Auxiliary winding and metallic assemblage of voltage transformer is should be earthed.

Definition:

A potential transformer is truth be told an instrument transformer that utilized in force framework to venture down essential current voltage and optional voltage from a more significant level to bring down level.

3.9 Current Transformer

Definition:

A current transformer is an instrument transformer, utilized along with estimating or defensive gadget. It is a kind of transformer that is utilized to decrease or increase a substituting current(AC).

Principal:

The fundamental rule of the current transformer is equal to that of force transformer. The current transformer contains fundamental and helper winding. Right when a pivoting current travels through the basic winding, subbing alluring progress is formed. The present transformer works under short out conditions. The current in the helper winding doesn't depend upon load impedance anyway rather depends upon the present gushing in the basic winding. The current transformer basically includes an iron place whereupon basic and discretionary windings are wound. The extent of basic current to the assistant current is known as the current change extent of the CT. The discretionary examinations are 5A, 1A, 0.1A while the fundamental assessments move from 10A to 3000A or more

3.10 Lighting Arresters

The gadget which is utilized for the assurance of the hardware at the substations against voyaging waves, such kind of gadget is known as lighting arrester or flood diverter. So, lighting arrester redirects the strange high voltage to the ground without upsetting the strength of flexibly. It is connected among line and earth in corresponding with the hardware. The lightning arrester gives a way of low impedance just when the voyaging flood arrives at the flood diverter. The lighting arrester is found near the hardware that will be secured.

3.11 Isolators

At a framework substation, there are line isolator, transport isolator, earth isolator, pin isolator and post isolator. All things considered it is utilized to separate a part of electrical frameworks from the force source. It is moreover used to guarantee that an electrical circuit can be totally de-stimulated for organization uphold. Isolator switches, explicitly are used in charge organizations and substation to capably isolate incredibly high voltage mechanical congregations, for instance, transformer and electrical switch when they are expected for upkeep. Explanation behind, isolators have found in giving prosperity during the organization and backing of power structure, control grid also, transmission line. They are also used in homes to give huge prosperity and affirmation against any electrical trouble.

3.12 Buchholz Relay

Named after its creator Buchholz, typically it is utilized to give an alert in instance of beginning issues in the transformer and to detach the transformer from the gracefully in case of tenacious internal issues. Buchholz hand-off is a gas-incited transfer introduced in oil inundated transformer for security against a wide range of deficiencies. In the field of electric force dissemination and transmission a buchholz hand-off is a wellbeing gadget mounted on some oil-filled force transformer and reactors.

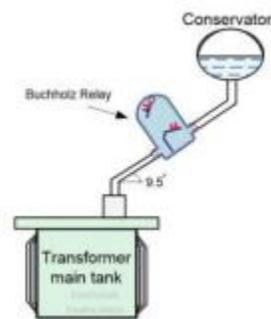


Figure 3.6: Buchholz relay

Operation:

Right when a little defect occurs inside the transformer, heat is outlined by the inadequacy streams. The outlined warmth causes breaking down of transformer oil furthermore, gas bubbles are made. These gas foam stream in upward course and get accumulated in the buchholz hand-off. The assembled gas evacuates the oil in buchholz move and the dislodging is identical to the proportion of gas accumulated. The migration of oil makes the upper float close the upper mercury switch which is related with an alert circuit. Thusly, when minor defect occurs, the attached alarm gets activated.

3.13 Battery and Battery Charger

In enterprises or substation mostly three sorts of batteries are utilized to be specific:

- I. Overwhelmed Lead Acid batteries
- II. Valve Regulated Lead Acid
- III. Nickel Cadmium batteries

Battery is the center of substation. It is required for back-up DC smoothly to ensure insurance. On the remote possibility that substation lost their energy due to any clarification, at that point these batteries can assist the substation with working the control space for regardless 6.



Figure 3.7: Batteries in substation

Chapter 4

SCADA

4.1 SCADA

Administrative Control and Data Acquisition or fundamentally SCADA is one of the plans existing for data possession, screen and control systems covering tremendous geographical zones. It insinuates the strategy of data achievement and telemetry. In this system, assessments are made under field or approach level in a plant by number of distant terminal units and a short time later data are moved to the SCADA central host PC with the objective that inexorably far reaching methodology or made information can be given regrettably.



Figure 4.1:DPDC (SCADA) control room

4.2 Component of SCADA

- Remote Terminal Units (RTUs)
- Master Terminal Units (MTUs)

Remote Terminal Units:

RTU is the main part in SCADA framework that has a straight association with various sensors, meters and actuators associated with a control climate.

Master Terminal Units:

A focal host workers or worker is called Master Terminal Unit, every so often it is additionally called as SCADA focus. It speaks with a few RTUs by perusing and composing activities during arranged filtering. Moreover, it performs control, disturbing, organizing with different hubs, and so forth.

4.3 SCADA in DPDC

DPDC has found a way to improve their SCADA framework by the name of "Pilot Project". The pilot venture for the DPDC organization comprise of the accompanying things:

- SCADA framework with 5 substation, including correspondence and substation transformation
- The focal control room renovation
- Network Information System
- Underground 11/0.4 KV substation
- 100+ substations added to SCADA
- Smart Grid usefulness

The primary control would be katabon and the wide range of various office will be associated by wan association.

4.4 NIS

NIS stands for Network Information System. It consists of the following steps;

- I. Network documentation and presentation (GIS)
- II. Network and calculations
- III. Outage Management (OMS)
- IV. Maintenance and Inspection
- V. Customer data

4.5 Benefits from NIS

The advantages from the NIS is as per the following:

- Network Information System conveyance with network arranging, blackout the executives and dissemination the board uphold.
- Leverage existing organization information speculation by field study and single line outline information.
- Main pilot venture conveyance in a year (12 months)

Which will permit to:

- Create a solitary regular organization resource vault and organization introduction in geological and schematic guides, for overhead and underground organization that will be utilized in the total utility.
- Build an organization model that is an establishment for all organization explanatory application. With the assistance of these application it is then simpler to improve network arranging measure, streamline network design and improve blackout rebuilding measure.
- Expand NIS into utility locale.

4.6 Functions of SCADA

SCADA improves the trustworthiness of gracefully by dropping term of blackouts and additionally gives the savvy cycle of conveyance framework. Accordingly, conveyance SCADA regulates the total electrical circulation framework. The key capacities of SCADA can be arranged into following sorts.

- Substation Control
- Feeder Control
- End User Load Control

Substation Control using SCADA:

SCADA plays out the exercises like voltage control, load changing, flowing current control, over-voltage control, transformer issue prosperity, transport defect security, etc. SCADA structure consistently screens the status of different kinds of stuff in substation and subsequently sends control sign to the controller supplies. Also, it assembles the real data of the substation and produces the alerts in the event of electrical disasters or inadequacies.

Feeder Control using SCADA:

Feeder voltage administer performs voltage guideline and capacitor arrangement activities while feeder exchanging manages far off exchanging of various feeders, uncovering of deficiencies, distinguish shortcoming area, segregating activity and reestablishment of administration.

Load Control by SCADA:

Such a robotization at customer end side stuff limits like far off weight control, modified meter scrutinizing and charging age, etc. It gives the essentialness use by the colossal clients and proper assessing on solicitation or plan openings shrewd. Other than recognizes essentialness meter changing and burglary and from now on separates the distant assistance. At the point when the issue is settled, it reconnects the organization

Points of interest of SCADA:

- Hardware mischief can be kept up a vital good ways from
- Constant checking and control of appointment arrange is performed from far off regions
- Spares work cost by removing manual action
- Improves the congruity of organization
- Consequently improves the voltage profile

Chapter 5

Renewable Energy

5.1 Introduction

Manageable force source is dependable and plentiful and will possibly be incredibly unobtrusive once development and structure advance. It consolidates sun power, wind, geothermal, hydropower and flowing essentialness, that are created and accumulated without oil based commodities. Nonrenewable essentialness, for instance, coal and oil, need extreme examinations and possibly risky mining and exhausting, what's more, they will end up being progressively expensive as arrangements decreasing and demand increases. Feasible force source makes just second degrees of carbon releases and in this manner helps fight natural change achieved by non-environmentally friendly power source use.

5.2 Renewable Energy

Manageable force source, a significant part of the time associated with as amazing imperativeness, starts from typical sources or methodology that are continually reestablished. For model, light or wind keep shining or blowing, whether or not their openness depends upon time and atmosphere. Along these lines, supportable force source is essentialness that is accumulated from endless resources, for instance, sunshine, wind, storm, tides, waves and geothermal, etc.

Types of Renewable Energy:

- Solar
- Wind
- Hydroelectric
- Geothermal
- Ocean
- Hydrogen
- Biomass

Few of them are discussed below.

5.3 Solar Energy

Individuals have been handling sun arranged essentialness for countless years to create crops, stay warm, and dry sustenances. As demonstrated by the public reasonable force source lab "greater imperativeness from the sun falls on the earth in one our than is used by everyone on the planet in one year". Today we use suns essentialness from various perspectives to warm homes and business, to warm water, or on the other hand power device. Sun based or photovoltaic cells are delivered utilizing silicon or various materials that change sunshine truly into power. Scattered close by planetary gathering make power locally for homes and business. Sun situated estates can create control for a considerable number homes.

5.4 Wind Energy

Today, turbines as tall as elevated structures with turbines almost as wide in estimation plan for activity all over. Wind imperativeness turns a turbines edges, which supports an electric generator and produces power.

5.5 Biomass Energy

Biomass is common material that begins from plants and animals, and join yields, waste wood, and trees. Right when biomass is seared, the engineered imperativeness is free as warmth and can create power with a steam turbine. Biomass is wrongly portrayed as an unblemished, feasible fuel. In any case, progressing science shows that various sorts of biomass make carbon outpouring.

5.6 Hydroelectric Power

Hydropower is the greatest feasible force source resource for power in various bits of the world, anyway wind essentialness is after a short time expected to accept power over the world. Hydropower relies upon water. It changes over the force of the water into power by turning a generators turbine sharp edge.

Chapter 6

Conclusion

6.1 Discussion

I have gone through some unprecedented days at DPDC during my field study program. DPDC is a standout amongst other handy justification for the Electrical and Electronic Designing in our nation. The speculations that I have learned at my college was test by me at DPDC. It allowed me a chance to apply my hypothetical information in essentially. The field concentrate on DPDC was extremely educational for me, as now I see how power area functions. This experience will help me a great deal in future. During this timeframe I have met numerous authorities people of DPDC like SE(superintended Engineer), Ex-n(Executive Engineer), AE(Assistant Designer) and increase information from by chatting with them and following their guidance.

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