VISVESVARAYA TECHNOLOGICAL UNIVERSITY

“Jnana sangama”, Macche, Belagavi, Karnataka-590018



# An Internship Report

# *On*

# CHAMUNDESHWARI ELECTRICITY SUPPLY CORPORATION LIMITED MYSORE

***Submitted in partial fulfillment of the requirements award of the degree of***

**Bachelor of Engineering**

In

Electrical & Electronics Engineering

### *Submitted By*

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**Under the guidance of**

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### DEPARTMENT OF ELEECTRICAL & ELECTRONICS ENGINEERING

### GSSS INSTITUTE OF ENGINEERING & TECHNOLOGY FOR WOMEN

**(Affiliated to VTU, Belagavi, Approved by AICTE, New Delhi & Govt. of Karnataka)**

**K.R.S ROAD, METAGALLI, MYSURU-570016, KARNATAKA**

**Accredit ed with Grade “A” by NAAC- 2022**

Geetha Shishu Shikshana Sangha (R)

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**DEPARTMENT OF ELECTRICAL AND ELECTROINICS ENGINEERING**

**(B.E (E&E) program Accredited by NBA, New Delhi, validity from 01.06.2021 to 30.06.2024)**

### CERTIFICATE

Certified that the 7th Semester Internship titled **“CHAMUNDESHWARY ELECTRICITY SUPPLY CORPORATION LIMITED MYSORE”** is a bonafide work carried out by **PRAKRUTHI K N (4GW19EE026)** inpartial fulfillment for the award of degree of bachelor of engineering in **Department of Electrical & Electronics Engineering** of the Visvesvaraya Technological University, Belagavi, during the year 2022-23. The internship report has been approved as it satisfies the academic requirements with respect to the Internship work prescribed for Bachelor of Engineering Degree.

**Mr. Girisha K M Dr.G Sreeramulu Mahesh**

Asst. Professor Professor and Head

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### Signature

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**(4GW19EE026)**

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# CHAPTER 1

**KARNATAKA POWER TRANSMISSION CORPORATION LIMITED**

## ABOUT:

Karnataka Power Transmission Corporation Limited is a registered company under the companies act, 1956. Was incorporated on 28-07-1999. And is a company wholly owned by the government of Karnataka with an authorized share capital of Rs.1000 crores. KPTCL was formed on by Carving out the transmission and distribution functions of the erstwhile Karnataka electricity board.

KPTCL is headed by a Chairman and Managing Director at the Corporate Office. He is assisted by 4 functional directors. The board of KPTCL consists of a maximum of 12 directors.

Karnataka Power Transmission Corporation Limited is mainly vested with the functions of transmission and distribution of power in the entire state of Karnataka. It operates under a license issued by Karnataka Electricity Regulatory Commission. KPTCL purchases power from Karnataka Power Corporation Limited, which generates and operates major power generating projects in the state consisting of Hydel, Thermal and other source. KPTCL purchases power from KPC at the rate fixed by state Government from time to time.

KPTCL also purchases power from Central Government owned generating stations like National Thermal Power Corporation, Neyvelli Lignite Corporation and the Automic Power Stations at Kalpakkam and Kaiga. The approximate share of power from these generating stations is around 16%. KPTCL serves nearly 109 lakhs consumers of different categories spread all over the state covering an area of 1.92 lakh square Kilometers. To transmit and distribute power in the state it operates nearly 684 sub stations, 28000ms, of transmission lines with voltages of 33KV and above nearly 130000 Kms of 11KV lines, 150000 distribution transformers and 357000 Kms of LT lines.

## EVOLUTION OF ELECTRICITY IN KARNATAKA:

The history of the phenomenal development of the old Mysore state was synonymous to the working of a few of its outstanding rulers and administrators. The principal persons who have contributed to the prosperity of Mysore state through their farsighted vision were his Highness the Maharaja Sri Krishna raja Wadiyer and famous diwans Sir K.Sheshadri Iyer, Sir M.Visvesvaraiah and Sir Mirza Ismail. Among the many measures of prosperity contributed by them the outstanding contribution was initiatives of prosperity contributed by them the outstanding contribution was initiatives taken for harnessing electric power. The history of power development in Mysore state makes an interesting reading. In fact, the first light was lit on our soil before Thomas Alva Edison invented electric bulb during May 1878, on the occasion of marriage of his highness chamarajendra wadiyar. This system was the source of light for the place up to 26th Sept.1908, when power supply from Shivanasamudra reached the Mysore place.

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## FUNCTION OF THE ORGANIZATION:

Karnataka Power transmission Corporation Limited is mainly vested with the functions of transmission of power in the entire at competitive rate by adopting best technical, high order maintenance and best customer service to its customers. KPTCL purchases power from

Karnataka Power Corporation Limited (KPTCL) which generated and operates major power generating projects of the state consisting of Hydel and Thermal an other sources. KPTCL purchases power from Karnataka Power Corporation Limited (KPTCL) at the rate fixed by the Government from time to time. The two power houses one on the left bank of Tungabhadra board, which is represented by the state governments of Andhrapradesh, Karnataka and Government of India and 20% of the energy generated by the above generating stations is the share by the above stations is the share of Karnataka Power Transmission Corporation Limited. Of central M.P. BIRLA INSTITUTE OF MANAGEMENT 16 allocation of power out of NTPC, NILL and MAPP generating stations at Ramagundam, Neyveli, and Chennai respectively, the share of KPTCL is 16%.

Only one Rural Electric Co-operative Society viz., the Hukkeri Electric Cooperative Society Limited, at Hukkeri is functioning in Karnataka (Hukkeri Taluk Belgaum District) which purchases bulk power from KPTCL / VVNL and redistributes it to the consumer within the taluk.

## EXISTING INFRASTRUCTURE AND PERFORMANCE

In June 2002, KPTCL emerged as the sole transmission company in Karnataka. It is responsible for power transmission in the state, as well as the construction and maintenance of 33 kV and above stations and lines. As of March 2018, the state-owned company owns 1,514 substations – five substations at the 400 kV level, 101 at 220 kV, 413 at 110 kV, 637 at 66 kV and 358 at 33 kV. KPTCL’s network comprises 36,124 ckt. km of transmission lines at the 66 kV and above voltage levels. Its network increased by 3 per cent from 35,119 ckt. km in the previous year. Of the current line length, about 31 per cent is at the 220 kV level, 30 per cent at 66 kV, 29 per cent at 110 kV and 10 per cent is at the 400 kV level.

# CHAPTER 2

# BACKGROUND

## NEED OF ELECTRICITY

Electricity is one of the greatest technological innovations of mankind. It has now become a part of our daily life and one cannot think of a world without electricity. Electricity is now an important part of homes and industries. Almost whole the devices at homes, businesses and industries are running because of electricity. The primary use of electricity depends on the place where it is used and the nature of the facility.For example, importance of electricity in our daily life:

At home: Electricity is important to run your appliances at home efficiently. Ex: Lighting, Fan, TV

In travelling: As electricity is an important part of our daily lives so is the travelling. Today a vast number of travelling medium like the electric train, aeroplanes, electrical cars, etc.

In medical facility: The medical sector is considering the place where you find continues flow of electricity 24\*7\*365. Ex: X-Ray machines, ECG, etc.

## A BRIEF NOTE ON ELECTRIC POWER GENERATION

The electric power is generated in different form like hydroelectric power plant, thermal power plant, nuclear power plant, and solar power plant.

### HISTORY

The fundamental principles of electricity generation were discovered in the 1820s and early 1830s by British scientist Michael Faraday. His method, still used today, is for electricity to be generated by the moment of loop of wire, or disc of copper between the poles of the magnet.In 1870 commercial electricity production started with the coupling of the dynamo to the hydraulic turbine. In 1870, the mechanical production of electric power began the second industrial revolution and created inventions using the energy, whose major contributors were Thomas Alva

Edison and Nikola Tesla. The first hydroelectric installation in India was installed near a tea estate at Sidrapong for the Darjeeling Municipality in 1897. Shivanasamudra is a small city in the Mandya District of the state of Karnataka, India. It is situated on the bank of the river Kaveri and the location of one of the first hydroelectric power station in Asia, which was setup in 1902. The project was designed by Diwan Sheshadri lyer. The first hydroelectric power station became operational on June 30, 1902 and then resident General of Mysore state, Donald Robertson launched the 700KW hydroelectric power generation station. Electric energy was transmitted to the Kolar gold fields from the new project.

The first electric street light in Asia was lit on 5 August 1905 in KR Market, Bengaluru. In the year September 1908 the world famous Mysore Palace was illuminated. To meet the increasing demand for power, the Shimsha generating station, with an installed capacity of 17.2MW, was commissioned in the year 1940.

### WAYS OF GENERATING POWER

**COAL POWER GENERATION**: Steam coal, also known as thermal coal, is used in power station to generate electricity, Coal is first milled to a fine powder, which increases the surface area and allows it to burn more quickly. In these pulverized coal combustion (PCC) systems, the powdered coal is blown into the combustion chamber of a boiler where it is burnt at high temperature. The hot gases and heat energy produced converts water-in tubes lining the boiler- into steam.

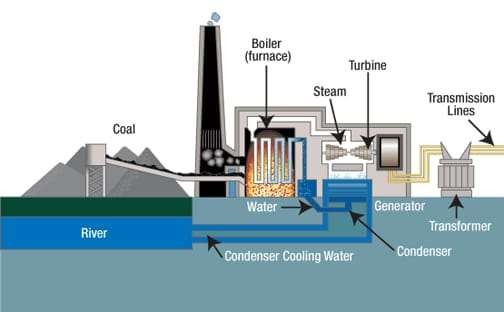


FIGURE 2.1: Coal Power Generation

**HYDRO-POWER GENERATION**: Hydro power is generated by using electricity generators to extract energy from moving water. Historically people used the power of rivers for agriculture and wheat grinding. Today, rivers and streams are re-directed through hydro generators to produce energy, although there are pros and cons as far as local eco-systems are concerned.

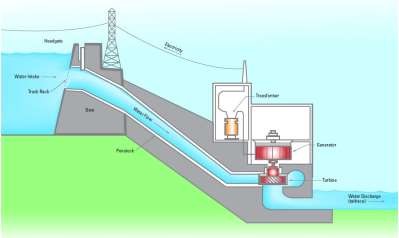


FIGURE 2.2: Hydro Power Generation

**NUCLEAR POWER GENERATION**: It is a thermal power station in which the heat source is a nuclear reactor. As it is typical of thermal power station, heat is used to generate steam that drives a steam turbine connected to a generator that produces electricity. Nuclear plants are usually considered to be base load stations since fuel is a small part of the cost of production and because they cannot be easily or quickly dispatched.

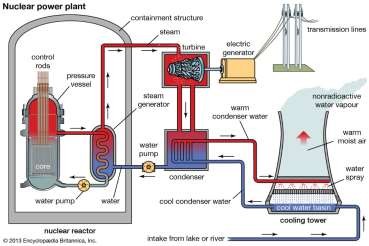


FIGURE 2.3: Nuclear Power Generation

**SOLAR POWER GENERATION**: Solar power is produced by collecting sunlight and converting it into electricity. This is done by using solar panels, which are large flat panels made up of many individual solar cells. It is most often used in remote locations, although it is becoming more popular in urban areas as well.

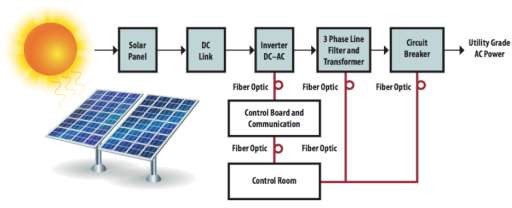


FIGURE 2.4 : Solar Power Generation

# CHAPTER 3

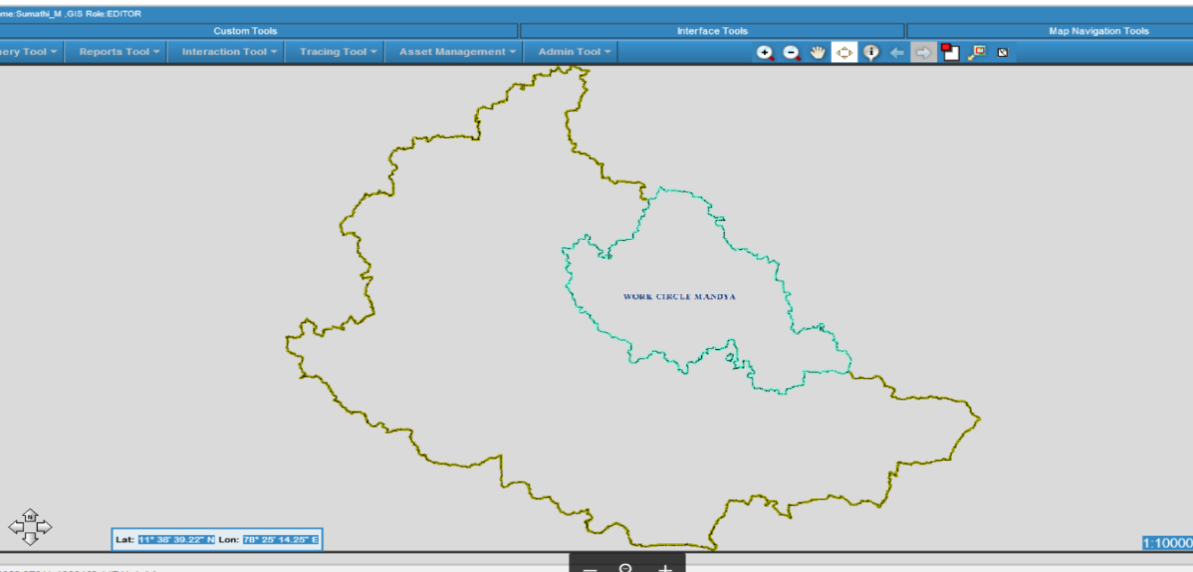
# GEOGRAPHIC INFORMATION SYSTEM

# 3.1 INTRODUCTION

A geographic information system (GIS) is a system designed to capture, store, manipulate, analyse, manage, and present spatial or geographic data.

GIS can relate unrelated information by using location as the key index variable. Locations or extents in the Earth space–time may be recorded as dates/times of occurrence, and x, y, and z coordinates representing, longitude, latitude, and elevation, respectively. All Earth-based spatial–temporal location and extent references should be relatable to one another and ultimately to a "real" physical location or extent. This key characteristic of GIS has begun to open new avenues of scientific inquiry. GIS which has been proven to be a workable system, allows the utility engineer to design and focus on the real issues rather than trying to understand the data, also analyze power system networks in less time, more economically and more accurately. In the distribution company, maintaining of assets like DTs, pole, cable, meter is very important. GIS plays a significant role in the R-APDRP project. GIS helps to tracking the assets of CESC.

**3.2 CESC GIS MAPPING:**



GIS based asset mapping & consumer indexing is one of the key modules out of total 17 various modules in RAPDRP. GIS in Electric Utility primarily deals with mapping of all the Assets of Utility.

The business process of Electric Utility is very complex. Dynamic nature of Data. Energy Auditing not possible without proper indexing of Assets as well as Consumers to their source of Supply.

The various Components of GIS are:

•GIS Application

•Field Survey

-Network Survey (HT and LT)

- Consumer Survey

•Asset coding including Painting

•Network Analysis

•Updating of Data

**3.3** **Importance of GIS:**

•Mapping of Sub transmission and Electrical Distribution Network.

•Creation of Consumer Database & consumer indexing.

•Load flow studies with use of Network Analysis Tools.

•GIS can be used for Load Flow studies for rectifying imbalances in network and for Load Forecasting.

**CHAPTER 4**

**ENERGY AUDIT**

**4.1 INTRODUCTION**

Energy Audit is the technique to establish the current status of energy efficiency of a system. It involves identifying energy losses, quantifying them, segregating the losses into technical and commercial losses, estimating energy conservation potential and proposing visible and economically attractive solutions.

The energy audit would enable analysing the data in meaningful manner to evolve measure to introduce checks and balances in the system to reduce leakages and losses and also to improve technical performances.

Procedure for energy audit:

• In the process of supplying electricity to consumers, energy losses are occurring on account of technical and commercial reasons.

• Technical losses are due to energy dissipation in the conductors and the equipments used for transmission and distribution of power.

• Commercial losses are caused due to pilferage of energy, defective meters, meter reading errors and energy not accounted for.

• The energy losses are to be computed for each element of the network on the basis of actual energy sent out and actual consumption as recorded by the meters installed on both sides of the elements.

**4.2 BILLING EFFICIENCY**

Billing efficiency is an indicator of proportion of energy that has been billed (includes both metered and unmetered sales) to consumers w.r.t. energy supplied to an area. Billing Efficiency can be computed using formula provided below:-

*Billing Efficiency = Total Energy Billed to Consumers (kWh) / Total Energy Input (kWh)*

# 4.3 COLLECTION EFFICIENCY

All the consumers are billed on the basis of energy consumed by them which is obtained from meter reading and assessment of unmetered energy of consumers. The billed amount is computed on the basis of tariff fixed by regulatory commission for applicable customer category.

However, there are quite a few consumers who have tendency to default in their payments for various reasons. Thus utility is not able to recover entire amount billed by it, resulting in commercial losses.

Collection efficiency is an indicator of proportion of amount that has been collected from consumers w.r.t. amount billed to them. Collection efficiency can be computed using formula provided below:-

*Collection Efficiency = Revenue Collected (In Rupees)\* / Billed Amount (In Rupees)*

\*The revenue collected shall exclude the arrears. Collection efficiency to be capped at 100%.

**4.4 AT&C LOSSES**

The aggregate technical and commercial losses shall be measured using formula mentioned below:-

*AT&C Losses = {1 - (Billing Efficiency X Collection Efficiency)} X 100*

The concept of Aggregate Technical & Commercial losses provides a realistic picture of loss situation in the context it is measured. It is combination of energy loss *(Technical loss + Theft + inefficiency in billing) & commercial loss (Default in payment + inefficiency in collection).*

**CHAPTER** **5**

**WSS (WEB SELF SERVICE)**

**5.1 INTRODUCTION**

During the last decade, there has been provisioning of self-service over the Internet by Utilities that are seeking to reduce the cost of service and improve customer satisfaction, through access to an always-on, low-cost channel. A successful self-service strategy encompasses more than a web-technology solution or simply "web-enabling”. In addition to a technology solution, there are several critical business process changes that are essential to increasing adoption of self-service. The Web Self Service (WSS) solution takes a holistic approach, covering not just the software application such as usability, functionality, security, real-time integration, etc., but the associated need to communicate and encourage self-service. This will facilitate a shift in consumer behaviour thus delivering business results of lower cost and higher customer satisfaction.

The interactive web would act as a catalyst to drive change in consumer behaviour and put control in the hands of to a utility-consumer like never before. Utility company that has a full self-service portal that can cater to the changing consumer behaviour will have competitive advantage as the comprehensive self service will be an influencing factor in a consumer choosing a utility company in a competitive scenario.

WSS is a role-based system that comes with the following pre-defined roles:

• Customer: Customers register or enrols to utilize the self- service features offered by the utility website.

• Administrator: Person responsible for administering the WSS features and portal.

**5.2 BUSINESS FUNCTIONALITIES**

**5.2.1 Registration and Account Setup**

WSS allows the both existing and new customers of the utility to register with the portal. User can set user id and password that they can use to login. It also addresses the situations when the user has forgotten the password. The user can also change his/her credentials and opt for a new user id and password. The user can also update his/her profile related information.

**5.2.2 My Account and Bill Management**

WSS lets the user to view and manage multiple service accounts. Bill management helps the customer to view present and past bills, provide options for bill payment and setup bill preferences. The user can also view the/her bill and payment history and can also view his/her electricity consumption over a period of time**.**

**5.2.3 Customer Services**

WSS presents online solution for customers to post service, complaint, new connection request and also track their request status. They get to see the all information they need and can search the portal for specific terms. WSS aims to reduce calls to utility by providing the commonly used services and related details.

**5.2.4 Energy Consumption**

WSS provides a feature in which the customer can view the Electricity Consumption for a period of time. The user can also filter the consumption depending on the dates. There is also a tabular data for more information regarding the Units consumed, Meter reading, Reading Date etc. Finally, the WSS solution is configurable and customizable to suit utility’s needs. All labels can be renamed via simple configuration to ensure that the system complies with the specific utility terminology. To enhance functionality, utilities can customizethe system to bring in specific behaviour that may be ingrained in the business processes. This allows for easy integration of the system with the business environment without having to go through a lot of change management.

**CHAPTER 6**

**TRANSFORMER**

## INTRODUCTION

A transformer is a device that transfers electrical energy from one circuit to another through a shared magnetic field. A changing current in the first circuit (the primary) creates a changing magnetic field; in turn, this magnetic field induces a voltage in the second circuit (the secondary). By adding a load to the secondary circuit, one can make current flow in the transformer, thus transferring energy from one circuit to the other. The secondary induced voltage VS is scaled from the primary VP by a factor ideally equal to the ratio of the number of turns of wire in their respective windings:

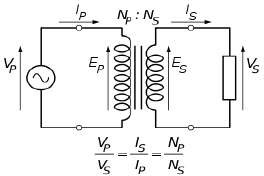


FIGURE 6.1: TRANSFORMER

By appropriate selection of the numbers of turns, a transformer thus allows an alternating Voltage to be stepped up — by making NS more than NP — or stepped down, by making it less Application of transformer is to reduce the current before transmitting electrical energy Over long distances through wires. By transforming electrical power to a high current from for transmission and back again afterwards the transformer allows electricity to be more effectively, enabling the economic transmission over long distance. Consequently, transformers have shaped the electricity supply industry, permitting generation to be located remotely from points of demand. All but a fraction of the world's electrical power has passed through a series of transformers by the time it reaches the consumer.

## BASIC PRINCIPLE

The transformer is based on two principles: first, that an electric current can produce a magnetic field (electromagnetism) and, second, that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction). By changing the current in the primary coil, one changes the strength of its magnetic field; since the secondary coil is wrapped around the same magnetic field; a voltage is induced across the secondary a simplified transformer design is shown in Figure. A current passing through the primary coil creates a magnetic field. The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as iron; this ensures that most of the magnetic field lines produced by the primary current are within the iron and pass through the secondary coil as well as the primary coil.

## DIFFERENT PARTS OF A TRANSFORMER

In a power transformer, these are the following main parts

* + 1. MAIN PARTS:
       1. Core
       2. Winding
       3. Tank cover
       4. Base channel
       5. L.V. & H.V. bushing
       6. Tap changer
       7. Conservator tank
       8. Earth terminals
       9. Rating plat
       10. Lifting lugs
    2. AUXILIARY PARTS
       1. Radiators
       2. Cooling fans
       3. Pressure Relief Valve\
       4. Breather
       5. Buchholz’s relay
       6. Drain valve
       7. Arching horns
       8. Oil level Indicator
       9. Oil Temperature Indicator
       10. Winding temperature Indicator

### CORE

* The magnetic core is three limbs or three limbs with two auxiliary limb types. Each limb being with top and bottom yokes. The lamination is made from high grade non aging cold rolled grain oriented silicon alloy steel. The insulation of lamination is carbide coating.
* The core has stepped core section. The gapes are clamped with end frames by yokes bolts or by fiber tube over clamped plates. For lighting the core with winding assembly. Four no. of lifting legs are provided on and frame cover.

### WINDINGS

Winding are arranged in concentric formation with lowest voltage winding next to the core in case, tertiary winding is arranged then this winding is placed next to the core over L.V. winding

* 1. winding and tapping are placed some time, tapping is placed after H.V. main winding depending upon requirement of impedance between various typed of winding used for making coil are as following:
     + Tertiary winding : Spiral/helied
     + Low winding : Helied/disc
     + High voltage winding : partially interlinked winding
     + Tapping winding: inter around spiral/helied coil.

### DRAIN VALUE

Drain Valve is used when we want to empty the transformer. With the help of drain valve we can release the total oil filled in the transformer.

### BUSHING

Bushings are of condenser type of protection depending upon the voltage class. Connection from the transformer winding is brought out by means of bushing ordinary protection bushing can be used up to 33Kv & above 33KV. Capacitor and oil fixed bushing is used. Bushings are fixed on the top of tank.

### AIR CELL

The air cell is the flexible rubber bag and is placed inside the conservator. It floats on the oil surface. The air cell inflates or deflates depending upon the expansion or contraction of oil. The dry air sucked into the cell doesn’t come in direct contact with oil, and then eliminates the probability of contamination.

### MAIN TANK

The tank is of welded mild steel plate construction sand/short blasted on inside and outside to remove scale formation. Tanks are designed to with stand a vacuum in line with CBIP recommended on transformer. The cover is either belt type of flat and remains mounted on the top of the tank rim. In tank insulating oil is fitted and it provides

### TAP CHANGER

Adjustment of voltage is done by changing the effective turn’s ratio of the system transformer by proper selections of tapping of the winding.

There are two types of tap changing:

* + - 1. Off load tap changing.
      2. On load tap changing.

In first form as the name implies it is essential to switch off the transformer before changing the tap. On load tap changers are employed to regulate voltage while transformer is delivering normal load.

Tap changer is provided on the outer winding or H.V. more ever the HV side as more no. of turns during transition, to adjacent taps are moment ably connected and the short circuit current is limited by automatic insertion of impedance in between the corresponding tapping other end.

A value is fitted at the lowest point of the tap for draining and sampling of oil. On the feed pipe buchholz’s relay is mounted.

### ARCHING HORNS

Arching horns protects a transformer over voltage faults. Whenever the voltage exceeds from its rated voltage. Supplying from generating station, this high voltage comes from generating station, this voltage comes on the arching horns and thus there is a sparking between the providing safety to the transformer from over voltage. Arching horns are mounted on the transformer bushing on every bushing there is a couple of arching horns, one is on upper side of the bushing and the second one is

on lower side. The distance of two horns are being standardizing as per rule for various voltages.

### OIL TEMPERATURE INDICATOR

This desistance thermometer operating on the principle of liquid expansion. It provides local indication of the top of the oil temperature at them marshalling box. The connection between thermometer bulb and the dial indicator is made by flexible steel capillary tube is enclosed in a pocket and the pocket is fixed on the transformer at the hottest oil region. The pocket has to be filled with transformer the oil temperature is provided with a maximum pointer and the two mercury switches one for alarm and other for trip. Switches are adjustable to make contact between 50˚C and 120˚C.

### OIL LEVEL INDICATOR

This indicator shows the level of oil filled in transformer. It is attached with conservator tank.

### WINDING TEMPERATURE INDICATOR

This indicator operating on the principle of liquid expansion provides local indications at the marshalling box of hot spot temperature of windings. The winding hot spot to top oil temperature differential is simulated by means of CT current fed to a coil around the operating bellows. Thus winding temperature indicates tem reading are proposal to load current pulse top oil tem the indicator is heated with maximum pointer and for mercury switch.

**6.3.12 CONSERVATION TANK**

As the temperature of oil increase or decrease during operation there is corresponding rise or fall in the volume of oil. The account for this and It is a gas and oil actuated protection and is used practically In all oil immersed transformer with the exception of smaller distribution transformer. The device relies on the fact then an electric fault is side the transformer tank is accomplished by generation of gas and if the fault current is high enough by a surge of oil form the tank to conservator. The use of buchholz’s relay is possible only with transformer having conservator and the relay is placed between transformer tank and the conservator tank.

### BREATHER

When the transformer is loaded or unloaded the oil temperature inside the transformer tank ruses of falls. Accordingly the air volume inside the tank changes by either sucking in or pushing out the air. This phenomenon is called Breathing of the transformer. The air, which is sucked in, contents either foreign Impurities and or humidity, which change dielectric strength of transformer oil. Hence it is necessary that the air entering into the transformer is free from moisture and foreign impurities.

### BUCHHOLZ’S REALAY

* The transformer if fitted double float Buchholz’s relay. It is fitted in the feed pipe from conservator to tank and is provided with two set of mercury contacts (Connected between main tank and conservator tank). The devices comprises of cast iron housing containing the hinged floats. One is upper part and other part is lower part. Each float is fitted with a mercury switch, which are connected to a terminal box. This alarm detects minor or major faults in transformer. The alarm element with operates after a specified volume of gas has collected to five an indication. Such faults are:

1. Broken drown core-bolt insulation
2. Sorted lamination
3. Bad contacts
4. Over heating of part of winding

* The alarm element will also operates in the even of the coil leakage or if air gets into the oil system the trip element will be operated by an oil surge in the event of more serious faults such as:-

1. Earth fault
2. Winding short circuit
3. Puncture of Bushing
4. Short circuit between phases.

The trip element will also be operated if a rapid loss.

### PRESSURE RELIVE VALVE

* The pressure relief valve is designed to use on power transformer. When pressure in the tank rises above predetermined safe limit this valve operates and perform following functions:-

1. Allow the pressure to the drop by instantaneously opening a part of about 150 mm
2. Given valve operating by rising a flog.
3. Operates a micro switch.

* This pressure relief valve has integral flange with six halves for mounting. The valve can be mounted vertically and horizontally on tank. The PRV has got a part of about 150 mm diameter.
* A stainless steel diaphragm seals this part. Whenever the pressure in the tank rises above pre- determined stage limit the diaphragm gets lifted from its seal this lifting in instantaneous and allow vapours gases or liquid to come out of tank depending upon the position of valve on tank. The diaphragm restores its position as soon as pressure in the tank drops below set limit.

### EARTHING ARRANGEMENTS

* Core earthling connecting leads from core and end frame are being laminated at the top of cover. By connecting those to tank cover core and core frame are earthed.
* Tank to tank cover earthling: - It is done by connecting copper straps between tank rim And tank cover.
* Earthling of Tank: - For farthing of tank, to earthing pads have been provided on tank.

# CHAPTER 7

**PROTECTIVE EARTHING**

# AND TRANSFORMER PROTECTION

## PROTECTIVE EARTHING

Earthing is a general term broadly representing grounding of power systems and bonding of equipment bodies to grounded electrodes. Earthing associated with current carrying power conductors, usually neutral conductor, is normally essential for the stability of the system and is generally known as system earthing. Earthing of non-current carrying metal works of equipment bodies is essential for the safety of life and property and is generally known as safety equipment earthing. The basic requirements of any earthing system are:

* It should consist of equipotential bonding conductors capable of carrying the prospective earth fault current and a group of pipe/rod/plate earth electrodes for dissipating the current to the general mass of the earth without exceeding the allowable temperature limits in order to maintain all non-current carrying metal works reasonably at earth potential and to avoid dangerous contact potentials being developed on such metal works.
* It should limit earth resistance sufficiently low to permit adequate fault current for the operation of protective device in time and reduce shifting.
* (iii) It should be mechanically strong, withstand corrosion and retain electrical continuity during the life of the installation. Earth electrodes, which form part of the earthing system, are provided to dissipate fault current during earth fault and to maintain the earth resistance to a reasonable value so as to avoid rise of potential of the earthing grid. The resistance to earth of an electrode of given dimensions is dependent on the electrical resistivity of the soil in which it is installed. In addition to the measurement of soil resistivity at the design stage, it is essential to repeat the measurement at the pre-commission stage also, as the effectiveness of the earthing system depends on the value of soil resistivity . Hence before energising electric supply lines and apparatus it is necessary that all components of the earthing system including the soil are inspected and tested to ensure efficient functioning of the system.

## TRASFORMER PROTECTION

If the electric transmission and distribution system is like a human body, then a transformer is as a backbone in human body. So protection for a transformer is much necessary.

The following protections are provided to power transformer mounted at GSS:-

1. Over current protection
2. Differential protection
3. Over pressure protection
4. Temperature over rise protection
5. Earth fault protection
6. Buchholz’s protection
7. Winding temperature rise protection
8. Oil temperature rise protection
9. Over voltage protection
10. Impedance or Distance protection

### OVER CURRENT PROTECTION

When as the load increases on the transformer, current taken by transformer also increases in steps. In this situation transformer is said to be in over current position and if this position is maintained for a long period, then there can be dangerous hazard to transformer and obviously there can be damage to line. So to protect transformer from over current, there is a relay called (over current relay) is connected to the transformer, which operates when the transformer gets in the control panel and automatically the circuit breaker opens and cut-off the transformer from mains. The relay is energized by 220V DC coming from battery room.

### DIFFERENTIAL PROTECTION

The operation of relay is depends on the difference in magnitude or phase of current or voltage. For the purpose two current transformers are used at both ends of the system to be protected

.These transformer have same ratio of transformation and their secondary are interconnected.

For this protection there is also a relay used which is connected in for the feeder between the substations. Whenever there is a difference in the magnitude of transformer. relay operates and gives a signal to the C.B. to be operated, providing protection to the transformer.

### OVER PRESSURE PROTECTION

When we know that a transformer is filled up with transformer oil, then oil is filled in a particular pressure, when as there is any heating in winding or oil, gas formation develops which increase the pressure in the tank. Tank is made for definite pressure to be tolerated. If the pressure increase from this definite value, there can be a danger to transformer from over pressure situation there is a pressure relief value operates or opens providing free exist of a formatted gases so that the over pressure can be converted into normal pressure and escape the tank from over pressure.

### TEMPERATURE OVER RISE PROTECTION

This type of protection protests the transformer from the over heating of transformer winding and oil. So this protection as called over temperature rise protection. As the current flows through the winding, there is I²R losses takes place in winding resulting in the heating of winding .whenever the transformer is over loaded over heating of transformer oil and winding. If this over heating will not be compensated by any source then there can be burning of winding or failure of the insulation. If the insulation of winding fails then may be short circulating between winding turns. So to protect the transformer and to compensate the overheating , the cooling is used.

**COOLING OF TRANSFORMER:** Due to internal heating in the winding of a transformer, cooling is a necessary part of any power transformer.

There are three type of cooling:

* + - 1. ONAN (Oil Natural Air Natural)
      2. ONAF (Oil Natural Air Forced)
      3. OFAF (Oil Forced Air Forced)

### EARTH FAULT PROTECTION

When from any reason, the winding insulation or conductor insulation breaks down, the base conductor touches metallic part and spreading current in whole of metallic body. If any body touches in these condition, then there may be a great a great electric shock to human body. Difference between phase and earth becomes zero.

### BUCHHOLZ’S PROTECTION

It is a gas and oil actuated protection and is used practically In all oil immersed transformer with the exception of smaller distribution transformer. The device relies on the fact then an electric fault is side the transformer tank is accomplished by generation of gas and if the fault current is high enough by a surge of oil form the tank to conservator. The buchholz’s relay is particularly useful in that, it is capable of detection fault conditions of vary low magnitude such as internal fault, incipient winding fault and core faults. The use of buchholz’s relay is possible only with transformer having conservator and the relay is placed between transformer tank and the conservator tank.

### WINDING TEMPERATURE RISE PROTECTION

Whenever the temperature of the winding increases more than sufficient then the winding temperature indicator gives signal for that and the alarm warm us about the rise in winding temperature. Then we can easily make the suitable arrangement to protect the transformer.

### OIL TEMPERATURE RISE PROTECTION

We use an Oil Temperature Indicator whose work is to keep a watch on the temperature of the transformer oil. In case of any unwanted rise in the temperature of oil the Oil Temperature Indicator provides a signal and the alarm warm us about the temperature rise in transformer oil.

### OVER VOLTAGE PROTECTION

Due to any over voltages the transformer winding can be damaged therefore it is very necessary for us to avoid such conditions. Thus to prevent this we uses Over Voltage Protection.

### IMPEDENCE OR DISTANCE PROTECTION

Distance protection is a resistance depends time graded protection. The operation time of which is determine by the distance to the faults. This protection is used for transformer lines. It is a new unit type protection and high speed protection and simply to apply. It can be used as a primary and backup protection.

# CHAPTER 12

**CONCLUSION**

During one-month training period, a lot of experience, knowledge and exposure that I have handy. All disclosures were awaken myself in a boost of self-confidence to face life more challenging now. Practical is a complement to the science or theory learned. This is clearly the concept of science and charity, where they have learned without practice will be lost and will not give anything - what effect. So if we do without the knowledge of course there will be problems in terms of grip and stance ever - changing.

During my industrial training, there are many changes from the point of learning environments and discussion among colleagues. It can directly increase the dedication and rational attitude toward myself.

However, there are still some weaknesses that can be improved in the future. Therefore, I conclude that the industrial training program at CESCOM has provided many benefits to me so that this weakness can be rectified in the future.

I would like to conclude that this industry training I received helped me get a lot of exposure in the electrical practical world. I would like to thank the (CESCOM guide) giving me an experience with having Industrial Training like this.