INDUSTRIAL TRAINING REPORT

ON

"POWER TRANSMISSION AND DISTBUTION"

Submitted to partial fulfilment of the requirement for the degree of

B TECH

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

AT

ARKA JAIN UNIVERSITY, JHARKHAND

SUBMITTEDBY:

NAME: **ANUPAM AADARSH**

ENROLLMENT NO: **AJU/191491**

(2019-2023)

UNDER THE GUIDANCE OF:

R.K SACHAN

(SR. MANAGER, TATA STEEL)

TATA STEEL
WeAlsoMakeTomorrow

TATA STEEL
Digi e-Shala
Learn • Innovate • Perform

CERTIFICATE

is presented to

Anupam Aadarsh

for successfully completing the Elearning program on

Power System Transmission and Distribution

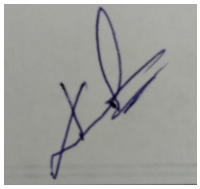
08-09-2021
DATE

JAYA SINGH PANDA
Chief Learning & Development

ARKA JAIN University
Jharkhand
Estd. Under Jharkhand State Private University Act

CERTIFICATE

This is to certify that the Industrial Training Report titled ‘’**POWER TRANISMISSION AND DISTBUTION**” in partial fulfilment of the requirement for the award of the Degree of the BTECH in Electrical and Electronics Engineering submitted to ARKA JAIN UNIVERSITY, JHARKHAND, is an authentic record of bonefide industrial training work carried out byMr. R.K SACHAN (S.R MANAGER, TATASTEEL) and submitted under my supervision/guidance.



Ashwini Kumar

Mr. Kundan Parmanik
Assistant Professor
Faculty- in charge
Engineering & I.T

Mr. AshwiniKumar
Assistant Dean

Date: 10.10.21
Place: Jamshedpur

ACKNOWLEDGMENT

I would like to express my utmost gratitude to the AJU for providing an opportunity to purse the engineering training as a partial fulfilment of the requirement for the degree of BTECH IN ELECTRICAL AND ELECTRONIC ENGINEERING. The internship opportunity I had with TATA STEEL was a great chance for learning and professional development. Therefore, I consider myself as a very lucky individual as I was provided with an opportunity to be a part of it. I am also grateful for having chance to meet so many wonderful people and professional who led me through this internship period.

I express my deepest thanks to MR. RK SACHAN (SR. MANAGER), TATA STEEL, BISTUPUR for taking part in useful decision & giving necessary advice and guidance and arranged all facilities to make life easier. I choose these moments to acknowledge his contribution gratefully.

I express my deepest thanks to all staffs and employee of company for taking part in useful decision & giving necessary advice and guidance and arranged all facilities to make life easier. I choose these moments to acknowledge their contribution gratefully. I perceive as this opportunity as a big milestone in my career development. I will strive to use gained skills and knowledge in the best possible way, and I will continue to work on their improvement, in order to attain desired career objectives. Hope to continue cooperation with all of you in the future.

ABSTRACT

The aim of this training is to get exposed to the structural & foundation Engineering. Learning about how power distribution and transmitted to tata steel and local areas, knowing about MPDS, getting familiar by spare line and a single line of 132kv from DVC.

I joined the company as trainee for one month training. In this report, I have highlighted the challenges that I encountered and the actions taken or solution to problems during training in TATASTEEL.

It was a rewarding opportunity for me to learn the work culture of PWD, as how the organizationwork for the entire project was structured its hierarchy how various department work in coordination with one another inside the system to achieve a common target and predetermined goals how the information is being delivered from the top to the bottom level employee.

TABLE OF CONTENTS

DECLARATION BY THE STUDENT

CERTIFICATE

ACKNOWLEDGMENT

ABSTRACT

TABLE OF CONTENT

- **INTRODUCTION**
- **GENERATION**
- **TRANSMISSION**
- **DISTRIBUTION**
- **SLD OF 132KV OF TATA STEEL**
- **BIBILIOGRAPHY**
- **CONCLUSION**

INTRODUCTION

- The power system is a network which consists generation, distribution and transmission system. It uses the form of energy (like coal and diesel) and converts it into electrical energy. The power system includes the devices connected to the system like the synchronous generator, motor, transformer, circuit breaker, conductor, etc.

- Generation is the production of electricity at power stations or generating unitswhere a form of primary energy is converted into electricity. Transmission is thenetwork that moves power from one part of a country or a region to another

- Electrical power transmission involves the bulk movement of electrical energy from a generating site, such as a power station or power plant, to an electrical substation where voltage is transformed and distributed to consumers or other substations.

- The distribution system is the part of an electric system after the transmission system that is dedicated to delivering electric energy to an end user. A drop in voltage levels results when demand for electricity exceeds the capacity of the distribution system.

- The single-line diagram is the blueprint for electrical system analysis. It shows a correct power distribution path from the incoming power source to each downstream load – including the ratings and sizes of each piece of electrical equipment, their circuit conductors, and their protective devices.

POWER SYSTEM

An electric power system is a network of electrical components deployed to supply, transfer, and use electric power. An example of a power system is the electrical grid that provides power to homes and industries within an extended area

How does power system work?

The generator produces energy. Convert energy into a high voltage for distribution. Power lines deliver power to populated areas while transformers intersect the high voltage power and convert it back to a voltage that houses can use. Then power is delivered to consumers.

What are the components of power system?

The most basic power system components are generators, transformers, transmission lines, busses, and loads.

What is state power system?

For the analysis of power system security and development of approximate control systems, the system operating conditions are classified into five states: normal, alert, emergency, in extremis and restorative.

What are the stages of power system?

In power system, frequency control consists of three stages: primary, secondary and tertiary frequency control.

Why power system control is required?

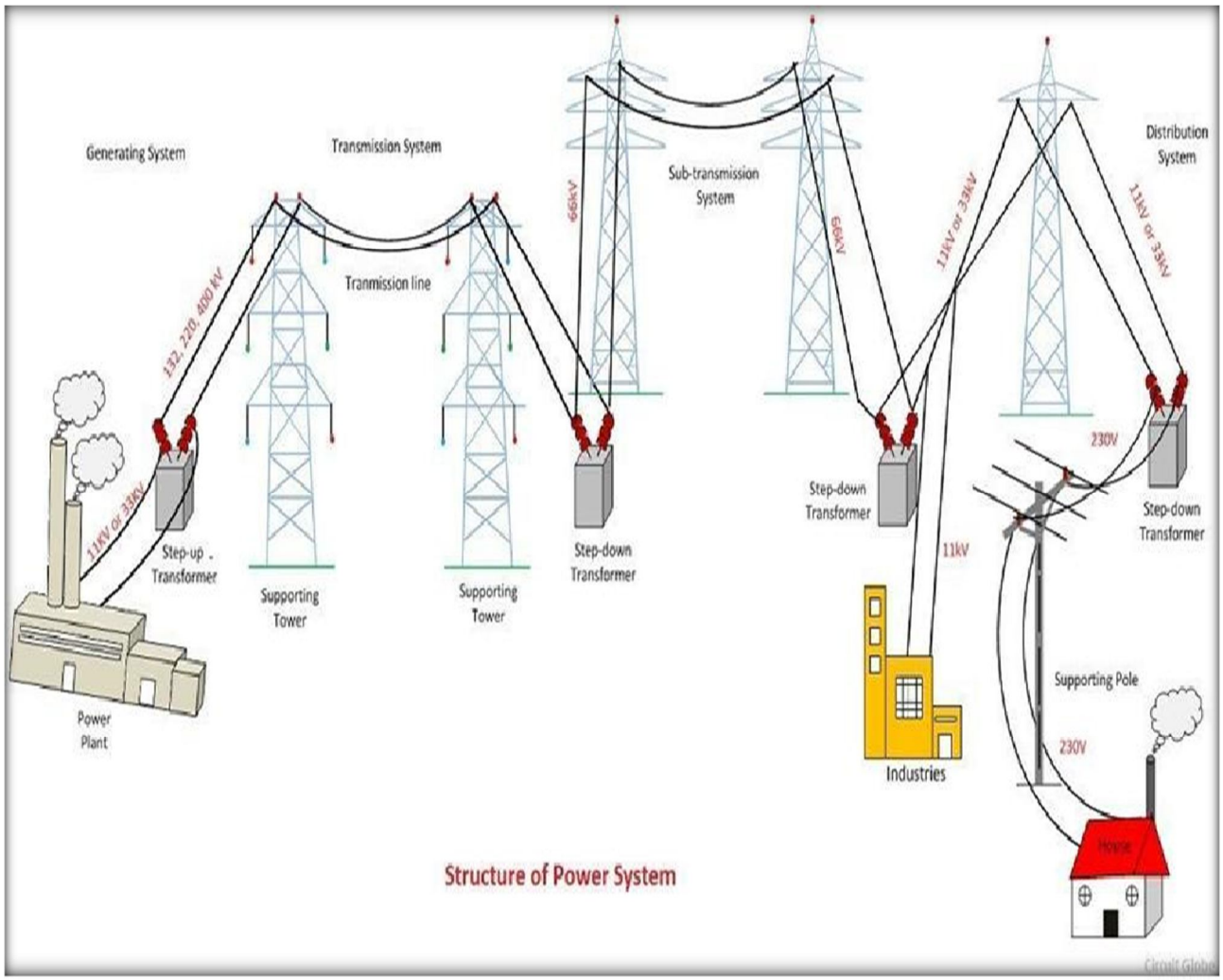
The main objective of power system operation and control is to maintain continuous supply of power with an acceptable quality, to all the consumers in the system. The system will be in equilibrium, when there is a balance between the power demand and the power generated.

What is the main function of a power system?

Power systems deliver energy to loads that perform a function. These loads range from household appliances to industrial machinery. Most loads expect a certain voltage and, foralternating current devices, a certain frequency and number of phases.

STRUCTURE OF POWER SYSTEM

The power system is the complex enterprise that may be subdivided into the following sub-systems The subsystems of the power system are explained below in details.



Generating Substation

In generating station, the fuel (coal, water, nuclear energy, etc.) is converted into electrical energy. The electrical poweris generated in the range of 11kV to 25kV, which is step-up for long distance transmission. The power plant of the generating substation is mainly classified into three types, i.e., thermal power plant, hydropower plant and nuclear power plant.

The generator and the transformer are the main componentsof the generating station. The generator converts the mechanical energy into electrical energy. The mechanical energy comes from the burning of coal, gas and nuclear fuel, gas turbines, or occasionally the internal combustion engine.

The transformer transfers the power with very high efficiencyfrom one level to another. The power transfer from the secondary is approximately equal to the primary except for losses in the transformer. The step-up transformer will reduce losses in the line which makes the transmission of power over long distances.

Transmission Substation

The transmission substation carries the overhead lines which transfer the generated electrical energy from generation to the distribution substations. It only supplies the large bulk of power to bulk power substations or very big consumers.

The transmission lines mainly perform the two functions

1. It transports the energy from generating stations to bulk receiving stations.
2. It interconnects the two or more generating stations. The neighboring substations are also interconnected through thetransmission lines.

The transmission voltage is operating at more than 66kv and is standardised at 69kv, 115KV, 138KV, 161KV, 230KV, 345KV, 500KV, and 765KV, line-to-line. The transmission line above 230KVis usually referred to as extra high voltage (EHV).

The high voltage line is terminated in substations which are called high voltage substations, receiving substations or primary substations. In high voltage substation, the voltage is step-down to a suitable valuefor the next part of flow toward the load. The very large industrial consumers may be served directly to the transmission system.

Sub-transmission Substation

The portion of the transmission system that connects the high voltage substations through the step-down transformerto the distribution substations is called the sub-transmissionsystem.

The sub-transmission voltage level ranges from 90 to 138KV. The sub-transmission system directly serves some large industries. The capacitor and reactor are located in the substations for maintaining the transmission line voltage.

The operation of the sub-transmission system is similar to that of a distribution system. It differs from a distribution system in the following manner.

A sub-transmission system has a higher voltage level than a distribution system.

It supplies only bigger loads.

It supplies only a few substations as compared to adistribution system which supplies some loads

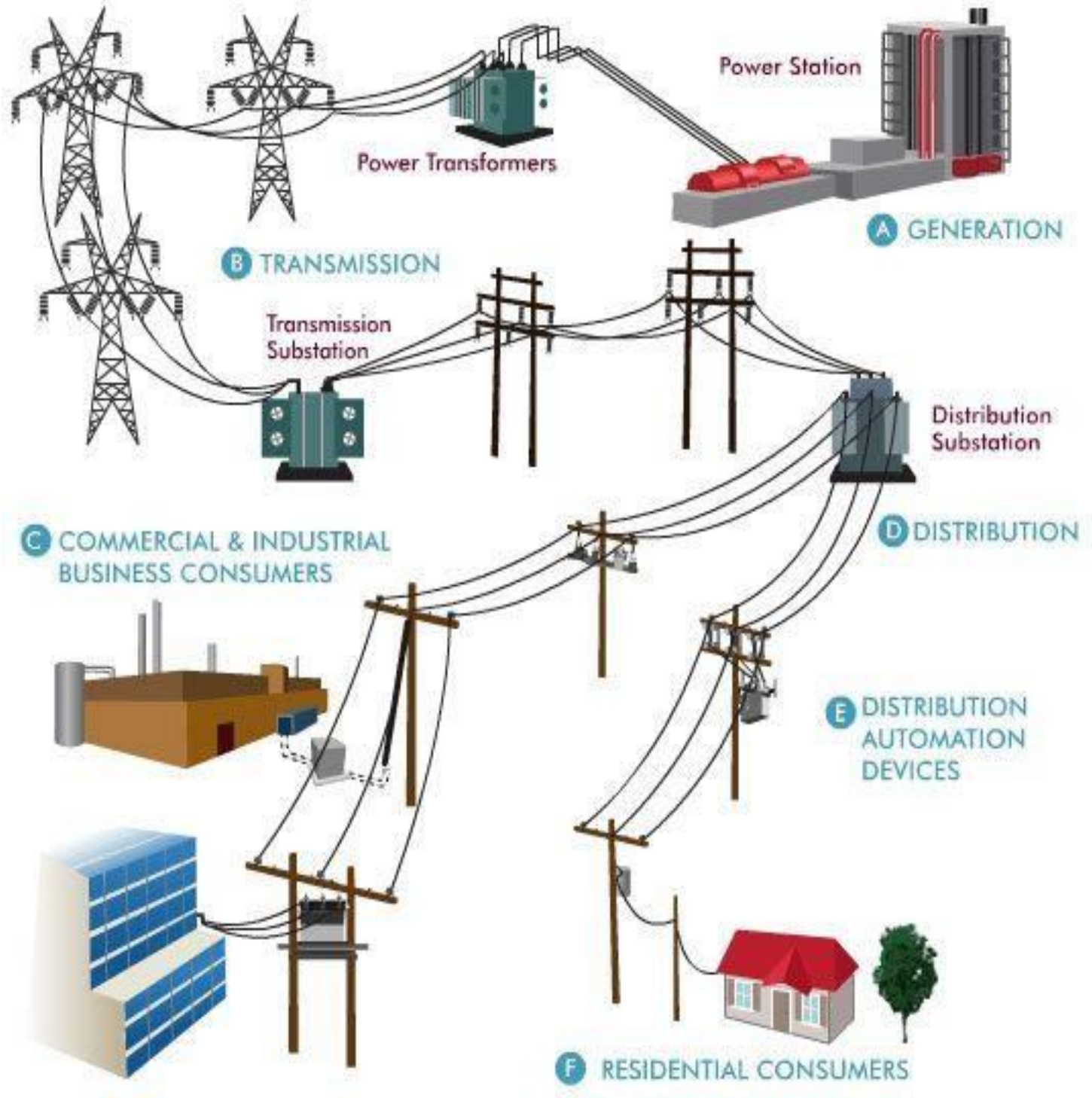
Distribution Substation

The component of an electrical power system connecting all the consumers in an area to the bulk power sources is called a distribution system. The bulk power stations are connected to the generating substations by transmission lines. They feed some substations which are usually situated at convenient points near the load centers.

The substations distribute the power to the domestic, commercial and relatively small consumers. The consumers require large blocks of power which are usually supplied at sub-transmission or even transmission system.

GENERATION

Generation is the production of electricity at power stationsor generating units where a form of primary energy is converted into electricity



TRANSMISSION

Electrical transmission is the process of delivering generatedelectricity - usually over long distances - to the distribution grid located in populated areas. An important part of this process includes transformers which are used to increase voltage levels to make long distance transmission feasible.

- ✓ What are the types of transmission system in electrical engineering?

Power transmission systems – including short transmission lines, medium transmission lines, and long transmission lines.Its transport the power from the generation source and into a power distribution system.

- ✓ What is transmission in power systems?

Transmission is the “interstate highway” of electricity delivery. It refers to the part of electricity delivery that movesbulk electricity from the generation sites over long distances to substations closer to areas of demand for electricity.

- ✓ What are the basic elements of transmission system?

This system consists three basic components: transmitter, channel, and receiver. Fig 1. Communication system. The transmitter's function is to process the message signal into a form suitable for transmission over the communication channel

- ✓ What is the voltage of transmission lines?

Transmission line voltages vary from 44,000 to over 765,000 volts. The higher the voltage, the more electricity the line cancarry.

- ✓ What is the standard voltage range for primarytransmission system?

The standard primary distribution voltage levels include 4.16kV, 7.2kV, 12.47kV, 13.2kV, 14.4kV, 23.9kV, and 34.5kV.

- ✓ What is the voltage of primary transmission?

Primary lines have voltages ranging from 2,300 to 39,000 volts. Common primary line voltages are 2,300, 4,160, 12,470, 13,800, 25,000 and 34,500 volts depending on whichdistribution voltages a utility uses. Common secondary line voltages are 120, 208, 240, 277 and 480 volts.

- ✓ What is the main point of difference between AC and DCtransmission?

The most crucial difference between the AC and the DC transmission line is that the AC transmission line uses threeconductors for power transmission whereas the DC transmission line requires two conductors.

- ✓ Are transmission lines AC or DC?

Most transmission lines are high-voltage three-phase alternating current (AC), although single phase AC is sometimes used in railway electrification systems. High- voltage direct-current (HVDC) technology is used for greater efficiency over very long distances.

- ✓ Why DC is better than AC in transmission?

Alternating current is cheaper to generate and has fewerenergy losses than direct current when transmitting electricity over long distances. Although for very long- distance direct current can often be better.

- ✓ Why transmission is done at high voltages?

The primary reason that power is transmitted at high voltages is to increase efficiency. As electricity is transmittedover long distances, there are inherent energy losses along the way. High voltage transmission minimizes the amount ofpower lost as electricity flows from one location to the next.

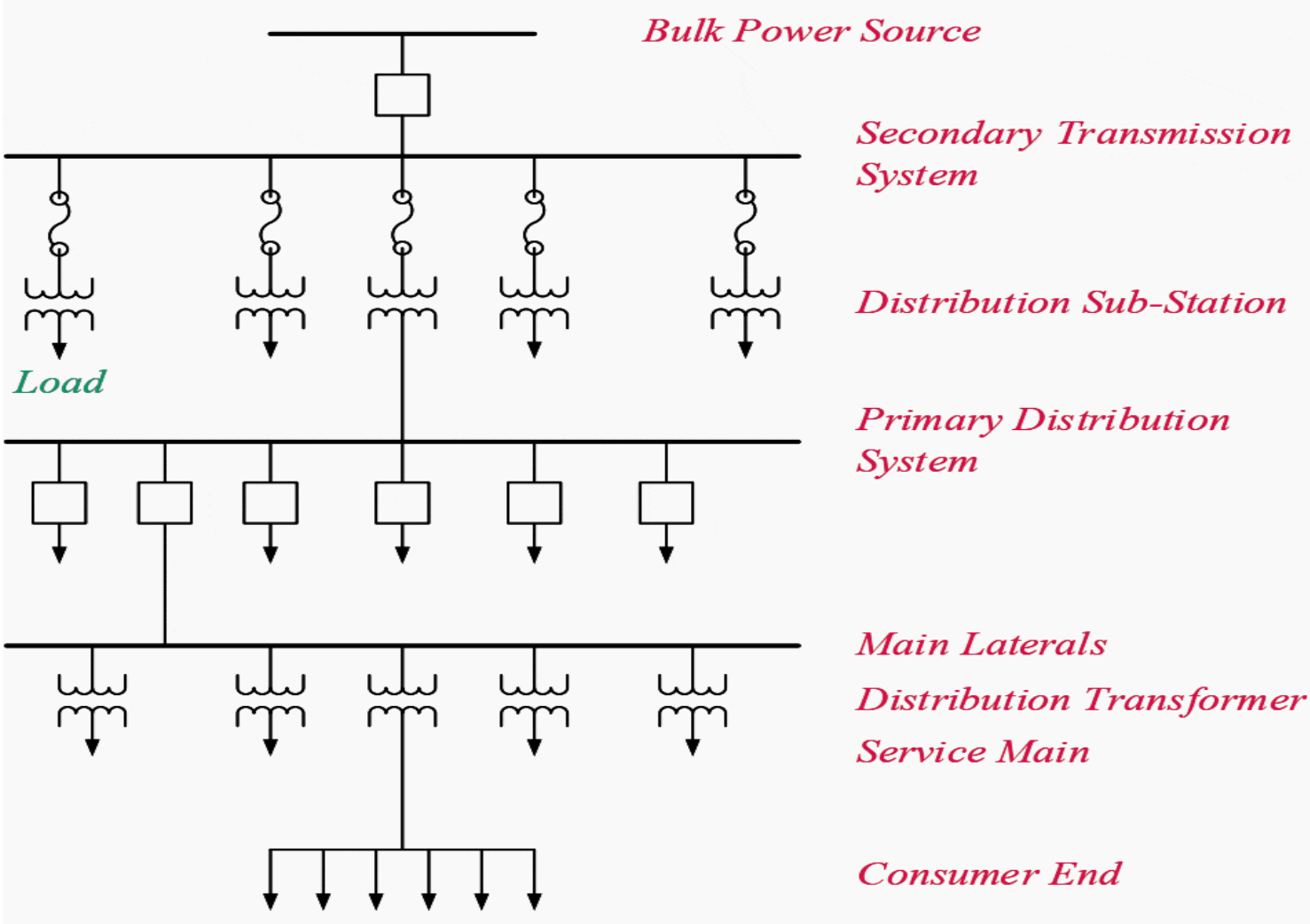
- ✓ Why is electricity stepped up before transmission?

In the National Grid, a step-up transformer is used to increase the voltage and reduce the current. Less current means less energy is lost through heating the wire. To keep people safe from these high voltage wires, pylons are used to support transmission lines above the ground

DISTRIBUTION

Distribution systems usually employ such equipment as transformers, circuit breakers, and protective devices. The original electrical distribution system developed by ThomasEdison was an underground direct current (DC) system

It generally consists of feeders, distributors. The single linediagram of a typical distribution system is shown in Figure



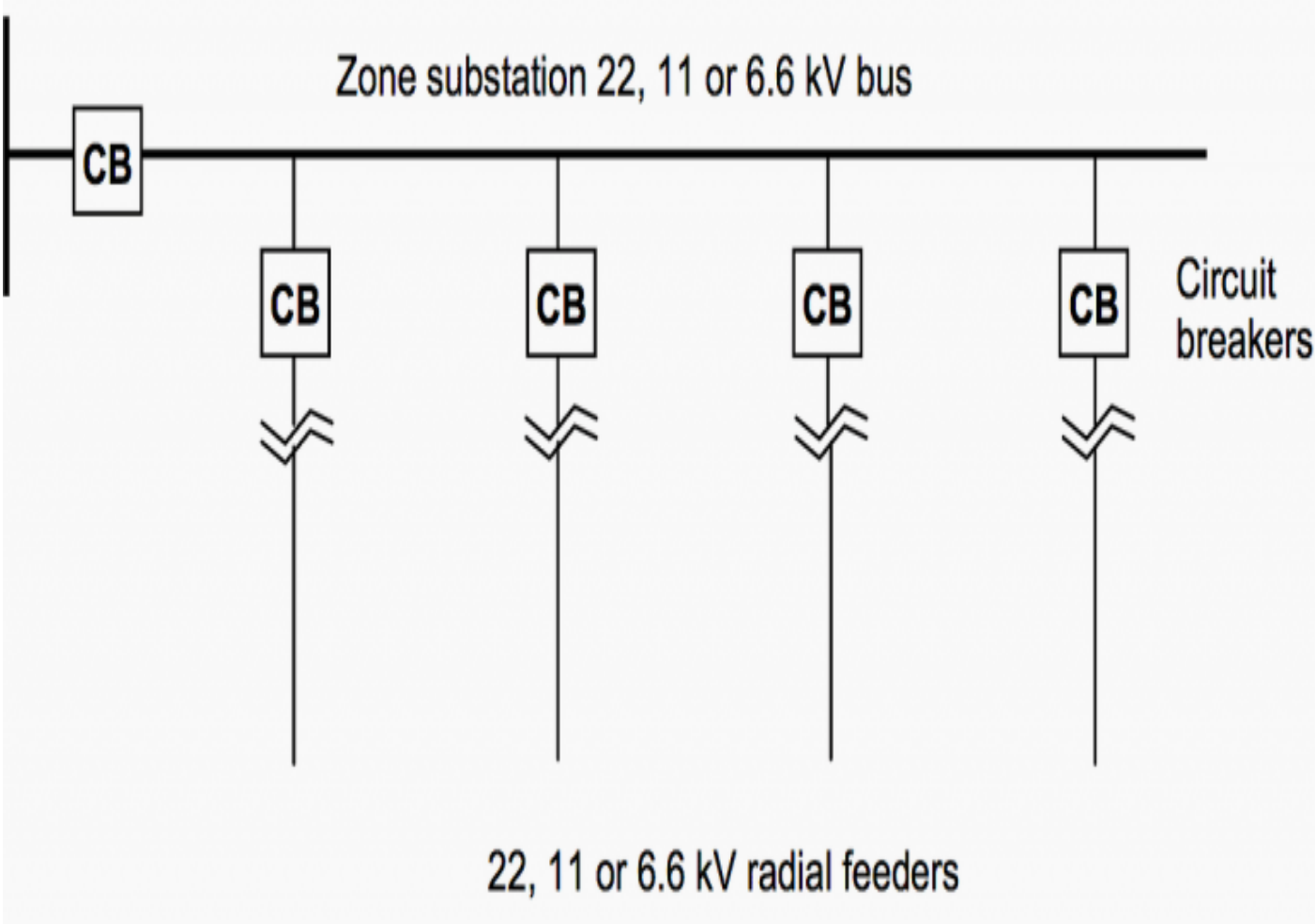
Basically, we can say, that part of power system whichdistributes electric power for local use is known as

Distribution system

FEEDER

A feeder is a conductor which connects the substation (or localized generating station) tothe area where power is to be distributed.
Generally, no tapings are taken from the feeder so that current in it remains the samethroughout.

The main consideration in the design of afeeder is the current carrying capacity

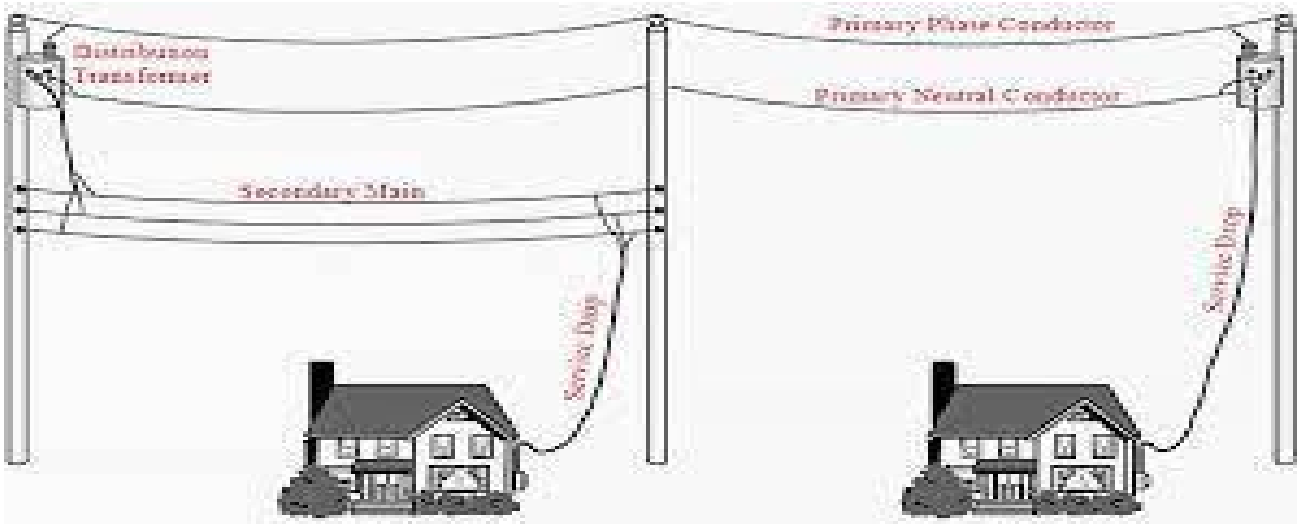


DISTRIBUTOR

A distributor is a conductor from which tapings are taken for supply to the consumers. The current through a distributoris not constant because tapings are taken at various places along its length.

SERVICE MAIN

A service main is generally a small cable whichconnects the distributor to the consumers' terminal



CLASSIFICATION

A distribution system may be classified according to:

1. According to nature of current, distribution system may be classified as:

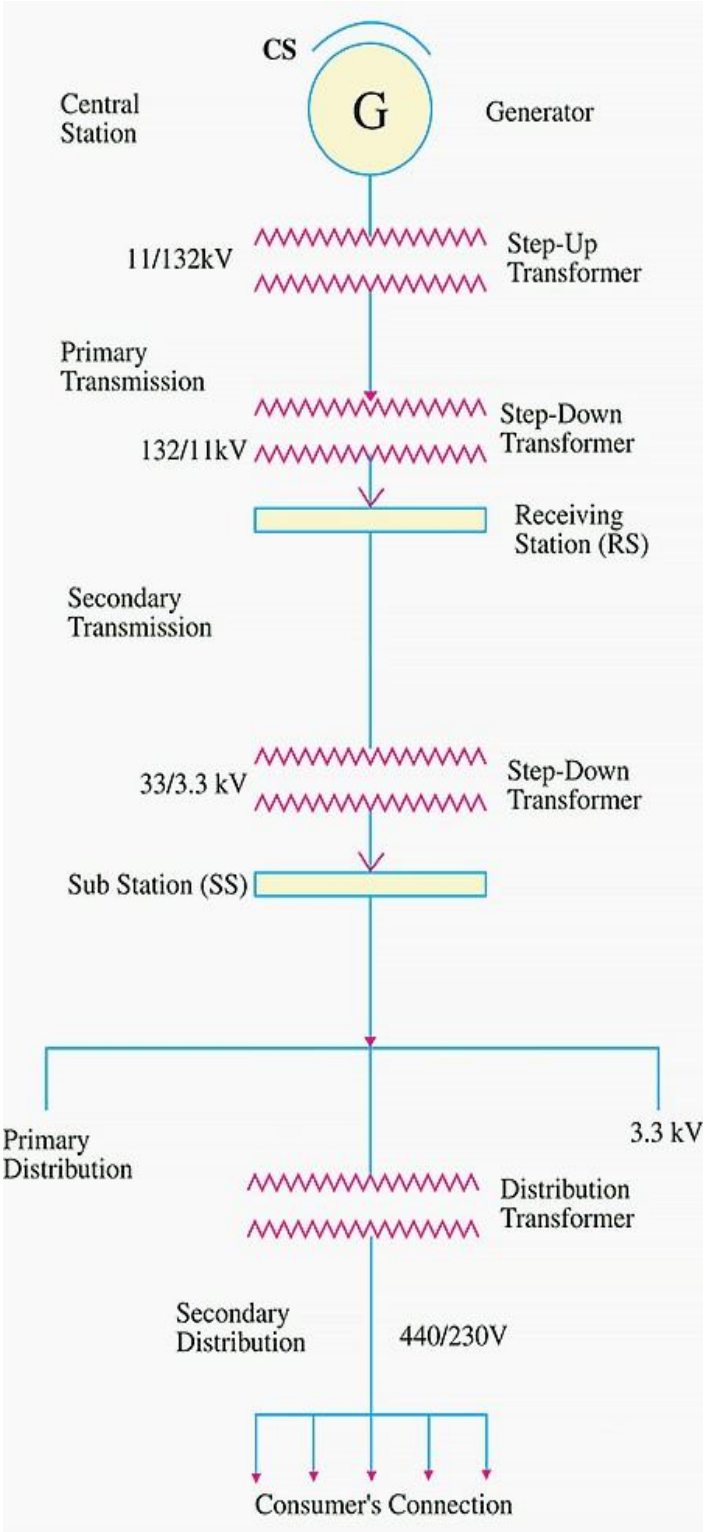
- ✓ Direct current (DC) distribution system
- ✓ Alternative current (AC) distribution system.

Now-a-days, AC system is universally adopted for distribution of electric power as it is simpler andmore economical than direct current method.

2. According to scheme of connection, the distribution system may be classified as:

- ✓ Radial system
- ✓ Ring main system
- ✓ Inter-connected system.

AC DISTRIBUTOR



Now-a-days electrical energy is generated, transmitted and distributed in the form of alternating current. One important reason for the widespread use of alternating current in preference to direct current is the fact that alternating voltage can be conveniently changed in magnitude by means of a transformer.

There is no definite line between TRANSMISSION and DISTRIBUTION according to voltage or bulk capacity. This line also varies from country to country

However, in general, the AC distribution system is the electrical system between the step-down substation fed by the transmission system and the consumers' meters.

The AC distribution system is classified into:

- Primary distribution system

and

- Secondary distribution system.

PRIMARY DISTRIBUTION

It is that part of AC distribution system which operates at voltages somewhat higher than general utilization and handles large blocks ofelectrical energy than the average low-voltage consumer uses

One to economic considerations, primary distribution is carried outby 3-phase, 3-wire system.

Electric power from the generating station is transmitted at high voltage to the substation located in or near the city. At this substation, voltage is stepped down to 11 kV with the help of step-down transformer.

SECONDARY DISTRIBUTION

It is that part of AC distribution system which includesthe range of voltages at which the ultimate consumerutilizes the electrical energy delivered to him.

The secondary distribution employs 400/230 V, 3- phase, 4-wire system. The primary distribution circuit delivers power to various substations, called distribution substations.

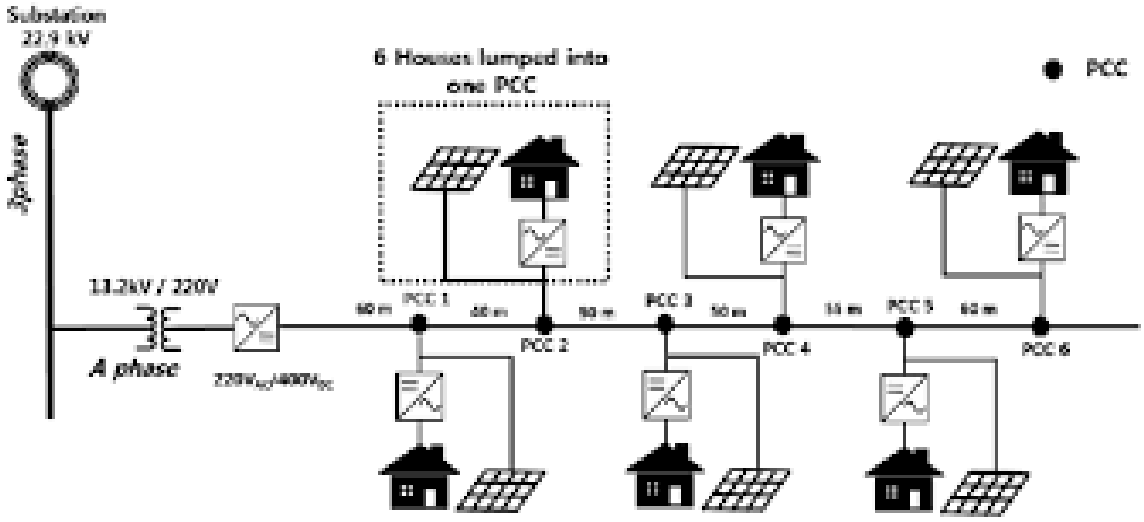
The voltage between any two phases is 400 V andbetween any phase and neutral is 230 V.

The single phase domestic loads are connected between any one phase and the neutral, whereas 3-phase 400 V motor, power transformer loads are connected across 3-phase lines directly.

DC DISTRIBUTION

It is a common knowledge that electric power is almost exclusively generated, transmitted and distributed as AC However, for certain applications, DC supply is absolutely necessary.

For instance, DC supply is required for the operation of various speed machinery, for electro-chemical work and for congested areas where storage battery reserves are necessary.



The DC supply hum the substation may be obtained in theform of:

2-wire

or

3-wire for distribution

2- WIRE DC SYSTEM

As the name implies, this system of distribution consists of two wires (+ and -). One is the outgoing or positive wire and the other is the return or negative wire. The loads such as lamps, motors etc. are connected in parallel between the twowires.

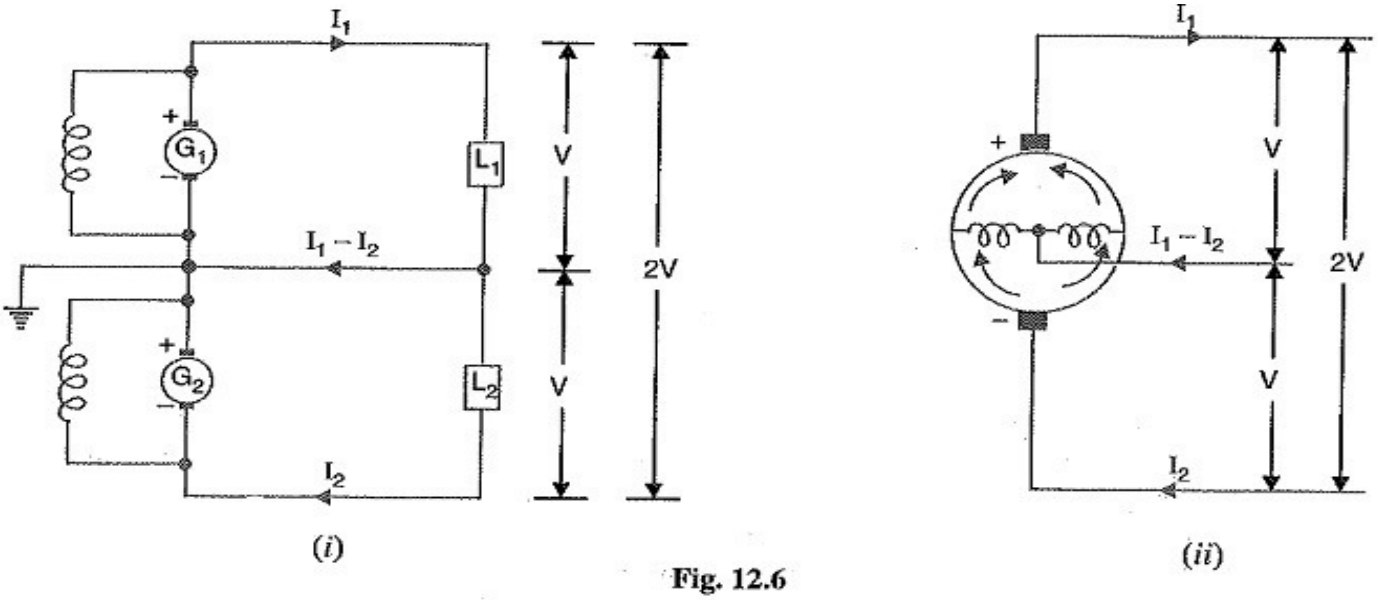


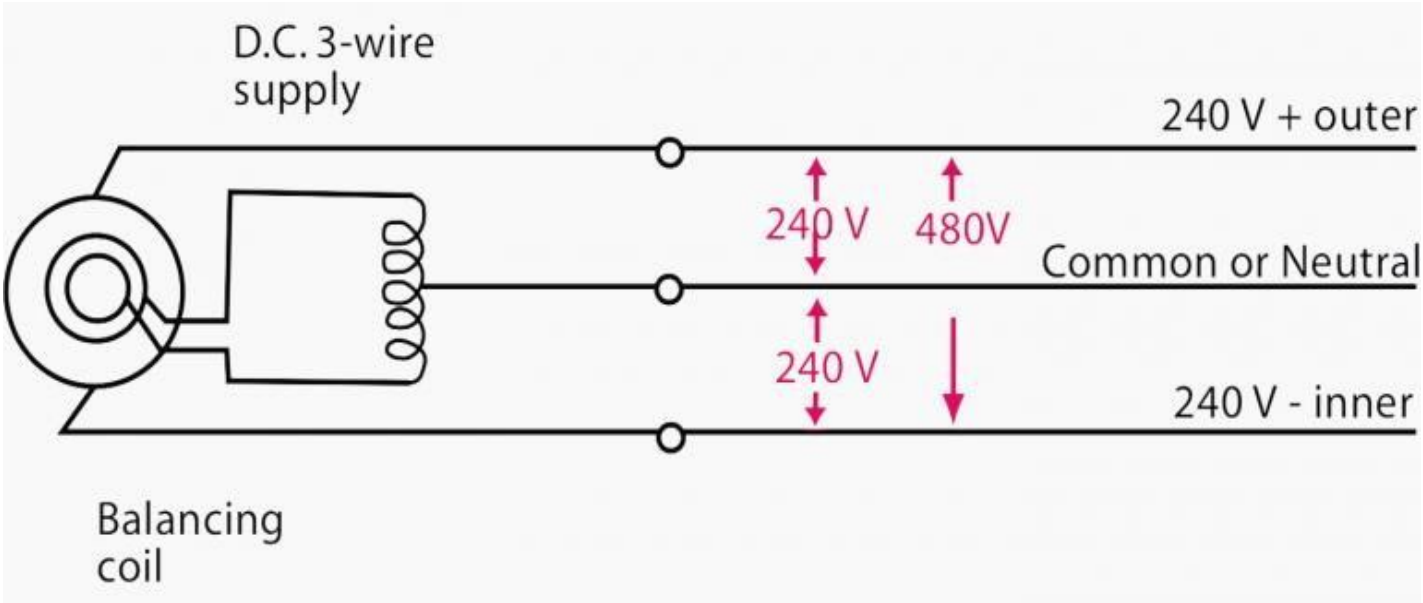
Fig. 12.6

Unipolar DC distribution system (2-wire DC system)

As the name suggests, this system uses two conductors, one is positive conductor and the other one is negative conductor. The energy is transmitted atonly one voltage level to all the consumers using this system.

3 – WIRE DC SYSTEM

It consists of two outer and a middle or neutral wire which is earthed at the substation. The voltage between the outers is twice the voltagebetween either outer and neutral wire.



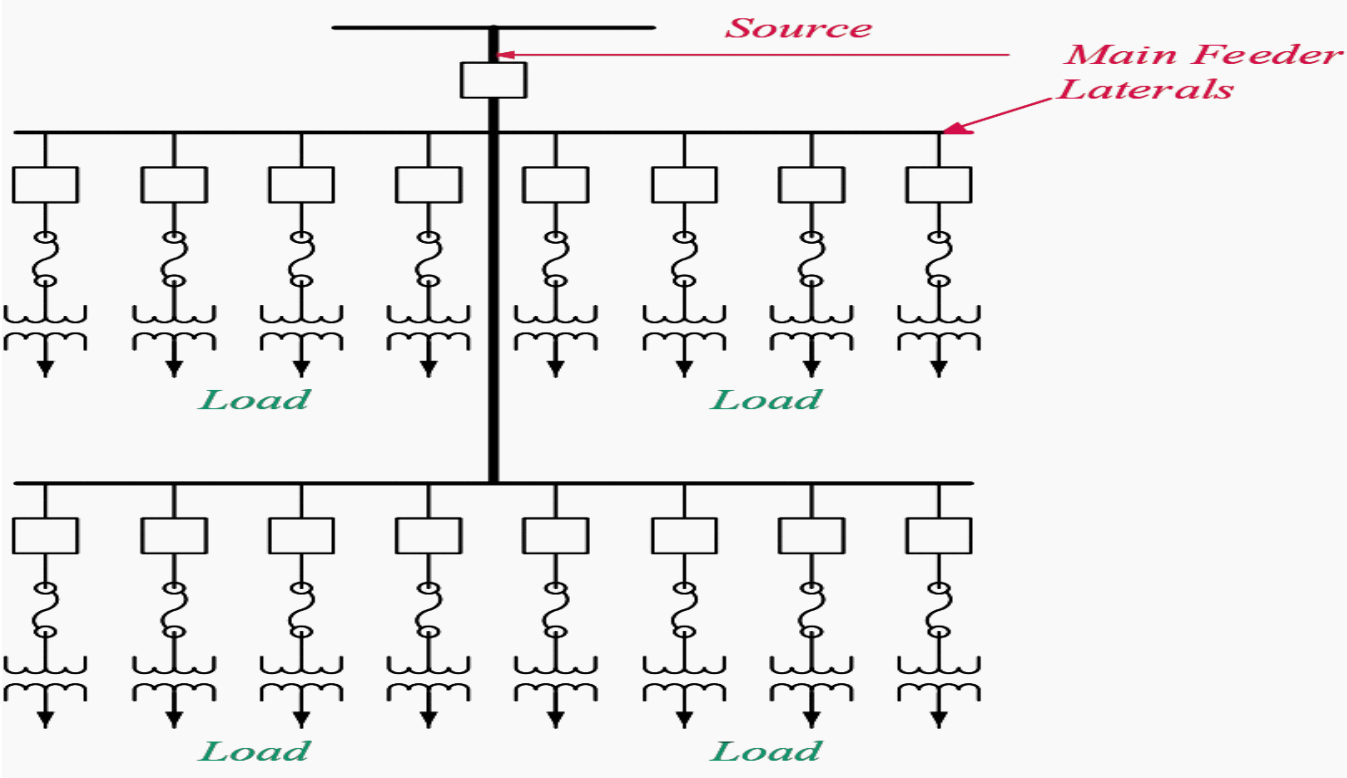
Loads requiring high voltage (e.g., motors) are connected across the outers, whereas lamps and heating circuits requiring less voltage are connected between either outer and the neutral

MOST COMMON DISTRIBUTOR

RADIAL SYSTEM

In this system, separate feeders radiate from a single substation and feed the distributors at one end only. A single line diagram of a radial distribution system is shown in Figure 6. The radial system is employed at low voltage and the substation is located at the center of the load.

This is the simplest distribution circuit and has the lowest initial cost.



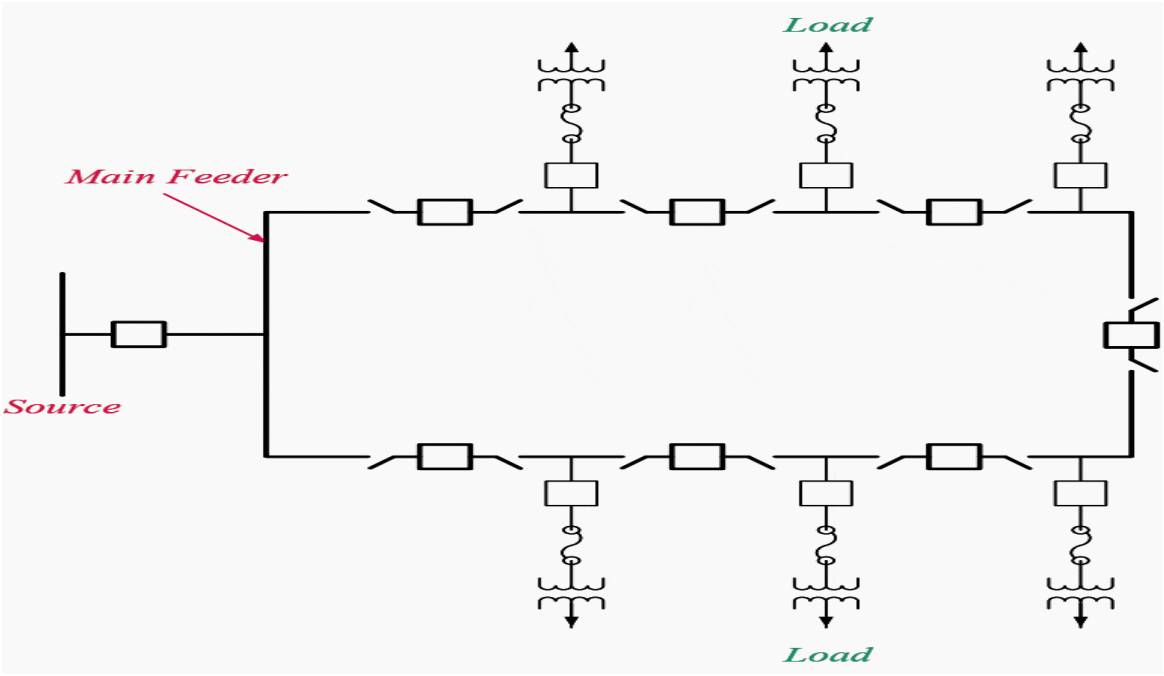
However, it suffers from the following drawbacks.

The end of the distributor nearest to the feeding point will be heavily loaded.
The consumers are dependent on a single feeder and single distributor.
The consumers at the distant end of the distributor would be subjected to serious voltage fluctuation when the load on the distributor changes.

Due to these limitations, this system is used for short distances only. The radial system can be extended by introducing more laterals and sub-laterals

RING MAIN SYSTEM

In this system, the primaries of distribution transformers form a loop. The loop circuit starts from the substation bus-bars, makes aloop through the area to be served, and returns to the substation.



The single line diagramof ring main system is shown in Figure

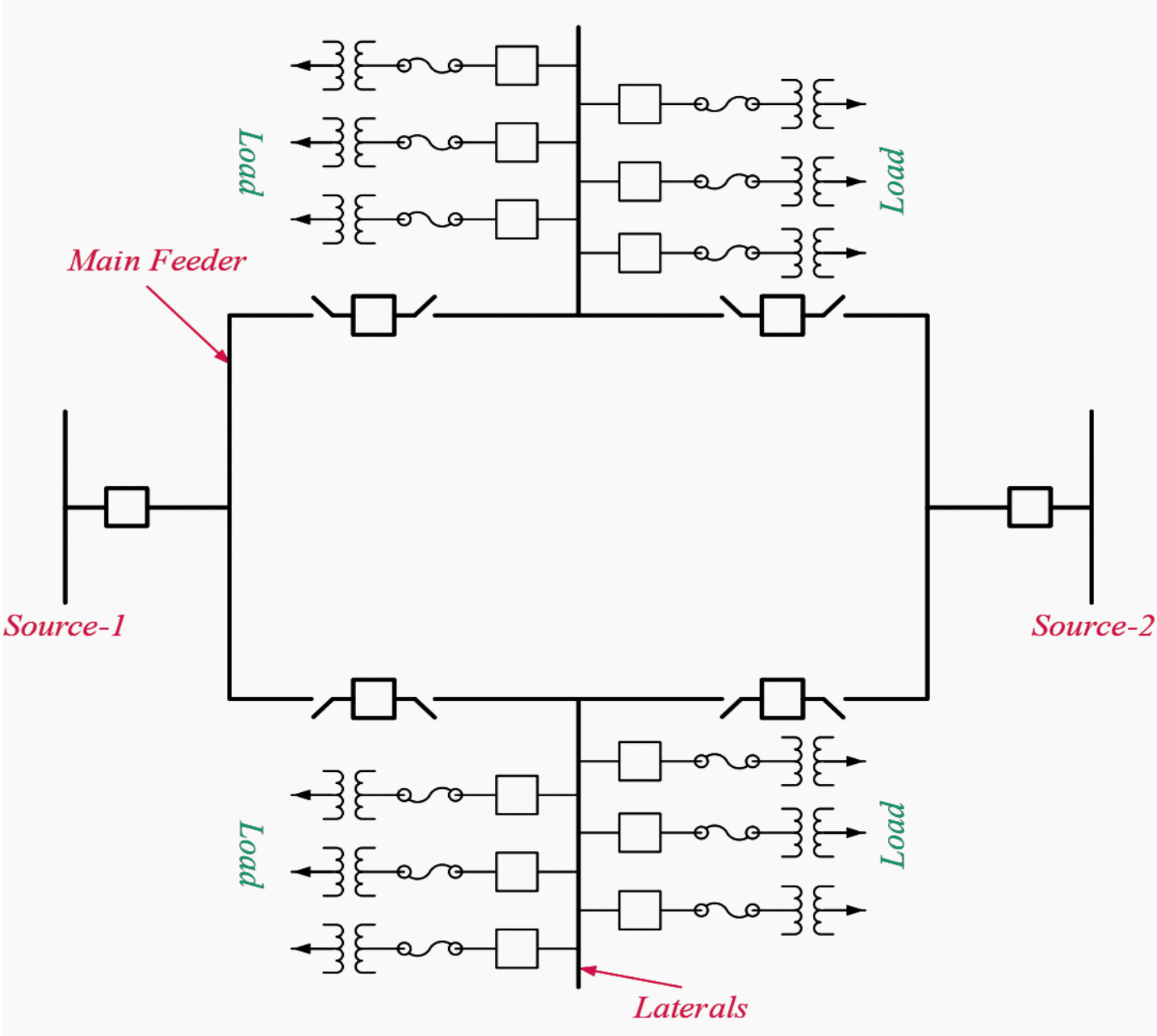
The ring main system has the following advantages:

- There are less voltage fluctuations at consumer's terminals.
- The system is very reliable as each distributor is fed via two feeders. In the event of fault on any section of the feeder, the continuity of supply is maintained.

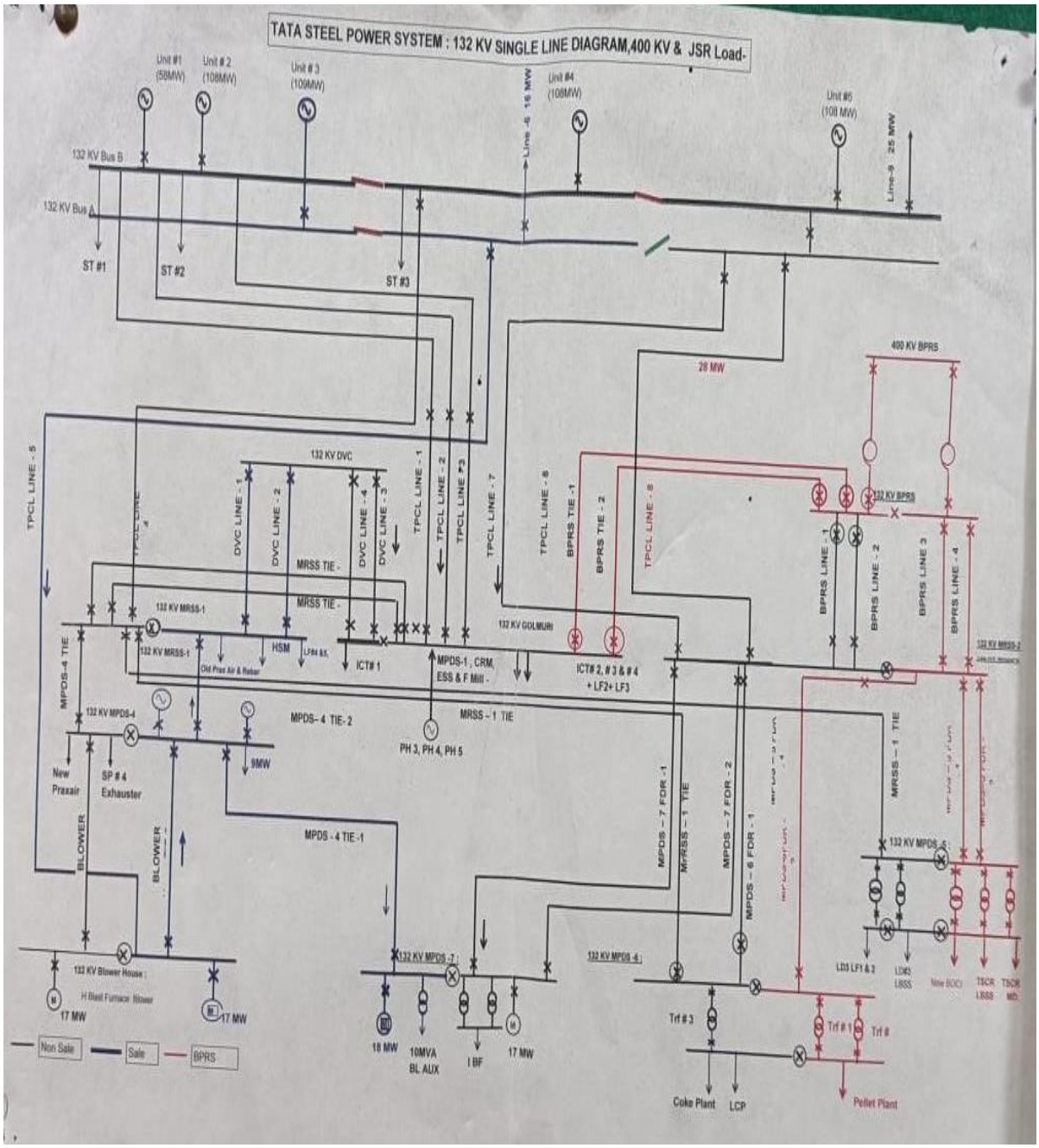
INTERCONNECTED POWER SYSTEM

When the feeder ring is energized by two or more than twosource, it is called interconnected system.

The single line diagram of interconnected system is shownbelow.



132 KV SLD OF TATA STEEL POWER SYSTEM



CONCLUSION

From this visit, we got to information and practical knowledge about Generation, Transmission and Distribution. We got the knowledge about different stages in an power system. We got the idea how the whole power system works form generation to distribution. Then welearn the different type of distribution system. Then after we see that how the whole power system is designed in Tata Steel.

.

BIBLIOGRAPHY

Reference

http://capabilitydevelopment.org

https://tslhr.tatasteel.co.in