# Transmission and Distribution system analysis of Rajshahi Palli Bidyut Samity

**A Project and Thesis submitted in partial fulfillment of the requirements for the Award of Degree of Bachelor of Science in Electrical and Electronic Engineering.**


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# CERTIFICATION

This is to certify that this industrial attachment and thesis entitled "**Transmission and Distribution system analysis of Rajshahi Palli Bidyut Samity**" is done by the following students under my direct supervision and this work has been carried out by them in the Rajshahi Palli Bidyut Samity in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering. The presentation of the work was held on January 2021.

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The project and thesis entitled **"Transmission and Distribution system analysis of Rajshahi Palli Bidyut Samity"** submitted by **Eti Akter Shathi**(ID: 172-33-509),**K.M.Asaduzzaman**(ID: 172-33-515) and **Md. Sabuj Mian**(ID: 172-33-529), Session: Spring 2017 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of **Bachelor of Science in Electrical and Electronic Engineering** on January 2021.

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Dedicated to

# *Our Parents*

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# List of Abbreviations

| | |
|---|---|
| BREB | Bangladesh Rural Electrification Board |
| REB | Rural Electrification Board |
| PBS | Palli Bidyut Samity |
| ACR | Automatic Circuit Recloser |
| CT | Current Transformer |
| PT | Potential Transformer |
| ABS | Air Break Switch |
| HV | High Voltage |
| LV | Low Voltage |
| CB | Circuit Breaker |
| OCB | Oil Circuit Breaker |
| CD | Chromatic Dispersion |
| EMI | Immune to Electromagnetic Interference |
| FBG | Fiber Bragg Gratings |
| FWHM | Full Width at Half Maximum |
| GVD | Group Velocity Dispersion |
| LED | Light Emitting Diodes |
| WD | Wave-guide Dispersion |

# List of Symbols

| |
|---|
| $\lambda$- Wavelength |
| $\lambda_B$- Bragg wavelength |
| $n_{eff}$- Effective index |
| z- Position along the grating |
| n- Mode index |
| f- Fundamental Frequency |
| $\omega$- Angular frequency |
| M- Modulation Index |
| T- Fundamental Time Period |
| V- Voltage |
| I- Current |
| R- Resistor |
| C- Capacitor |
| L- Inductor |

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First of all, we have to thank our research supervisors, Mr. Md. Sohel Rana [Lecturer] and special thanks to Dr. Md. Alam Hossain Mondal [Associate Professor] and Dr. Mohammad Tawhidul Alam [Associate Professor]. Without your help and dedicated participation at every stage of the process, this document would never have been made. We would like to thank you very much for your support and understanding over the past four years.

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With the above in mind, we take this opportunity to express our deepest appreciation and special thanks to the very identity of GM Palli Bidyut of Rajshahi who, despite being extraordinarily busy with his duties, took some time to listen to us. , guide us and keep us on track. Right. and allowing us to carry out our project in your esteemed organization and extend throughout the course

It is our radiant feeling to record our best regards, the deepest sense of gratitude to Mr. Md Akramul Haque [General Manager (GM)], Mr. Md. Shahrul Islam [D.G.M. Technician], Mr. A.K.M. Ahsanul Haque [AGM (O&M)], Mr. Md.Monjurul Alom Sohag [AGM Admin] and Mr. Md. Abdur Rahman [AGM (HR)] Mr. Md Shoriful Islam [AGM Member Service (MS)] Mr. Md. Abdul Alim [AGM Finance] for his careful and valuable guidance which has been extremely valuable to our study both theoretically and practically.

We perceive this opportunity as a great milestone in our professional development. We will try to use the skills and knowledge acquired in the best possible way and we will continue to work on their improvement to achieve the desired professional goals. Hope to continue cooperating with all of you in the future,

Sincerely,

1. Eti Akter Shathi
2. K.M. Asaduzzaman
3. Md.Sabuj Mian

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# ABSTRACT

Rajshahi Palli Bidyut Samity rest area consists of Naogaon Road, Puthiyapara, Paba, Rajshahi. The goal of the PBS is to provide electricity to each city located within its geographic service area for irrigation pumping, food processing, craft industries and other small or large industries, shopping malls, health services and social and family homes. This objective will be achieved through the concept of Area Coverage Rural Electrification (ACRE) through the construction, management and maintenance of lines up to 33KV, extending the lines from the existing distribution system. Any potential customer within the PBS service area can become a PBS member, membership is achieved by requesting and paying a minimum membership fee. Providing electricity and energy to its user members at the lowest possible cost in accordance with a sound economy and good management is a primary requirement of the PBS.

# CHAPTER 1
# Introduction

## 1.1 Background of the Study:

The majority of the population living in developing countries does not have access to modern forms of energy and the majority of these two billion people are poor and live in rural areas. These rural dwellers depend on firewood for cooking and heating their needs, and contrary to popular belief, most of them prioritize modern energy over many other needs. Due to the lack of energy, including electricity, social and economic development is very limited or absent and living conditions remain low in terms of subsistence. To promote rural development and adequate living conditions for the rural population, both traditional and modern forms of energy will be needed.

It is generally accepted that there are good performing utilities in the developing world, including in terms of electrification of rural areas. But there are many other developing countries where efforts to supply electricity to rural areas have had only limited success. Despite international support, many utilities continue to perform poorly.

As a result of recent technological advances, several alternative and low-cost options have emerged involving both traditional and renewable sources. These technological advances coincide with a growing concern for the ecological health of our planet and, in particular, the impact of emissions from the combustion of fossil fuels. International and national agreements are forcing utilities to reduce emissions and, as a result, programs are being implemented to increase the efficiency of energy production and use and to promote the deployment of renewable energy.

Other important developments, mainly driven by neoliberal ideology, are the recent regulatory changes and the introduction of competition in the electricity supply sector in industrialized and some developing countries.

These observations led to the start of the study on electricity supply to rural areas. The goal of the study was to identify and evaluate technical developments and institutional trends, look forward to opportunities to provide electricity to rural and remote areas, and translate the findings into recommendations for decision makers. The study linked existing theoretical knowledge, practical experience and empirical discoveries, was approached from a useful perspective and was characterized by its breadth and multidisciplinary nature.

The work sought to complement existing literature and serve as a vehicle for transferring specific management knowledge and, in particular, to know why. Therefore, it can help improve the situation of rural communities in developing regions and the performance of the organizations serving their areas. While the study's finding is primarily relevant to developing countries, countries with mature electricity infrastructure may also find some of the findings useful.[1]

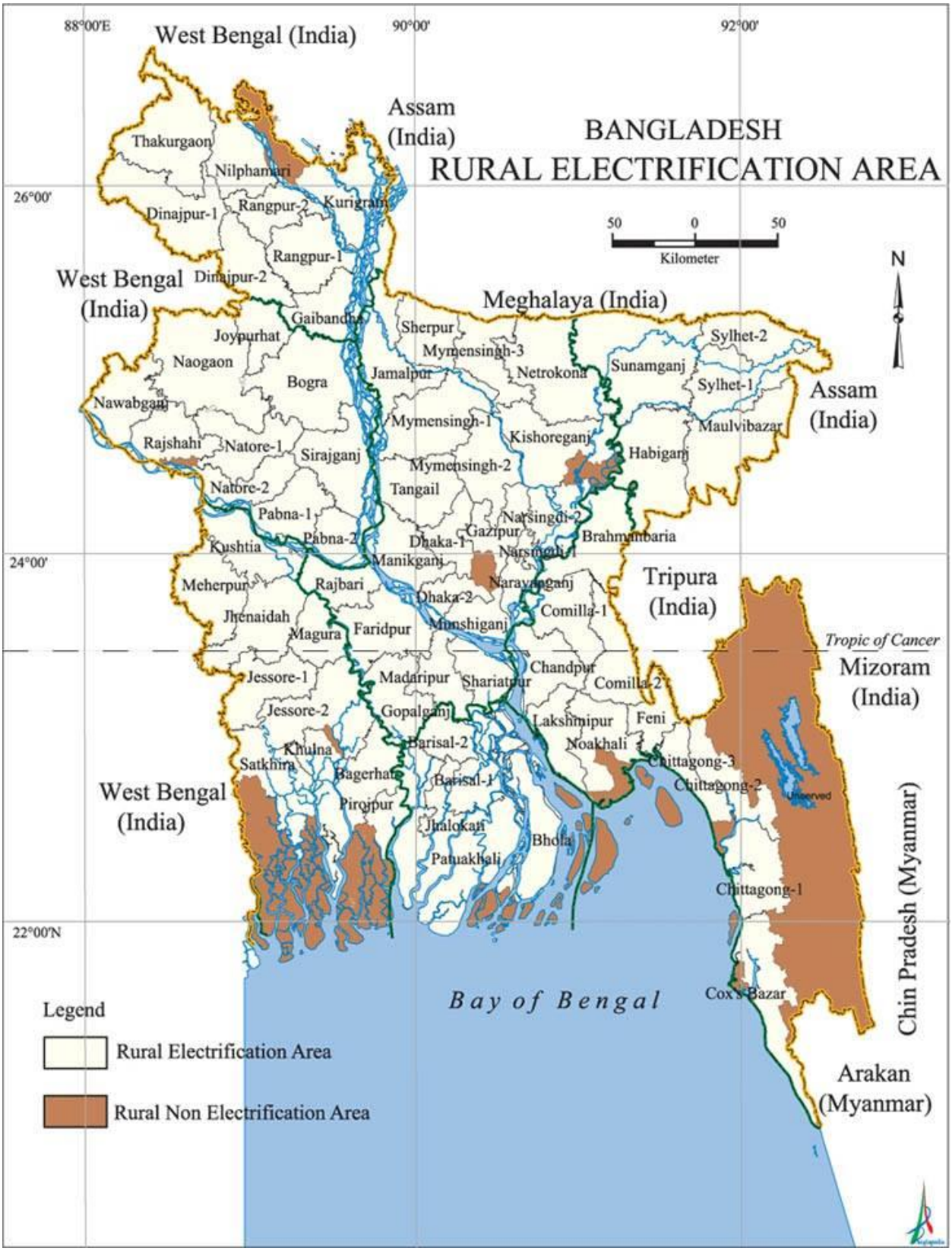



Fig 1.1: Bangladesh Rural Electrification Area

## 1.2 Objective of the Study:

The main objective of the study is to access the academic knowledge in every part of the company-

1. Administration (Admin) Category
2. Human Resources (HR).
3. Member Services (MS).
4. Accounts.
5. Finance Sections.
6. Operations & maintenance (O&M).
7. Substation.
8. Feeder.
9. Meter Side.
10. Transformer.
11. Load.
12. ACR Function.
13. Voltage Regulation.
14. Bus Bar.
15. Vacuum Interrupter.
16. Marshalling or controlling box.

## 1.3 Limitations:

The section of this chapter deals with the limitations of the study that are as below:

1. We cannot acquire all the information of the Rajshahi Palli Bidyut Samity. because of the company internal rule.
2. I haven't any permission to get photos of all equipment.

## 1.4 Challenges of PBS's:

1. As distribution lines of rural electrification system are constructed in remote areas, it is difficult to resolve line inspection and maintenance complaints**.**
2. If there is a fault in the line, the fault has to be determined by physical inspection which is time dependent.

3. Due to the length of the feeder of the distribution line being large (on average about 200 km), it is difficult to supply uninterrupted and quality electricity.
4. Since most of the customers of Palli bidyut Samity are in remote rural areas, the customers are unaware of the use of safe and economical electricity.
5. As 80% of the customers of Palli bidyut Samity are of residential class / low tariff, the Samity are not financially viable.
6. As the distribution lines are in rural areas, there is a lot of right of way in the line, so it is difficult to provide uninterrupted power supply during the rainy season.
7. As most of the officers / employees of the rural power associations are non-technical, there is a complication in the management of the system.
8. It is difficult to ensure uninterrupted power supply as the goods used in the distribution line are faulty most of the time.

## 1.5 Solution of the line of PBS's:

1. Distribution lines need to be constructed along the road.
2. It is necessary to use modern automatic system for fault construction.
3. Feeder length needs to be reduced by constructing new substations.
4. To make consumers aware of the use of safe and economical electricity through various meters.
5. To create industrial enterprises for the growth of industrial / commercial class subscribers.
6. To make the customers more aware to plant trees next to the power lines (to use covered wire through various projects.
7. To increase the technical manpower.
8. To ensure the use of quality goods.

# CHAPTER 2
# Company Profile

## 2.1 Introduction:

The industry name is “Rajshahi Palli Bidyut Samity” and it is a Rural Electrification Industry. “Rajshahi Palli Bidyut Samity” is not only a Rural Electrification Industry,they manufacture transformer also. Rajshahi Palli Bidyut Samiti has been playing a major role in the development of agriculture, industry and socio-economic condition of Rajshahi district since its inception in 1995. Achieving food self-sufficiency through modern irrigation systems, expanding large and medium and small scale industries and playing a leading role in education, health and information technology development is playing an effective role in improving the living standards of the people of Rajshahi district and Bangladesh as a part of rural electrification activities. . No profit, no loss - Rajshahi Palli Bidyut Samiti operates on the principle of real owners and servants and cooperative basis. It has 11 substation.[2]

## 2.2 Bangladesh Rural Electrification Board:

Bangladesh Rural Electrification Board or BREB, is government organization in Dhaka, Bangladesh and is responsible for rural electrification.It is the largest power distribution organization in Bangladesh.Major General Moin Uddin is the present chairman of the board.[3]

## 2.3 History of Rural Electrification Board:

Rural Electrification Board was established in 1977. It implements electrification of rural areas in Bangladesh and builds electrics lines and sub stations.It counterpart Bangladesh Power Development Board manages electric distribution in urban areas. Palli Bidyut Samities in a subsidiary of the board and acts as a consumer cooperative. The board has expanded rural electric connections rapidly. It has taken some market shares of solar energy.[4]

## 2.4 Member of Board:

There are 12 member of board.

1. Chairman
2. Member Admin
3. Member Finance
4. Member Distribution and Operation
5. Member Planing and Development
6. Member Samity Management
7. Member BSCIC
8. Member BADC
9. Member PGCB
10. Member ICAB
11. Member BRDB
12. Member BPDB

## 2.5 Zones:

1. Rajshahi Zone
2. Barisal Zone
3. Chittagong Zone
4. Dhaka Zone
5. Khulna Zone
6. Mymensingh Zone
7. Rangpur Zone
8. Sylhet Zone

## 2.6 List of Palli Bidyut Samity:

There are 80 subsidiaries of BREB.

1. ajshahi Palli Bidyut Samity
2. Mymensingh Palli Bidyut Samity-1
3. Mymensingh Palli Bidyut Samity-2
4. Mymensingh Palli Bidyut Samity-3
5. Tangail Palli Bidyut Samity
6. Pabna Palli Bidyut Samity-1
7. Pabna Palli Bidyut Samity-2
8. Dhaka Palli Bidyut Samity-1
9. Dhaka Palli Bidyut Samity-2
10. Dhaka Palli Bidyut Samity-3
11. Dhaka Palli Bidyut Samity-4
12. Gazipur Palli Bidyut Samity-1
13. Gazipur Palli Bidyut Samity-2
14. Netrokona Palli Bidyut Samity
15. Chattagram Palli Bidyut Samity-1
16. Chattagram Palli Bidyut Samity-2
17. Feni Palli Bidyut Samity
18. Comilla Palli Bidyut Samity-1
19. Comilla Palli Bidyut Samity-2
20. Comilla Palli Bidyut Samity-3
21. Comilla Palli Bidyut Samity-4
22. Chattagram Palli Bidyut Samity-3

23. Chandpur Palli Bidyut Samity-2
24. Chandpur Palli Bidyut Samity-1
25. Cox'sbazar Palli Bidyut Samity
26. Narayanganj Palli Bidyut Samity
27. Sylhet Palli Bidyut Samity-1
28. Sylhet Palli Bidyut Samity-2
29. Sunamganj Palli Bidyut Samity
30. Kishoreganj Palli Bidyut Samity
31. Jamalpur Palli Bidyut Samity
32. Khulna Palli Bidyut Samity
33. Barishal Palli Bidyut Samity-1
34. Barishal Palli Bidyut Samity-2
35. Dinajpur Palli Bidyut Samity-1
36. Dinajpur Palli Bidyut Samity-2
37. Natore Palli Bidyut Samity-1
38. Natore Palli Bidyut Samity-2
39. Jhalakathi Palli Bidyut Samity
40. Munshiganj Palli Bidyut Samity
41. Shariyatpur Palli Bidyut Samity
42. Madaripur Palli Bidyut Samity
43. Faridpur Palli Bidyut Samity
44. Gaibandha Palli Bidyut Samity
45. Gopalganj Palli Bidyut Samity
46. Bagerhat Palli Bidyut Samity
47. Bhola Palli Bidyut Samity
48. Bogra Palli Bidyut Samity-1
49. Bogra Palli Bidyut Samity-2
50. Bhrammanbaria Palli Bidyut Samity
51. Chapainawabganj Palli Bidyut Samity
52. Habiganj Palli Bidyut Samity
53. Jessore Palli Bidyut Samity-1
54. Jessore Palli Bidyut Samity-2
55. Jhenaidaha Palli Bidyut Samity
56. Jaypurhat Palli Bidyut Samity
57. Kustia Palli Bidyut Samity
58. Kuri-lal Palli Bidyut Samity
59. LakkhipurPalli Bidyut Samity
60. Magura Palli Bidyut Samity
61. Manikganj Palli Bidyut Samity
62. Meherpur Palli Bidyut Samity
63. Moulavibazar Palli Bidyut Samity
64. Naogaon Palli Bidyut Samity-1
65. Naogaon Palli Bidyut Samity-2
66. Narasingdhi Palli Bidyut Samity-1
67. Narasingdhi Palli Bidyut Samity-2
68. Narayanganj Palli Bidyut Samity-2
69. Nilphamari Palli Bidyut Samity
70. Noakhali Palli Bidyut Samity
71. Patuakhali Palli Bidyut Samity
72. Pirojpur Palli Bidyut Samity
73. Rajbari Palli Bidyut Samity
74. Rangpur Palli Bidyut Samity-1
75. Rangpur Palli Bidyut Samity-2
76. Sherpur Palli Bidyut Samity
77. Sirajgonj Palli Bidyut Samity-1
78. Sirajgonj Palli Bidyut Samity-2
79. Shatkhira Palli Bidyut Samity
80. Thakurgaon Palli Bidyut Samity

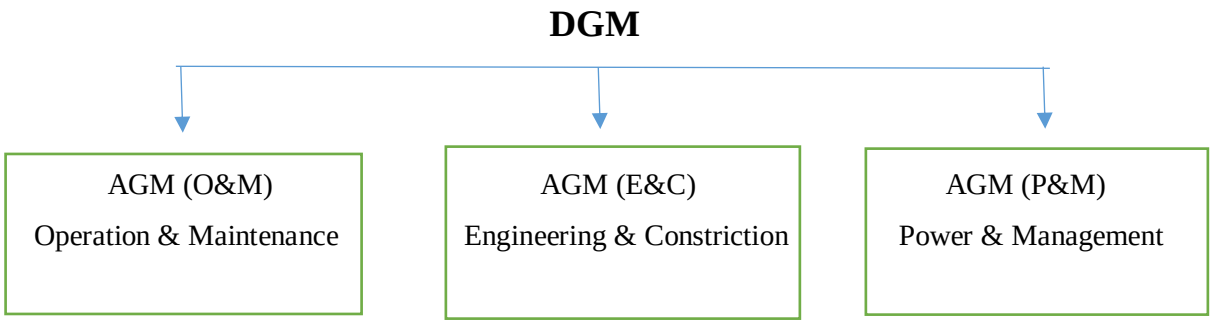
## 2.7 Central Ware House:

1. Central Ware House,Dhaka.
2. Central Ware House,Khulna.[5]
3. Central Ware House,Chattagram.

# Chapter-3

# Technical side

## 3.1 Technical side:




## 3.2 Operations & Maintenance (O&M):

All the work done by its line crew is solved through service order. The line crew completes the service order properly at the end of any work.

1. Complaint acceptance register.
2. Shutdown register.
3. Tools movement register.
4. Duty register of line crew.
5. New CMO (Consumer meter order) register.
6. Reconnect register
7. Meter change register
8. Sub-Station reading register.
9. Maintenance stock register.
10. Service order book.
11. Worker safety tag. REB form number 451.
12. Safty register.

## 3.3 Engineering & Constriction (E&C):

The Engineering and Construction is responsible for providing national leadership and policy direction in the fields of architecture, engineering, urban development, construction services and project management. The office also has design and fine arts programs, historic preservation, border stations, and law courts.

The office is also responsible for inter-agency relations and contacts with national professional organizations in the disciplines mentioned above. In addition, it is responsible for developing standards of excellence for the planning and construction phases of capital projects.

He is also responsible for facilitating the success of the project office by providing the necessary support and training to the regions. Office success is measured by delivering projects on time and within budget that meet internal, external, and regulated specifications for construction planning, design and implementation.

1. All types of CMO
2. Line maintenance.
3. Complaint resolution.
4. Meter Report Investigation.
5. Seal Breakage order (SBO).
6. Transformer damage investigation report.
7. Request for Outage [REB form NO: 458]
8. Line Inspection and Maintenance log sheet:

The details of this form are stored permanently in the inspection and maintenance of line poles. It also records the amount of work that will be done and the amount of work that has been done. Evidence documents of inspection and maintenance activities are sent to the department for making preservation orders to record the results of line inspections in the workplace. It will be permanently stored in the office.

## 3.4 Construction side:

A short line is created on the construction side. Line work is done at the request of the customer. In all these places of industrial, irrigation, residential, line related work is provided under the construction site at the request of the customer.

★2 Pole / 2-Span of a customer means short line works. The work is done through Worker / mini constructor.

★ Consultants are appointed by the Rural Electrification Board for line construction work mainly to supervise the line construction work.

★ The consulting firm performs all the work of line construction including design and construction, supervision, single line diagram, detail map, key map update and close out.

## 3.5 Power & Management (P&M):

Electricity distribution is the final stage of providing electricity to end users. A network of distribution systems transports electricity from the transmission system and supplies it to consumers.

# Chapter-4
# Substation

## 4.1 Substation:

A substation is a part of an electrical generation, transmission, and distribution system. Substations transform voltage from high to low, or the reverse, or perform any of several other important functions.

## 4.2 (O&M):

Transport log book

Two types of tools-

1. Line tools.
2. Lineman tools.

## 4.3 Line tools

-Hot stick.
-Grip AN clamp stick.
-Post hold deeger.
-Tamping bar.
-Bolt cutter.
-Transformers zin.
-Temporary grounding set.
-Pike Pole.
-Cant hook.
-Wire grip.
-Double shiv block.
-Single shiv block.
-Hand line hook.
-Drill Machine.

## 4.4 Lineman tools.

-Tools Carrying bag (for lineman).
-Body belt.
-Safety belt.
-Rubber Gloves.
-Working gloves.
-Climber set.
-Adjustable range.
-Voltage detector.
-First aid box.
-Safety cap.
-Combination plyers.
-Hammer.
-Screw driver.

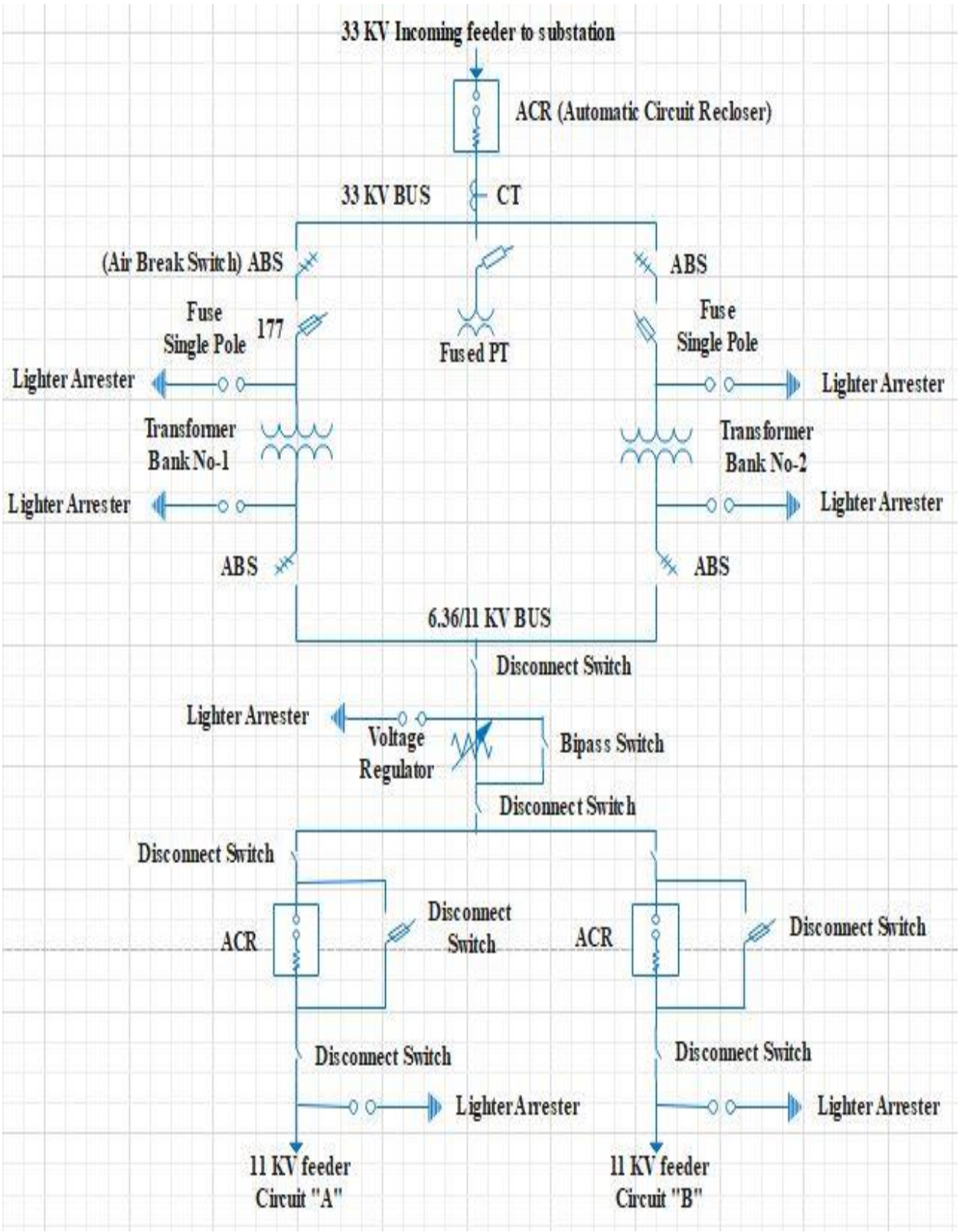



Fig-4.1: Single line diagram 33/11 KV Substation

## 4.5 Classification of Substation:

There are two types of substation.

1. Indoor substation.
2. Outdoor substation.

### 4.5.1 Indoor substation:

The switching activity that is inside is the indoor substation or a substation in which the apparatus is equipped inside the substation building is called indoor substation.

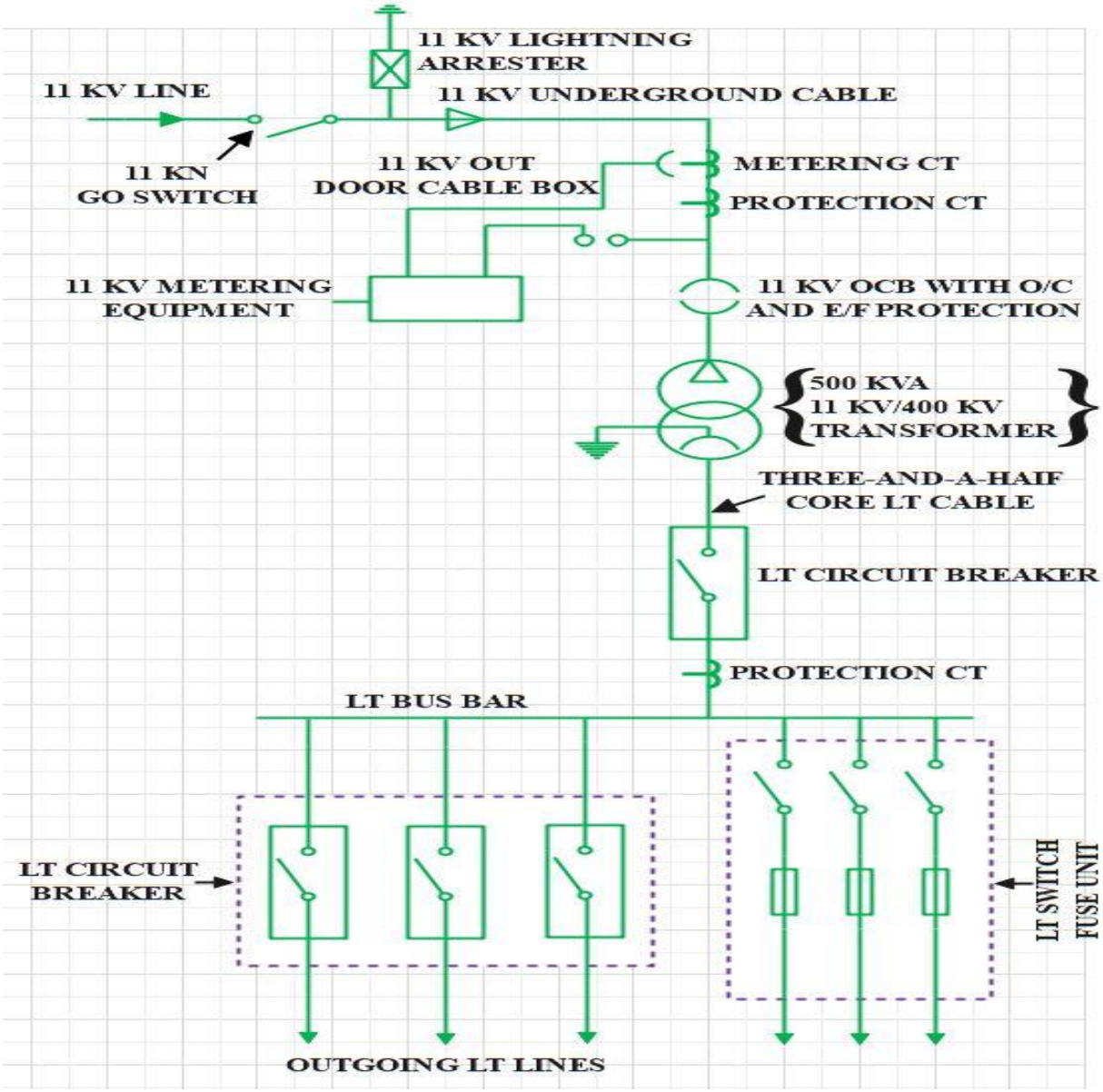



Fig-4.2: Single line diagram of an indoor sub-station

**4.5.2 Outdoor substation:** Switching activities that are outside are outdoor substation.

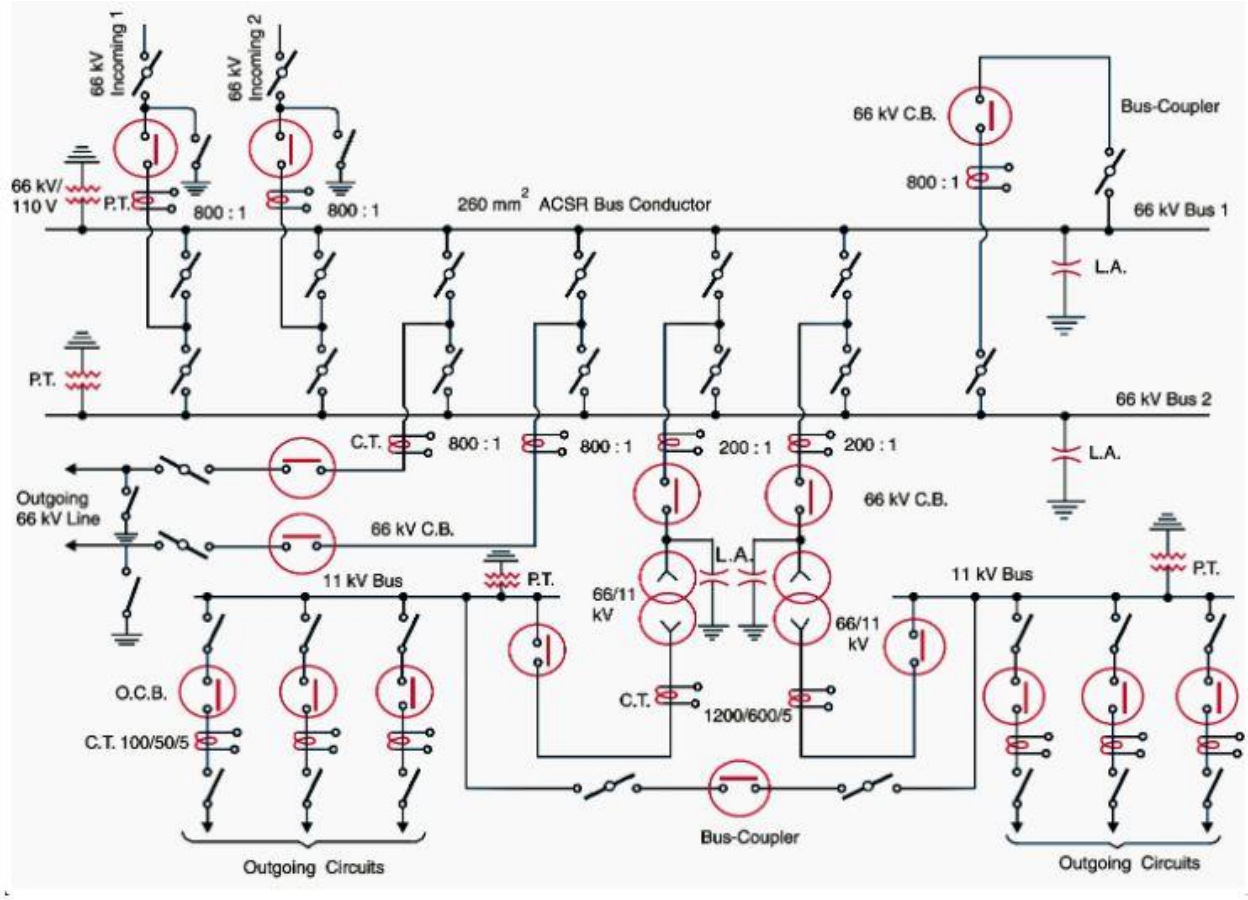



Fig-4.3: Single line diagram of 33/11 KV outdoor sub-station

* 33KV ACR (automatic circuit recloser)
* 199 No. switch
* Meter panel board.
* 33KV CT / PT
* Two power transformers
* 10 MVA + 5 MVA = 15 MVA
* Voltage regulator (RYB) 3 phase

Red = North / West

Yellow = in the middle / above

Blue = East / South.

## 4.6 Transmission Line:

### 4.6.1: 33 KV ACR

The incoming voltage comes to 33KV and has a switch gear (ACR).

Fig-4.4: Automatic Circuit Recloser

### 4.6.2 ACR functions:

The work of the ACR is usually;

1) 33KV / 11KV is the voltage regulator of the transformer, if there is any fault between CT and PT, it should be turned off.

2) Here it is usually known by tripping Amp fault current.

3) Dividing 33 KV by √3 gives the voltage of individual phases.

4) Phase to phase voltage 33 KV.

5) Phase to line voltage 33÷√3.

### 4.6.3 Potential transformer (PT):

PT is used for metering. The incoming voltage of PT is 33KV

And output voltage 240 V.

Fig-4.5: Current Transformer (CT) & Power Transformer (PT)

### 4.6.4 Current transformer (CT):

CT is used for metering. CT varies depending on the capacity of the substation.

Such as: - 10 MVA

Power transformer: Power transformer's job is to convert 33/11 KV i.e. high voltage to low voltage.

### 4.6.5 Quantum meter:

This meter shows the amount of current flowing through CT.

Fig-4.6: Quantum Meter

### 4.6.6 Vacuum Interrupter:

Vacuum Interrupter usually switches the line ON / OFF. Its line to line voltage is 11KV and Phase to ground voltage is 6350 V / 6.35 KV

### 4.6.7 Voltage Regulator:

Voltage Regulator is working,

1. Keep the line voltage stable.

2. To control if the voltage is low or high, that is, if the voltage on the HT line decreases, the voltage on the LT line will increase and if the voltage on the HT line increases, the voltage on the LT line will decrease.

Fig-4.7: Voltage Regulator

The voltage regulator controls the voltage.

Incoming voltage ± 10%

CT, PT is placed at 33 KV for 199 No metering by SCR at incoming volt 33 KV.

CT = current transformer. CT used for reducing current.

PT = Potential Transformer. PT used for reducing voltage.

### 4.6.8 Bus bar:

Bus bar usually has 6 feeders.

Namely:

1) 1A feeder.

2) 2B feeder.

3) 3C feeder.

4) 4D feeder.

5) 5E feeder.

6) 6 F feeder.

At the bus bar, the feeder numbering is usually done from the right hand side, leaving the voltage regulator behind.

1A feeder:

The connection of several villages is done step by step in a single feeder.

* Rajshahi Palli Bidyut campus, Madhusundar Pur, East Puthia Para of Tapas, West Puthia all these places have all connections in 1A feeder. Similarly all the other villages in the rest of the feeders are connected to each feeder step by step.

* A SCR is placed here.

* If there is a fault in any line in a village, SCR trips it and stops it while working.

* It acts as a switching to work on any line.

## 4.7 Distribution Line:

### 4.7.1 Feeder:

One of the lines that are constructed in different ways for area based electrification starting from substation is called feeder.

1. 1A Feeder.
2. 2B Feeder.
3. 3C Feeder
4. 4D Feeder
5. 5E Feeder
6. 6F Feeder

★ 11 KV / 6.35 KV is generated by power transformer in step down method from 33 KV.

Step installing distribution transformer on 11 KV / 6.35 KV line in step down method [$L_T$]

The acceptable voltage in the system is at nominal voltage, 33KV / 550V, 6670V, 415-phase to phase [$L_T$].

Single phase-230V [240Volt max]

**4.7.2 Hot Stick:** Used for electrification line operation. It is made of epoxy glass.

**4.7.3 Backbone Feeder:** The wide line that is built until the feeder leaves the substation and changes the size of the cable is called backbone feeder or line.

### 4.7.4 Total feeder:

KWH=27685128

KVAR=5524001

$\text{Pf} = \text{KWH} \div \sqrt{\text{KWH}^2 + \text{KVAR}^2}$

$\text{Pf} = 27685128 \div \sqrt{(27685128)^2 + (5524001)^2}$

Pf =0.98

### 4.7.5 Durgapur Feeder:

33 KV

KWH=6018720

KVAR=1465680

$\text{Pf} = \text{KWH} \div \sqrt{\text{KWH}^2 + \text{KVAR}^2}$

$\text{Pf} = 6018720 \div \sqrt{(6018720)^2 + (1465680)^2}$

Pf =0.97

### 4.7.6 Paba Feeder:

33KV

KWH=2021640

KVAR=409368

$\text{Pf} = \text{KWH} \div \sqrt{\text{KWH}^2 + \text{KVAR}^2}$

$\text{Pf} = 2021640 \div \sqrt{(2021640)^2 + (409368)^2}$

Pf =0.98

### 4.7.7 System loss:

System loss=Purchase-Sales (100)÷Purchase (90)

Collection of arrears = Ending (8) ÷Average sales (5)

=0.94%

### 4.7.8 Marshalling or controlling box:

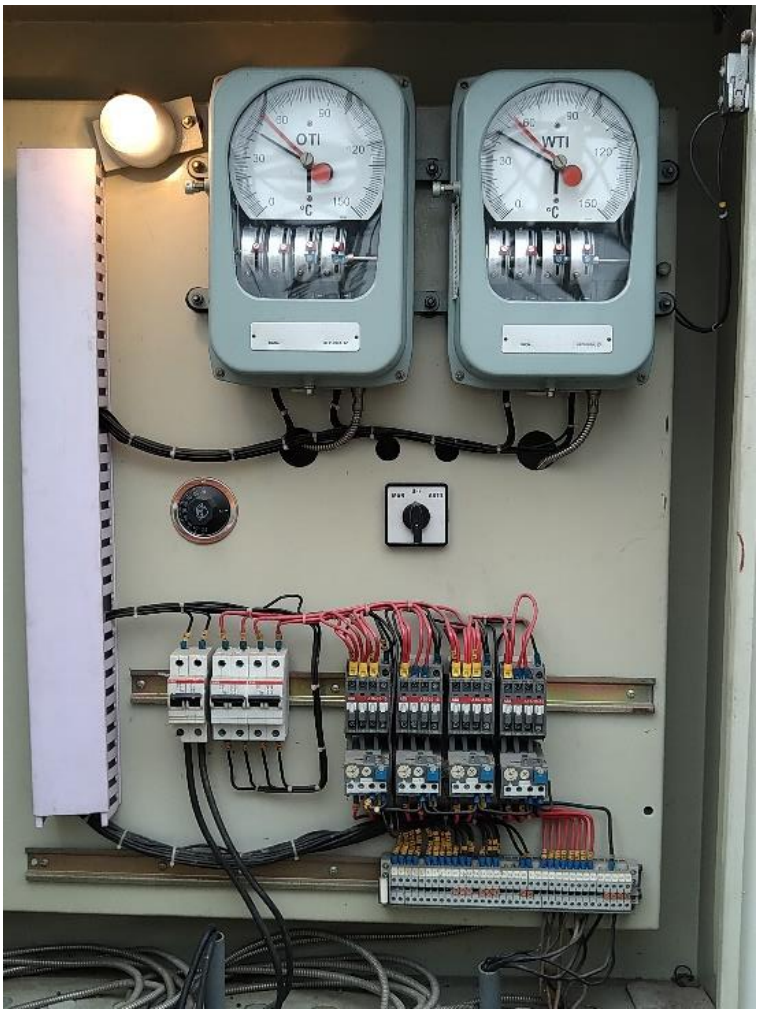



Fig-4.8: Marshalling or controlling box

Its job is to control all the lines and turn them ON / OFF.

# Chapter-5
# Meter side

## 5.1 Meter:

In the case of electricity, a meter is an instrument for measuring various parameters of electricity. Electric meters can be used to measure current, voltage, watts, hours, power factor, etc. All the meters installed at the customer end of the POBO / POBIS power distribution system are watt hour (without demand / with demand) meters. This watt hour meter is the energy meter.


Fig-5.1: Meter

## 5.2 Classification of Energy (Watt Hour) Meters:

### 5.2.1 According to the phase:

1. Single phase meter.
2. Three phase meter.

### 5.2.2 According to the base:

1. A-base meter (single / 3 phase).
2. S-base meter (single / 3 phase).

### 5.2.3 According to the load current transport:

1. Self-contained meter / self-contained meter.
2. TR meter / non-automatic meter.

### 5.2.4 According to the element:

1. 1 element (single phase meters).
2. 2 elements (Quantum meter).
3. 2.5 element (3 phase meter).
4. 3 element (3 phase meter).

### 5.2.5 According to the acceptable error of the meter in the light of IEC standard:

1. Class-2 (usually single phase).
2. Class-1 (usually 3 phase meter).
3. Class-0.5 (generally 3 phase meter).

### 5.2.6 According to ANSI standard, according to the maximum current carrying capacity of the meter

1. Class-30 (generally single phase).
2. Class-40 (general single phase).
3. Class-50 (generally single phase).
4. Class-100 (generally single / 3 phase).
5. Class-200 (generally single / 3 phase).
6. Class-150 (generally 3 phases with demand).
7. Class-20 (generally 3 phases with demand).

### 5.2.7 According to the reading display

1. Analog type display meter.

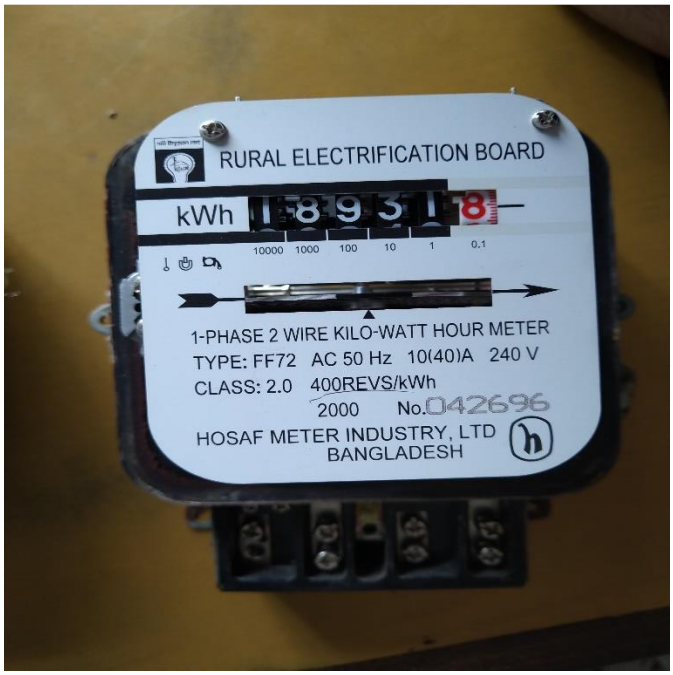



Fig-5.2: Analog type display meter

2. Digital (electronic) type.

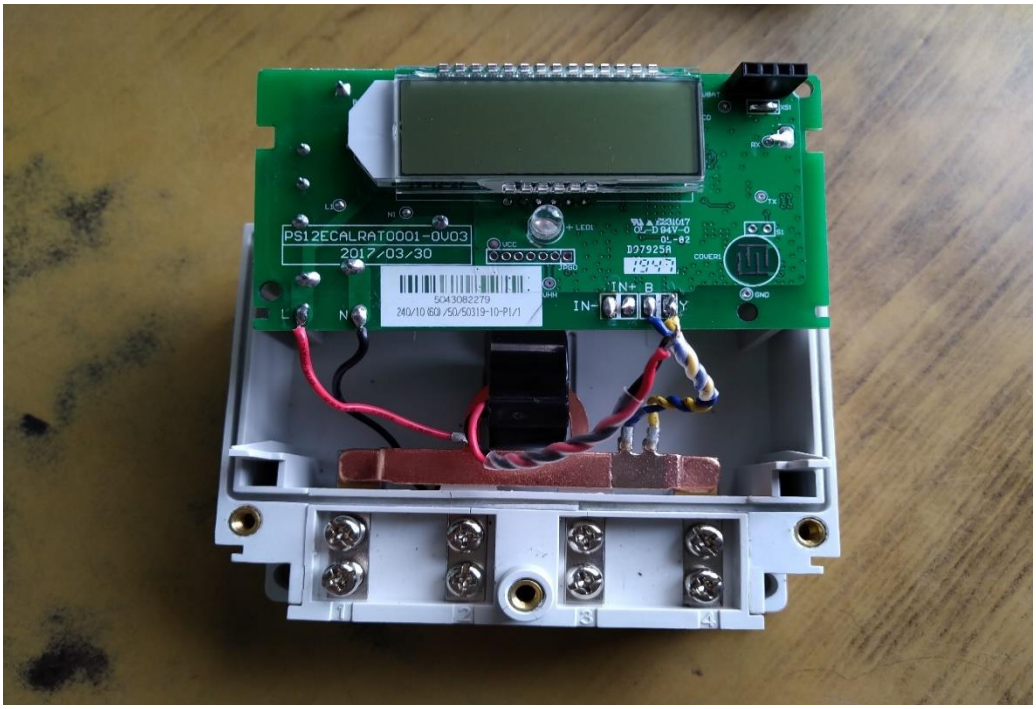



Fig-5.3: Digital (electronic) type display

3. Cyclometer type display meter.

### 5.2.8 As per demand:

1. Without demand (single / 3 phase).

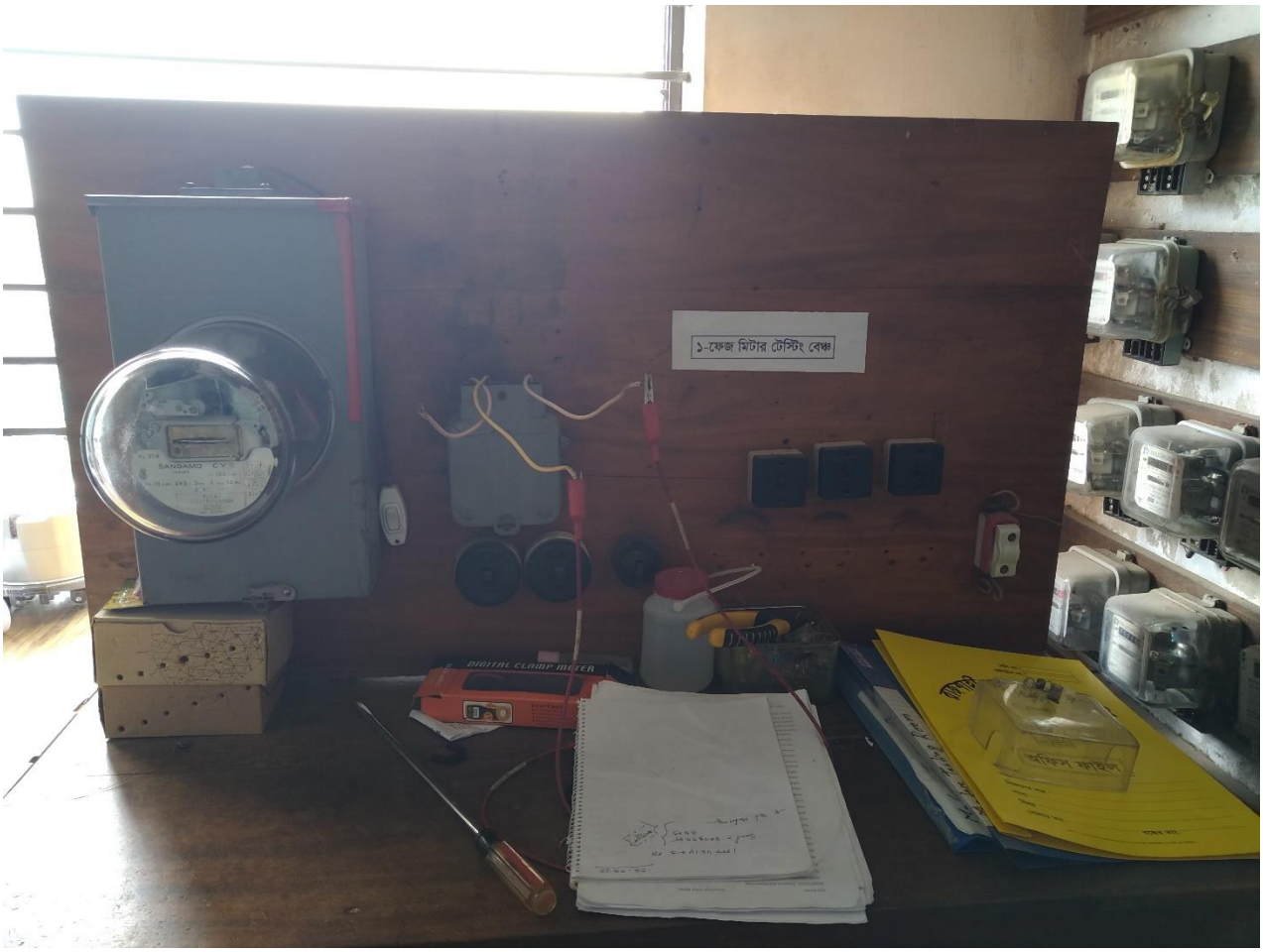



Fig-5.4: Without demand (Single Phase)

2. With demand (3 phase).


Fig-5.5: 3 phase meter

## 5.2.9 According to peak off-peak:

1. without demand, peak off-peak (3 phase).
2. with demand, peak off-peak (3 phase).

## 5.2.10 According to billing:

1. Postpaid.
2. Prepaid.

## 5.3 Kh:

### 5.3.1 What is meter kh?

The whr that measures the rotation of the meter discs or wheels is kh of the meter. It is a constant of meters. There may be separate kh for different types of meters. Kh is useful for testing the meter.

### 5.3.2 Normally meter two types-

1. Single phase meter
2. 3-phase meter

A. There are 2 coils in single phase meter.

1. Potential coil (PC)
2. Current coil (CC)

* Single phase meter has three main parts-

1. Stator (stationary part)
2. Rotor (rotating part)
3. Resister assembly (rotates different things)

* The job of the register is to count the readings.
* There are 3 types of meters-

1. Analogue meter
2. Digital meter
3. Prepaid meter

***Analog meter:** What is the hourly power consumption to turn the disc of the meter is called kh.

kh = watt hour÷ (revious÷kwh)

= 1000÷450

= 2.22

*** Digital meter:** The amount of watt hours consumed to give 1pulse of digital meter disc is called kh.

kh = watt hour÷revious

= 1000÷1600

= 0.625

kh = 0.625

1 amp= (kh*pulse*sec)÷240

= (0.625*2*3600)÷240

= 18.75

= (0.625*10*3600)÷1000

= 22.5

* If the wheel turns 450 times then 1 unit of electricity will be consumed (Analog meter).

* If the wheel turns 1600 times then 1 unit of electricity will be consumed (Digital meter).

## 5.4 Socket type meter:

A. 7 terminal

B. 13 terminal

## 5.5 Current coil and Potential coil different

### 5.5.1 Current coil:

1. The current coil is thick.
2. It stays in the series.
3. Its number of winds is less.

### 5.5.2 Potential coil:

1. The potential coil is thin.
2. It is in parallel.
3. It has a high number of winds.

## 5.6 Stacking sheet:

Stacking sheet contains field line calculation, cable size, phone number, etc., and line design with area name, village name, membership name, etc.

(REB form number 348).

## 5.7 AS-build stacking sheet:

According to the stacking sheet, after working in the field, the calculation that is done to make some correction in the line design is called as built stacking sheet.

# Chapter-6
# Transformer

## 6.1 Transformer

A transformer is a stationary device that increases or decreases voltage and current by keeping power and frequency constant.

Fig-6.1: Transformer

There are two types of Transformer -

1. Step Up transformer.
2. Step down transformer.

* All the distribution transformers in the rural power system are Step Up transformers.
* All the single phase transformers in the substation are step down transformers.

## 6.2 There are six types of transformer test-

1. Full load test.
2. No load test.
3. Ratio test.
4. Quantity test.
5. Polarity test.
6. Insulation test.

### 6.2.1 Full load test:

Usually,

* To know the core loss of the transformer.
* Full load test is copper loss.
* Full load test is short circuit i.e. X1 and X2 short.
* Distribution transformers up to 175 KVA are used.
* The voltage available to give 0.78A to a 5kv (10kva / 3.75kva etc) transformer is called rated.

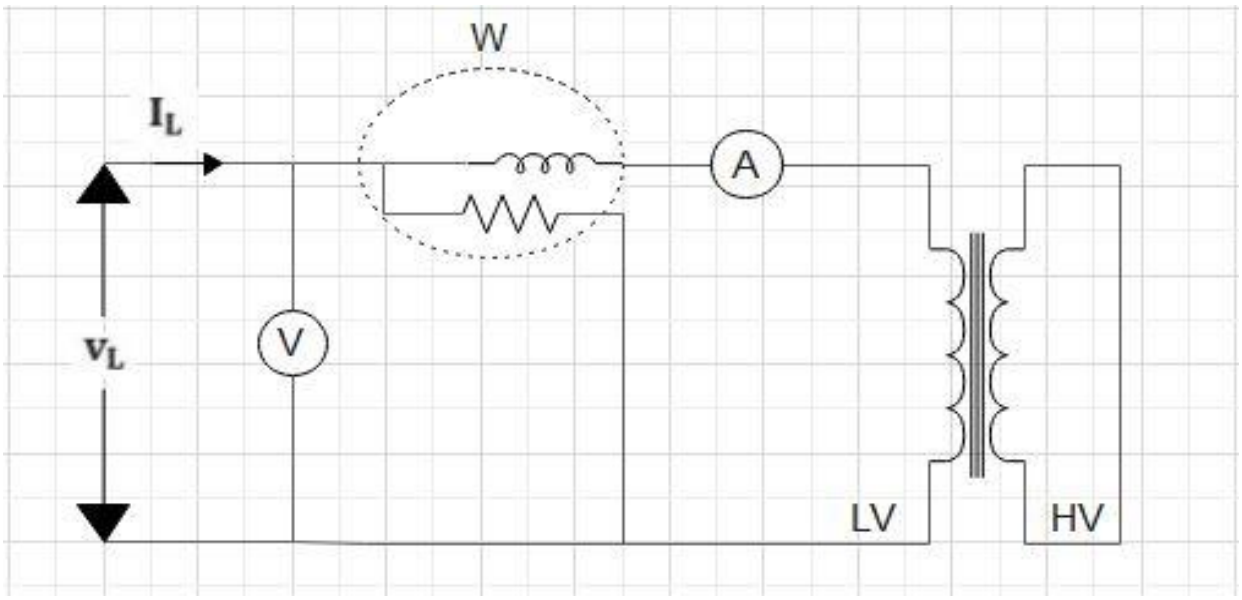



Fig-6.2: Full load/ Short circuit test

## 6.2.2 New Transformer Test:

**6.2.2.a Full load test**,

5 KVA = 120 W

10 KVA = 190 W.

15 KVA = 260 W

25 KVA = 400 W

37.5 KVA = 500 W

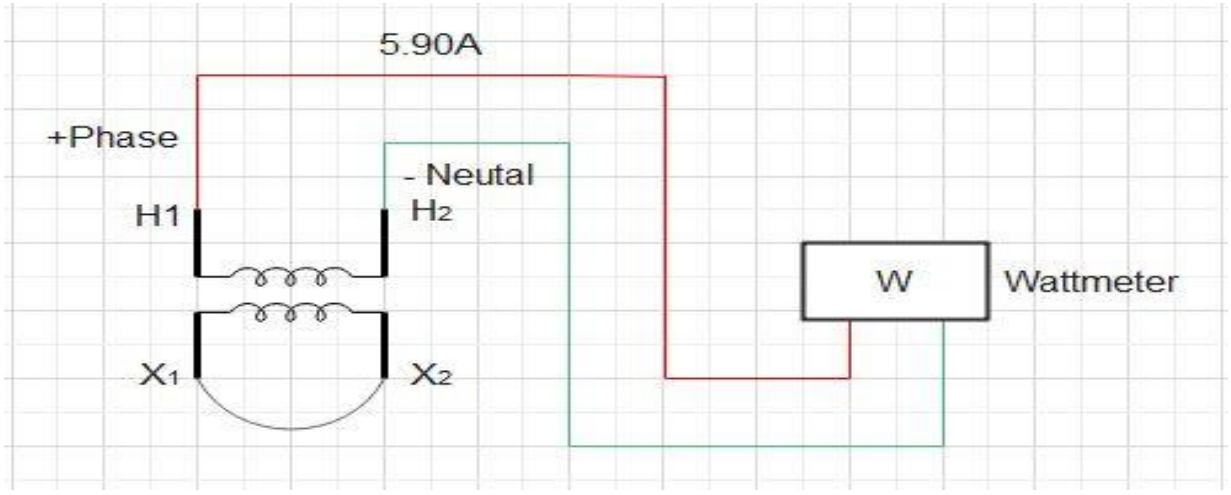



Fig-6.3: Connection diagram of Full load test

**6.2.2.b High Tension (HT):**

37.5 KVA / 6.35 KV = 5.9 A

5 KVA / 6.35 KV = 0.78 A

10 KVA / 6.35 KV = 1.57 A

100 KVA / 6.35 KV = 15.74 A

**6.2.2.c Low Tension (LT)**:

5 KVA / 0.24 KV = 20.83 A

10 KVA / 0.24 KV = 41.66 A

15 KVA / 0.24 KV = 62.5 A

**6.2.2.d % of Impedance:**

(234.5 + 85) / (234.5 + 30)

= 319.5 / 264.5

= 1.21

### 6.2.3 No-load test:

Usually,

* No-load test is core loss.

* H1 will be open in No-load test.

* No-load test to give LT power.

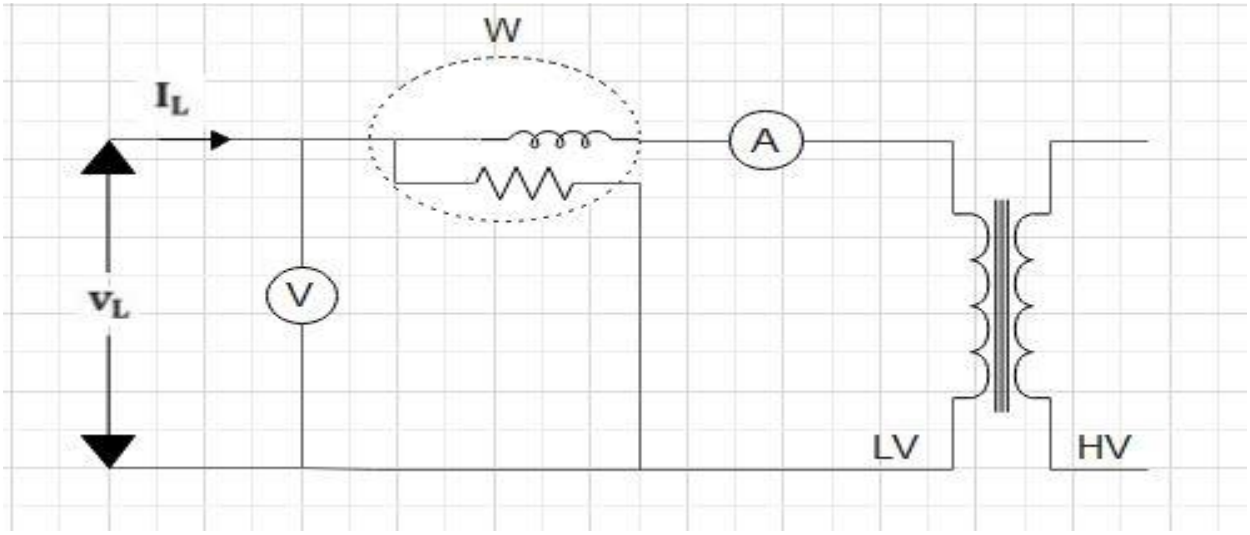



Fig-6.4: No-load/Open circuit test

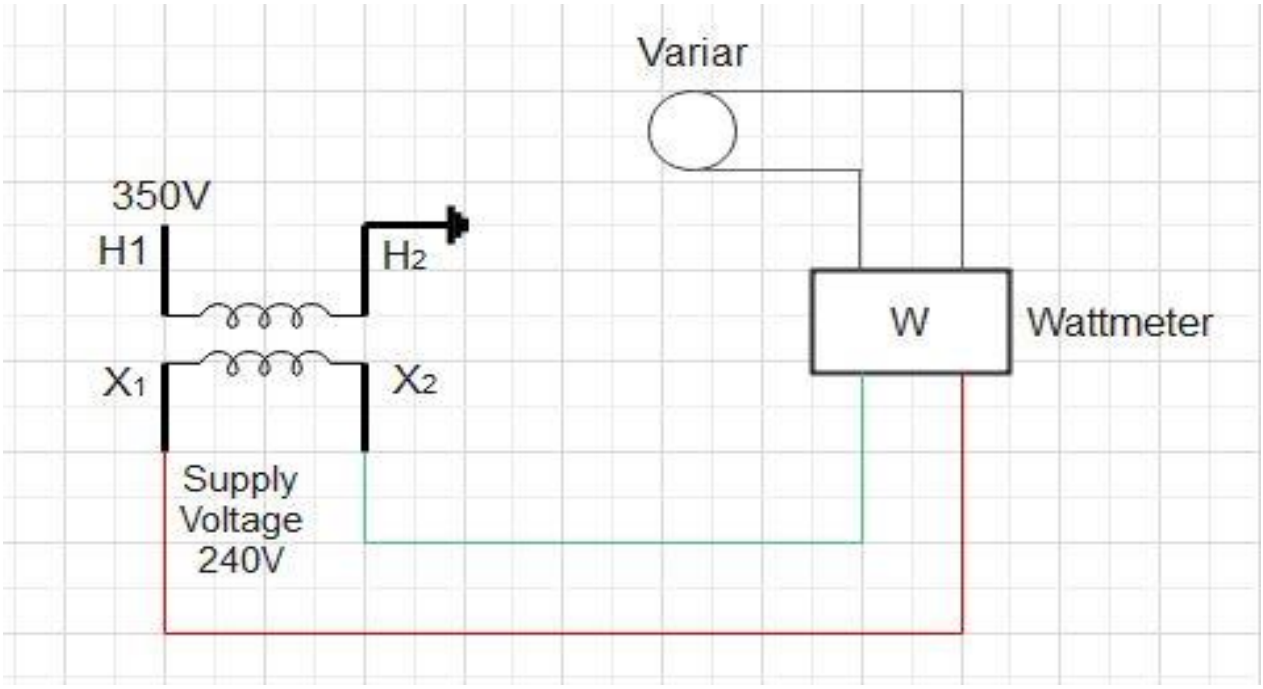



Fig-6.5: Connection diagram of No-load

**Test:**

5 KVA = 19 W

10 KVA = 25 W

15 KVA = 35 W

25 KVA = 50 W

37.5 KVA = 65 W

## 6.2.4 Ratio test:

Ratio test = supply voltage÷received voltage.

= HT ÷ LT

= 6350÷240

= 26.46

* LT voltage = supply voltage÷ ratio

= 240÷ 26.46

= 9.07

* HT voltage = supply voltage÷ ratio

= 6350÷ 26.46

= 240

* Multiplying the number of digits of LT by the ratio we get the digits of HT.

* If we multiply the number of HT by the ratio, we get the number of LT.

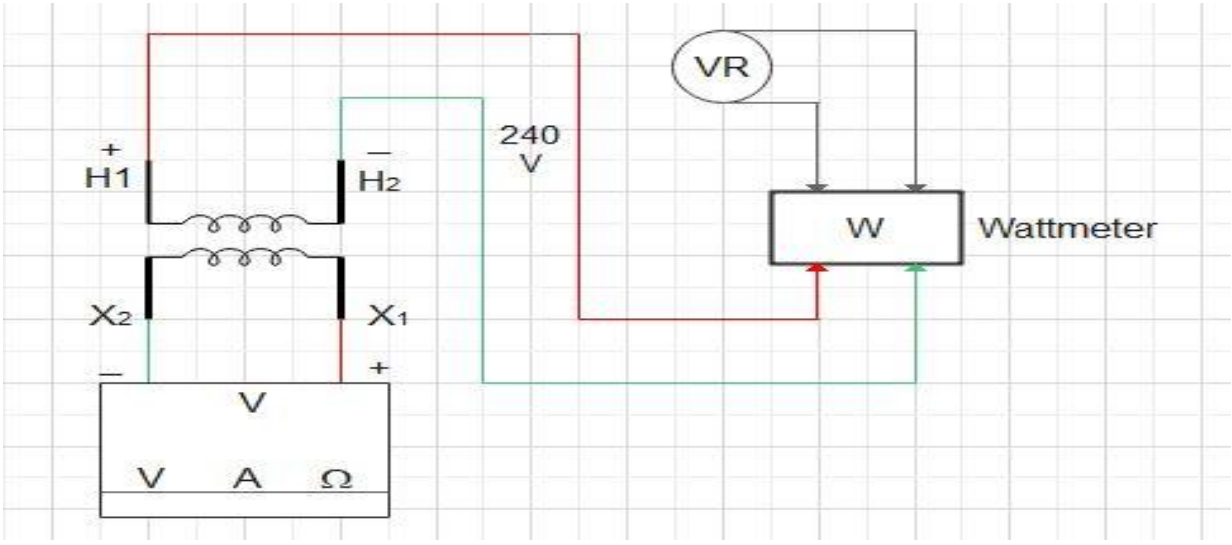



Fig-6.6: Connection diagram of Ratio test

### 6.2.5 Polarity test:

Determining the direction of voltage is called Polarity test.

There are two types of polarity test

1. Additive Polarity
2. Subtractive Polarity

#### 6.2.5.a Additive Polarity:

The amount of voltage that I will give at the input, if more voltage is found at the output, it is called additive polarity.

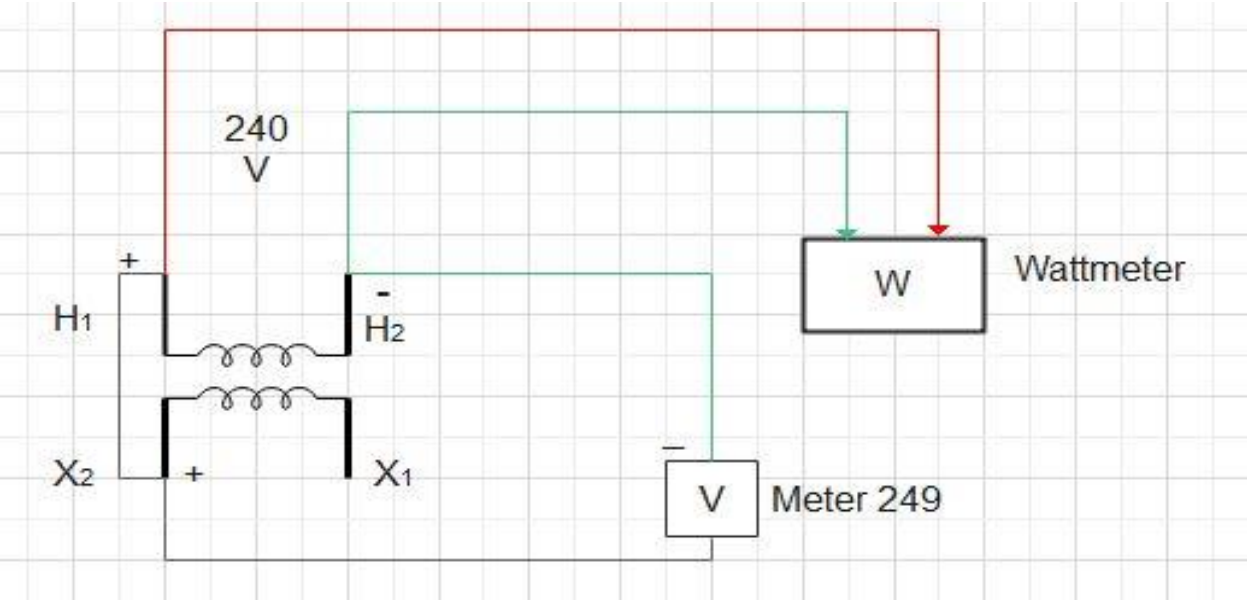



Fig-6.7: Connection diagram of Additive Polarity

**6.2.5.b Subtractive Polarity:**

Subtractive polarity is the amount of voltage at the input that is less than the voltage at the output.

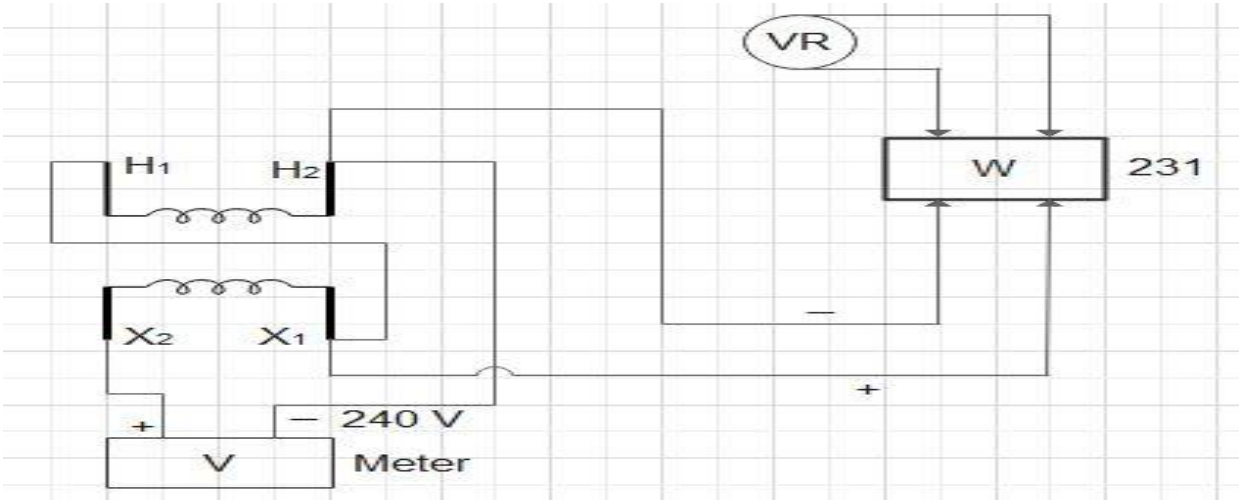



Fig-6.8: Connection diagram of Subtractive Polarity

* Secondary part means LT side. It is usually thick. This side contains $X_1$, $X_2$

* Primary part means HT side. It is usually thin. This side contains $H_1$, $H_2$

$H_1$-phase (+), $X_1$-phase (+).

$H_2$-Neutral (-), $X_2$-Neutral (-).

### 6.2.6 Mega Test:

Mega tests are usually insulation test and Quantity test.

* Insulation test: insulation test is the first end of the primary coil and the first end of the secondary coil must be equal to more than 1000V.

* Quantity test: If you test the two ends of the part in the quantity test, the result will be 0, then it will be understood that the test is correct. Quantity test is basically to check whether it is correct.

## 6.3 Overload:

Normally, the HT current of a 10 KVA transformer is 1.57A and the LT current of a 10 KVA transformer is 41.66 A.

In overload the transformer usually burns out. In other words, there is a financial loss of the rural power association. There is a system loss. Which can never be done.

**Under load:** Under load is usually,

The HT current of a 10 KVA transformer is 1.57A and the LT current of a 10 KVA transformer is 41.66 A. This is acceptable.

That changes when the number of turns of the transformer is more or less,

We know

$$V_p \div V_s = N_p \div N_s = I_S \div I_p = K$$

Accurate turn number (NP) if:

Here,

$V_p$= 6350.

$N_p$= 2645.

$N_s$= 100.

$V_s$=?

We Know,

$$\therefore V_p \div V_s = N_p \div N_s$$

6350 ÷ $V_s$= 2645÷100

$$V_s = \frac{6350 * 100}{2645}$$

$\therefore V_s$= 240 V.

That means there is no change in $V_s$.

**Again,**

If the number of turns is less then,

Here,

$V_p$= 6350.

$N_p$= 2645.

$N_s$= 100.

$V_s$=?

We Know,

$$\therefore V_p \div V_s = N_p \div N_s$$

$6350 \div V_s = 2645 \div 100$

$V_s = \frac{6350*100}{2645}$

$\therefore V_s = 240$ V.

That is, when the number of turns is less then the voltage is higher.

**Again,**

If the number of turns is more

Here,

$V_p = 6350$

$N_s = 100$

$N_p = 2700$

Vs =?

We know,

$\therefore V_s = \frac{v_p * N_s}{N_p}$

$V_s = \frac{6350*100}{2700}$

$\therefore V_s = 235$ V.

That is, when the number of turns is high then the voltage is low.

## 6.4 Three Phase Transformer Connections

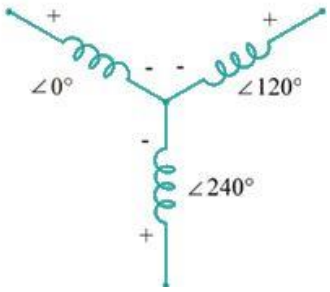



Fig-6.9: Star Connection

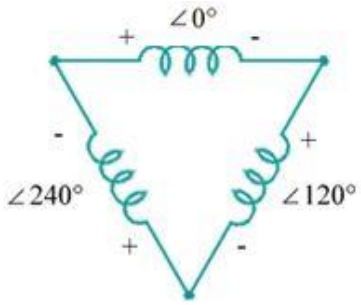



Fig-6.10: Delta Connection

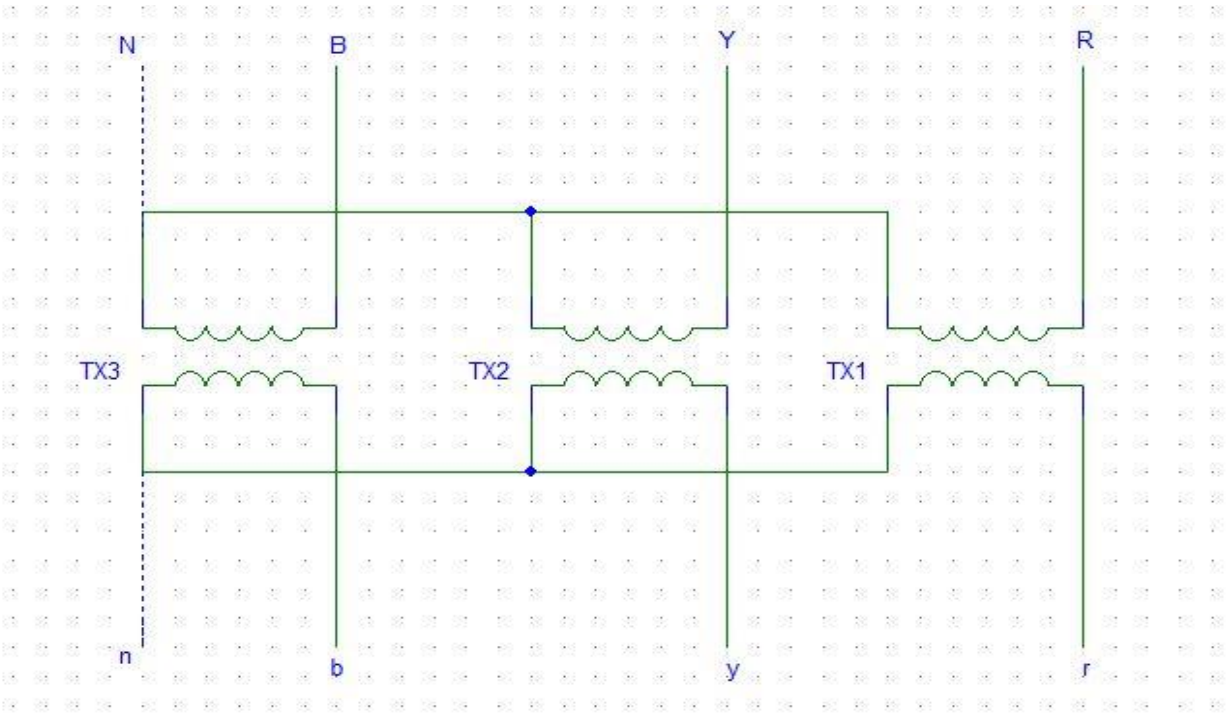



Fig-6.11: Star-Star (Y-Y) Connection

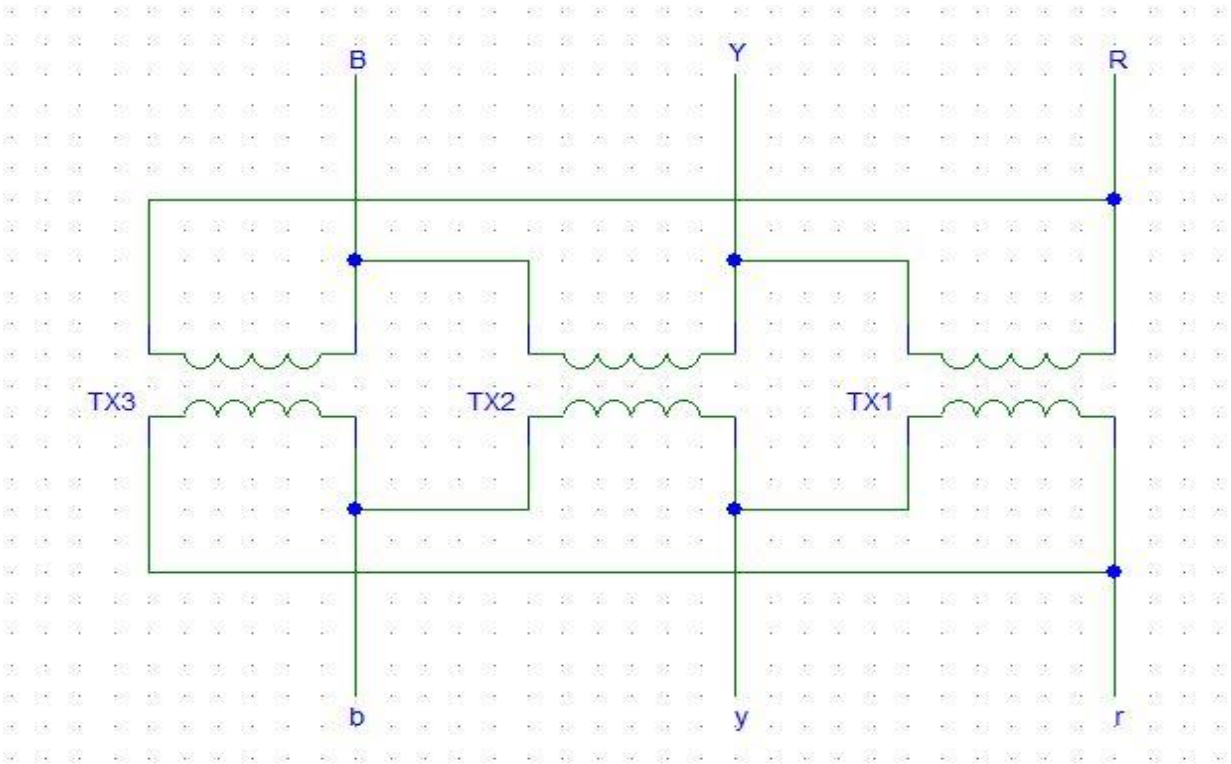



Fig-6.12: Delta-Delta (Δ- Δ) Connection

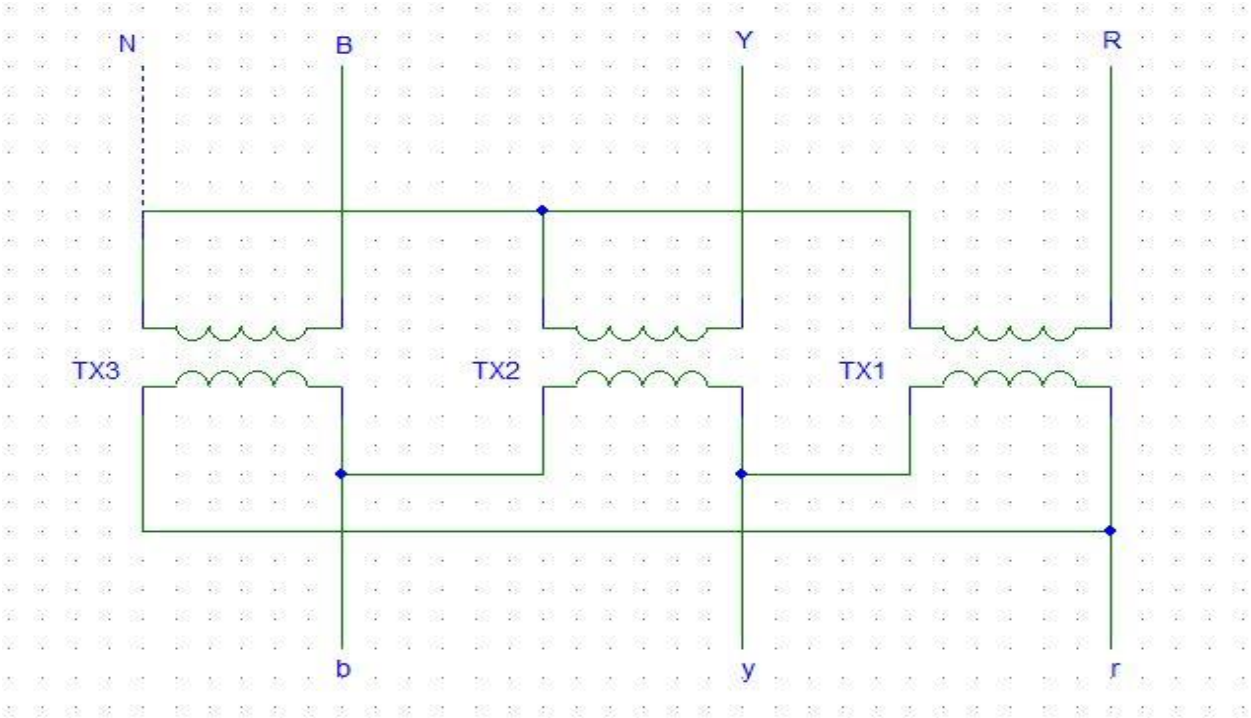



Fig-6.13: Star-Delta (Y- Δ) Connection

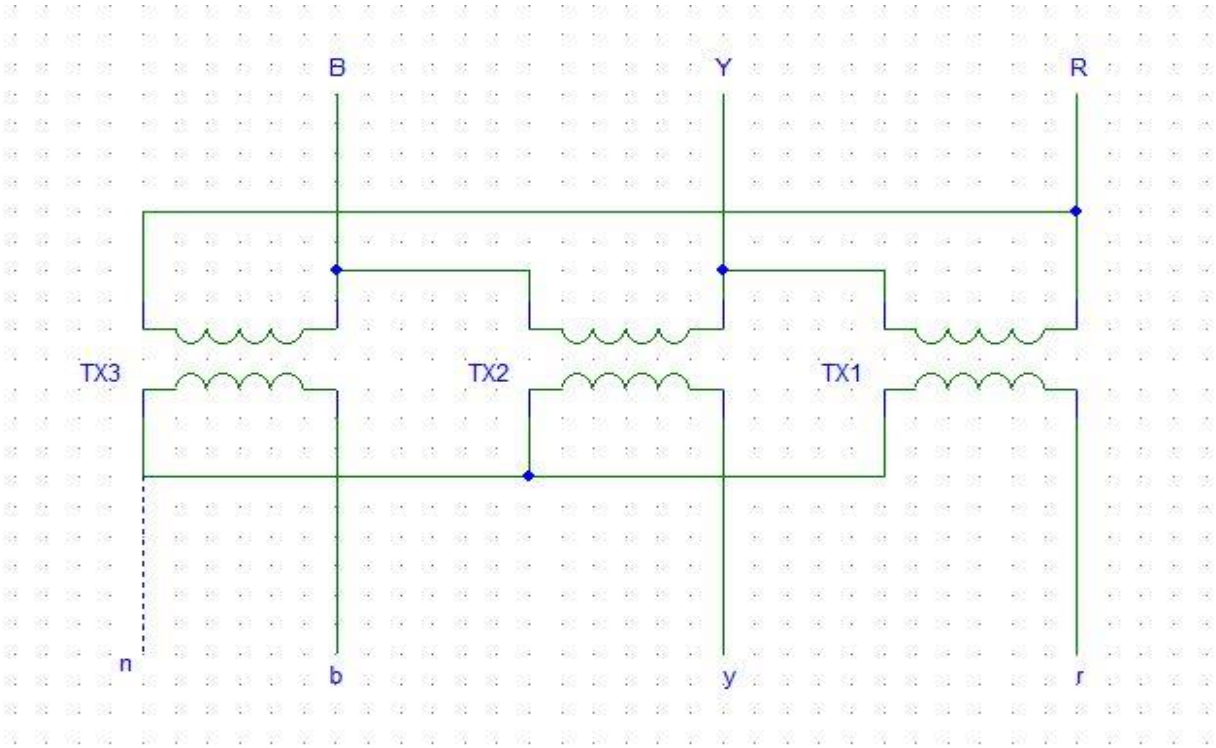



Fig-6.14: Delta-Star (Δ-Y) Connection

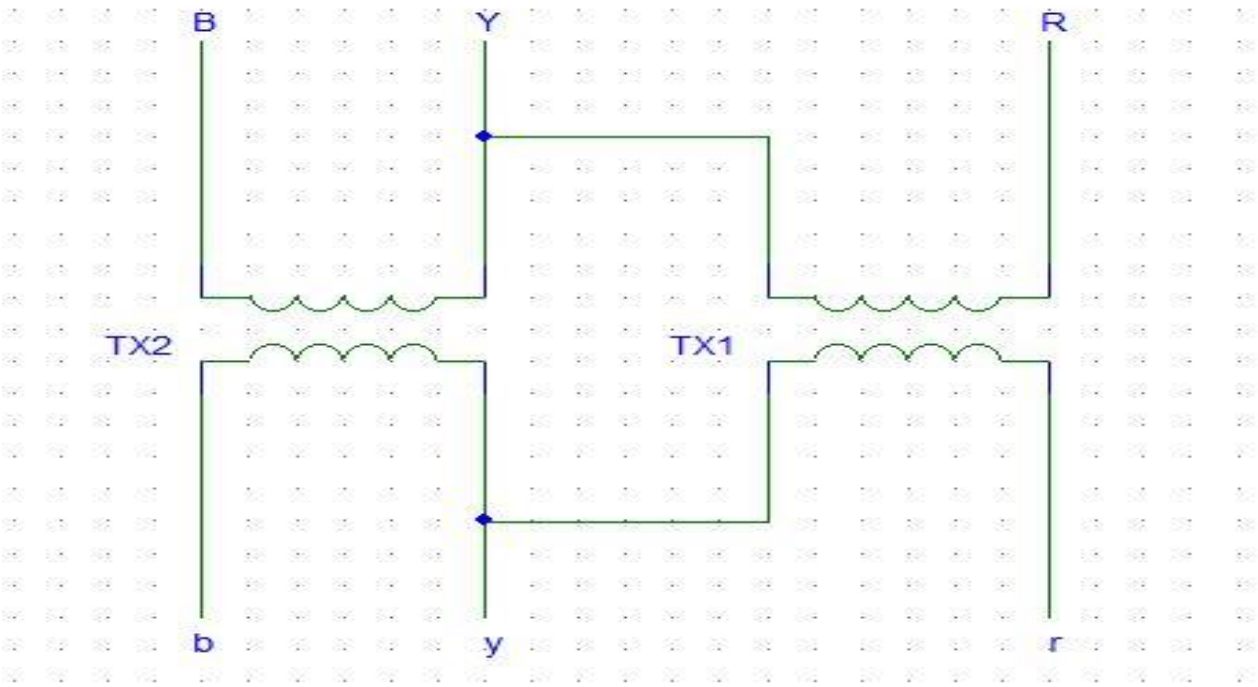



Fig-6.15: Open Delta (V-V) Connection

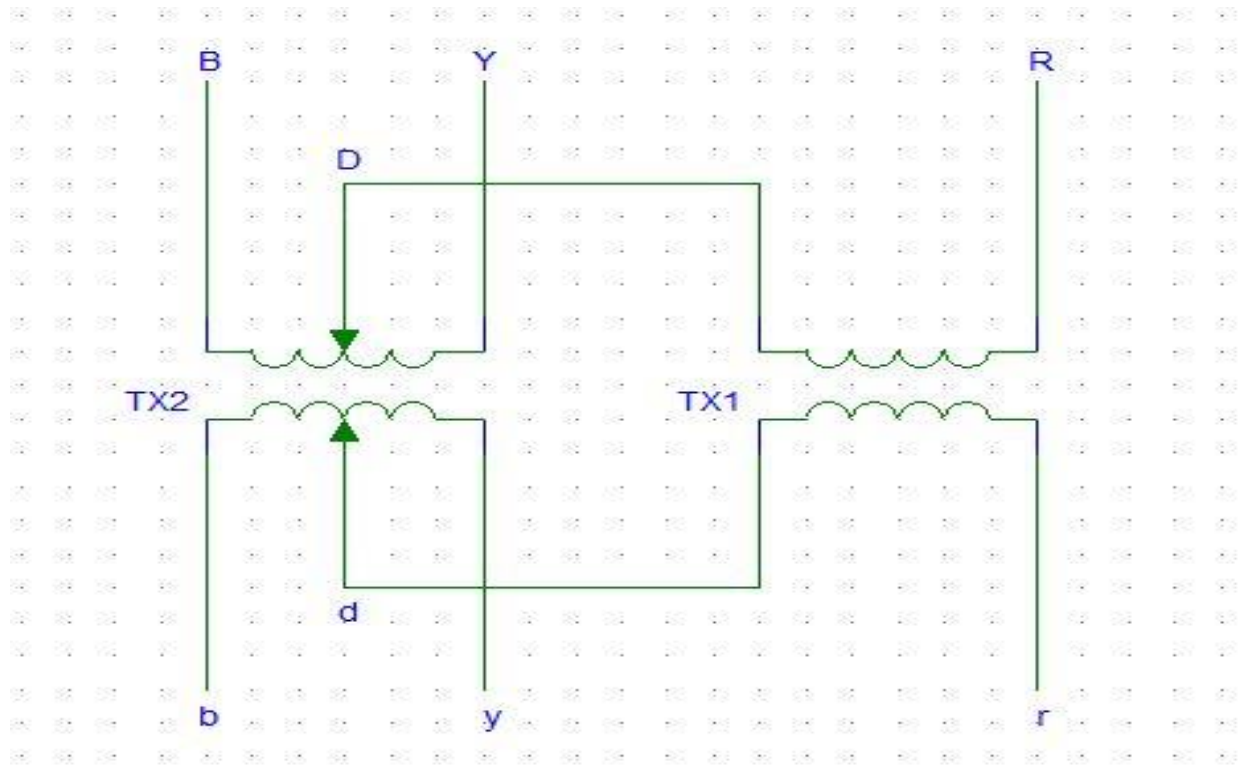



Fig-6.16: Scott (T-T) Connection

# Chapter-7
# Admin

## 7.1 Administration (Admin) Category:

Purchase goods through tender. Various board meetings and correspondence are exchanged. Various letters (emails are sent).

## 7.2 Human Resource HR (Administration):

Its main function is to recruit manpower, develop skills and regulate any problems faced by the employees. Increase efficiency by providing appropriate training to officers and employees.

## 7.3 Member service MS:

### 7.3.1 Functions:

1. Provide new connections.
2. Provide old connections.
3. To solve all the problems of the customer through service in one situation.
4. Measure the power factor.
5. To hold a public hearing meeting.
6. To hold yard meeting.
7. Select the area director.
8. Complete house wiring through village electrician and make report by inspecting wiring through inspector.
9. To organize annual member service assembly.
10. To provide different types of information in REB as information providing department.
11. To work for the promotion of rural electricity.

For example, publishing news in Dish Channel scrolling paper. Promoting Citizen Charger through miking banners.

12. Above all to solve all the problems of the customer.

## 7.4 Account:

1. Create a budget and ensure spending according to the budget.
2. To calculate the purchase and sale of electricity and to pay the price. (PDB, PGCB)
3. Calculate all types of expenses and pay the principal.
4. Collect from the consumer level and pay VAT and taxes to the government.

## 7.5 Finance section:

1. Reading collection
2. To bill processing.
3. Bill delivery.
4. Meter report and inquiry
5. Bill collection and automatic bill adjusting.

**Table No: 7.1**

| **FINANCIAL AND STATISTICAL REPORT** PBS**:** Rajshahi PBS<br>TO: THE RURAL ELECTRIFICATION BOARD Month Ending: June 2020 | | | |
|---|---|---|---|
| Part-A : Statement of Revenue and Expenses | | | |
| ITEMS | Year To Date | | This Month |
| | Last Year | This Year | |
| 01. SALE OF ELECTRICITY | 1,574,650,177.00 | 1,637,058,540.00 | 143,452,694.00 |
| 02. OTHER OPERATING REVENUE | 24,235,560.00 | 19.023,598.00 | 1,087,973.00 |
| 03. TOTAL OPERATING REVENUE | 1,598,885,737.00 | 1,656,082,138.00 | 144,540,667.00 |
| 04. COST OF PURCHASED POWER | 1,097,575.386.92 | 1,140,980,414.97 | 104,674,813.00 |
| 05. DISTRIBUTION EXPENSE-OPERATION AND | 103,095,996.15 | 119,951,299.00 | 15,332,749.00 |
| 06. CONSUMER SELLING EXPENSE | 102,220,111.00 | 99,767,412.00 | 10,804,839.00 |
| 07. ADMINISTRATIVE & GENERAL EXPENSE | 123,204,016,84 | 106,501.700.90 | 33,537,838.25 |
| 08. TOTAL OPERATING & MAINTENANCE EXPENSE | 1,426,095,510.91 | 1,467,200,826.83 | 164,350,259.25 |

| | | | |
|---|---|---|---|
| 09. DEPRICIATION AND AMORTIZATION EXPENSES | 139,009,046.00 | 152,862,755.00 | 14,593,128.00 |
| 10. TAX EXPENSE | 5,557,688.00 | 6,335,994.00 | 1,426,695.00 |
| 11. INTEREST ON LONG TERM DEBT | 93,967,564.00 | 98,104,273.00 | 5,895,727.00 |
| 12. TOTAL COST OF ELECTRIC SERVICE | 1,664,629,808.91 | 1,724,503,848.83 | 174,474,355.25 |
| 13. OPERATING MARGINS | 65,744,071.91 | 68,421,710.83 | 29,933,688.25 |
| 14. GOVERNMENT SUBSIDY | 0.00 | 0.00 | 0.00 |
| 15. NON-OPERATING MARGINS-INTEREST | 25,397,533.70 | 43,966,177.41 | 3,975,332.80 |
| 16. NON-OPERATING MARGINS OTHER | 3,688,114.00 | 4,577,982.43 | 1,390,206.43 |
| 17. MARGINS | 36,658,424.21 | 19,877,550.99 | 24,748,149.02 |

**Table No: 7.2**

| SL. NO | Description | This Month | YTD |
|---|---|---|---|
| 1 | Purchase of electricity from BUB (KWH) | 27,689,552 | 319,054,934 |
| 2 | Beauvais Power Resell (KWH) | 0 | 0 |
| 3 | Purchase of electricity without resale (KWH) | 27,689,552 | 319,054,934 |
| 4 | Cost of Power Purchased | 24,422,185 | 281,406,451 |
| 5 | The amount of money received for the current financial year discount facility | 57,490,000 | 165,998,000 |

**Table No: 7.3 Information on discounted benefits**

| **FINANCIAL AND STATISTICAL REPORT** | | | | PBS**:** Rajshahi PBS | | | | |
|---|---|---|---|---|---|---|---|---|
| TO: THE RURAL ELECTRIFICATION BOARD | | | | Month Ending: June 2020 | | | | |
| **Pert-B : Aging of Consume Account Receivable-Electric** | | | | | | | | |
| Class of Service | Total Recv. Amt. | Current | | Over 30 Days | | Over 90 Days | | Number Now Disc. |
| | | Number | Amount | Number | Amount | Number | Amount | |
| Total: | 157,119,789 | 148,434 | 105,915,969 | 27,300 | 27,407,139 | 7,436 | 23,796,681 | 12,152 |

**Table No: 7.4**

| | This Month | Year To Date | Paet-B-1: Other Information | |
|---|---|---|---|---|
| Collection | 232,833,490 | 1,617,997,171 | 1. Number of Elakas Served | 7 |
| Percent of Collection | 162.31% | 98.84% | 2. Number of Lady Advisors | 3 |
| Month Rev. Outstanding | 1.15 and without RI 1.15 | | 3. Number of Directors | 8 |
| Outstanding of Religious Inst. | 8,046 | | 4. Number of Employees | 375 |

**Table No: 7.5**

| | |
|---|---|
| Accounts Receivable Electric with Rebate | 157119789 |
| Govt. Agro Based Industry Rebate | 5516711 |
| Irrigation – Rebate | 27605835 |
| Total Rebate | 33122546 |
| Accounts Receivable Electric | 123997243 |
| Twelve Month Sales with | 1637058540 |
| Twelve Month Rebate | 50905815 |
| Twelve Month Sales without | 1586152725 |
| Average Sales without Rebate | 132179394 |
| Month Rev. Outstanding | 0.94 |

**Table No: 7.6**

**FINANCIAL AND STATISTICAL REPORT** PBS**:** Rajshahi PBS

TO: THE RURAL ELECTRIFICATION BOARD Month Ending: June 2020

## Pert-B : Aging of Consume Account Receivable-Electric

| Class of Service | Total Recv. Amt. | Current | | Over 30 Days | | Over 90 Days | | Number Now Disc. |
|---|---|---|---|---|---|---|---|---|
| | | Number | Amount | Number | Amount | Number | Amount | |
| 1.1 LT_A(DOM) | 67,728,766 | 135,981 | 55,981,073 | 22,916 | 10,700,158 | 3,766 | 1,047,535 | 8,768 |
| 1.2 LT_B(IRRI) | 34,016,253 | 2,679 | 4,813,928 | 2,360 | 12,526,852 | 2,756 | 16,675,473 | 114 |
| 1.3 LT_C1(S.INDUSTRY) | 8,553,006 | 1,227 | 6,584,726 | 251 | 1,236,993 | 105 | 731,287 | 247 |
| 1.4 LT_C2(CONS) | 47,963 | 18 | 50,588 | 2 | 788 | 0 | 3,440 | 5 |
| 1.5 LT_D1(CI) | 895,899 | 2,021 | 769,596 | 318 | 131,988 | 107 | 5,685 | 153 |
| 1.6 LT_D2(SL&WP) | 1,412,583 | 182 | 142,233 | 78 | 127,877 | 65 | 1,142,473 | 9 |
| 1.7 LT_D3(BCS) | 91,797 | 9 | 60,270 | 2 | 9,687 | 1 | 21,840 | 0 |
| 1.8 LT_E(COM) | 6,957,901 | 6,264 | 4,388,963 | 1,364 | 993,027 | 625 | 1,575,911 | 2,837 |
| 1.9 LT_T(TEMP) | 69,537 | 5 | 59,880 | 1 | 3,840 | 2 | 5,817 | 8 |
| 2.1 MT_1(DOM) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.2 MT_2(COM) | 83,291 | 2 | 2,198 | 1 | 18,111 | 1 | 62,982 | 3 |
| 2.3 MT_3(INDUSTRY) | 37,271,485 | 46 | 33,062,514 | 7 | 1,657,818 | 6 | 2,551,153 | 5 |
| 2.4 MT_4(CONS) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.5 MT_5(GEN) | 8,715 | 0 | 0 | 0 | 0 | 0 | 8,715 | 0 |
| 2.6 MT_6(TEMP) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.7 MT_7(BCS) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.8 MT_8(IRRI) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3.1 HT_1(GEN) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3.2 HT_2(COM) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3.3 HT_3(INDUSTRY) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3.4 HT_4(CONS) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4.1 EHT_1(GEN) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4.2 EHT_2(GEN) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5. SOLAR PV SYSTEMS | 50 | 0 | 0 | 0 | 0 | 2 | 50 | 3 |
| 6. RESALE TO OTHER PB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

**Table No: 7.7**

FINANCIAL AND STATISTICAL REPORT PBS: Rajshahi PBS

TO: THE RURAL ELECTRIFICATION BOARD Month Ending: June 2020

## Part-C : Balance Sheet

| Assets & Other Debits | Amount | Liabilities & Other Credits | Amount |
|---|---|---|---|
| 1. ELECTRIC PLANT IN SERVICE | 4,240,237,870.25 | 31 MEMMBERSHIP ISSUED | 6,168,546.00 |
| 2. ACCUMULATED PROVISIONS FOR DEPR | 1,526,431,322.28 | 32 MEMBERSHIP SUBSCRIBED HOT ISSUED | 1,728,470.00 |
| 3. NET UTILITY PLANT IN SERVICE | 2,713,806,547.97 | 33 OPERATING MARGIS PRIOR YEARS | (1,204,438,723.42) |
| 4. CONSTRUCTION WORK IN PROGRESS | 485,991,057.97 | 34 OPERATING MARGIS CURRENT YEAR | (68,438,723.42) |
| 5. TOTAL UTILITY PLANT | 3,199,797,605.95 | 35 OPERATING MARGINS-GOVT. SUBSIDY | 44,309,203.00 |
| 6. DONATION RESERVE FUND | 7,383.486.57 | 36 NON-OPERATING MARGRES PRIOR YEARS | 299,337,279.57 |

| | | | |
|---|---|---|---|
| 7. REPLACEMENT RESERVE FUND | 181,486,750.00 | 37 NON-OPERATING MARGINS CURRENTYEAR | 48,544,159.84 |
| 8. CONTRIBUTION TO REB REVOLVING FUND | | 38 DONATED CAPITAL & CAPITAL GAIN OR LO | 144,283,320.91 |
| 9. INVESTMENT IN ASSOCIATED COMPANIES | | 39 TOTAL EQUITIES & MARGINS | (728,489,454.93) |
| 10. OTHER SPECIAL FUND | 783,496, 214.01 | 40 REB LOANS-CASH<br>10 OTHER SPECI | 11,305,500.00 |
| 11. TOTAL INVESTMENTS | 972.366,450.58 | 41 REB LOANS-IN KIND | 3,136,798,486.54 |
| 12. CASH | 247,861,981.96 | 42 REB LOANS-IN KIND-PROVISION | 233,768,526.19 |
| 13. IMPREST FUND | 120,000.00 | 43 REB LOANS-OTHER | |
| 14. TEMPORARY CASH INVESTMENT | | 44 TOTAL LONG TERM DEBT | 213,381,872,512.73 |
| 15. SPECIAL DEPOSITS | | 45 CONSUMER DEPOSITS | 209,311,168.83 |
| 16. ACCOUNTS RECEIVABLE-ELECTRIC | 152,119,789.41 | 46 EMPLOYEES BENEFIT | 581,347,065. |
| 17. AOC PROV FOR UNCOLLICTBLE MC-CR | 64,666,631.63 | 47. SELF INSURANCE RESERVE | |
| 18. OTHER ACCOUNTS RECEIVABLE | 415,247,079.59 | 48 TOTAL OTHER LONG TERM LIABILITIES | 790,658,234.04 |
| 19. MATERIALS & SUPPLIES-ELECTRIC | 175,699,894.93 | 49 ACCOUNTS PAYABLE | 133,491,448.68 |
| 20. MATERIALS & SUPPLIES-MARCHANDISE | 46,382.62 | 50 CONSUMER FOR IRRIGATION | |
| 21. PREPAYMENTS | 2,368.00 | 51 ACCRUED TAXES | |
| 22. OTHER CURRENT & ACCRUED ASSETS | 62,326,130.26 | 52 MIATURED INIEREST | 217,950,034.80 |
| 23. TOTAL CURRENT & ACCUED ASSETS | 993,716,995.14 | 53 MIATURED LONG TERM DEBT | 1,115,449,548.00 |

| | | | |
|---|---|---|---|
| 24. EXTRAORDINATORY PROPERTY LOSSES | 44,977,834.41 | 54 OTHER CURRENT-ACCRUED LIABILITIES | 39,600,089.35 |
| 25. PRELIMINARY SURVEY/INVESTIGATION | | 55 TOTAL CURRENT-ACCRUED LIABILITIES | 1,506,491,120.83 |
| 26. UNCLASSIFIED EXPENSES | 317,810.20 | 56 SECURITY ADVANCES AND DEPOSITE | 11,109,964.44 |
| 27. TEMPORARY FACILITIES | | 57 CONSUMER ADVANCES FOR CONSTRUCTION | |
| 28. OTHER DEFFERED DEBITS | 1,440,618.00 | 58 OTHER DEFFERED CREDIT | 250,974,937,17 |
| 29. TOTAL DEFFERED DEBITS | 46,736,262.61 | 59 TOTAL DEFFERED CREDITS | 262,084,901.61 |
| 30. TOTAL ASSETS AND OTHER DEBITS | 5,212,617,314.28 | 60 TOTAL LIABILITIES & OTHER CREDIT | 5,212,617,314.28 |

**Table No: 7.8**

**FINANCIAL AND STATISTICAL REPORT** PBS**:** Rajshahi PBS

TO: THE RURAL ELECTRIFICATION BOARD Month Ending: June 2020

## Part-C/1: Details of Total Long Term Debt

| PHASE | DONOR | Amount |
|---|---|---|
| 1. 1.5 MCCP, 082 | 1.5 MCCP, 082 | 326,631,421.09 |
| 2. 1.8 MCCP | GOB | 506,590,450.88 |
| 3. 10 LAKH CONSUMER CONNECTION DFID | GOB | 15,446,337.00 |
| 4. 10 LAKH CONUMER GOB | GOB | 51,086,748.38 |
| 5. 12 PBS EXTENSION LOCAL FUND | GOB | 536,558.00 |
| 6. 15 PBS 2nd PHASE | GOB | 131,397.00 |
| 7. 15 PBS 2nd PHASE ADB | ADB | 13,837.00 |
| 8. 13 PBS LOCAL FUND | GOB | 10,548.00 |
| 9. 15 PBS OECF JAPAN | JAPAN | 1,231.00 |
| 10. 18 PBS 2nd PHASE (GOD) | GOB | 1,359,403.00 |
| 11. 18 PBS 2nd PHASE (IDA) | IDA | 4,224.00 |

| | | |
|---|---|---|
| 12. 18 PBS USAID | USAID | 7,102.00 |
| 13. 2.5 MCCP. 086 | 2.5 MCCP, 086 | 62,802,530.64 |
| 14. J3 KV LOCAL FUND | GOB | 32,375,180.00 |
| 15. IC LOCAL FUND | GOB | 1,686,576.00 |
| 16. 4 CNETHERLAND | NETHERLAND | 189,662.00 |
| 17. 4 COECF JAPAN | JAPAN | 161,645,309.00 |
| 18. 4 COPEC | OPEC | 6,768,377.00 |
| 19. 4A IDA | IDA | 395,916.00 |
| 20. S A IDB | IDB | 201,795.00 |
| 21. SAJBIC | JAPAN | 13,126.00 |
| 22. S A NETHERLAND | NETHERLAND | 340,666.00 |
| 23. 5B LOCAL FUND | GOB | 412,187.00 |
| 24. 67 PBS CONCENTRATION & EXPANSION | GOB | 22,784,774.00 |
| 25. 67 PBS CONCENTRATION & EXPANSION | GOB | 4,234,263.00 |
| 26. 7000 KM EXPANSION 2nd PHASE | GOB | 3,360,930.00 |
| 27. 7000 KM EXTENSION LOCAL FUND | GOB | 68,644,960.62 |
| 28. 7000 KM NETHERLAND | NETHERLAND | 348,329.00 |
| 29. 9 PBS CONCENTRATION & EXPANSION | GOB | 34,687,335.00 |
| 30. 9 PBS EXPANSION DFID | GOB | 253,684,813.00 |
| 31. BORO SEASONABLE IRRIGATION CONNECTION | GOB | 390,688.00 |
| 32. BREB SOCIO DEVELOPMENT | GOB | 13,587.00 |
| 33. BREB SOCIO DEVELOPMENT-1 | GOB | 7,309.00 |
| 34. BREB SOCIO ECONOMIC DEVELOPMENT | GOB | 287,281.00 |
| 35. CONCENTRATION & EXPANSION 9 PBS GOB | GOB | 223,313,804.00 |
| 36. DNE (RRKB) 093 | DNE (RRKB) | 204,022,352.26 |
| 37. ECONOMICAL EVALUATION | GOB | 55,865.00 |
| 38. GOB LOCAL FUND | GOB | 22,242,006.14 |
| 39. GRAMEEN BIDYUTALON | GRAMEEN BIDYUE | 20,329,253.00 |
| 40. O&M MATERIALS | GOB | 18,154,201.00 |
| 41. OLDT, 088 | OLDT, 088 | 139,951,263.00 |
| 42. PDB MATERIALS | GOB | 5,047,596.00 |
| 43. REE RRDP-I | GOB | 369,714,387.61 |

| | | |
|---|---|---|
| 44. REE-RRDP II, 075 | REE-RRDP II, 075 | 272,031,747.53 |
| 45. REE-RRDP-I (BREB) | GOB | 8,316,982.00 |
| 46. REHAB II, 077 | REHAB II, 077 | 0.00 |
| 47. RENEWABLE FUEL MANAGEMENT | GOB | 9,188.00 |
| 48. REUP JICA | JAPAN | 346,860,689.87 |
| 49. S L R GOB | GOB | 1,153,044.00 |
| 50. S L R IDA | IDA | 1,630,386.00 |
| 51. SPIP&SHS | SPIP&SHS | 175,355.00 |
| 52. URIDS, 091 | URIDS, 091 | 252,821,305.73 |
| | Total= | 3,381,872,512.73 |

**Table No: 7.9**

**FINANCIAL AND STATISTICAL REPORT** PBS**:** Rajshahi PBS

TO: THE RURAL ELECTRIFICATION BOARD Month Ending: June 2020

## Part-C/2: Changes in Utility Plant

| **Description** | Balance Beginning Year | Additions Year To Date | Retirement Year To Date | Adjustment and Transfer | Current Balance |
|---|---|---|---|---|---|
| REVNEW LINE CONSTRUCTION | 12,918,250.00 | 12,918,250.00 | 0.00 | 0.00 | 0.00 |
| TOTAL PLANT-NOT CLASSIFIED | 12,918,250.00 | 12,918,250.00 | 0.00 | 0.00 | 0.00 |
| DISTRIBUTION PLANT-CLASSIFIED | 3,855,412,644.31 | 226,170,315.58 | 0.00 | 0.00 | 4,081,582,959.8 |
| TOTAL ENERGIZED PLANT | 3,868,330,894.31 | 213,252,065.58 | 0.00 | 0.00 | 4,081,582,959.8 |
| LAND & LAND RIGHTS | 719,951.00 | 0.00 | 0.00 | 0.00 | 719,951.00 |
| STRUCTURE AND IMPROVEMENTS | 68,352,952.00 | 3,636,161.00 | 0.00 | 0.00 | 71,989,113.0 |

| | | | | | |
|---|---|---|---|---|---|
| OFFICE FURNITURE & EQUIPMENT | 18,895,709.00 | 2,880,564.00 | 0.00 | 0.00 | 21,776,273.00 |
| TRANSPORTATION EQUIPMENT | 21,950,002.00 | 6,128,077.000.00 | 0.00 | 0.00 | 28,078,079.00 |
| STORES, TOOLS & LABORATORY EQUIPMENT | 30,905,314.77 | 1,456,877.07 | 0.00 | 0.00 | 32,362,191.00 |
| POWER OPERATED EQUIPMENT | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| COMMUNICATION EQUIPMENT | 1,973,443.52 | 71,470.00 | 0.00 | 0.00 | 2,044,913.00 |
| OTHER EQUIPMENT | 6,033,718.00 | 4,349,329.00 | 0.00 | 0.00 | 1,684,389.00 |
| TOTAL GENERAL PLANT | 148,831,090.29 | 9,823,820.07 | 0.00 | 0.00 | 158,654,910.00 |
| INTANGIBLE PLANT | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ELECTRIC PLANT IN SERVICE | 4,017,161,984.60 | 223,075,885.65 | 0.00 | 0.00 | 4,240,237,870.00 |
| ACCUM. PROV. FOR DEPRECIATION | 1,375,566,166.47 | 150,428,386.81 | 436,769.00 | 0.00 | 1,526,431,320.00 |
| NET UTILITY PLANT IN SERVICE | 2,641,595,818.13 | 72,647,498.84 | 436,769.00 | 0.00 | 2,713,806,540.00 |
| CONSTRUCTION WORK IN PROGKESS | 333,455,856.98 | 154,171,591.00 | 0.00 | 0.00 | 487,627,400.00 |
| TOTAL UTILITY PLANT | 2,975,051,675.11 | 226,819,089.84 | 439,769.00 | 0.00 | 3,201,433,900.00 |

**Table No: 7.10**

**FINANCIAL AND STATISTICAL REPORT** PBS: Rajshahi PBS

TO: THE RURAL ELECTRIFICATION BOARD Month Ending: June 2020

## Part-D : Consumer Sales and Revenue Data

| Class Of Service | THIS MONTH | | | | YEAR TO DATE | | |
|---|---|---|---|---|---|---|---|
| | Number billed | KWH Sold | Amount Billed | No.Min Bill | Number Billed | Kwh Sold | Amount Billed |
| 1.1 LT_A(DOM) | 206,352 | 16,994,190 | 85,398,484 | 0 | 2436849 | 168,365,673 | 822,182,921 |
| 1.2 L_ B(IRRI) | 2,682 | 861,328 | 4,780,992 | 0 | 31844 | 50,195,641 | 214,426,902 |
| 1.3 LT_CH(S.INDUSTRY) | 1,231 | 692,473 | 6,568,959 | 0 | 13129 | 7,814,800 | 70,188,962 |
| 1.4 LT_C2(CONS) | 24 | 3,669 | 53,628 | 0 | 194 | 27,676 | 414,412 |
| 1.5 LT_DI(CI) | 3,788 | 227,734 | 1,532,714 | 0 | 44712 | 2,652,559 | 16,957,636 |
| 1.6 LT_D2(SL & WP) | 190 | 21,557 | 185,133 | 0 | 2148 | 320,636 | 2,648,871 |
| 1.7 LT_D3(BCS) | 16 | 10,290 | 83,624 | 0 | 59 | 32,450 | 261,602 |
| 1.8 LT_E(COM) | 10,794 | 748,847 | 8,515,381 | 0 | 124820 | 8,504,331 | 93,920,130 |
| 1.9 LT_T(TEMP) | 6 | 4,036 | 68,776 | 0 | 81 | 34,545 | 602,420 |
| 2.1 MT_1(DOM) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.2 MT_2(COM) | 3 | 3,466 | 55,777 | 0 | 31 | 80,081 | 863,871 |
| 2.3 MT_3(INDUSTRY) | 50 | 4,071,984 | 36,038,927 | 0 | 608 | 48,757,421 | 413,279,498 |
| 2.4 MT_(CONS) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.5 MT_5(GEN) | 1 | 4,540 | 42,023 | 0 | 12 | 50,835 | 453,823 |
| 2.6 MT_6(TEMP) | 0 | 0 | 0 | 0 | 0 | 4,564 | 77,624 |
| 2.7 MT_7(BCS) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2.8 MT_8(IRRI) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3.1 HT_1(GEN) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3.2 HT_2(COM) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3.3 HT_3(INDUSTRY) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3.4 HT_4(CONS) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4.1 EHT_1(GEN) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4.2 EHT2(GEN) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5. SOLAR PV SYSTEM | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6. SALES TO SYSTEMS | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7. RESALE TO PBS | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8. OFFICE USE | 49 | 12,571 | 128,276 | 0 | 452 | 109,049 | 779,868 |
| **Total Sale of Electricity** | 225,180 | 23,656,685 | 143,452,694 | | 2654939 | 286,949,261 | 1,637,058,540 |

**Table No: 7.11**

**FINANCIAL AND STATISTICAL REPORT** PBS**:** Rajshahi PBS

TO: THE RURAL ELECTRIFICATION BOARD Month Ending: June 2020

## Part-E: Energy and Demand Data As Per Billing Meter

| Name of Sub-station | Energy Purchased (KWH) | | Peak Demand (MW) & Date | | | | MVAR Purchased | |
|---|---|---|---|---|---|---|---|---|
| | | | This Month | | Y-T-D | | This Month | Y-T-D |
| | This Month | Y-T-D | MW | Date | MW | Date | | |
| Rajshahi-Paba | 1,886,640 | 46,646,387 | 0.000 | | 0.000 | 30-Now-02 | 0.000 | 0.000 |
| Nawabganj-Ai-hai | 4,498,104 | 53,624,084 | 0.000 | | 0.000 | | 0.000 | 0.000 |
| Niamatpur-Tanore-1 | 1,066,160 | 25,006,710 | 0.000 | | 0.000 | | 0.000 | 0.000 |
| Rajshahi-Durgapur | 6,068,720 | 62,160,141 | 0.000 | | 0.000 | | 0.000 | 0.000 |
| Rajshahi-Mohonpur | 4,514,128 | 38,808,175 | 0.000 | | 0.000 | | 0.000 | 0.000 |
| Namatpur-Tanere-2 | 0 | 23,903,801 | 0.000 | | 0.000 | | 0.000 | 0.000 |
| Rajshshif(North)Basantop | 4,040,678 | 44,812,238 | 0.000 | | 0.000 | | 0.000 | 0.000 |
| Amouna-Tenore | 4,258,016 | 22,736,292 | 0.000 | | 0.000 | | 0.000 | 0.000 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Rajshahi(North)Kakonha | 1,357,106 | 1,357,106 | 0.000 | | 0.000 | | 0.000 | 0.000 |
| Total : | 27,689,552 | 319,054,934 | 0.000 | | 0.000 | | 0.000 | 0.000 |
| Total KWH Sold: | 23,656,685 | 286,949,261 | **REMARKS** | | | | | |
| KWH Loss : | 4,032,867 | 32,105,673 | | | | | | |
| Percent Loss: | 14.56% | 10.06% | | | | | | |

**Table No: 7.12 Energy Purchased**

| Name of Grid Sub-station | Purchase from | This Month | | | Y-T-D | |
|---|---|---|---|---|---|---|
| | | KWH | Unit Price (TK) (BST+ Wheeling Charge) | Amount TK | KWH | Amount TK |
| Rajshahi (Paba) | PDB | 1,886,640 | 4.6623 | 8796082 | 46,646,387 | 206349388 |
| Nawabganj (Ai-Hai) | PDB | 4,498,104 | 4.6623 | 20971510 | 53,624,084 | 239165226 |
| Niamatpur (Tanore-1) | PDB | 1,066,160 | 4.6623 | 4970758 | 25,006,710 | 110407554 |
| Rajshahi (Durgapur) | PDB | 6,068,720 | 4.6623 | 28294193 | 62,160,141 | 277428566 |
| Rajshahi (Mohonpur) | PDB | 4,514,128 | 4.6623 | 21046219 | 38,808,174 | 172042062 |
| Namatpur (Tanere-2) | PDB | 0 | 4.6623 | 0 | 23,903,801 | 103649271 |
| Rajshshif North (Basantop) | PDB | 4,040,678 | 4.6623 | 18838853 | 44,812,238 | 201014148 |
| Amouna-Tenore | PDB | 4,258,016 | 4.6623 | 19852148 | 22,736,292 | 106003414 |
| Rajshahi North (Kakonha) | PDB | 1,357,106 | 4.6623 | 6327235 | 1,357,106 | 6327235 |
| **Total:** | PDB | 27,689,552 | | 129,096,998 | 319,054,934 | 1,422,386,865 |

**Table No: 7.13**

| **FINANCIAL AND STATISTICAL REPORT** | PBS:Rajshahi PBS | | |
|---|---|---|---|
| TO:THE RURAL ELECTRIFICATION BOARD | Month Ending:June 2020 | | |
| Part-F: Plant and Consumer Data | | | |
| DESCRIPTION | THIS MONTH | YEAR TO DATE | CUMULATIVE FROM INCEPTION |
| 1.Services Connected | 830 | 10,550 | 241,536 |
| 2. Services Removed | | 0 | 3,628 |
| 3.Services in Place | ////////////////// | ////////////////// | 237,908 |
| 4.Idle Services(Services in Place but not Energized) | ////////////////// | ////////////////// | 0 |
| 5.Services Presently Energized(3-4 Disconnected) | ////////////////// | ////////////////// | 225,756 |
| 6.Houses Wired | 830 | 10,550 | 233,335 |
| 7.Wired Houses Inspected | 830 | 10,550 | 233,335 |
| 8.Total number of Village *( ) in PBS Area & Electrified | 0 | 0 | 914 |
| 9.Kilometers of Line Constructed – REB | 27.436 | 113.010 | 3,615,507 |
| 10.Total Kilometers PDB/DESA Lines Taken Over | 0 | 0 | 857,569 |
| 11.Kilometers of PDB/DESA Lines Renovated | 0 | 0 | 1,007,431 |
| 12.Kilometers of Lines Constructed – PBS | 5.191 | 13.337 | 132,387 |
| 13.Total Km of Lines Constructed (REB+PBS+**Taken Over) | 32.627 | 126.347 | 4,755,325 |
| 14.Total Kilometers of Lines Energized | 10.927 | 104.647 | 4,733,625 |
| *Put total number of villages<br>**In case Renovation is more than taken over renovation figure should be taken | | | |

# Chapter-8
# CONCLUSIONS

## 8.1 Conclusion:

At Rajshahi Palli Bidyut Samiti, we have learned everything from administration section to power distribution by hand. Also learned how to do Transformer oil Test, Full Load Test, No Load Test, High Tension Test, Low Tension Test, Polarity Test, Additive Polarity Test, Ratio Test, Mega Test, Overload Test. We have learned the classification of meter on site, according to the face, according to the bus, according to the load current, according to the element etc. We have learned how it works from the transmission line of the sub-station to the distribution. The transmission line includes 33 kV ACR, ACR function, potential transformer, current transformer, quantum meter, vacuum interrupter, voltage regulator, bus bar. Distribution includes feeder, hot stick, backbone feeds, lateral feeds, total feeder etc. Also technical side includes operation and maintenance, engineering and construction, power and management etc. In construction site a short line is created on the line and the line work is done at the request of the customer. In all these places of Industrial, irrigation, residential, line related work is provided under the construction site at the request of the customer. Electricity Distribution is the final stage of providing electricity to end users. A network of distribution system transports electricity from the transmission system and supplies it to customers. Also learned Administration, Human Resource, Member of Service in addition to how to provide new connections, how to improve old connections, to solve all the problems of the customers through service in one station, measure the power factor, to hold a public hearing meeting, to holder yard meeting, select the area direction etc. On the other hand, we also learned how to create a budget and ensure spending according to the budget, to calculate the Purchase and sale of electricity and to pay the price, calculate all types of expenses and their pay the principal, reading collection to bill processing, Bill delivery, meter report and inquiry etc.

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