INTERNSHIP REPORT

ON

Polli Bidyut Somity-1

By

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Department of Electrical and Electronic Engineering
Faculty of Sciences and Engineering
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in partial fulfillment of the requirements for the degree of
Bachelor of Science in Electrical and Electronic Engineering
(B.Sc. in EEE)

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Approved By

04.10.2011
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05.10.2011
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Approval Letter

To whom it may concern

This is to certify that A. H. M. Zamiul Haq Tuhin student ID 2006-2-80-027 has successfully completed the project work that was assigned to him/her as part of the internship program. I, Engineer Md. Abul Kalam Azad on behalf of REB am recommending this work as the fulfillment for the requirement of EEE 499 Industrial Training. I wish him/her success.

মোঃ আবুল কালাম আজাদ
এস.ই. এম-ইঞ্জিনিয়ারিং
ঢাকা পল্লী বিদ্যুৎ সমিতি

Md. Abul Kalam Azad

Acknowledgment

At the very beginning, I would like to thank the omnipotent Allah for giving the chance to complete my internship and preparing the internship report. The spetial thanks goes to my helpful supervisor AGM of REB Engineer Asgar. The supervision and support that he gave truly help the progression and smoothness of the internship program. The co-operation is much indeed appreciated.

My grateful thanks also go to both Mr. Saiful Islam and Engineer Sushanto. A big contribution and hard worked from both of you during the internship period is very great indeed. All projects during the program would be nothing without the enthusiasm and imagination from both of you. Besides, this internship program makes me realized that the value of working together as a team and as a new experience in working environment, which challenges us every minute. The whole program really brought us together to appreciate the true value of friendship and respect of each other.

Great deal appreciated go to the contribution of my advisor S.M Shahriar Rashid and Dr. Md. Ishfaquar Raza.

Last but not the least I would like to thank my parent, I am always inspired by them. I also like to thank my friends especially those who work together as intern at REB.

Executive Summary

Electricity is a fundamental requirement, to upgrade the socio economic condition and to alleviate poverty. Proper and enough electricity supply have a great positive impact on our national economy as well as on GDP of the country, where GDP is one of the important measures of the economic condition for a developing country like Bangladesh to attract foreign investment. But Bangladesh is going through a huge power crisis for a long time. Demand of power is very high but supply is not adequate.

Rural Electrification Board is the largest electricity distribution company in Bangladesh which is covering 61 districts and 48,687 villages. REB has 70 'Polli Bidyut Somity', through this 'Somity' REB operates and distributes electricity all over Bangladesh. Among this 'Somity' Dhaka Polli Bidyut Somity-1(PBS-1) is one of the best electricity distribution company among it's kinds. To meet the demand of consumer Dhaka PBS-1 generates electricity through Summit Power Limited and United Power Generation and distribution Company Limited. PBS-1 also has their own substation to ensure electricity supply to the user end. The main goal of REB is to improve the standard of living and quality of life for the rural people.

During our internship we observed the generation and distribution sector of REB. To observe the generation sector we visited Summit Power Limited and United Power Generation and distribution Company Limited and observe how they operate, generator factors and other technical terms of generation sector. To observe the distribution sector we visited Power Grid Company Bangladesh and their own distribution substation. From our internship we also learned about staking design and supervision and the electrical equipments they are using.

Internship Schedule

Description	Location	Date	Supervisors	Time	Hour
Power Generation in Summit Power Limited	Ashulia, Savar, Dhaka	25th September, 2010	Engineer Habib	9.30-4.00	6.00
United Power Generation and Distribution Company Limited	EPZ Savar, Dhaka	09th October, 2010	A.S.M. Ahsan Habib	9.30-5.00	7.00
Grid Substation	Hamannogor, Savar	18th September, 2010	Safiul Islam	9.30-4.00	6.00
Distribution Substation	Nobinogor, Savar	8th September, 2010	Saiful Islam	9.30-4.00	6.00
Staking, Design and Supervision	Nobinogor, Savar	6th November, 2010	Engineer Shushanto	9.30-5.00	7.00
Construction, Operation and Maintenance	Nobinogor, Savar	2th October, 2010	Engineer Shushanto	9.30-5.00	7.00
Nipor Service	Nobinogor, Savar	16th October, 2010	Safiul Isam	9.30-5.00	7.00
Engineer service	Nobinogor, Savar	23th October, 2010	Engineer Shushanto	9.30-5.00	7.00
Member Service	Nobinogor, Savar	30th August, 2010	N/A	9.30-4.00	6.00
Finance Section	Nobinogor, Savar	27th November, 2010	N/A	9.30-5.00	7.00
Consult Service	Nobinogor, Savar	4th October, 2010	N/A	9.30-5.00	7.00
				Total	=73

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1.1. Motivation of Internship:

Internship is the part of the undergraduate degree in EEE department of the East West University. Internship is merged the theoretical and practical knowledge which is important for our career. For developing the practical knowledge we want to do internship. We have been completed our major area in Power Engraining. Rural Electrification Board or Polli Bidyut Somity is the leading electricity distribution company in rural and industrial area in Bangladesh. Polli Bidyut Somity-1 is ensured us to the best support for developing the practical knowledge with the help of the theoretical knowledge. In our internship we have been learned how power plant generates power, what is the distribution system or process for Power Distribution Company and other relevant topics. My internship supervisor S. M. Shahriar Rashid Research Lecturer of Electrical & Electronic Engineering department, he gave enough support to complete the internship and prepare the final internship report. And the objective of the internship report will be the important source for them, who want to thesis in power sector or power distribution system. At the end of this report will give a short summary of the industrial training.

1.2. Company profile:

The Bangladesh Rural Electrification (RE) Program was founded with a Presidential Ordinance in October 1977 that established the Rural Electrification Board (REB) as the semiautonomous government agency reporting to the Ministry of Power Energy and Minerals Resources. Which was responsible for electrifying rural Bangladesh. Since its inception, the purpose of the program has been to use electricity as a means of creating opportunities for improving agricultural production and enhancing socio-economic development in rural areas, whereby there would be improvements in the standard of living and quality of life for the rural people.

REB sets forth the following major objectives in implementing the rural electrification program:

- Ensure peoples participation in policy formulation in a democratic way.
- Provide reliable and sustainable electricity to the rural people at affordable price.
- Improve economic condition of the rural people by using electricity in agriculture, cottage and agro based industry.

- Improve living condition of rural peoples.
- Bring about entire rural Bangladesh under RE program or an area coverage basis.

To fulfill the objectives today there are 70 operating rural electric cooperatives called Palli Bidyuit Samity (PBS), which bring service to approximately 79,00,000 new connection being made and more than 14,000 kms of line being constructed each year. Now a days they are also launching a new program which is known as one client one ampere. Among this 70 PBS, except PBS-1 all are in loss.

There are six departments in each PBS:

- Member Service
- General Service
- NIPOR Service
- Finance Department
- Revenue
- Engineering Section

The greatest result of Rural Electrification program has been achieved in the agricultural sector. The use of electric pumps for irrigation in the dry seasons (January-April) brought revolution in the food production culture. Boro paddy produced in this dry period fully depends on irrigation from surface or underground water. Hand driven tube wells proved to be inadequate for large fields and diesel pumps are too expensive source of water. Diesel pumps need regular maintenance, skilled operators and mechanics are not readily available. This method of irrigation lost popularity in course of time and farmers showed reluctance to use diesel pumps. Comparatively cheap irrigation of land is provided by electric pumps which need negligible maintenance.

As a result, popularity of electric irrigation pumps among farmers of Bangladesh has grown up in past years. With less than 2000 electric pumps in 1981-82 Fiscal Year, the number of pumps come under electrification has increased tremendously exceeding 1,31,795 up to October, 2010. The role of Rural Electrification Board and GOB in popularizing electric pumps in agricultural sector was very important. Although tariff of all other categories of consumers has gone up over a period of time, tariff for irrigation consumption remains almost same for last five years. It enables the farmers to keep cost of production low and price of products competitive in the market.

The followings are the main features of rural electrification in Bangladesh as on October, 2010.

Table1.1: Main features of REB

Number of RES organized	**70**
Number of RES operating commerciall	70
Number of district under the program	61
Number of Up-Zillas under the prograi	433
Number of villages electrified	48,687
Total distribution line constructed	2,22,780 Km (June'10)
Total distribution line energized	2,26,558 Km (Oct'10)
Total 33/11 KV sub-stations constructe and commissioned	426 (343 Constructed by REB, 83 take over from PDB/DPDC/OTHERS)
Installed Capacity of Sub-stations	2825 MVA
Total number of consumers	81,20,611
Total number of irrigation pumps connected	1,31,795
System Los	14.85% (cumulative),12.03% (Oct'10)

1.3. Territory of REB:

REB already covered almost all of the part of our country. Mainly they provide electricity in rural areas but they also distributed in industrial areas. They covered all most 2, 22,608 Km line. The territorial map is given below in consists of figure 1.1:

Figure 1.1: Territorial map of REB

In Polli Bidyut Somity-1 has covered four numbers of the Up-Zillas and these areas are Savar, Dhamray, Kaliakor and Gazipur. And the territorial figure of the PBS-1 which shows in figure 1.2 and which is given below:

Figure 1.2: Territorial map of PBS-1

1.4. Development of PBS-1 in relation to Socio Economics arena:

During our internship we meet a few numbers of consumers and discuses about the feature of the socio economic development. The mission of the Polli Bidyut Somity is to develop the rural area. In Bangladesh, we mainly depend on agriculture. Most of the rural people are mainly farming or doing small type business. Extension of infrastructure in rural areas is essential for bringing down any meaningful change in the rural living patterns. Before our liberation in the year 1971, we had little facilities created for the rural people. Virtually, govt. had little opportunities for expansion of the distribution network in a massive scale. In 1972, Rural Electrification Directorate (under Power Development Board) was established to gear up efforts towards formation of a separate body responsible for electrifying rural areas. In 1976 NRECA conducted a feasibility study for reaching electricity to each and every rural home and other rural establishments. As a result Rural Electrification Board was formed to take up efforts at bringing down changes in rural living patterns. Rural Electric societies have provided jobs to rural families. In addition, a total of 8000 persons are employed in the construction firms and consulting offices working for the program. Rural people now have much better work-habits and an improved sense of discipline and social security, which came as a result of the assurances of basic amenities in life. Figure 1.3 proves that they work for social development and this figure is the true statement of their development.

Figure1.3: Social Development by REB

Women of the rural areas are enjoying the benefits of electricity very well. They can do extra work after household job and increasing family earnings. Women are getting self-dependent, making small groups of income generating purposes, specially rearing poultry and cattle, making vegetable farms & taking-up weaving and sewing projects and opening small shops.

The use of light during evening ensures women's safe movement from one place to another. Electricity has left a profound impact on women's mobility, participation in income generating activities (IGAs), decision-making, freedom of using income and saving, better utilization of credit, knowledge about gender inequality issues, household work plan according to convenience, changes attitude in terms of reducing health care disparities, increase in overall years of schooling for both boys and girls, preference to send girls to schools, awareness of legal issues (i.e., marriage for girls at 18 and boys at 21) and awareness about negative impact of dowry.

They are gaining much more knowledge and thus produce modernization effect. About 15 areas of knowledge disseminated through radio or TV include the value of good health:

- Value of education
- Value of female education
- Utility of family planning
- Development of knowledge-base through news

- Improvement in agriculture practice
- Knowledge of modern fishing
- Knowledge of pest management
- Govt. program for the distribution of Khas land
- Prohibition of dowry
- Laws about divorce
- Legal tools to combat violence against women
- Local governance issues
- Women right issues
- Issues of human rights

Rural Electricity has acted as a leap-forward in the development of commercial activities in rural Bangladesh. Out of the total shops in Bangladesh an estimate 24% are using rural electricity. Electrified commercial establishments are more attached to market.

In agriculture, rural electricity program (REP) has significantly in attaining food self-sufficiency through use of productive and efficient irrigation equipments. Both land use intensity and cropping intensity with electrified pumps (DTW/STW/LLP) is higher than diesel operated. Average yield per acre under electrified pumps is 24% higher than that of diesel operated ones. Electrified pumps contribute one-third of the food self-sufficiency in Bangladesh. REP through its electrified irrigation pumps covers 4.1 million acres of land for HYV Boro and Aman. REP irrigated land produces 6.43 million tons of HYV Boro and Aman, which is about 29% of all similar types of rice, produced in Bangladesh. 20% rebate to the electric bill to the irrigation pumps sanctioned by govt. induces the farmer to enhance the agricultural growth. As agricultural productivity has increased, availability of rice & other food items in villages have helped rural people to maintain better food habits.

A recent USAID study's findings and assessments about impact of the rural electrification program in Bangladesh are the following:-

- Presently 55.41% villages and 5.08 million rural households are electrified and no. of beneficiaries is 30.5 million.
- Literacy rate in the electrified HHs is 71%, where 54% in the un-electrified HHs.
- Electrified HHs use daily 50 minutes more than that of non-electrified HHs between sunset and sleep.
- In the electrified HHs students study 23 minutes more than the non-electrified HHs daily.
- 78.2% HHs reported an increase on working house.
- 62.0 % HHs reported an increase in HHs income.
- 81% HHs reported an increase in reading habits.
- 93.7% reported an increase in children's study time.
- 92.0% reported an increase in amusement as well as standard of living.
- About 68% of currently married women in the electrified HHs reported of using contraceptive methods, where in the non-electrified HHs the rate is 63%.
- 61% electrified HHs use hygiene latrine, where only 29% non-electrified HHs use the same latrine.
- 53% women of the electrified HHs reported allowing young girls/women to work outside the village.
- 71% women of the electrified HHs reported that a couple should have two children.
- Annual energy cost (diesel) saving by all electric pumps $2.41 million by not using diesel.
- Creates 5.06 million direct employment opportunities in the electrified irrigation pumps, industries and commercial shops.

Based on the empirical findings presented above, it would be pertinent to conclude that rural electricity has profound and far-reaching economic, socio-cultural and demographic impacts on life and living of the rural people in Bangladesh. It has significant and sustained impact on agricultural growth, industrialization and business and commercial activities. It has impact on human capital formation through knowledge building mediated through electricity-driven media exposure. Thus, in order to accelerate the process of economic growth, strengthening pro-poor orientation in the growth process, attain the millennium development goal with an emphasis to PRSP and to further boost up human development in Bangladesh access to electricity of the households and social and economic institutions should be expanded within shortest time.

1.5 Scope And Methodology:

Electricity has a great impact in our national economy and REB is a major distributor of electricity. During our internship we came to know that among 70 Polli Bidyut Somity only PBS-1 makes profit and all other PBS are in loss. One part of our internship was to visit the generation and distribution station of PBS-1.For this purpose we visited Summit Power Plant at Ashulia and United Power Generation & Distribution at Savar EPZ. During our intern at Summit Power and UPGD we observe the generator facts, how they operate, synchronizing condition of generator, memic diagram of power station and the protection devices, their electricity contribution to REB and how they provide it to the consumers.

We visited Power Grid Company Bangladesh and their own distribution station to observe the distribution system. For protection purpose REB uses mostly vacuum circuit breaker and for higher safety SF6 circuit breaker on their substations. We also learn about bus bar arrangement, staking design and supervision and other electrical equipment.

We also observe the departments of REB, it has five individual departments. They are Nipor Section, Engineering Section, Member Service, Finance Section and Consultant Service. We observe the revenue collection of the month September which is done by the Finance Department. During this time we also learn about load shedding and how they maintain the schedule of load shedding. These observation helps us to complete our internship and gives us a practical knowledge on electricity generation and distribution.

Chapter-2: Power Generation

2.1 Introduction:

This chapter will focus on power generation of REB. The generation of PBS-1 is covered by Summit Power and UPGD. UPGD covers only Export Processing Zones (EPZ) and rest of the PBS-1 area is covered by Summit Power and by the rationing of PDB. Both of the power plant rechargeable battery for backup and both the power plant runs by natural gas. For the overall view of the power station Memic diagram is used. There control system is automatic and highly secured.

2.2 Power Generation:

The Rural Electrification Board (REB) is charged with the responsibility to provide financial support, technical oversight, and long-term direction to the rural electrification program in Bangladesh. Throughout its 32 years history, REB has performed exceedingly well and has risen to the challenges that have faced the establishment and continued development of this program. REB has sponsored the foundation of 70 PBSs connecting nearly 8 million electric services, representing slightly over 45% of the rural population of Bangladesh. The power supply crisis it now faces represents a serious challenge to the rural electric program, and correspondingly REB is taking steps to prepare itself to provide technical leadership to overcome the obstacles, this crisis has placed before the program. In the aim of alleviating the power shortage problem of the country, the Ministry of Energy, decided to go for Small scale power generation on B.O.O. basis under the auspices of REB and accordingly gave directives to REB in 1998 for the construction of 10 MW power stations in financially viable PBSs.

REB, accordingly, selected 3 (three) sites, namely Dhaka PBS-1, Narsingdi PBS-1 and Comilla PBS-1 for implementing its 1st phase of Small Scale Power Generation as Pilot Project. Guaranteed Net Plant Capacity of each of the power station is 11 MW. Power generation of said three PBS has already been commissioned. Recently another six IPP has been commissioned.

Table 2.1: The power plant details of REB

Name of PBS	Name of the Power Plant	Capacity (MW)	Date of Contract	Date of Commer Operation	Name of Company
Dhaka-1	(i) Ashulia Power Plant (ii) Ashulia Expansion Power Plant	11.00 33.75	10/02/2000 20/03/2006	01/09/2003 04/12/2007	Summit Power Limited
Narshingdi-1	(i) Madhabdi Power Plant (ii) Madhabdi Expansion Power Plant	11.00 24.30	10/02/2000 28/06/2005	01/09/2003 16/12/2006	Summit Power Limited
Comilla-1	(i) Chandina Power Plant (ii) Chandina Expansion Power Plant	11.00 13.50	10/02/2000 28/06/2005	01/09/2003 15/11/2006	Summit Power Limited
Narshingdi-2	Norsingdi Power Plant	22.00	11/10/2007	21/12/2008	Doreen Power Generation & systems Ltd.
Hobigonj	Hobigonj Power Plant	11.00	11/10/2007	10/01/2009	Energypac confidence power venture Ltd.
Sirajgonj	Ullapara Power Plant	11.00	11/10/2007	02/03/2009	Summit Uttaranch Power Co. Ltd.
Mymensingh-2	Maona Power Plant	33.00	11/10/2007	12/05/2009	Summit Uttaranch Power Co. Ltd.
Feni	Feni Power Plant	11.00	11/10/2007	25/04/2009	Doreen Power House & Technologies Ltd
Narayangonj	Rupgonj Power Pla	33.00	11/10/2007	09/06/2009	Summit Purbanch Power Co. Ltd.
	Total	225.55			

2.3 Our Observation:

We observed that the generation part of PBS-1 is covered by UPGD (United Power Generation and Distribution Company Limited) and Summit Power Limited.

We learnt that though energy is convenient for alternator, so the heat or sun or any type of energy can be converted into Electrical Energy' that means Electrical Energy converted into Mechanical Energy. There are various types of alternator can be used such as water, coal, diesel, with fuel and without fuel etc. Normally gas, steam, diesel, petrol engine is used in UPGD (United Power Generation and Distribution Company Limited). Though there are two power plant of PBS-1 for generation power, UPGD is one of the power plant between these two. Another power generation power plant SUMMIT Power also similar type for generation. Summit Power has increased this plant's production capacity by 33.75 MW with the total output being 46 MW. This project was set up to provide electricity for Dhaka Palli Bidyut Samity-1 less than 100 years Power Purchase Agreement (PPA). An implementation agreement has also been signed with the Government of Bangladesh (GOB).

Lean burn engine is used in UPGD where water reserve is main function of its own. According to gas distribution from TITAS UPGD can supply 22MW to 25MW in Dhaka EPZ. But the total generation capacity is being 41MW. Thus in January 2007 United Power Generation & Distribution Co. Ltd. (formerly known as Malancha Holdings Ltd.) was born out of the necessity for uninterrupted, quality power supply to the industries housed within the Export Processing Zones (EPZ) of Bangladesh. Natural gas is morally used hence because of more available, sufficient and low cost than diesel. The efficiency of diesels engine is very greater than efficiency of gas engine. Also diesel engine is big in size otherwise gas engine is small in size so gas engine needs small place. But water engine is more sufficient and it also be low maintenance cost engine. Though technology depends on generation so in steam turbine waste energy is reuse by combine cycle. Heat turbine=1/3*capacity of heat turbine.

Here we show the main feature of the United Power Generation and Distribution Company Limited consists of the total capacity, types of generator they use, when they start in commercially, number of generators, who are their client etc:

Generation Capacity per Generator: 3.73 Megawatts and 8.73 Megawatts

Fuel: Natural Gas

Location: Asulia, Dhaka

Number of Generators: 7

Capacity: 46 Megawatts

Number of Battery: 110

Commercial Operation Date: February, 2001 and January, 2008

Clientele: Polli Bidyut Somity-1

2.4. Memic diagram of power Station:

Memic diagram is required for the overall view of the power station with bus-bar arrangement which shows in figure 2.2. Every power station has the memic diagram in the station and it will be used in various ways such as it indicates the total feeder number, arrangement of the feeders, transformers, circuit breakers, current transformers, potential transformers etc. This memic diagram provides the plant manager of the UPGD and it is given in below:

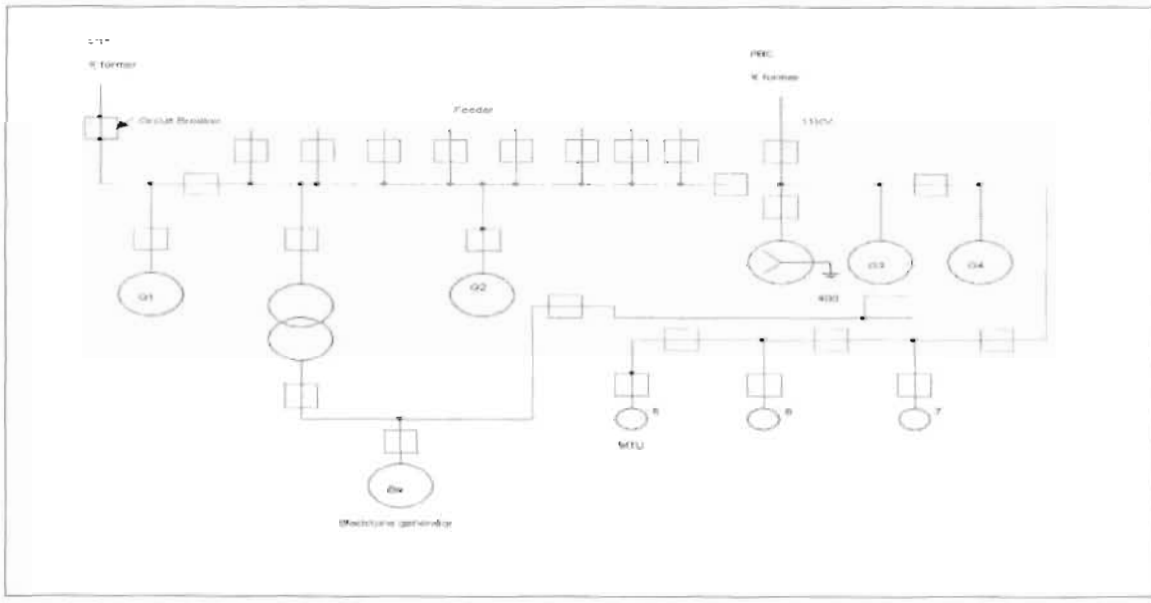


Figure2.2: Memic Diagram of the Power Station

Requirement of Power Plant:

Electricity is the most vital resource for economic growth. For this resources requirement of Power Plant is essential. Power plant operators control and monitor boilers, turbines, generators, and

auxiliary equipment in power-generating plants. They distribute power among generators, regulate the output from several generators, and monitor instruments to maintain voltage and regulate electricity flows from the plant. When demand changes, power plant operators communicate with dispatchers at distribution centers to match production with adjusting the load. On the basis of this communication, they start and stop generators, altering the amount of electricity output. They also check that everything in the plant is operating correctly or not and keep records of switching operations and loads on generators, lines, and transformers. In all of these tasks, they use computers to report unusual incidents, malfunctioning equipment, or maintenance performed during their shifts. Especially some essential systems are shown in bellow for a power plant:

- Engine and its accessories like radiator fuel, reserves, water etc.
- Alternator (generator)which are self excited type.
- Switchgear like CT (current Transformer) which is used to step-down current, PT (power transformer) which is also used to step-down potential current. In figure 2.3 we shows the two types CT one is pole mounted single phase CT and another is 11KV CT. Both of this figure we have been seen during internship period in the grid substation, distribution substation and in the transmission lines.

Figure2.3: Current Transformer rating 150:5(Pole mounted and 11KV)

- Sub -station where there are Transformer, CB, Isolator, feeder etc.
- Others: Into others there should be DCS, Control panel and its required system.

❖ Control panel: Control panel is an essential part of a power plant. This diagram shows the arrangement of the control panel which includes engine, alternator, bus-bar,

substation, distribution substation, etc. Now we show the control panel in figure 2.4 which is given by the plant manager of UPGD:

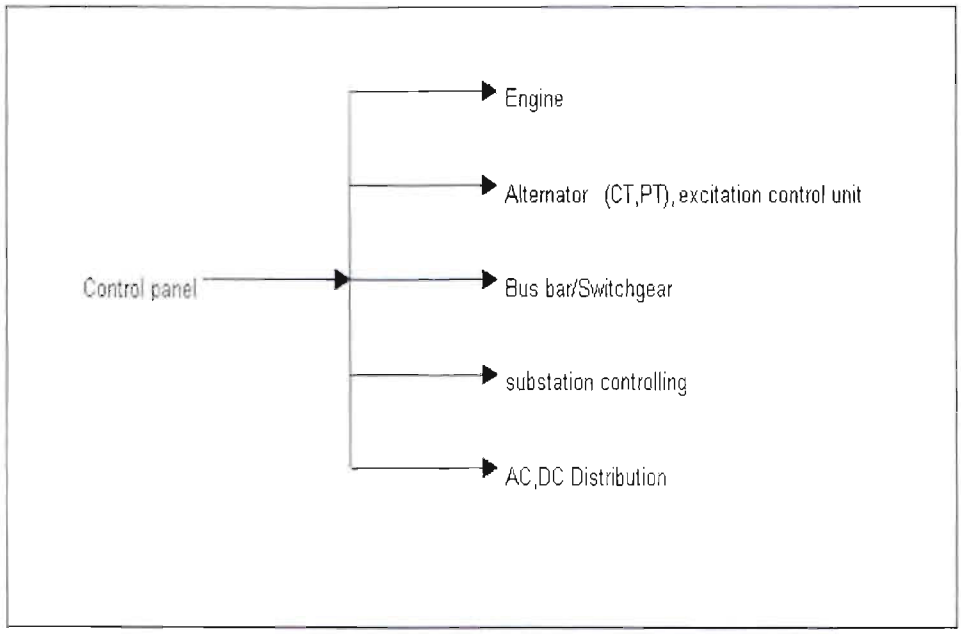


Figure2.4: Control Panel of UPGD

- DCS: DCS is the scatter system which is used in the power plant. The DCS system consists of distributed process units, procedure I/Os, human-machine interfaces and control software. It monitors and controls these boilers, turbines, thermal auxiliary equipment, generators, transformers and power supply systems[1]. In figure 2.5 we show the DCS scatter which is used in REB and only includes AVR, CT (current transformer) and PT (potential transformer).

Figure2.5: DCS(Containing AVR,CT,PT)

2.5. Synchronizing condition:

The process of connecting an AC generator (alternator) to other AC generators is known as synchronization and is crucial for the generation of AC electrical power. A synchronizer system includes a sequencer which is largely embodied in the digital computer as an element of the automatic control and it further includes a synchronizer which is external to the automatic control. The sequencer connects the synchronizer to synchronize the three generators in a sequence which depends on the startup and loading operation of the turbines, the synchronization operation of the synchronizer and the operation of the breakers. Turbine speed changes are initiated by the speed/load control under synchronizer control.

The alternator must have equal of,

I. *line voltage*,

II. *frequency*,

III. *phase sequence*,

IV. *phase angle*

V. and *waveform*

To that of the system to which it is being synchronized. Waveform and phase sequence are fixed by the construction of the generator and its connections to the system, but VOLTAGE, FREQUENCY and PHASE ANGLE must be controlled each time a generator is to be connected to a grid.

2.6. Synchronous generator:

In that unit of control room there was synchronizing frequency display, synchronizing voltage display and synchronoscope, reset button, plant emergency- stop- button and also synchronizing control unit. During our internship we learn about the parameter of the control unit of the generator. In above we mention that the voltage, phase and frequency will be same as generator unit and bus-bar. The result will be shown with the help of the parameter of the control panel of synchronizing frequency display, synchronizing voltage display and synchronoscope. Reset button will be need when the system will face any kind of trouble. Plant emergency stop will be need in emergency stop of the plant in an emergency case. All the work we have been learning in our internship with the help of the Summit Power Limited. In figure 2.6 we show the synchronous generator control unit which is provided by the internship supervisor of the Summit Power Limited:

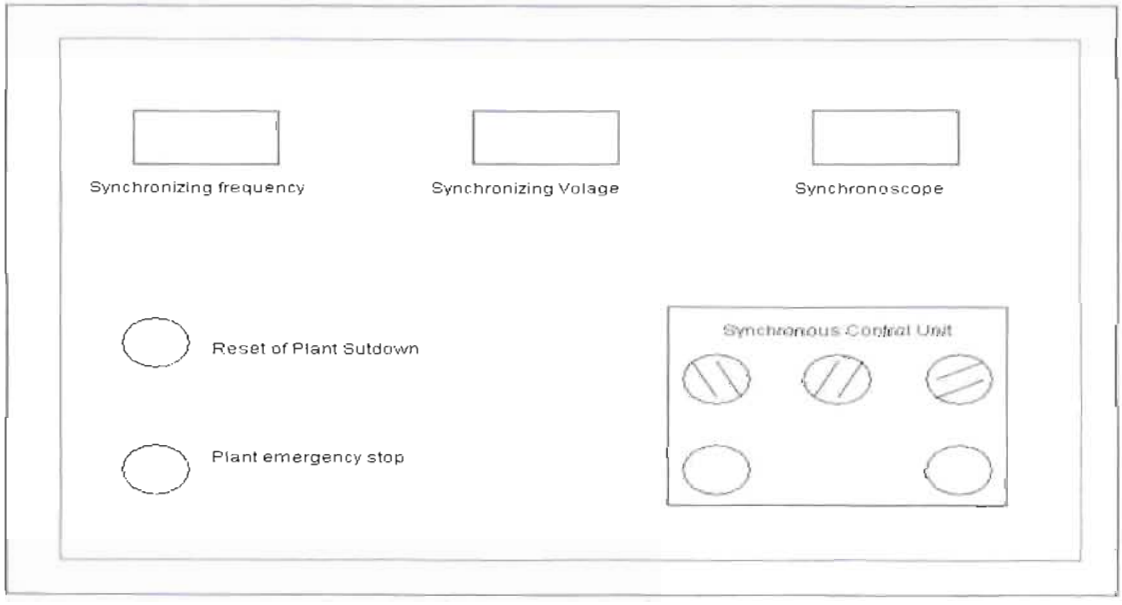


Figure 2.6: Synchronous Generator Controlling Unit of Summit power plant

Alternator: Alternators are used in UPGD are self excited generator provided from ABB Company. And alternator's frequency is 50Hz, 11kv, 750rpm and power factor is 0.8.

Transformer: There are two 30MVA transformers are used in UPGD which are auto tap change type are provided from Energy pack supplier of Bangladesh. In transformer there also spark plug system which creates high voltage, also DC voltage is converted into AC voltage by pulse leading DC. PLC automatically does tapping of transformer:

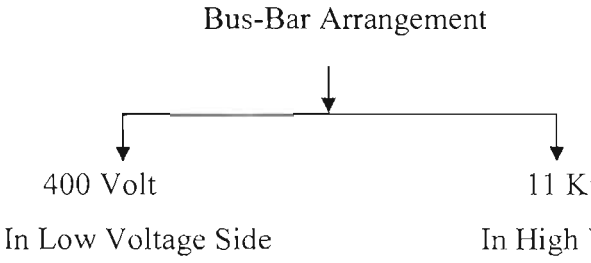
2.7. Control Panel:

A control panel is a flat, often vertical, area where control or monitoring instruments are displayed. They are found in places such as nuclear power plants, ships, aircraft and mainframe computers.

- Differential relay: Most differential-relay applications are of the 'current-differential' type.
- PLC: A programmable logic controller (PLC) or programmable controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or lighting fixtures
- Ventilation unit: Generator is used in this unit.
- Rectifier unit: In this unit AC is converted into 110volt and 24volt DC. For 110Volt each of 92 Battery consumes1.5Volt. And for 24 Volt each of 12 batteries consumes 2 Volt. Battery capacity is measured by observing since how much time battery will give amp-hour. All battery is VRLA (Ventilation Lead Acid battery) type. For illustration we observed that 400 amp-hours give 24 Volt and 120 amp-hours give 110 Volt. In that unit variable frequency diode used for varying frequency to change rpm (rotation per minute).

Switchgear: The term switchgear, used in association with the electric power system, or grid, refers to the combination of electrical disconnects, fuses and/or circuit breakers used to isolate electrical equipment. Switchgear is used both to de-energize equipment to allow work to be done

and to clear faults downstream. Here Bus-Bar Arrangement is shown in bellow by a flow chart of load division in switchgear :



From upper flow chart of load division we see that main Bus-Bar Arrangement (BBA) is divided into two side's .Where 400 Volt in Low Voltage Side and 11 Kilo Volts in High Voltage Side.

- Circuit Breaker (CB): Most of the circuit breaker is vacuum circuit breaker but SF6 circuit breaker is used in Alternator side (Wartsila Finland) because of more safety.
- NGR (Natural Grounding Resistance).
- PPE (Personal Protective Equipment): Such as heal mate, ear-protection, and glass.
- Fire Protection: Fire, water, fire extinguisher.

MTU: Engine control panel capacity 548degree centigrade.

Auxiliary control panel: Wartsila (Finland) engine consume 500 degree centigrade.

Radiator: In figure 2.7 we show the radiator which is captured in UPGD. In radiator there are 24 fans are used in radiator unit. Where 24 fans are arranged in three columns and each column consumes 8 fans to come out hot air for cooling purpose. Radiator always ensure that the maximum cooling of the generator which is learn in our internship.

Figure 2.7: Radiator(with 14 fans) exhaust at UPGD

Though SUMMIT POWER and United Power Generation and Distribution Company Limited (UPGD) cover the generation part of REB (Rural Electrification Board) .So SUMMIT POWER provides 46 MW for REB. Each four generator provides 8.73MW individually and another three generator also provide 3.73MW individually. Hence most of the Circuit Breakers (CB) is provided from Energy Pack. At first in 2000 SUMMIT POWER provides 11MW for REB later in 2008 this supply capacity was extended to 35MW. Diesel engines are provided form Italy are Wartsila (Finland) type which is used for their own service. 33KV engines are purchased from SIMENSE Company. In sub-station transformer are also used for tapping purpose of 33KV side to 11KV side. If 11KV side reduces at 9KV then by tapping it is done 11KV by transformer.

Actually generating power plant of UPGD and SUMMIT POWER are same from constructional view. Hence also Radiator unit and there 48 fans are used. Those 48 fans are arranged in six columns and each column contains 8 fans exhaust hot air for cooling purpose also. All battery is provided by Rahimafrooz Company Limited. All battery is used for engine controlling in load shedding condition.

2.8 Conclusion:

From this chapter we learn about two power generations station UPGD and Summit Power. Both of them provide electricity to Dhaka PBS-1. We also learn the capacity of the power stations and learn which type of Lean burn engine is used in UPGD. Most of the circuit breaker used in this power plants are vacuum circuit breaker but SF6 circuit breaker is used in Alternator side (Wartsila Finland) because of more safety. Through this chapter have a complete overview on power station and their using components.

Chapter-3: Power Distribution

3.1 Introduction:

This Chapter will focus on the distribution side. Substation is used for distribution purpose. To establish a substation there are some important points which have to be maintained. Different types of substations are used to meet the different requirements which we will learn through this chapter. This chapter will also focus on circuit breaker used in substation, arrester and earthling. We also learn about Current transformer, potential transformer and bus bar arrangement from this chapter. And finally we will learn why transformer is used in both end of the substation and the household.

3.2. Power Distribution:

Electricity distribution is the final stage in the delivery of electricity to end users. A distribution system's network carries electricity from the transmission system and delivers it to consumers. Typically, the network would include medium-voltage (less than 50 kV) power lines, electrical substations and pole-mounted transformers, low-voltage (less than 1 kV) distribution wiring and sometimes electricity meters.

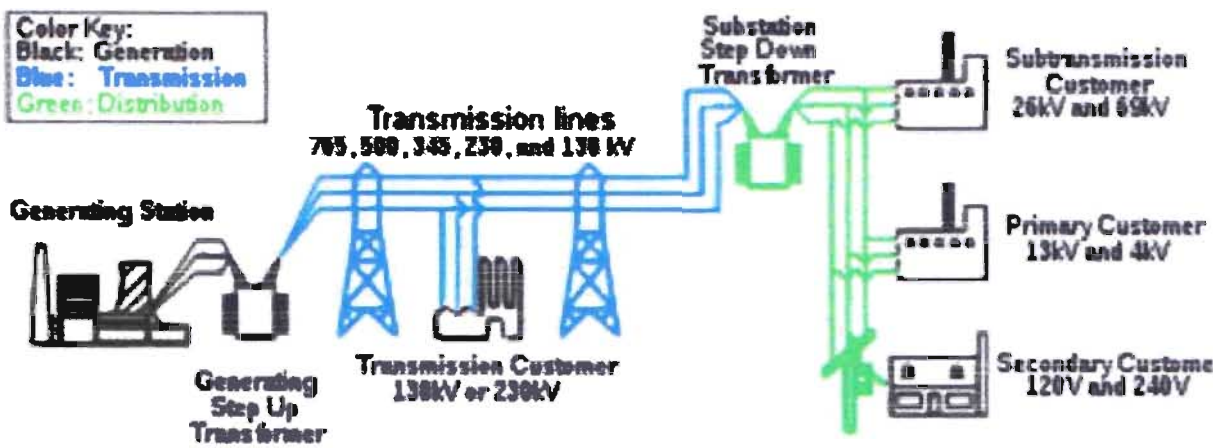


Figure3.1: Power Distribution(generation to consumer end)

The same phenomenon is applicable for REB. At first power come to the Grid Station(415 kv) from National Grid, then power transmitted to the substation(33/415kv). From substation power is transmitted to the bus bar(11/33kv) and then to the consumer through transformer.

3.3. Substations:

The assembly of apparatus used to change same characteristics of electric power supply e.g voltage, ac to dc; frequency etc is called a substation. Substations are important part of the power system. The continuity of supply depends to a considerable extent upon the successful operation of substations. It is, therefore, essential to exercise utmost care while designing and building a substation. There are some important points which must be kept in view while lying out of a substation. These points are given below:

- It should be located at a proper site. As far as possible, it should be located at the centre of gravity of load.
- It should be provide safe and reliable arrangement. Due safety, consideration must be given to the maintenance of regulation clearances, facilities for carrying out repair and maintenance abnormal occurrences such as possibility of explosion or fire etc.
- It should be easily operated and maintained.
- It should be involve minimum capital cost.

Classification of substations:

There are several ways of classifying substations. However, there are two most important ways of classifying the substations. These classifications are given below:

- On the basis of service requirement and
- On the basis of constructional features.

According to service requirement:

A substation may be called upon to change the voltage level or improve power factor or convert ac power into dc power etc. according to the service requirement substation may be classified into:

- **Transformer Substations:** These substations which are changing the voltage level of electric supply are called transformer substations. These substations are receiving power at same voltage and delivering at another voltage. Obviously, transformer will be the main component in such substations.

- **Switching Substations:** These substations do not change the voltage level i.e incoming and outgoing lines have same voltage but it performs the switching operations of the power lines.

- **Power factor correction Substations:** Those substations which improve the power factor of the system are called power factor correction substations. Such substations are generally located at the receiving end of the transmission lines. These substations generally use synchronous condensers as the power factor improvement equipment.

- **Frequency changer Substations:** Those substations are changing the supply frequency are known as frequency changer substations. Frequency change may be needed for industrial purpose.

- **Converting Substations:** Those substations which change ac power to dc power are called converting substations. These substations receive ac power and convert into dc power or it receives dc power and converts it into ac power.

- **Industrial Substations:** Those substations which supply power to individual industrial concerns are known as industrial substations.

According to constructional feature:

A substation has many components which must be housed properly to ensure continuous and reliable service. For the constructional feature the substations are classifying in given below:

- **Indoor Substations:** For voltage up to 11KV, the equipment of the substation is installed indoor because of the economic considerations.

- **Outdoor Substations:** For voltages beyond 66KV, equipment is invariably installed outdoor. It is because for such voltages, the clearances between conductors and the space required for switches, circuit breakers and other equipment becomes so great that it is not economical to install the equipment indoor.

- **Underground Substations:** Where the population growth rate is high and the space is not available for the substations, underground substations are applicable for those areas.

- **Pole mounted Substations:** This is an outdoor type substation with equipment installed over head on H pole or 4 pole structure. It is the cheapest form of substation for voltages not exceeding 11KV or some extraordinary case in 33KV. Electric power is almost distributed in localities through such substations.

3.4. Transformer Substations:

The majority of the substations in the power system are concerned with the changing of the voltage level of electric supply. Transformer substations are four types depending on the purposed or used. Classification of these transformer substations are given below:

- **Step-up Substation:** Step-up substation is being situated at end of the generator side. In our internship we have been visited two power stations. Both of the stations supply 11KV at end of the generator side.

- **Grid Substation:** From the step-up substation, electric power at 220KV or 132KV etc. is transmitted by 3-phase. 3 wire overhead system to the outskirts of the city. Here electric power is received by the primary grid substation which reduces the voltage level to 66KV or 33 KV or any another type for secondary transmission. Generally grid substation is of outdoor type.

- **Secondary Substation:** From the grid substation, electric power is transmitted at 66 KV or 33 KV or ant another type by 3-phase, 3-wure system to various secondary substations located at the strategic points in the city. At a secondary substation the voltage is further stepped down to 11 KV. The 11 KV lines run along the important road sides of the city. It may be noted that big consumers are generally supplied power at 11 KV for further handling with their own substations. The secondary type substations are also called outdoor type substations.

- **Distribution Substation:** The electric power from 11 KV lines is delivered to distribution substations. These substations are located near the consumers' localities and to 400V or 230V. 3-phase or 4-wire for supplying to the consumers. The voltage between any two phases is 400V and the voltage between any phase and neutral is 230V.

Equipment of the Grid Substation:

The equipments required for a substation which is depend on the type of the substation and service requirements. However a transformer has the following equipments. These equipments are described in the given below:

- **Bus-bars:** Bus-bar is necessary when multi lines are operating at the same voltage have to be directly connected electrically, bus-bars are used as the common electrical component. All the bars are copper or aluminum bars. All the incoming and outgoing lines are connected to the bus-bar.

Figure 3.2: Bus-Bar of Substation(double bus bar arrangement)

Figure 3.2 shows the bus-bar which is necessary because it consists of incoming line and outgoing line. It is needed to transmit the electricity through one end to another. There are 3(three) types of bus-bar arrangements. According to the theory types of bus-bar arrangement is given below:

- **Single bus-bar arrangement:** In figure 3.3 consists of a single bus-bar and all the incoming and outgoing lines are connected to it. Initially is low cost arrangement, less maintenance and simple operation. If there is a fault then the total system is affected by it.

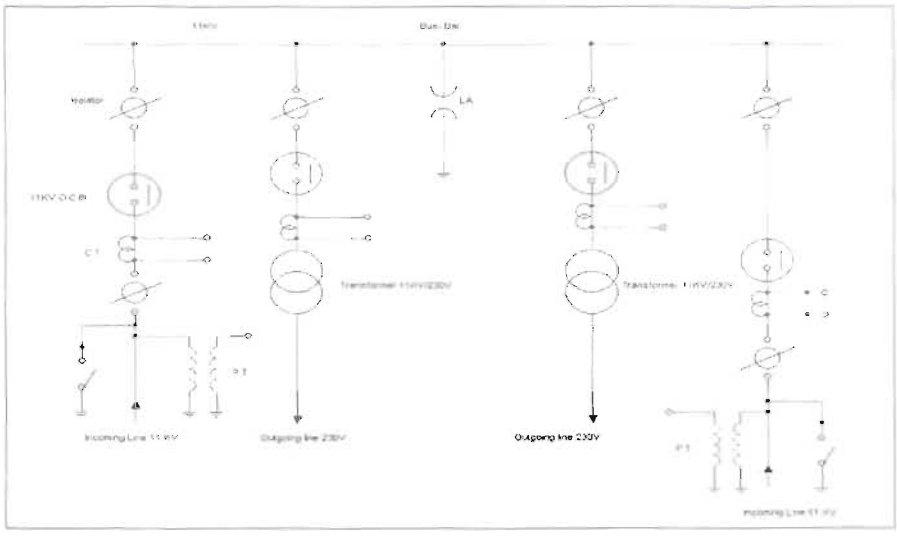


Figure 3.3: Single Bus-Bar Arrangement

- **Single bus-bar system with sectionalization:** The single bus-bar arrangement is divided into section and load is equally distributed on all the sections. Between two sections connected with circuit breaker and isolator which is showing in figure 3.4.

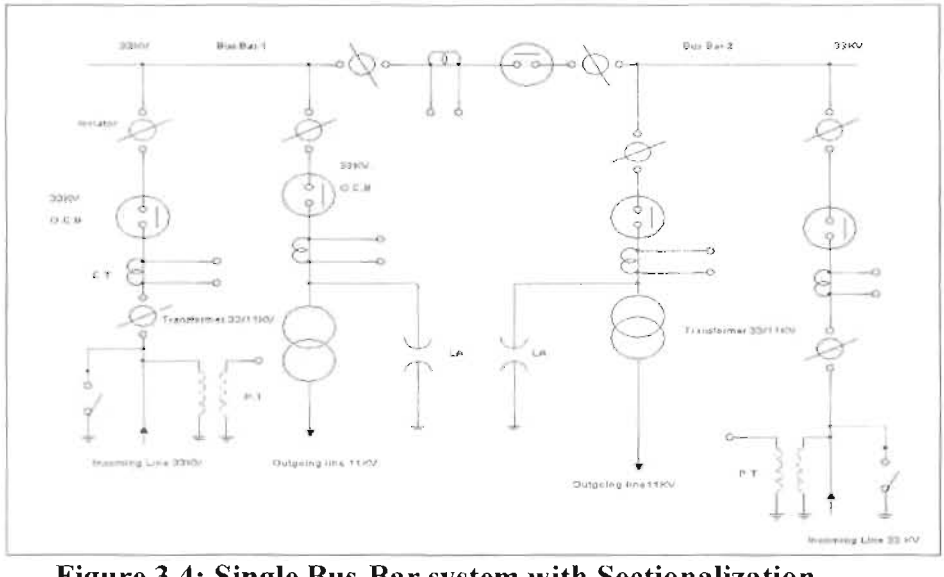


Figure 3.4: Single Bus-Bar system with Sectionalization

- **Double bus-bar arrangement:** In figure 3.5 double bus-bar arrangement consisting of the two bus-bars, a main bus-bars and a spare bus-bar. Incoming and outgoing both have multi-line bus-bars, they are connected in separates lines.

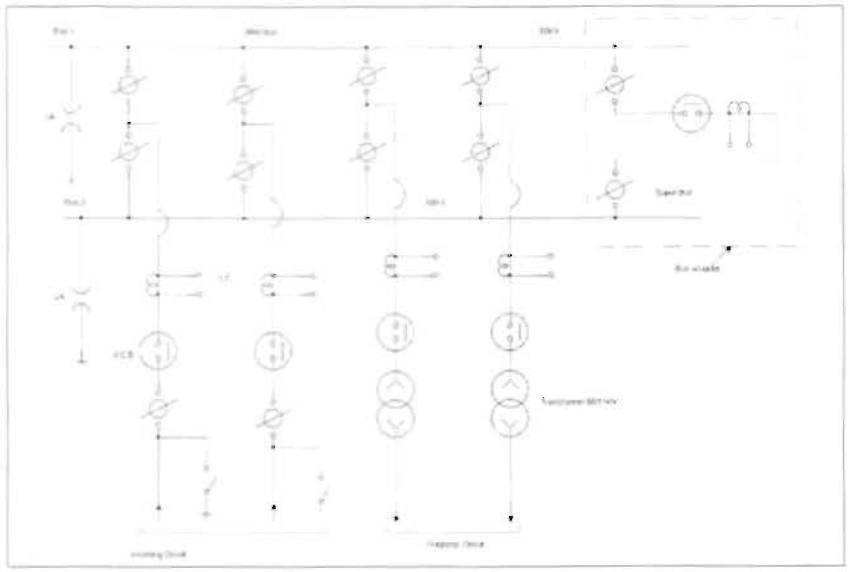


Figure 3.5: Double Bus-Bar Arrangement

In PBS-1 all kinds of substation are double bus-bars arrangements what we have seen. Grid substation of the Hamannogor, Savar has also the double bus-bars arrangements. Double bus-bar arrangement has the main advantage is that if any of the bus has occurred in a fault then there is no effect to other bus at that time so that all of the consumer is not affected to the fault. PBS-1 is used this advantage which we see there.

- **Insulators:** We know that the insulator serves two purposes. One is they support the conductors (or bus-bars) and confine the current to the conductors. In our internship we see porcelain insulator which is the most commonly used material for the manufacture of insulators is porcelain. There are several types of insulators (e.g. pin type, suspension type, post insulator etc.). And their use in the substation will depend upon the service requirement. For example, post insulator is used for bus-bars. A post insulator consists of a porcelain body, cast iron cap and flanged cast iron base. The hole in the cap is threaded so that bus- bars can be directly bolted to the cap.

- **Isolating Switches:** In substation, it is often desired to disconnect a part of the system for general maintenance and repairs. This is accomplishing by an isolating switch or isolator. An isolator is essentially a knife switch which is designed to open a circuit under no load. In other words, isolator switches are operated only when the lines in which they are connected carry no current.

- **Circuit Breaker:** A circuit breaker is equipment which can open or close a circuit under normal operation as well as fault condition. In Hamannogor grid substation, all the circuit breaker is SF6 type. In closed position of the breaker, the contacts remain surrounded by SF6 gas and the pressure of the gas is 2.8 kg/cm^2. When the breaker operates the pressure of the gas is goes to 14kg/cm^2. We know that the high pressure flow of SF6 can absorb the free electron easily. During our internship we know that the pressure of the SF6 circuit breaker are 2.8 kg/cm^2 in normal condition of the circuit breaker and the abnormal condition this pressure rise to the 14kg/cm^2. If the pressure goes down then the circuit breaker do not able to do proper work and it may be risky for the whole system and also it is dangerous to system protection. This kind of circuit breaker will be costly in the since of the high cost of the SF6 gas. But it is environment friendly because it cannot deposit the high amount of carbon. And it also low maintenances cost and the light foundation requirement. Over all in this grid substation has ensure that the protection is valid and it is user friendly.

- **Power Transformers:** A power transformer is used in a substation to step- up or step down the voltage. It is important part for a substation; we also mention that power transformer is required for any type of substation. Except at the power station, all the subsequent sub- station use step- down transformers to gradually reduce the voltage of electric supply and finally deliver it at utilization voltage. The modern practice is to use 3-phase transformers in substation, although 3 single phase bank of transformers can also be used. The use of 3-phase transformer (instead of 3 single phase bank of transformers) permits two advantages. Firstly, only one 3 phase load tap changing mechanism can be used. Secondly, its installation is much simpler that the three single phase transformers. We know from our internship the power transformer is gradually installed upon lengths of rails fixed on concrete slabs having foundation 1 to 1.5 m deep. For rating up to 10 MVA, naturally cooled, and also forced air immersed transformers are used. For higher ratings, the transformers are generally normal and forced air cooled.

- **Instrument Transformation:** in the grid substation the main lines in sub-station operate at high voltage and carry current of thousand of amperes which we have seen. The measuring instruments and protective devices are designed for low voltage (generally

110V) and currents (about 5A). Therefore, they will not work satisfactorily if mounted directly on the power lines. This difficulty is overcome by installing instrument transformers on the power lines. The function of these instruments of these instrument transformers is to transfer voltage or currents in the power lines to values which are convenient for the operation of measuring instruments and relays. There are two types of instrument transformation viz.

- Current Transformer (C.T)
- Potential Transformer (P.T)

❖ **Current Transformer (C.T.):** A current transformer in essentially a step-up transformer which steps down the current to a known ratio. The primary of this transformer consists of one or more turns of fine wire and provides for the measuring instruments and relays a current which is a constant fraction of the current in the line. Suppose in the Hamannogor grid substation, a current transformer rated at 100:5 A is connected in the line to measure current. If the current the line is 100 A, then current in the secondary will be 5A. Similarly, it current in the line is 50A, then secondary of C.T. will have a current of 2.5 A. Thus the C.T. under consideration will step down the line current by a factor of 20.

❖ **Voltage Transformer:** It is essentially a step down the voltage to known ratio. The primary of this transformer consists of a large number of turns of fine wire connected across the line. The secondary winding consists of a few turns and provides for measuring instruments and relays a voltage which is a known fraction of the line voltage. Suppose in the Hamannogor grid substation, a potential transformer is rated at 132KV/33KV is connected to a power line. If line voltage is 132KV, then voltage across the secondary will be 33KV.

➢ **Metering and Indicating Instrument:** There are several metering and indicating instruments (e.g. ammeters, voltmeters, energy meters etc.) installed in a sub-station to maintain watch over the circuit quantities. The instrument transformers are invariably used with them for satisfactory operation what we observed during our intern.

- **Miscellaneous Equipment:** In addition to above, there may be following equipment in a substation which we also see:
  - Fuses
  - Carrier-current equipment
  - Substation auxiliary supplies

3.5. Arrester and Earthling:

- In a grid substation lighting arrester, absorber and earthling is important factor for protecting it. Lighting arrester or surge diverter is a protective device which conducts the high voltage surges on the grid substation to the ground. These devices work under three conditions. These three conditions are given here. Under normal operation, on the occurrence of the over voltage and non linear operation of the arrestor are the three different conditions. And there is various type of the lighting arrestor which we use in different purpose of the grid substation. Lighting arrestor are five types and these difference is only possible for constructional details. With respect to the difference, the main purpose of the lighting arrestor is same but there have some advantage and disadvantage which we describe in below in tabular from:

Table 3.1: Description about different type Arrester

Name	Description
Rod type arrestor	Very simple type and consists of the two rods. One is connected to the cir and another is connected to the earth.
Horn type arrestor	Consists two rods with a small air gap. One of the end is connected to the l through resistance and inductor on the other hand another end is connected to ground.
Multigap arrestor	Consists of a series of metallic cylinders insulated from one another and separa by small intervals of air gaps.
Expulsion type arrestor	Also called protector tube and used in mainly operating upto 33KV.
Valve type arrestor	Important for non linear resistors and operating at high voltages.

- In Hamannogor grid substation, horn type arrestor has been used which we observed. Horn type arrestor has two separate horns. The horns are so constructed that distance between them gradually increase. Both the horns are porcelain type insulators. It has a resistance and inductor or coil so that it helps to follow the limiting current through the resistance. During the intern we observe some advantage and limitation about the horn type arrestor. This type arrestor will be able to the self clearing arc and series resistance will be able to pass the limited current. On the other hand we know horn type arrestor have also some disadvantage. The setting of horn gap is likely to change due to corrosion or pitting and it has adverse affects on the performance of the lighting arrestor. Operation time is comparatively long, which we mention that around three seconds. Surge absorber is also a protective device which reduces the steepness of wave front of a surge by absorbing surge energy. Now we show the block diagram of the horn type lighting arrestor is given below with the help of the figure 3.6:

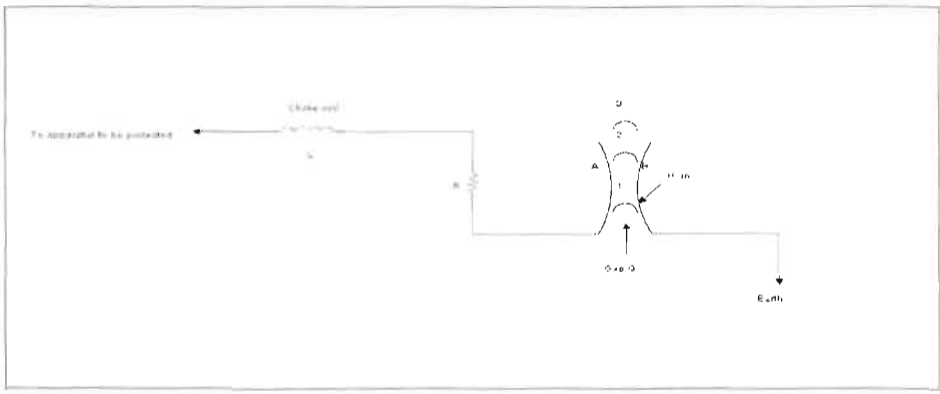


Figure3.6: Lighting arrestor

3.6 Conclusion:

From this chapter we learn about power distribution and how electricity is distributed. We learn that electric power from 11 KV lines is delivered to distribution substations. We also learn that the voltage between any two phases is 400V and the voltage between any phase and neutral is 230V. This chapter also contain the information about which type of circuit breaker and arrester is used for safety purpose in grid station. We also learn about the type of bus bar arrangement used in REB and its benefit.

Chapter-4: Distribution Substation

4.1 Introduction:

Through this chapter we will learn about distribution substation and its impact on Polli Bidyut Somity-1. Through distribution substation voltage level is maintained. We will also learn about staking design and supervision department of REB. We also learn that by proper functioning of this department user get their deserved connection. We will also learn from this chapter that why the authority of REB has to do load shedding and why they have to maintain a load shedding schedule.

4.1 Distribution Substation:

During our internship we have been visited a distribution substation which is located in the main yard of the polli bidyut somity-1. In this distribution substation, 33KV voltages come from the step-up transformer and it reduced the voltage level to 230V. There are 19 distribution substations and this substation is out of this. In this distribution substation Here we see the PT (Potential Transformer) rating 33KV:240V and this rating is fixed in the substation. And also we observe the CT (Current Transformer) rating 150:5 which is variable. There are two distributing unit and the capacity of one of these unit is 20MW and the unit capacity is 10MW. Here the entire transformer is single phase and the number of the transformer is 6. We know in here the rating of the power transformer is 3.33 MVA. In REB whole the distribution system with line is Y connected. Here we see the use of the voltage regulator. Voltage regulator 10% voltage increase or decrease of the whole system and we also the use of filter valve, filter valve is used to see level of the oil. Oil is an important factor of the transformer and transformer oil must be changed when it could be smashed. Temperature of the transformer must be below 60°C because of protection. For 33KV bus-bar we need 6 lighting arrestor and all of the lighting arrestor is horn type. In a substation there is more than 4 feeders but in this substation there are 6 feeders because of the good service providing. In figure 4.1 we have been shown the block diagram of the distribution substation. This figure consists of circuit breaker which is operated by SF6 gas, bus-bar which is double bus-bar arrangement, CT, PT, power transformer etc. All this information is provided by the internship supervisor during our internship. Now we show the figure in the next page:

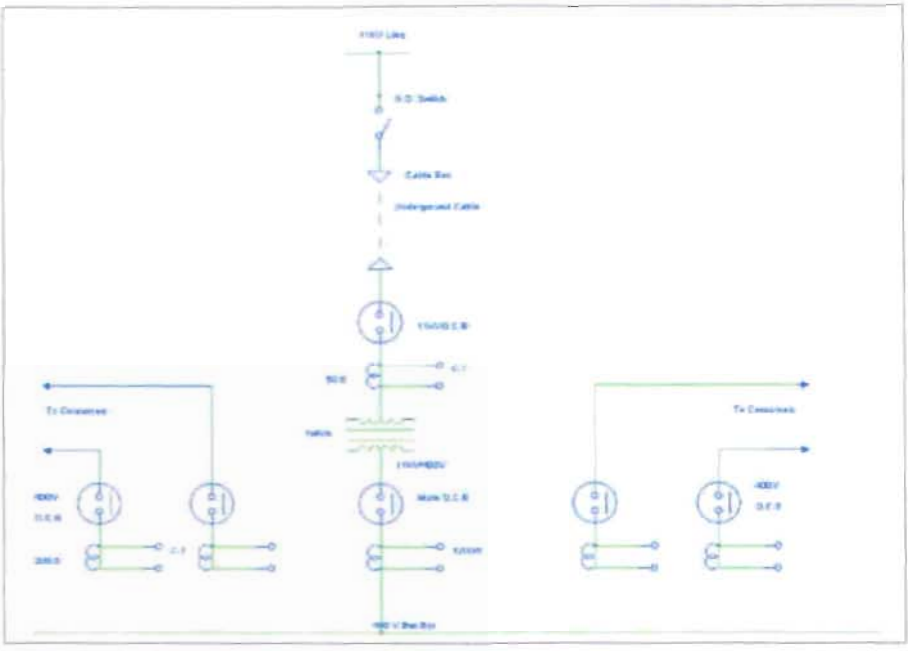


Figure 4.1:Layout of Distribution substation

Now we show the overall view of the distribution substation in figure 4.2 and consisting parameter description in above:

Figure 4.2: Overall View of the Distribution Substation

Already we mention that the in distribution substation they use single phase transformer and these transformer is manufactured by the Toshiba Company and now we show the nameplate of these transformer.

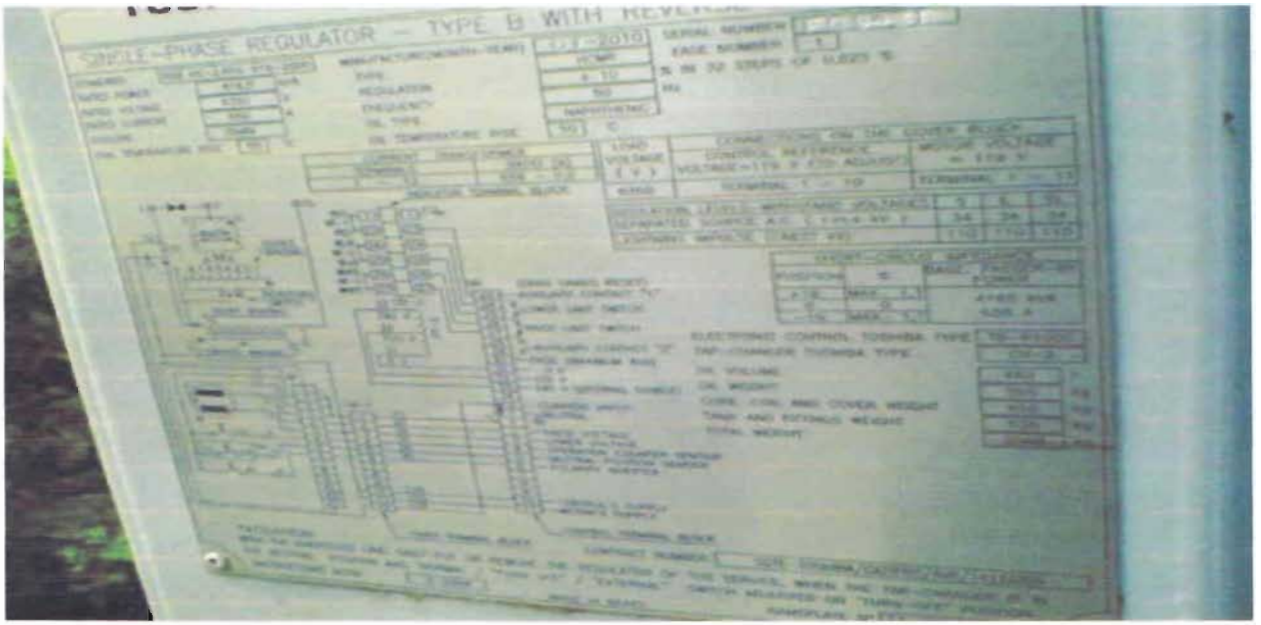


Figure 4.3: Nameplate of the Transformer (3.33 MVA)

4.3 Staking Designing and Supervision:

Staking design and supervision is an important part of the PBS-1 for both the consumer and the somity. It is need to the somity for distributing the proper service and it is helpful for updating the behavior of the organization. Staking and supervision department is working for the constructing the new lines and design department also works for design the new line or new area or to provide the best service. Sectionalization of the line and to create the road map for the new consumer is also responsibilities for the staking department. To set up the fuse and ACR in the line, to ensure the same voltage we establish the voltage regulator in the line which is also responsibilities of the staking department. Suppose there are 8 consumers the distance of the transformer is 200foot. So that there is possible power factor and voltage drop will measured by this process

8*200 foot = 1600A.Foot

We know from here, V= IR = IL [here L=R; L=length]

So that V= 1600A.Foot / 1950 = 0.8 [here 1950=constant]

Theoretically possible power factor will be 0.8 but voltage drop might be increase to 11V and in LD it would be 9.2V. Calculate the voltage drop is the important work for this section and it directly related to the consumer premises. This department also studies the system loss of this samity. Now we show the system loss flow chart (percentage vs year) from 1981 to 2009 is given below in figure 4.4:

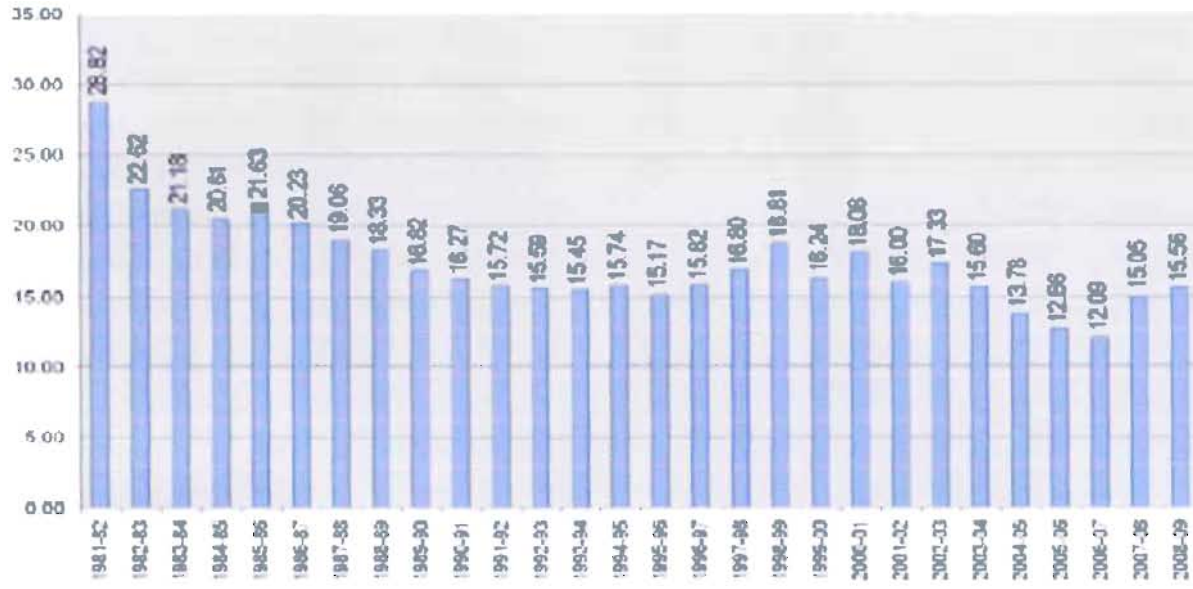


Figure 4.4: System Loss Chart

The data of this chart we collect from the polli bidyut somity. This system loss is depending on the many other things such as technical loss, over load loss, cross section loss etc.

4.4. Load Shedding:

Now we show the average load shedding of month September, 2010 at different time with the help of the table 4.1 consists of demand and supply is given:

Table4.1: Load Shedding Information of September

Serial	Time	Demand	Supply
1	1.00 AM	3953 MW	2960 MW
2	5.00 AM	3405 MW	3405 MW
3	10.00 AM	4980 MW	2858 MW
4	17.00 PM	5225 MW	2703 MW
5	20.00 PM	5515 MW	2523 MW
6	23.00 PM	5430 MW	2567 MW

Now we show column chart for the load shedding in gig watts with the help of figure 4.5. Here series1 represents that the load demand and series2 represents the total supply in the month September, 2010.

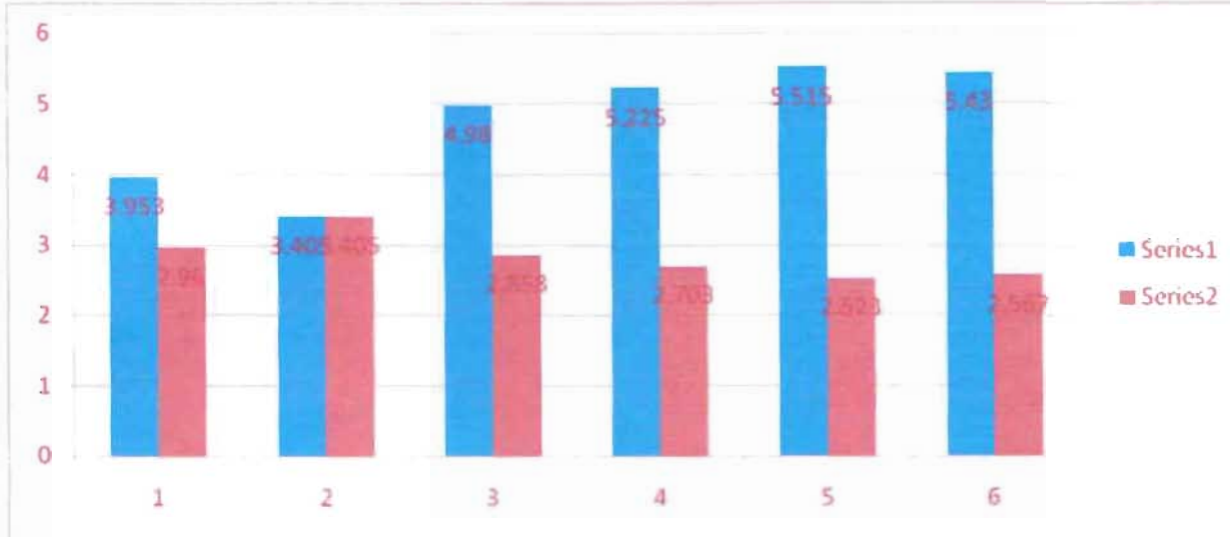


Figure 4.5: Load Shedding Scenario in September

4.5 Conclusion:

Through this chapter we learn that in distribution substation 33KV voltage is reduced to 230V for the consumer's end and the rating of CT and PT used in the distribution substation is 150:5 and 33KV:240V which is variable. We also learn that to provide a connection it is very important to calculate the power factor and voltage drop which is done by the staking design and supervision department and we also learn about the system loses of REB. Because of less resource and as the supply is almost half of the demand REB have to face the load shedding problem.

Chapter-5: Departments of REB

5.1 Introduction:

To operate properly an organization needs different departments. This chapter will focus on the departments of REB, their duties and responsibilities. To get a connection or line from REB consumer have to maintain few procedure which we will learn through this chapter. We will also learn through this chapter that what type of facility and service is provided by REB and their campaign to make their user conscious about fair uses of electricity as they have limited supply of electricity.

5.2 Other Departments of REB:

We have been learning during our internship various kinds of other activities. The Polli Bidyut Somity-1 has the five sections of their other activities which are learning during our internship. All the activities are interred related to each other. All sections are responsible to run somity. In the internship we work these sections and try to learn how they work or how they organize it. Now we describe these sections in given below:

- **Nipor Section:** In nipor section, all staffs are working together for maintaining the line and for constructing the line.Maintenance and construction is the main requirement for purchaseing a connection. When a consumer receives the line or connection then he or she became a member of the somity. Then he or she is also responsible for preserving the line.

- **Engineering Section:** In engineering section, we learn how they investigate the constructing line and also they supply the necessary equipment for the consumer to get connection. This section also records the system loss information and the information of the peak demand. They also recorded the total receiving power from the grid substation and also distributed power. Damaged transformers also repair from this section. Repairing transformer and supply the new transformer to the consumer or distribution substation is also the major responsibilities for the engineering section. Engineering section also work for sudden accident when it happen and ensure the best solution as early as possible. Load dispose center also works under this section. Engineering

department estimating that how long the line will be constructed for relevant year and they pass their estimate from their higher authority. The entire engineer and the staff will work together as their target. Polarity testing and the required number of the pole supply will the responsibilities of the engineering section. In here we show the figure 5.1 how they repair the transformer and fill up the oil in the transformer which we have seen is given below:

Figure 5.1: Repairing Transformer at PBS-1

- **Member Service:** Member service is most important part for the somity which we know, when we go to the internship. For the member somity have been established at one point service center. In the one point service center a member will solve their any kind of problem which they face. One point service is too much effective for a consumer because they do not face any problem to solve a problem and also it is time saving service for a consumer. In one point service, all the worker of this section is motivated to serve properly. Increasing member is also the responsibilities of the one point service.

- **Finance Section:** Finance department is working to collect the bill from the consumer and they also record the total earning revenue from the consumer. In finance section also determine the bill per unit. In below we show the table 5 consists of the number of different type consumer, total different type revenue of this month and the percentage of the total revenue of the current month September:

Table 5.1: Total Revenue of the month September

Contents	Class of Service	Number of the Connections	Amount of the Revenue	Percentage of the total Revenue
1	Domestic	1, 42,959	77,513,781	29.63%
2	Commercial	18,769	26,158,667	10%
3	Irrigation	3823	803,727	0.31%
4	Charity Organization	1507	1,057,405	0.404%
5	General Power	4489	91,690,070	35.05%
6	Large Power	83	32,551,135	12.44%
7	Street Lights	183	40,094	0.02%
8	Resale to other PBS	0	31,787,119	12.15%
	Total	1, 71,768	261,601,998	100.004%

Now we show the pie-chart of the percentage of the total revenue of this month in figure 5.2 consists of the percentage of the total revenue and these data will be taken from above table

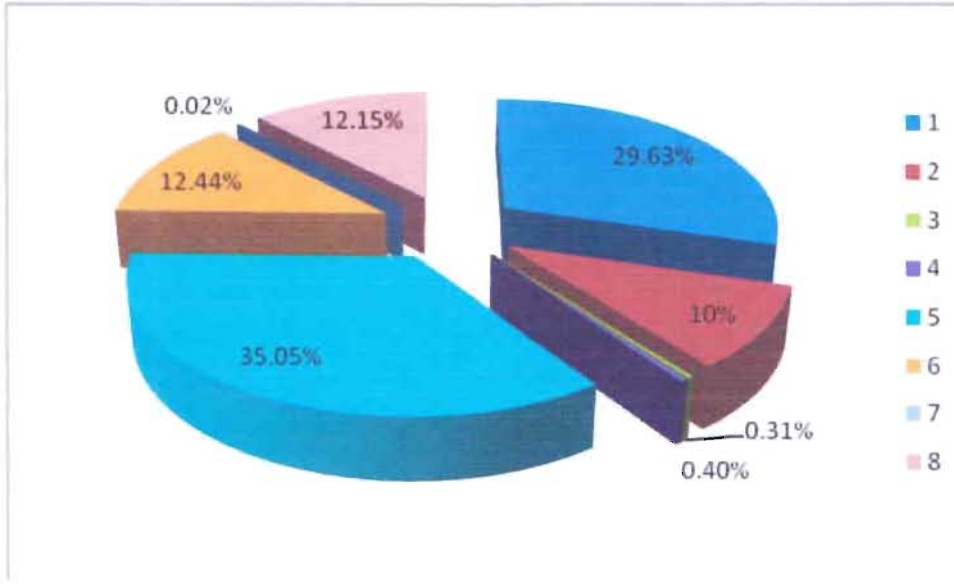


Figure5.2:Pie-Chart for total revenue collection of the month September

- **Consultant Service:** Consultant department works transparently because it is responsible for other works. This section calculated and receives the extra equipment for doing their running project. If this department is refused any kind of bill so that they cannot able to collect the bill from the finance section. This section cannot pass any bill without proper investigation and proper authorization reference. Future master planning and field survey will be held under the consultant section. Consultant department calculate the number of the member when a new line will be constructed.

5.3 Conclusion:

At the end of this chapter we came to know that to operate properly REB has five different departments. If any client wants a line or connection from REB they have to come to the consultant service department. After investigation if Consultant Service gives the permission then Nipor Section construct the line. Load shedding schedule and maintenance is done by the Engineering Department and the revenue collection is done by the Finance Department. Member Service provides service to their existing consumer.

Chapter-6: Recommendation And Conclusion

6.1 Problems and Recommendation:

We have completed our internship on 27th November 2010. During our intern ship we came to know that REB faces lot of problems and they also have some limitations. Transformer stealing is one of the major problem of REB. Criminals stole 13 transformers of Moulvibazar Palli Bidyut Samity (PBS) in last two months, causing immense sufferings to the consumers of electricity in rural areas of the district. In July, five transformers were stolen from Shaymerkuna, Ashia, Mukundapur and Kamalpur areas of Moulvibazar Sadar upazila and Baramchal of Kulaura upazila, which we informed by the PBS officials . Now REB is strict to stop this type of crime, according to the rules and regulations of the PBS, the transformer is provided free of cost at the time of opening electricity supply in any area. If transformer is stolen from an area for the first time, the authority is to pay 50 percent and the consumers concerned are to pay the rest for installing a new transformer. But in case of a stealing for the second time and afterwards, the consumers have to make full payment for a transformer to resume electricity supply, and for commercial use the concern company have to purchase the transformer from the opening of electricity supply. They also need social awareness to stop this crime.

During our internship we were unable to learn that how much gas is required to produce one MW electricity, that was our limitation. To complete our internship and to understand the technical terms properly Power System Protection and Power Station these two courses helps us. So if someone want to do internship at REB, they need to complete these two courses and stay in REB's quarter and it will be better if they choose it after completion of there all academic courses.

6.2 Conclusion:

At the end of our internship we want to clearly say that the REB (Rural Electrification Board) is the semi-autonomous government agency reporting to the Ministry of Power Energy and Minerals Resources, which was responsible for electrifying rural Bangladesh. REB is charged with the responsibility to provide financial support, technical oversight, and long-term direction to the rural electrification program in Bangladesh. There are foreign and local electrical consultants working in PBS. Though REB takes generation from Summit Power Limited and United Power Generation and Distribution Company Limited and grid supply from PGCB (Power Grid Company Bangladesh) so REB has commitment with those company for supplying Power. However, although we have huge lack of electricity in Bangladesh but all of generation, Grid supply, sub-station, consultancy, local member service of REB is more efficient and taking important role to cover lack of electricity.

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Appendix A
Glossary

Acronyms

REB	Rural Electrification Board
GDP	Gross Domestic Product
GOB	Government of Bangladesh
KWh	Kilo-Watt-Hour
KV	Kilo-Volt
MW	Mega Watt
PBS	Polli Biddut Somity
PBS-1	Polli Bidyut Somity-1
PDB	Power Development Board
PGCB	Power Grid Company Bangladesh
UPGD	United Power Generation and Distribution Company Limited
PT	Potential Transformer
CT	Current Transformer
LD	Load Division
LA	Lighting Arrestor
IGA	Income Generating Activities
EPZ	Export Processing Zones
AVR	Automatic Voltage Regulator