FIELD STUDY ON ELECTRICITY IMPORT AND DISTRIBUTION OF MADARIPUR PBS

A Thesis paper

Submitted in partial fulfillment of the requirements for the degree of

Bachelor of Electrical and Electronic Engineering

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October- 2022

Certification

The following student worked on this thesis, "**Field Study on Electricity Import and Distribution of Madaripur PBS**" under my close supervision, and at the lab of the Department of Electrical and Electronic Engineering. The Bachelor of Science in Electrical and Electronic Engineering requirements are partially satisfied by the Daffodil International University Faculty of Engineering. A work presentation is held,

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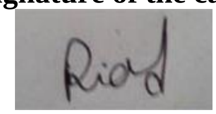

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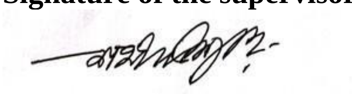

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ACKNOWLEDGEMENT

First of all I express my gratitude to Almighty Allah who has given me the ability to complete this work. I am deeply grateful to my very sincere supervisor **Prof. Dr. MD Shahid Ullah, Professor and head, Department of EEE**, Daffodil International University, for his unparalleled encouragement and timely guidance. Sir solved every problem beautifully and encouraged my work with proper guidance.

Also I would like to express my special gratitude to my co-supervisor **MD. Ramjan Ali, Lecturer, Department of EEE,** for guiding me with his valuable suggestions and constructive criticism of my work in the midst of his busy schedule and helping me to complete the work. I would like to thank all the officers and employees of Madaripur Palli Bidyut Samity including the respected DGM Sir MD. Abdul Majed, DGM, Madaripur PBS and Junior Engineer MD Mehedi Hasan, AJE, Madaripur PBS. Because without their cooperation I would not have been able to complete this work. They have been very cooperative in any need and have collected the information very politely and provided it to me as soon as I asked for any information. I am thankful to my family and friends who have always supported and encouraged me in my studies. Finally I am thankful to God that I have been able to complete the work successfully.

ABSTRACT

Sufficient power generation and proper supply is essential for socio-economic and infrastructural development of a developing country like Bangladesh. After independence in 1971, the country's most difficult and essential commodity was electricity, while some urban areas were covered by electricity facilities, it was a difficult task to reach people in rural areas. For that purpose, the government established the Rural Electrification Board from the Bangladesh Power Development Board in 1977 to deliver the electricity produced in Bangladesh to all parts of the country. At present, electricity is being delivered to 99.5% of people in Bangladesh through eighty rural electricity societies under the Rural Electrification Board. The utility of using electricity depends on its cost base, which is determined by the cost of generation, transmission and distribution of electricity. In this paper we have taken **Madaripur Palli Bidyut Samity (MPBS)** as a standard PBS which is a distribution company. Here we have presented their electricity purchase and sale information. Like energy import, energy distribution cost, monthly consumer, system loss, power factor penalty etc. We have also tried to highlight the social and economic impact of the region along with their number of customers, types of customers, substation equipment. We have also highlighted the organization's total distribution cost, distribution cost per unit, total supply cost, supply cost per unit, total revenue, power purchase cost, system loss, quotation and many more. By observing all these data, we can get an idea about the income and expenses of such distribution organizations in the future and we can invent new methods to balance income and expenses. Finally we can say that Madaripur Palli Bidyut Samity is an important distribution company which is playing an important role in electricity supply like other distribution companies.

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- Chapter 9: Conclusions, Limitations of the Work.

CHAPTER 1

INTRODUCTION

1.1 Introduction

At present, there has been a revolutionary change in rural electrification in our country. As a result, the quality of life in rural towns has improved and economic prosperity has come. The rural electrification system is a cost-effective delivery system through which 99.5% of people in Bangladesh are covered by electricity facilities. This rural electrification system has gradually brought a dark country to the path of light after the war of liberation. Through my laboratory, I have tried to show how to provide electricity to rural towns more cost-effectively and safely with less loss. I have also tried to highlight how to overcome the traditional problems. The Rural Electrification Board established in 1977 made the process of rural township development easier and faster.

1.2 Introduction of REB

In 1971, when Bangladesh became independence, the first major project of the electricity sector was undertaken in 1975 with the aim of extending electricity supply to remote rural areas. The project was called Total Electrification Program. Which till 1978 played an important effective role including the basic structure and development of electricity supply in rural areas. At the same time it was envisaged to establish an institutional framework that would promote technological, financial and social development in the rural townships. After that, at the request of the Rural Electrification Project Committee, the Government of Bangladesh decided to establish a new national organization under the Ministry of Power to develop and manage the rural electrification program. Accordingly, the Rural Electrification Board was established on 29 October 1977, which started functioning on 1 January 1978. The objectives with which the organization started are:

- Bringing entire Bangladesh under electrification through expansion of electricity supply.
- Providing affordable electricity to all.
- Ensuring reliable and sustainable power supply to the people in rural areas.

- To improve the economic condition of rural areas by ensuring electricity supply required for agricultural work.
- To help improve the quality of life of people in rural towns.
- Ensuring participation of consumers in formulating electricity consumption policies.

The mission of BREB is to ensure affordable, reliable, sustainable and modern electricity services for all people of the country by 2030. BREB is working towards that goal. Government of Bangladesh provides all facilities to the organizations involved in power generation and supply to achieve their goals. So that no obstacle is created to reach the target set by 2030. BREB is working hard to achieve this goal along with their PBSs.

And the Vision OF REB is to ensure quality electricity service for all people of Bangladesh.

This organization forms Rural Electricity Societies on cooperative principle and through these Rural Electricity Societies constructs electricity distribution lines and sub-stations in urban and rural areas under the said society. In this way, the organization implements the electricity distribution program in the rural areas of the country. The headquarters of the company is located in Nikunja, Dhaka. At present, BREB has established a total of eighty PBS across the country and has brought electricity to 84 thousand 400 villages in 462 upazilas of 64 districts. BREB is supplying electricity to a total of 3.2 million consumers by constructing 1160 substations and 5.38 thousand kilometers of distribution lines.

Website of Bangladesh Rural Electrification Board	www.reb.gov.bd
Establishment as BREB	1978
Date of 1st Electrification	2 June 1980
Total Employees	1447
Total SE offices	12
No PBSs electrified	80
RE program Area:	
a. Total District	64
b. Total Upazila	462
c. Total Village	84800
d. Total Population	About 13 Crore
Approved Project Numbers	83
Constructed 33/11 KV Sub-Station	1,160
Distribution Sub-stations Capacity	10075
Total energized distribution line	5,38,000KM
Monthly Sale	TK 2,100 Crore
system Loss (80 PBSs)	9.67%
Consumers	3.20 Crore

1.3 Achievements of last economical Year 2021-2022

It has always been exciting news that the Bangladesh Rural Electrification Board (BREB), the nation's main rural electrification organization, would release its annual report for the fiscal year 2020–2021. Government has designated "MUJIB YEAR" as the palli bidyut service year for BREB. It is a source of pride that grid 462-upozila has already been completely electrified.

The Prime Minister Sheikh Hasina has already officially opened the remaining 288 upozila that have been fully electrified. The BREB's effort to work with the government to meet the Sustainable

Development Goals (GSDs), which include delivering "affordable, reliable, sustainable, and modern energy for all," is embodied in this 100% electrification scheme (Goal-07).

To carry out its mission of "my village-my town," BREB is also collaborating with the current administration. Through the construction of 5, 38,000 kilometers, it has already connected roughly 3.2crore users to electricity. A total of 13 million beneficiaries who live in the BREB's service region have benefited directly or indirectly from distribution lines up to this point. The percentage of those with access to electricity has improved from 28% to 99.5% over the past 12 years of the current government's rule.

System loss has dramatically decreased throughout this time, going from 18% to 9.67%.

Alongside the residential connection, the 80 PBSs of BREB have provided connections to 2,16,962 small industries, 15000 medium industries, 490 large industries, 08 EPZs, 3,87,891 irrigation pumps. Besides, through the ongoing project named “translating Electricity Supply into Improvements of Rural Household”, it has trained 2,700 rural people to turn them into entrepreneurs and 33% of the participants are women.

1.4 Palli Bidyut Samity

The Rural Electrification Board was formed in 1977 from the Electricity Development Board to distribute the electricity produced at all levels in Bangladesh. These Rural Electricity Boards conduct their activities through locally formed Rural Electricity Societies called PBS for specific areas. This PBS is based largely on the rural electric cooperative model of the United States governed by the Cooperative and Consumer Ownership Act. BREB never generates electricity they mainly purchase electricity from national grade and BPDB at 33kv voltage level. This purchased power is supplied by BREB to their eighty PBSs and customers.

FUNCTIONS OF PBS

- Consumer connection
- Substation and line maintenance.
- Consumer complains handling.
- Decide on line extension.
- Motivate people.

Purchase & sale of electricity.

Tariff setting in consultation with BREB.

1.5 Madaripur PBS

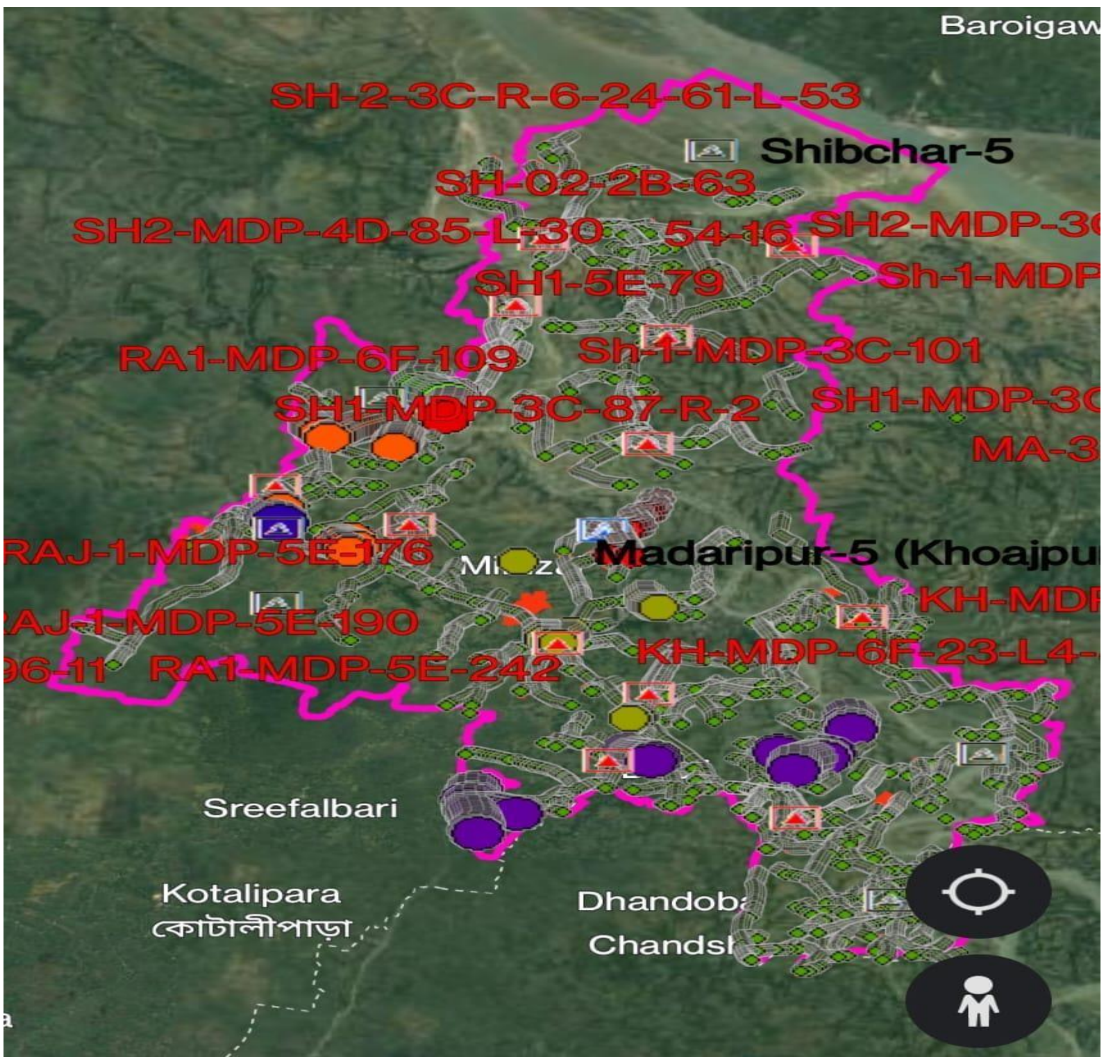
Madaripur Palli Bidyut Samity has been a key player in the agricultural, industrial, and socioeconomic development of Madaripur District since its founding in 1985. The Madaripur Palli Bidyut Samity's Rural Electrification Program has made significant strides in the socio-economic structure development of rural communities throughout the Madaripur District and the country of Bangladesh. It has a considerable and long-lasting effect on rural economic and commercial activity, industrialization, and agricultural growth. It is a consumer-owned organization built on cooperative principles that distributes electricity to its members on a no-loss, no-profit basis for the mutual benefit of all of its members.

website	http://pbs.madaripur.gov.bd
Registration Date	15-01-1985
Date of Energization	12-12-1985
OFFICES :	
a. ZONAL OFFICE	3
b. SUB-ZONAL OFFICE	1
c. COMPLAIN CENTRE	14
d. SUB-STATION (33/11 KV)	11
TOTAL AREA	1104 Sq. km
a. Upazila	5
b. Union	63
c. Village (all electrified)	1123
Total Line Constructed (electrified)	5725.258 km
TOTAL CONSUMER	364557
a. Domestic	325813
b. Commercial	24935
c. Industry	168
d. Irrigation	4036
e. Charitable institution	7051
f. Street light	1515
g. Others	508
Rate of Connection	100%
Maximum Demand	67MW
% System loss	11.73%

Electricity purchased (feb2022)	21654417kwh
Electricity sale (feb2022)	21643184kwh
Electricity purchased (TK)	85635430tk.
Electricity sale (TK)	133949006tk.

1.5.1 Geo Map of MPBS

Madaripur PBS covers o total area of 1104 Sq.km in Madaripur Sadar, Kalkini, Tekerhat, Dasar and Shibchar upazilas of Barisal divison. Total electrified line is 5725.258 km.



1.6 Objective

In this chapter we have discussed the origination, activities and constructive objectives of various electricity distribution institutions. Apart from this, we have highlighted the types of distribution organizations and their scope. It is very important to identify guidelines on how organizations can deliver electricity to consumers at a fair and transparent price through proper management of their operations. The following costs may be referred to for exact pricing of distributed energy:

- Cost associated with the power losses.
- Cost caused by system congestion.
- Fixed cost of the power system.

Our study's primary goal is a modest attempt to identify any energy supply error or gaps that might help the rural electrification board's supply become more established. And also how to be more smooth in maintenance work.

1.7 Methodology

We were aware that there were no established approaches or methodologies in this area of socioeconomic research both throughout the course of our study and after conversations with representatives of the power division of the Department of Rural Electrification. In fact, it is unlikely that any technique other than a very broad one could be devised given the particularity of the places under study and the dearth of pertinent data. The concepts, definitions, and challenges we found in our approach to the study are therefore described in greater length than is customary in the hopes that these descriptions will be helpful in future research. For industry and home energy consumption policies, we present several reform alternatives and suggestions. Losses are significant because they come at a financial and environmental cost. The goal of this research is to establish a methodology or model based on the System Dynamic Approach to increase the amount of energy that is available at reasonable rates so that everyone can use contemporary energy to meet their fundamental needs. to increase energy efficiency, reduce waste, and make energy sources more environmentally friendly in order to reduce the total growth of energy consumption. Currently, BREB operates 80 Palli Bidyut Samity rural electric cooperatives (PBS). I decide to use the Madaripur PBS for my research. I obtained some primary data from BREB, BERC, and Madaripur PBS.

CHAPTER 2

LITERATURE REVIEWS

2.1 Literature review

In the present industrial revolution era, the social and economic development of people, the progress of industry and above all the way of life of people are very much dependent on energy. This electricity is currently traded internationally and the effects of its use affect everyone in the world. Scientists predict that huge amount of energy will be needed in the future due to huge population growth and industrial development. A developing country like Bangladesh needs an efficient energy system to ensure low cost power generation and maximum utilization. This paper will help to highlight some of the factors affecting energy production, energy distribution, energy consumption, energy loss and cost of energy production.

According to Paul Cook, rural electrification has emphasized their development through the use of energy for constructive purposes and the eradication of poverty. However, there hasn't been much progress in electrifying remote rural areas. He provides a critical analysis of the economic and social factors driving rural electrification development. To make rural electrification more possible and cheap as well as for ancillary services, the right institutions must be in place.

According to Helene Ahlborg and Linus Hammar, Mozambique and Tanzania have extremely low rates of rural electricity. Effective rural electrification through grid-extension and off-grid installations faces substantial obstacles. The main drivers are political aspirations based on expected demand growth. The major reasons for the difficulties include the difficulties in planning and donor dependence, the tiny rural markets, the lack of interest from the private sector, and more technical problems.

According to Michael Pollitt and Patooraj Jamasb , calculating the marginal costs of quality can help energy regulators create more effective incentive programs for distribution network utilities that will encourage them to maintain the highest possible quality standards and minimize welfare losses. They implement this methodology to the case of the UK electricity distribution networks.

They discover that performance has improved as a result of the incentives utilities received to urge them to cut back on network energy losses.

The Residential Energy Consumption Survey (RECS), according to Heather Orr, Thomas F. Sanquist, and Bin Shui, identified five lifestyle traits that indicate social and behavioral patterns connected to the usage of TV, computers, laundry, and air conditioning. It is possible to identify answers using multiple regression analysis that explain around 40% of the fluctuation in electricity demand over the period of two years. About 50% more of the local power price fluctuation is taken into consideration as a result of the household and market income variables.

Energy poverty is a well-established notion among energy and development specialists, as Hussain A. Samad and Shahidur Khandker noted. They utilize a demand-based method to define the energy poverty line as the point at which energy consumption starts to rise with increases in household income. In contrast to 45 percent of rural Bangladeshi households who lack sufficient funds, the study finds that 58 percent of them lack access to energy. The findings also suggest that programs to promote rural electrification and the use of modernized biomass stoves could contribute to a reduction in energy poverty.

According to Manfed Dennis and MD. Alam Hossain Mondal, in order to plan the expansion of electricity supply system in a certain area, there must be an idea of the future electricity demand of that area. The degree of industry reorganization and technological advancement gradually increases in the low to high GDP growth scenarios. The study also contrasts Bangladesh's expected per-capita power consumption with the historical expansion in a number of other emerging nations. The planners of Bangladesh's power system expansion to accommodate the country's high future demand may become more knowledgeable as a result of such an examination.

However, this paper presents more emphasis on the needs of family-oriented residential areas. However, some studies analyzing industrial, agricultural irrigation and commercial demand are also reviewed.

CHAPTER-3

SOCIAL IMPACT OF BREB

3.1 Introduction

For any significant change in rural life patterns to occur, infrastructure expansion in rural regions is necessary. We had little facilities built for the rural population prior to our freedom in 1971. Virtually no opportunities existed for the government to expand the distribution network on a large scale. In order to accelerate work toward the development of a distinct organization responsible for powering rural areas, the Rural Electrification Directorate (within the Power Development Board) was founded in 1972. The feasibility of providing electricity to every single rural home and other rural establishment was studied by NRECA in 1976. In order to tackle efforts to slow down changes in rural living patterns, the Rural Electrification Board was established.

As a result of the program's approximately 461 thanes of the country it has reached over the past 28 years, it has become one of the most important developmental activities. Many families who were previously in total darkness have now found light thanks to the program. They now have a modern perspective and are no longer bound by hunger, malnutrition, or poverty. Many households have moved near the rural properties thanks to electricity. Some of them have fresh ideas in the industrial and agricultural sectors on their minds. Rural families and youth now have employment thanks to rural electric societies. A total of eight thousand people employed by various construction companies and consulting firms are employed under this organization to ensure that the required manpower and materials are available at any moment. As a result, the social security of rural people today has increased, discipline has improved and they are accustomed to good work.

The mass education program's expansion has significantly raised the literacy rate in rural areas. After the day's labor is done, low-income workers can enroll in night classes. Additionally, they can sit next to the kids and watch over their academic progress. Due to the arrival of new consumer goods including fans, refrigerators, televisions, radios, and cassette players, rural living patterns have changed. In the form of sanitation, civic facilities, health care and regular education, as well as improved economic conditions, villages are undergoing a type of urbanization activities. People are now aware on the most recent sports, cultural, and political developments thanks to television. People become familiar with the world as a result of the satellite expanding it before their eyes, ensuring early socialization. Women now have less job to do, and they have more time to watch TV, listen to the radio, and help their kids with their schoolwork. Access to resources, wage/employment equality between men and women, the eradication of child trafficking, the use of family planning at one's discretion, and the freedom to vote in rural elections have all sped up other development initiatives. In order to support government initiatives for poverty alleviation and human development, a large number of new NGOs and human development agencies have expanded their activity in isolated rural areas. Through the use of electricity, NGOs support a range of human efforts, such as the growth of handicrafts and cross-cultural interactions.

3.2 Specific Objective

The main aim of this study was to highlight the social and economic impact of rural electrification program in Bangladesh. The specific objectives of this study were in accordance with the terms of reference and general objectives.

- To develop the Rural Electrification Program's economic and social impact evaluation study, which includes reaffirming direct (intended) objectives and identifying broader (indirect) impacts of REP, establishing effect indicators, locating pertinent testable hypotheses, and developing an appropriate procedure.
- To evaluate how the Rural Electrification Program has affected several aspects of human development, with a focus on gender development, poverty reduction, and standard of living.
- To evaluate the impact of Rural Electrification Program on industrial development.
- To assess the impact of Rural Electrification Program on the develop commercial activities.
- To evaluate the impact of Rural Electrification Program on the various dimensions of irrigation and agriculture.
- The above objectives are in line with the government's energy policy and to present logically sound recommendations by considering experimental negative impacts, particularly to reduce rural poverty through rural electrification and accelerate sustainable development.

3.3 Impact on Irrigation and Agriculture

By providing quality and sustainable electricity at a fair price, the Rural Electrification Program has played a significant role in achieving food self-sufficiency in the region through the use of productive and efficient irrigation equipment and other necessary equipment in agriculture and has created employment opportunities in the area. Generally electrically powered irrigation equipment is more dependable than diesel-powered counterparts. Efficiency and energy consumption of electric operated machinery and equipment is three quarters higher than diesel powered machinery and equipment. The nation’s rural areas, the electrification of irrigation machineries has resulted in the creation of more than 100,000 extra jobs throughout the year, providing two employer people for about more than six months. Electrified irrigation has specific advantages over other methods of irrigation because it uses more acreage and produces more crops, and because its operating costs (including breakdowns and related issues) are lower than those of diesel equipment.

- Electric-powered equipment is more efficient then diesel-powered equipment.
- Providing electricity connections has signaled a revolutionary change in agriculture. Electric pumps are 24% more efficient and cost effective in irrigation activities. One third of the country’s agricultural land is now covered by electric pumps and it is gradually increasing. As a result, farmers are benefiting by increasing agricultural production in the country as well as reducing production costs.

3.4 Educational Impact

As a result of electrification of an area, the economic development of the people in the area also increases the education rate. It is observed that the overall education rate of men and women in electrified households is higher than that of non-electrified households. Electricity plays an important role in improving the quality of education. As the children of electrified families get more time to study after sunset they can also provide adequate light and fan ventilation for comfort. They can also increase their knowledge by watching educational programs through television and radio. As a result of electricity fires, financially well-off family members can devote more time to supporting their children's education. If the family income increases as a result of electricity, the family can afford to increase the expenditure on education, as a result, a significant change can be observed in the number of children in the final examination, increase in school drop-out attendance, etc. Additionally, there was less of a literacy gap between the wealthy and the poor in electrified houses than in non-electrified ones.

3.5 Impact on Electronics and social Media

The impact of electrification in a particular area increases the prevalence of electronic media and social media in that area. Also the communication system improves. Because the people of the area are aware of the various conditions of the country and can quickly be aware of the rules and regulations and administrative instructions set by the government. Also through social media can raise their issues and promote overall activities including business and commerce. The electrified area has demonstrated a significantly more forward-looking tendency in their economic strengths as indicated by an improvement in the situation of people's assets.

3.6 Impact on Gender Dimensions

Today, the participation of women in every field of the world has increased significantly. Increasing women's education rate, creating women entrepreneurs, ensuring women's social status, eliminating gender discrimination and women's predominance in various awareness activities are key to the development of the present society. These issues have been accelerated by the expansion of electricity supply.

In addition, women's freedom of decision-making, freedom of earning and saving money, awareness of gender inequality, doing household chores according to benefits, reducing inequality in health care and participation in social work, sustainable power development plays a significant role. Electrification has also increased the prevalence of electronic media which has given impetus to various mass awareness campaigns and activities such as compulsory education for both boys and girls, priority of sending girls to school and other issues such as not marrying girls below 18 years and boys below 21 years. The increase in the use of electricity has led to an increase in the use of machinery and equipment in factories, resulting in a reduction in labor in the overall activity, so men as well as women are getting opportunities in productive work.

Electrification has impact on women's empowerment, women's contribution to poverty alleviation and increase in family status of women. Because electrification creates an enabling environment for economic growth and rationalizes electricity provision to ensure quality of life. Ensuring electricity supply at the household level provides extra time after sunset resulting in more learning opportunities and ensuring better use of time, participation in new activities along with old activities at extended intervals thereby improving quality of life and ensuring equal rights for women and men in the family. As a result, the overall gender gap narrows.

Comparing the time allocation patterns for electrified family members before and after electricity revealed higher time allocation for activities like making money or watching TV. Reduced home chores for female family members and a narrower gender gap in daily average study time are both strong indicators of enhanced gender status in electrified households. It can be concluded that in order to ensure better use of time after sunset through optimal allocation across diverse activities, energy provision at the household level will be essential.

3.7 Impact on Rural communication

As electrification improves the education, economy, agriculture and quality of life of an area, it also improves communication in rural areas. Electricity plays an important role in infrastructure development of rural areas, construction of roads, communication with the outside world, etc.

3.8 Summary

Finally we can say that rural electrification has brought infrastructural changes in rural areas. The quality of education in the region has increased, the communication system has improved, the standard of living of the people has improved and the economic transformation of the people has been achieved. Before electrification, most of the people were involved in agriculture, but now they have set up various businesses and factories. As a result, employment has been created for the people of the region, gender inequality has been eliminated and the social status of all has increased.

CHAPTER-4

IMPORT ENERGY OF MADARIPUR PBS

4.1 Introduction

Lack of electricity is one of the major problems in our country. With the increase in population and progress in industry and commerce, the demand for electricity is increasing day by day. In such a situation, it is very important to increase the generation of electricity, increase the transmission and transportation capacity and bring the entire population of the country under the power of electricity to meet the electricity needs of the devotees and for the economic liberation of the country. It is also essential to ensure an effective and efficient management. For that purpose, the government of Bangladesh works to generate and distribute electricity through various public, private and autonomous institutions. Palli Biddyut Samity conducts the most activities among the electricity distribution institutions. In this chapter we will try to discuss the amount and cost of electricity import of Madaripur PBS.

4.2 Important Terms of Energy Import

4.2.1 Grid System:

The large network used to transport high power from power generation plants to various substations is called a grade system. Transmission lines can be single circuit or double circuit for transporting more power. On the basis of operating voltage, the transmission line is divided into two parts:

Primary transmission and secondary transmission.

4.2.2 Substation:

An electrical generation, transmission, and distribution system includes a substation. Substations conduct a number of additional crucial tasks in addition to converting voltage from high to low or vice versa.

4.2.3 Kilowatt-Hour (KWh):

1000 watts of electricity used for one hour is considered as one kilowatt hour. Usually one kilowatt hour of electricity is expressed as one unit of electrical energy.

4.2.4 Peak Demand:

Simply said, the highest demand that has happened over a certain time period is the peak demand for an installation or a system. Peak demand is frequently described as seasonal, daily or annual, and it has a power unit. Peak demand, Peak load, or On-peak are phrases used in energy demand management to describe a time when it is anticipated that electrical power will be supplied for a prolonged duration at a level that is noticeably greater than usual.

4.2.5 System Loss:

The importance of the system in the progress of the electrical system of the country is immense. It is not possible to achieve certain goals unless this system is reduced today. The loss of equipment including the own consumption of the generating station, the loss due to the resistance of the transported cable and other types of technical and technical waste. In the case of distribution companies, the ratio of total imported electricity to the difference between the total imported electricity and the bill collected from the customer is called the system of the distribution company. The system today is usually expressed as a percentage.

$$\textbf{System Loss(\%)} = \frac{\textbf{Energy Input to feeder (Kwh)} - \textbf{Billed Energy to Consumer (Kwh)}}{\textbf{Energy Input (KWh)}} \times \textbf{100}$$

4.2.7 Load Factor:

The ratio of the average load and peak load of a power system at a given time is called load factor. Higher value of load factor is better.

$$\textbf{Load Factor} = \frac{\textbf{Total Unit KWh(Purchase)}}{\textbf{Total Peak Demand} \times 1000 \times 24 \times 30} \times \textbf{10}$$

4.3 Import Energy Data Analysis of Madaripur PBS

Energy import of MPBS (2021-2022)

September'21		
Import point	Energy(KWh)	Purchase cost(Tk)
BPDB	36172236	2,69,59,960
BPDB Resale	297372	
Power purchase without resale	35874864	

October'21		
Import point	Energy(KWh)	Purchase cost(Tk)
BPDB	34351763	2,55,90839
BPDB Resale	298750	
Power purchase without resale	34053013	

November'21		
Import point	Energy(KWh)	Purchase cost(Tk)
BPDB	21864011	1,63,01,151
BPDB Resale	172526	
Power purchase without resale	21691485	

December'21		
Import point	Energy(KWh)	Purchase cost(Tk)
BPDB	22310280	1,66,34,658
BPDB Resale	175006	
Power purchase without resale	22135274	

January'22		
Import point	Energy(KWh)	Purchase cost(Tk)
BPDB	23160732	1,57,22,365
BPDB Resale	142352	
Power purchase without resale	12003521	

February’22		
Import point	Energy(KWh)	Purchase cost(Tk)
BPDB	21395892	1,59,66,550
BPDB Resale	149651	
Power purchase without resale	12146241	

March’22		
Import point	Energy(KWh)	Purchase cost(Tk)
BPDB	30865325	2,30,15,518
BPDB Resale	239220	
Power purchase without resale	30626105	

April’22		
Import point	Energy(KWh)	Purchase cost(Tk)
BPDB	40935482	3,05,26,905
BPDB Resale	314184	
Power purchase without resale	40621298	

Bangladesh Power Development Board buys electricity directly from all power generating companies in Bangladesh and they sell power to all distribution companies. According to the demand of Madaripur Palli Biddyut Samity and their consumers, Bangladesh imports electricity from available development board and also from private sector as per convenience. And Most of the power transmitted by PGCB. After purchased the power MPBS change the power range by their substation. Then the power is sold among the consumer according to their demand.

4.4 Substation of Madaripur PBS

Substation are built between power generation plants and consumers. Where electricity is received through multiple feeders with the help of various electrical appliances and converted into different voltages with the help of transformers. Also power factor, frequency, AC to DC conversion is done with the help of substation.

33/11KVA, 20MVA substation, Kalkini, Madaripur

Madaripur PBS has a total of 14 sub-stations to control power supply in the area under its jurisdiction. These substations are connected to different grids.

There are-

1 substation of 25MVA

3 substations of 20MVA

1 substation of 15MVA and

9 substations of 10MVA

Electricity distribution company sub-stations mainly receive electricity from the national grid and supply it to specific areas by changing the voltage level according to the customer's demand. Also through this substation the electricity supply of certain area is switched on and off and the quantity of electricity supplied and electricity demand of the area is known. The substation rating is determined based on the area size, amount of industrial plants, transmission distance, number of customers and customer demand. Below is the list of all substation names and power rating of Madaripur Palli Biddyut Samity.

Madaripur 1- 25MVA	**Shibchar 1-20MVA**	**Rajoir 1- 20MVA**
Madaripur 2- 10MVA	**Shibchar 2- 10MVA**	**Rajoir 2- 10MVA**
Madaripur 3-10 MVA	**Shibchar 3- 10MVA**	**Rajoir 3- 10MVA**
Madaripur 4- 10MVA	**Shibchar 4- 10MVA**	**Kalkini 1- 20MVA**
Madaripur 5- 15MVA		**Kalkini 2- 10MVA**

4.4.1 Transformer

A transformer is an electrostatic device that transfers electrical energy by means of electromagnetic induction without any electrical connection between the coils without changing the frequency and power. The maximum rated transformer of Madaripur PBS is 10MVA (Madaripur 1) and the minimum rated transformer is 2.5MVA (Shibchar 2).

10/14MAV transformer (33/11 indoor substation, Maispara,Kalkini-2,MPBS)

4.4.2 Feeder

Feeder is a non-tapping electrical line used to supply power from grid substation to various load centers for power distribution in populated areas, industrial areas or residential areas. The current density is the same throughout the length of the feeder. Basically feeders are designed based on current capacity.

Here we discuss about 33/11KVA,20MVA Kalkini-1 substation of Madaripur PBS:

Feeders name	Rated KV	Supply KV
Feeder-1	2.5MW	1.5MW
Feeder-2	2.5MW	2.2MW
Feeder-3	2.5MW	1.4MW
Feeder-4	2.5MW	1.7MW
Feeder-5	2.5MW	1.8MW

4.5 System Losses

Name of the Month	System Loss (%)
September	4.14
October	5.76
November	1.01
December	11.85
January	0.29
February	4.33
March	16.65
April	19.57

From the above table we can see that the system loss is slightly less in winter but increases manifold in summer. Most of the total losses in an electrical system depend on temperature. Since the temperature is relatively high during summer, overall losses also increase during this period. Also, non-technical losses such as illegal power connections, incorrect billing and bill waivers by influencers can increase the total loss amount.

4.6 Load Factor

The ratio of the average load to the peak load of an electrical system over a period of time is called the load factor. That is, the load factor is the ratio of the power used in that system to the maximum load at a given time. Through load factor we can identify the maximum load consumed by the system for a particular period and the average value of the total load consumed over that entire period. A higher value of load factor is better. It maintains consistency with the average load value of the entire period and the peak load value of the particular period. Madaripur PBS has limited their load factor value between 37 percent to 42 percent. Even if the value of load factor is high in some months, it is very important to keep it within the specified limits at the end of the year.

4.7 Summary

The success of the power sector depends on the proper distribution of the generated power. Proper management and impartial operation of electricity distribution companies will enable them to work more efficiently, which will encourage private power generation companies. As a result, it will be easy to achieve the target of meeting the total electricity demand of the country. For this purpose, the Bangladesh government, local government administration and private owned power generating companies are working continuously. In this chapter we have highlighted the power import and distribution process of Madaripur pbs and various types of losses and ratios. Through the said discussion we can say that Madaripur PBS energy import and distribution system is more effective and advanced than other PBSs.

CHAPTER 5

THE CONSUMERS OF MADARIPUR PBS

5.1 Introduction

Electricity has become one of the main needs of people. Currently, all necessary activities such as production, transportation, communication, comfort, agriculture, etc., are impossible without electricity. Basically, every aspect of life is now dependent on electricity.

5.2 Classification of Consumers

Each PBS divides its total customers into different segments and supplies electricity through separate feeders. Basically customers are segmented based on energy demand and energy consumption. Below is the classification of customers of Madaripur PBS:

5.2.1 Commercial Consumers

All the supplies that are given to different types of commercial establishments are considered as commercial customers. Although commercial customers are supplied from single phase lines like domestic customers, the demand of commercial customers is higher than that of domestic customers.

Customers who are considered as commercial customers are government and semi-government offices, various commodity shops, private clinics, community centers, cinema halls, mobile towers, petrol pump stations, hatt bazaars etc.

5.2.2 Domestic type Consumers

All the connections provided in residential premises are called domestic customers. Here electricity is mainly used to operate household appliances. These consumers are classified based on the amount of unit energy consumed. These consumers are supplied from single phase line and generally 230 volt supply. These domestic customers are further divided into eight categories which are-

- Minimum KWh
- 0-50 KWh
- 0-75 KWh

- 76-200 KWh
- 201-300 KWh
- 301-400 KWh
- 401-600 KWh
- Above 600 KWh

5.2.3 Irrigation Consumers

Generally, water pumps used for irrigation purposes in agriculture are considered as irrigation consumers. These consumers are supplied with electricity from both three phase and single phase lines.

5.2.4 Charitable Institute

Public service institutions which are run on the basis of donations from various public or private institutions are called charitable institutions. If the charity's bill is unpaid, it is recovered from the managing body.

Organizations that are considered charity customers are orphanages, madrasas, schools, colleges, mosques, temples, clubs, pagodas, chargés, charitable hospitals, rehabilitation centers, old age homes and other general charities.

5.2.5 Large power

This customer category includes small manufacturing industries, army air force and naval bases, police stations, camps, government and charitable hospital complexes, government office complexes, religious and educational complexes and industrial and commercial complexes. Generally PBSs provide supply to such customers from High transmission metering or HT metering where the voltage level is 400/11000 volt and the power supply will be the same as general power consumers.

5.2.6 33KV Consumers

Generally, large industrial plants and universities are considered 33 KV customers. Such customers have their own or a separate substation is arranged for them. There is no customer of 33 KV in Madaripur Palli Biddyut Samity.

5.2.7 General power

This customer category includes small manufacturing industries, army air force and naval bases, police stations, camps, government and charitable hospital complexes, government office complexes, religious and educational complexes and industrial and commercial complexes. Generally PBSs provide supply to such customers from low transmission metering or secondary metering where the voltage level is 230/400 volt and the power supply is 50 kW.

5.3 Street Lights

Generally, the electricity used for lighting the roads of the area under the management of local governments such as Upazila Parishad, Municipalities and Union Parishad are included in this category. It is a public service system managed by the local government for the people of the area.

5.4 consumers List

All consumers of Madaripur PBS are divided into different categories based on their consumed load. Below is the list with number of consumers of all categories:

Consumer category	No. of consumers
Domestic	325813
Commercial	24935
Irrigation	4036
Charitable Institute	7051
Industry	1515
Street Lights	168
Others	508

5.5 Summary

Madaripur Biddyut Samity is failing to collect its desired revenue due to lack of proper information provision and verification of customers. Different prices are fixed for different customers. So it is very important to correctly categorize the customer with the right needs. However, Madaripur Palli Biddyut Samity has reduced customer classification errors as compared to earlier and has achieved most of the desired revenue collection.

CHAPTER 6

PF CALCULATION ACCORDING TO REB

6.1 Introduction

It is very important to keep the value of power factor fixed at a certain value for sustainable power supply. If the power factor falls below the specified value, the entire distribution system will suffer a major loss. Also the amount of loss will increase suddenly. Power factor is the ratio of active power to apparent power of the system. As per BERC guidelines the power factor of BREB is fixed at 0.95. If the value of power factor falls below a certain value due to any reason, it is increased by adopting various methods like using capacitor banking, synchronous motor etc.

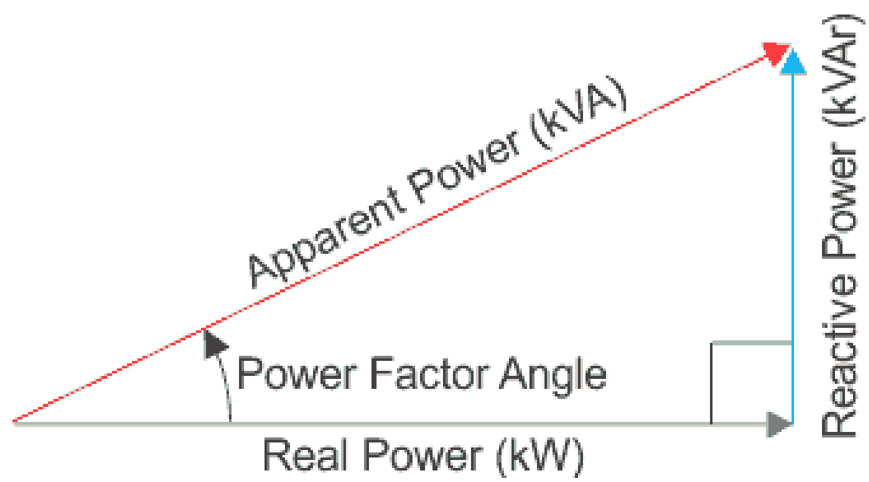


Fig 6.1: Relation between different kind of PF

From the above figure we can get a clear idea of the three types of relationships. A power or real power is denoted by P, reactive power by S and apparent power by Q.

Mathematically, $S^2=P^2+Q^2$

6.2 Power Factor Calculation

We use watt meter to measure the active power of the line and volt meter and ammeter to measure the supplied voltage and current respectively.

Now,

We know

P = VICosθ W

From this Cosθ = $\frac{P}{VI}$

Thus we can determine the power factor and calculate the value of the reactive power of the system with the value of the power factor.

Formula is Q =VISinθ VAR

And can supply by setting up capacitor banks accordingly. So that our original power factor value remains constant.

6.3 Power factor adjustment

6.3.1 Domestic (House-hold) Applicability

50 cycles are applicable for single phase and three phase consumers as per Rural Electrification Board regulations. Household appliances such as TV, fridge, lights, fans and water pumps up to 1.5 HP fall under this category of customers.

6.3.2 Commercial Applicability

50 cycles are applicable for single phase and three phase consumers as per Rural Electrification Board regulations.

Customers who are considered in this category are government and semi-government offices, various commodity shops, private clinics, community centers, cinema halls, mobile towers, petrol pump stations, hatt bazaars etc.

6.3.3 Charitable Institution Applicability

50 cycles are applicable for single phase and three phase consumers as per Rural Electrification Board regulations.

Organizations that are considered charity customers are orphanages, madrasas, schools, colleges, mosques, temples, clubs, pagodas, chargés, charitable hospitals, rehabilitation centers, old age homes and other general charities.

6.3.4 Irrigation Applicability

50 cycles are applicable for single phase and three phase consumers as per Rural Electrification Board regulations.

Generally, water pumps used for irrigation purposes in agriculture are considered as irrigation consumers.

6.3.5 General Power

50 cycles are applicable for single phase and three phase consumers as per Rural Electrification Board regulations. This is applicable for 50KW connected load.

Generally PBSs provide supply to such customers from low transmission metering or secondary metering where the voltage level is 230/400 volt and the power supply is 50 kW.

Customers who are considered in this category:

- All types of industries and industrial complex.
- Government office complex.
- Government and charitable hospital complex.
- Charitable, religious and education complex.
- Small Industries related to production or fabrication.
- Union Paribar Kalian Kendra.
- Cantonment, air, naval base/installation etc.
- Police station, Camp, Outpost etc. and BDR Camp, BOP Installation etc.

6.3.6 Large Power

50 cycles are applicable for single phase and three phase consumers as per Rural Electrification Board regulations. This is applicable for 50KW connected load. Generally PBSs provide supply to such customers from High transmission metering or HT metering where the voltage level is 6600/11000 volt and the power supply will be the same as general power consumers.

Customers who are considered in this category:

- All types of industries and industrial complex.
- Government office complex.
- Government and charitable hospital complex.
- Charitable, religious and education complex.
- Small Industries related to production or fabrication.
- Union Paribar Kalian Kendra.
- Cantonment, Air, Naval base/installation etc.
- Police station, Camp, Outpost etc. And BDR Camp, BOP Installation etc.

6.4 PF correction multiplication factor

By raising actual KWh consumption, that is, by multiplying actual KWh consumption in meters by the aforementioned power factor correction (PFC) Multiplication factor, the power factor will be corrected or adjusted. The consumer will be charged for the actual consumption (KWh) as per meter reading if the P.F. at the consumer end is greater than or equal to 0.95. It will occasionally be modified on BERC's orders.

6.5 Power Factor Correction Example

Let's say, the average power factor is 0.81 of a factory but the permissible power factor for that factory is 0.95; in that case,

PF correction $= \frac{\text{Allowable power factor}}{\text{Average power factor}} = \frac{0.95}{0.81} = 1.17$

We are aware that, if the power factor adjustment value is higher than 1, we will pay an additional charge.

Let the industry consumption unit is 1000KWh.

So, Billing Unit = Power factor correction ×Consumption Unit

= (1.17×1000)

= 1170 KWh

Therefore, an additional PF correction billing unit = (1170-1000) KWh.

= 170 KWh

If the per-unit rate is 10 Taka, the additional amount is = (170 x 10) Tk,

= 1700 Tk.

The power factor penalty is computed during this process.

6.6 The Benefits for high power factor

- Power loss and voltage drops of motor’s wire are decreased.
- Motor work’s without interval when voltage drop are less and motor’s lifetime are increased because of less temperature of the motor.
- If voltage drops are less then system loss also less.

- A lower loss in the motor wiring system results in a lower kilowatt-hour usage.
- The instruments efficiency is increased with feeder capacity.

The establishment of defined size Capacitor/auto PFI is recommended by the committee linking all types of irrigation and industrial motors. If the power factor falls below 0.95, a penalty is levied with the monthly charge in accordance with PBS regulations. Therefore, all consumers as well as PBS will gain if we employ fixed size capacitors or auto PFI to increase the power factor.

6.7 Difficulty of low power factor

- Line loss increases due to lagging current.
- Power loss increases.
- Line regulation is impaired.
- It takes more copper.
- Cost is increases.

6.8 Summary

Power factor is an important part in electrical energy. Improvement of power factor is reducing the losses and increase life of the machine. Power Factor Penalty is a way to save the unwanted losses of energy. It helps to bind the consumers to maintain standard Power Factor. P.F. Penalty can recover the financial losses not the mechanical losses. So consumers, using large amounts of inductive load, have to improve and maintain their P.F. at the standard level.

CHAPTER 7

MAINTENANCE AND PURCHASE COST

7.1 Introduction

Cost calculating is very important in every business where profit and loss calculating comes into play. The profit and loss account of the electricity supplier has to be kept. The cost of electricity is what a person pays for generating, distributing and using electricity. Electricity is the main source of every work in the world, so it is very important to determine the correct price of electricity to provide electricity at a fair price for the socio-economic development of every country.

7.2 Bulk rate

Bangladesh Power Development Board all the government power generating companies of the country produce electricity through it and sell it to distribution companies at bulk rate. BERC fixes different rates for this electricity in different areas. Sometimes distribution companies directly purchase electricity from private generation companies at lower prices than fixed bulk rates.

7.2.1 Wheeling Charge

Distribution businesses pay wheeling fees to PGCB. For the purpose of expanding its business, the corporation has undertaken infrastructure development projects. PGCB needs to be paid at greater rates than what it currently receives from the distribution firms in order to finance new investment and assure proper maintenance of its existing assets. At the level of the bulk supply, it is clear that losses are mostly caused by the cost of purchasing from rental power plants. A more thorough examination of supply and losses at various voltage levels and to the various bulk purchasers will be necessary for the precise measurement of losses.

The short-term generating strategy needs to be addressed more urgently so that the grid can access power at a cheaper cost. Given the roles played by the public and private sectors in the generating process, it is advised that, in the medium to long term, a concerted effort be made to create a competitive dispatch regime for electricity generation through a cooperative pool in order to increase competitiveness. Cross-subsidies between the various client categories occur at the retail level.

7.2.2 Electricity Purchase Cost

The purchase price of electricity is determined by combining the purchased price of electricity and the bulk price attached to it and its transportation fee. Distribution companies like Palli Biddyut Samity pay the bulk price of the power purchase price to the generation company and transport costs to the transmission company as wheeling charges. Madaripur Palli Biddyut Samity pays the bulk price of its power purchase price to Bangladesh Power Development Board and private power generation companies and pays the transportation cost to PGCB as wheeling charges.

7.3 Important Expenses Terms

7.3.1 Administration and General Expenses (AGE)

A portion of operation and maintenance expenses are administrative and general expenses. Operational expenses fall under this category. Such as general salaries of officers and employees, office supplies and expenses, office relocation expenses, outside services, accident and damage, various types of rent, insurance of property and machinery, purchase and rental of transport, guest entertainment etc. The cost of maintenance of overhead lines and sub stations etc. is treated as maintenance cost.

7.3.2 Tax expenses (TE)

All types of taxes paid are included in this cost like income tax, land and development tax municipal tax etc.

7.3.3 Interest expenses (IE)

Interest payable on loans taken by Madaripur Palli Biddyut Samity from various banks, BREB and other institutions is included as interest expense.

7.3.4 Consumer selling expenses (CSE)

Basically the expenses related to the consumer are identified as consumer selling expenses. Costs that fall under this category are consumer connection cost, consumer data collection and record cost, meter reading cost, field monitoring cost, consumer support cost and sale to freedom fighters.

7.3.5 Depreciation & Amortization Expenses (DAE)

Depreciation cost is the monthly depreciation on all fixed movable assets of the organization and used and useful machinery and equipment. It basically refers to the decline in value of the asset as a result of use. Madaripur Palli Biddyut Samity counts 4% of its assets as idle.

7.3.6 Operation & maintenance expenses (OME)

All operating costs and all maintenance costs are included as OME costs. These costs include customer installation costs, meter costs, overhead line installation and repair costs, substation costs, operation supervision and engineering cost and all kinds of operation and maintenance costs.

7.4 Distribution Cost

Distribution cost refers to the overall cost of delivering electricity to consumers. These costs include distribution company office equipment and operating costs of substations, maintenance costs of all machinery and lines, cost of solving customers' wiring problems, depreciation and system loss costs, duties, income taxes, interest costs and administrative and general costs.

Total Distribution cost = Consumer selling expenses+ Administration & general Expenses + Operation & maintenance + Interest Expenses + Tax Expenses + Depreciation & amortization

Distribution and total supply Cost (September'21-April'22)

Month		Distribution cost (Tk)					
	EC (Tk)	OME	CSE	AGE	DAE	TE	IE
September	141685867	168349522	9964172	7408333	28180347	1735060	6000000
October	134567385	154581247	8038535	5536658	28216767	768010	22442826
November	85636430	107576196	8064993	6360238	28207317	688410	6000000
December	87382566	111797782	8734166	6952052	28383416	426638	6000000
January	84485543	104521551	7562733	6541742	27506332	720416	6000000
February	83787518	105276231	7695843	6493794	28808148	1506020	6000000
March	120887887	144393553	8896220	6262231	29204274	390420	6000000
April	160236706	201354234	17658844	10412807	29498211	452770	34470253

7.5 System Loss (Tk)

To know the exact amount of system loss and calculate the system loss more transparently and accurately, the system loss is calculate in taka.

Madaripur Palli Biddyut Samity had system loss in taka/unit in previous years is 2.11(2019-20), 0.997 (2020-21), 0 .894 (2021-22)

System Loss (Tk/unit) = System loss (Tk/Unit) × Import Energy

7.6 Summery

In this chapter, the thesis formula is used to calculate the revenue, power rate and costs for Madaripur PBS. Loss to the system expressed in taka. Calculated month-by-month in units, total revenue, distribution costs, and system loss. Madaripur PBS discover a significant loss.

CHAPTER 8

COST AND REVENUE CALCULATION

8.1 Revenue

Revenue is the amount of income a PBS earns to finance the operations of a PBS. Revenue also plays an important role in raising investment capital. Madaripur Palli Biddyut Samity tries to earn revenue by keeping the cost to its customers at a minimum.

Energy Purchase, Energy Sell, Distribution cost, Revenue, System loss of energy according to MPBS 550 form (Sep'21-April'22)

Month	Energy Purchase (KWH)	Energy Sell (KWH)	Distribution Cost (tk)	Revenue From Sell Energy (tk)	Revenue From Other Sources (tk)	Total Revenue (tk)	System Loss (%)
September	36172239	34673131	9291139	205410590	6006685	211418275	4.14
October	34351764	32372669	6438668	192724599	5797984	198522583	5.76
November	21864011	21643184	7515535	133949006	5838977	139787383	1.01
December	22310280	19667449	8728996	124091874	17923514	142055388	11.85
January	23160732	23093645	7571921	122723144	4202418	126925562	0.29
February	21395892	20468554	7299075	126774738	5090749	131865487	4.33
March	30858003	25721386	8347214	157527461	6675450	164202911	16.65
April	40931940	32920656	8390697	173632350	2136421	175768771	19.57

Madaripur PBS imports electricity from public and private sector considering the demand of their consumers. They mainly import electricity from Bangladesh Power Development Board and West Zone Power Generation Company Limited which are used to supply electricity to consumers at different levels. In this chapter we will discuss about electricity purchase, sale, distribution cost, revenue, system loss for the month of (September'2021-April'2022). of Madaripur PBS. Also explain about different grids, substations, power received by consumers and supply.

8.2 Revenue from Sales Energy

This category includes income from solely selling electricity to consumers. These sums are being collected from the consumers through their electricity bills. Corresponding energy rate and some other charges and Demand charges are included in this revenue.

8.2.1 Other operating revenue

Other operating revenue is measured as late payment fees, other service fees, other electric revenue and rent for electric property.

8.2.2 Revenue from others

Actually, non-operating margins-Others, Non-operating margins- interest and operating revenue from other sources is what is referred to as "revenue from others".

Revenue from others = Non- operating Margins-Others + Non-operating Margins- Interest + other operating revenue

8.2.3 Total Revenue (TR)

Total revenue is the sum of a PBS's earnings. A PBS receives funding from two different sources. One comes from the sale of energy to users, and the other is income from other sources used for operation.

Total revenue = Revenue from energy sale + Revenue from others.

8.2.4 Non-operating Margins- interest

This part of the revenue account includes interest received on loans taken by employees and interest received on money deposited in banks. Normally Madaripur PBS employees pay 7.5% interest on the loans they take.

8.4 Per Unit Cost Calculation

A PBS calculates daily costs to determine the amount of loss and gain per unit of electricity at a given time. Here we have calculated some cost per unit of Madaripur PBS.

8.4.1 Distribution Cost (Tk/Unit)

Total operational and maintenance cost is including in Distribution cost.

Distribution cost = (Distribution cost/ Import unit)

In September 2021,
Distribution cost (tk/unit)= (9291139/36172239)
= 0.257 tk/unit

In October 2021,
Distribution cost (tk/unit)= (6438668/34351764)
= 0.187 tk/unit

In November 2021,
Distribution cost (tk/unit)= (7515535/21864011)
= 0.344 tk/unit

In December 2021,
Distribution cost (tk/unit)= (8728996/22310280)
= 0.391 tk/unit

8.4.2 System Loss (SL) (Tk/Unit)

The price of each unit in the system loss is calculated as system loss (Tk/Unit).

For January 2022
MPBS had bought 23160732 Unit with 844,85,543 tk and sell of Energy is 23093645 Unit.
System loss (Tk/Unit) therefore in January 2022 is

$$\text{System loss (Tk/Unit)} = \left(\left(\frac{\text{Purchase cost}}{\text{Sell Energy}}\right) - \left(\frac{\text{Purchase cost}}{\text{Import Energy}}\right)\right)$$

$$= \left((84485543\ /23093645) - (84485543\ /23160732)\right)$$

$$= 0.015 \text{ Tk / Unit}$$

For February 2022
MPBS had bought 21395892 Unit with 83787518 taka and sell of Energy is 20468554 Unit.
System loss (Tk/Unit) therefore of February 2022 is

$$\text{System loss (Tk/Unit)} = \left(\left(\frac{\text{Purchase cost}}{\text{Sell Energy}}\right) - \left(\frac{\text{Purchase cost}}{\text{Import Energy}}\right)\right)$$

$$= \left((83787518/20468554) - (83787518/21395892)\right)$$

$$= 0.177 \text{ Tk / Unit}$$

For March 2022
MPBS had bought 30858003 Unit with 120,887,887 tk and sell of Energy is 25721386 Unit.
System loss (Tk/Unit) therefore of March 2022 is

$$\text{System loss (Tk/Unit)} = \left(\left(\frac{\text{Purchase cost}}{\text{Sell Energy}}\right) - \left(\frac{\text{Purchase cost}}{\text{Import Energy}}\right)\right)$$

$$= \left((120887887/25721386) - (120887887/30858003)\right)$$

$$= 0.78 \text{ Tk / Unit}$$

In April 2022 MPBS had bought 40931940 Unit with 1602,36,706 tk and sell of Energy is 32920656 Unit.
System loss (Tk/Unit) therefore of April 2022 is

System loss (Tk/Unit) = $\left(\left(\frac{\text{Purchase cost}}{\text{Sell Energy}}\right)-\left(\frac{\text{Purchase cost}}{\text{Import Energy}}\right)\right)$

$= \left(\left(160236706/32920656\right)-\left(160236706/40931940\right)\right)$

= 0.95 Tk / Unit

8.4.3 Revenue (Tk/Unit)

For January 2022,

The total revenue for MPBS was 126925562 taka, and 21123032 units of energy were imported.

Revenue (Tk/unit) therefore in January 2022 is,

Revenue (Tk/Unit) = (Total Revenue / Energy Import)

= (126925562/23160732)

= 5.48Tk / Unit

For February 2022,

The total revenue for MPBS was 131865487 taka, and 21216856 units of energy were imported.

Revenue (Tk/unit) therefore in February 2022 is,

Revenue (Tk/Unit) = (Total Revenue / Energy Import)

= (131865487/21395892)

= 6.16 Tk / Unit

For March2022,

The total revenue for MPBS was164202911taka, and 30394735 units of energy were imported.

Revenue (Tk/unit) therefore in March 2022 is,

Revenue (Tk/Unit) = (Total Revenue / Energy Import)

= (164202911/30858003)

= 5.32 Tk / Unit

For April 2022,

The total revenue for MPBS was 175768771 taka, and 36090583 units of energy were imported.

Revenue (Tk/unit) therefore in April 2022 is,

Revenue (Tk/Unit) = (Total Revenue / Energy Import)

= (175768771/40931940)

= 4.29 Tk / Unit

8.5 Total supply cost (TC)

Total supply Cost includes the purchase price of electricity and all cost incurred till it is delivered to consumer. This represents a PBS's overall operational costs. In 2021-22 fiscal year MPBS showed about 9291139 Cr(September), 6438668 Cr(October), 7515535 Cr(November), 8728996 Cr(December) taka as their total supply cost, where energy purchase cost was respectively 141685867, 134567385, 85636430, 87382566 Tk.

Total supply cost = Distribution cost + System Loss (Tk.) + Energy Purchase Cost

8.6 Tariff Rate

Bangladesh Energy Regulatory Commission is the name of the regulatory agency that controls and determines the price of electricity, gas and petroleum products in Bangladesh. In short it is called BERC.

This organization published the new price list of electricity, gas and petroleum products in Bangladesh last November 23, 2017. The Bangladesh Rural Electrification Board sets their electricity retail prices according to that list and it has been implemented since December 2017. The new tariff for retail price of electricity fixed by BERC is as follows:

(A) For LT: 230/400V

	Consumer Class	Tk/Unit	Demand Rate/Charge (permitted load/Month)
1	LT A: Domestic		25.00
	0-50 Unit	3.50	
	0-75 Unit	4.00	
	76-200 Unit	5.45	
	201-300 Unit	5.70	
	301-400 Unit	6.02	
	401-600 Unit	9.30	
	Above 600 Unit	10.70	
2	LT B: Irrigation	4.00	15.00
3	LT C: Small Industry		25
	Flat	8.20	
	Off-peak hour	7.38	
	Peak hour	9.84	
4	LT C: Construction	12.00	80.00
5	LT D1: Education, religion, hospital, charitable institute	5.73	25.00
6	LT D2: Street light, Pump, Charging station	7.70	40.00
7	LT E: Office		30.00
	Flat	10.30	
	Off-peak Hour	9.27	
	Peak Hour	12.36	
8	LT T: Temporary	16.00	100.00

(B) For MT: 11KV

	Consumer Class	Tk/Unit	Demand Rate/Charge (permitted load/Month)
1	MT 1: Domestic		50.00
	Flat	8.00	
	Off-peak Hour	7.20	
	Peak Hour	10.00	
2	MT 2: Office		50.00
	Flat	8.40	
	Off-peak Hour	7.56	
	Peak Hour	10.50	
3	MT 3: Industry		50.00
	Flat	8.15	
	Off-peak Hour	7.34	
	Peak Hour	10.19	
4	MT 4: Construction		80.00
	Flat	11.00	
	Off-peak Hour	9.90	
	Peak Hour	13.75	

5	MT 5: General		50.00
	Flat	8.05	
	Off-peak Hour	7.25	
	Peak Hour	10.06	
6	MT 6: Temporary	15.00	100.00

(C) For HT: 33KV

Consumer Class		Tk/Unit	Demand Rate/Charge (permitted load/Month)
1	HT 1: General		40.00
	Flat	8.00	
	Off-peak Hour	7.20	
	Peak Hour	10.00	
2	HT 2: Office		40.00
	Flat	8.30	
	Off-peak Hour	7.47	
	Peak Hour	10.38	
3	HT 3: Industry		40.00
	Flat	8.05	
	Off-peak Hour	7.25	
	Peak Hour	10.06	
4	HT 4: Construction		40.00
	Flat	10.00	
	Off-peak Hour	9.00	
	Peak Hour	12.50	

(D) For EHT: 132KV and 230KV

Consumer Class		Tk/Unit	Demand Rate/Charge (permitted load/Month)
1	EHT 1: General		40.00
	Flat	7.95	
	Off-peak Hour	7.16	
	Peak Hour	9.94	

8.7 Bill Explanation

What should be included on every utility bill?

The electricity bill must always be on a date. The bill will also contain the following information:

- Your Name and Address.
    - Your customer account or reference number (Always quote this when you contact your supplier).
    - The name of your supplier and its contact details.
    - How much you need to pay and when you need to pay by.

More Information about billing:

On a second page of the bill, you can frequently find the following additional comprehensive information regarding how much energy you've used:

- Billing Period – the time frame during which you consumed the energy for which you are being charged.
- Meter Readings– The energy (Kwh) you've consumed is the difference between the most recent reading and the preceding one.
- The amount your supplier is charging you for every Kwh electricity. If you cover a recurring fee you will pay a single rate, which includes things like meter readings and the cost of keeping you connected to the network; if not, you will pay a higher price for a specific amount of units and then a lower rate moving forward.
- Meter Number– You will get readings for two separate meter numbers if your supplier replaced your meter during the billing period.

8.8 Summary

In this chapter we have calculated the revenue and per unit cost of MPBS through various formulas. Earning revenue is very important to sustain all the activities and existence of PBS. Like all other institutions, PBS also calculates and records revenue at regular intervals.

CHAPTER 9

CONCLUSIONS

9.1 Conclusions

In our nation, the cost of electricity distribution is a major concern. Because the cost of distribution and the rate of electricity tariff are tied to the expansion of our economy. The poor in our country suffer greatly when the price of electricity rises. By keeping them in mind, our nation's power tariff rate ought to be low.

Power development in Bangladesh has been given top priority by the government, which is dedicated to producing enough electricity by 2021 for every resident. The government should take action to upgrade our power plant. The generator efficiency rate in our power plant is low. It should be increased to a high value by taking necessary steps.

9.2 Limitations of the Work

There are few limitations I have faced are mentioned below-

- In this report I have presented the partial information of Madaripur PBS. Also I have collected various information from BERC and BREB and included it.
- The Madaripur PBS distribution costs that I calculated are nearly identical to those provided by BERC. The data that are assumptions lead to the small cost difference.
- I analyzed the structure of energy distribution and estimated the distribution costs for various power plants in this thesis. However, the cost of production, transmission, and distribution determines the electric power tariff rate. The transmission and distribution costs must be considered along with the generation costs in order to determine the electric power tariff rate.

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